



**An Annotated Bibliography of MANPRINT-Related  
Assessments and Evaluations Conducted by the  
U.S. Army, 2nd Edition: 1953 to 2009  
Volume II – MANPRINT Assessment and Evaluations**

**by Sam E. Middlebrooks, Ph.D.**

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**ARL-SR-189**

**February 2010**

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## **An Annotated Bibliography of MANPRINT-Related Assessments and Evaluations Conducted by the U.S. Army, 2nd Edition: 1953 to 2009 Volume II – MANPRINT Assessment and Evaluations**

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<b>14. ABSTRACT</b> The term “manpower and personnel integration” (MANPRINT) was coined in 1984 by General Richard H. Thompson, Commanding General of the U.S. Army Materiel Command. MANPRINT became an official directorate in the Office of the Deputy Chief of Staff for Personnel in 1987. In 1991, MANPRINT was expanded to include Automated Information Systems (AIS). This report is the second edition of this document and references 583 MANPRINT assessments and evaluations performed by the MANPRINT community as required by U.S. Army Regulation 602-2 that were conducted by the U.S. Army between 1953 and the date of this report in 2009. New to this edition are 443 reports regulated by Army Regulation 73-1 and produced by the Army test and evaluation (T&E) community from 1979 that address MANPRINT issues. Covering both of these categories are 1026 assessment reports related to MANPRINT reported in this bibliography that are covered under AR 73-1 and AR 602-2. While the MANPRINT program was officially established in the late 1980s, there had been work in what was to become many of the MANPRINT domains going back many years. Searches of the available archives in various Army organizational databases and files produced study reports from 1953 onward for work for, and related to, the official MANPRINT program and from 1979 onward for T&E-related work. Readers and users of this bibliography are encouraged to contact the author if additional studies and reports are discovered, or are known to exist, so that they can be included in future editions of this work.					
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## Foreword

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### 1. Introduction.

This section provides a general overview of this bibliography along with comments on how to best utilize it in both its manual and automated forms.

This publication is intended for those MANPRINT practitioners who, for whatever reason, need to know if or what MANPRINT work has been performed on a particular system or system type and when. Also, an inquiry might take the form, ‘... well, I know that Joe Smith did a study on a like system a few years ago...’. This bibliography also serves this type of inquiry and can provide a reference on which systems have been studied and when. The significance is that when a new system study is being contemplated or started then one of the first things the principal investigator (PI) is interested in is what issues have been identified for this type of system in the past to use as a benchmark to see if the new system is being designed with the same problems in it that historical knowledge has shown to be a problem.

Because of the size this report has been divided into 3 volumes. Volume I, titled the Index, consists of an introduction to the series and a set of table oriented indexes designed to give the reader the ability to focus into a desired past study when only limited, or no, knowledge exists. All the index tables contain the columns of year of the study, short name for the study, long name for the study, and type of study, i.e., a MANPRINT Assessment (MA) or a Test & Evaluation Report (T&ER).

Volume II contains the annotated bibliography of the 583 MA reports reviewed by this paper. MANPRINT Assessments are performed according to the direction of AR 602-2. They consist of an evaluation of all 7 MANPRINT domains and a summary of the findings. The approving authority for these MAs is the DA G1 for MANPRINT. Once the MA has been approved by this office it is used as an input document for ASARC and Milestone Decision Reviews for the system being evaluated. The lead performing organization for MAs is the Human Research and Engineering Directorate (HRED) of the U.S. Army Research Laboratory (ARL). ARL-HRED will perform the MPT and HFE portions of the MA directly and will coordinate with other agencies for the other domain reports as appropriate. ARL-HRED will then consolidate all of the domain reports into a draft MA and forward it to DA G1 - MANPRINT for approval.

Volume III contains the annotated bibliography of the 443 T&ERs reviewed by this paper. A T&ER is a system evaluation performed according to AR 73-1 for all systems in development in the Army except those developed by MEDCOM and SOCOM. The U.S. Army Test and Evaluation Command (ATEC) conducts these evaluations according to AR 73-1 through its subordinate commands the U.S. Army Evaluation Center (AEC), the U.S. Army Development Command (DTC), and the U.S. Army Operational Test Command (OTC). The Test &

Evaluation (T&E) process is very structured and typically produces a series of documents related to the system under test that may include (as required) an event design plan (EDP), a test data report (TDR), and a system evaluation report or operational test agency evaluation report (SER before 2008 and OER after 2008).

#### 1.1. Performing Organizations.

MANPRINT studies documented in this report were performed by the following organizations:

- Military Operations Research Society (MORS), Alexandria, VA.
- U.S. Air Force, Air Proving Ground Center, Eglin Air Force Base, FL.
- U.S. Army Aviation Technical Test Center, Fort Rucker, AL.
- U.S. Army Chemical Research and Development Laboratory, Edgewood Arsenal, MD.
- U.S. Army Combat Systems Test Activity (Prov), Aberdeen Proving Ground, MD.
- U.S. Army Directorate of Flight Standards and Qualification Research, St. Louis, MO.
- U.S. Army Dugway Proving Ground, UT.
- U.S. Army Electronic Proving Ground (EPG), Fort Huachuca, AZ.
- U.S. Army Evaluation Analysis Center (EAC), Aberdeen Proving Ground, MD.
- U.S. Army Evaluation Center (AEC), Aberdeen Proving Ground, MD.
- U.S. Army Frankford Arsenal, Philadelphia, PA.
- U.S. Army Human Engineering Laboratory (HEL), Aberdeen Proving Ground, MD.
- U.S. Army Materiel Test and Evaluation Directorate, White Sands Missile Range, NM.
- U.S. Army Natick Research, Development and Engineering Center, Natick, MA.
- U.S. Army Operational Test and Evaluation Command (OPTEC), Alexandria, VA
- U.S. Army Operational Test Command (OTC), Fort Hood, TX.
- U.S. Army Research Institute (ARI) for the Behavioral and Social Sciences. Alexandria, VA.
- U.S. Army Research Laboratory (ARL), Human Research and Engineering Directorate (HRED), Aberdeen Proving Ground, MD.
- U.S. Army Research Office (ARO), Research Triangle Park, NC.
- U.S. Army Test and Evaluation Command (ATEC), Alexandria, VA.
- U.S. Army Troop Support and Aviation Materiel Readiness Command, St. Louis, MO.

- U.S. Navy Air Test Center, Patuxent River, MD.

## 1.2. Sources of Data.

MANPRINT reports documented in this bibliography came from the following sources:

- Scientific & Technical Information Network (STINET) library of the Defense Technical Information Center (DTIC) web page: <https://dtic-stinet.dtic.mil/>.
- National Technical Information Service (NTIS): <http://www.ntis.gov/>.
- Library archives of the U.S. Army Research Laboratory (ARL), Human Research and Engineering Directorate (HRED), (formerly U.S. Army Human Engineering Laboratory (HEL), Aberdeen Proving Ground, MD.
- Unpublished MANPRINT files at ARL-HRED, Aberdeen Proving Ground, MD.
- Library archives of the U.S. Army Research Institute (ARI), Alexandria, VA.
- ARL Inside Web page: <https://arlininside.arl.army.mil/>.
- ARL Technical Library WEBCAT Web Page: <https://arllit.arl.army.mil/>.
- Library archives at the U.S. Army Operational Test Command (formerly TEXCOM) of the U.S. Army Research Institute at Fort Hood, TX.
- Library archives of the U.S. Army Research Laboratory, Fort Hood Field Element, Fort Hood, TX.
- Library archives of the U.S. Army Research Laboratory, ARDEC Field Element, Picatinny, NJ.
- Library archives of the U.S. Army Research Laboratory, PM SWAR Field Element, Fort Belvoir, VA.
- Library archives of the U.S. Army Research Laboratory, Fort Rucker Field Element, Fort Rucker, AL.

## 1.3. Document Types.

The reports and documents in this report consist of a variety of formats and types. These are:

### 1.3.1. Formal published reports from DTIC.

These documents have been published by the originating organization in the appropriate technical report format for that organization and submitted to the DTIC for inclusion in the technical reports national archive. Each of these reports contains a reference to the DTIC control number so it can be accessed by qualified government and other personnel in the archive. A sample of DTIC control number formats is:

- ADA123123 – reports that have no distribution limitations and are available to the general public.
- ADB123123 – reports that are unclassified but have distribution limited to qualified government employees and their contractors.
- ADC123123 – reports that are classified at the confidential or secret level with controlled access. The description of these reports is unclassified as listed in this report, however, the actual report is subject to the distribution controls and access limits as stated in the document.

#### 1.3.2. Formal published technical reports.

These documents have been published in a technical or other report format by the originating organization in the appropriate technical report format for that organization. Typical organizations publishing these types of reports are the U.S. Army Test & Evaluation Command, U.S. Army Research Institute, U.S. Army Research Laboratory's Human Research and Engineering Directorate and the U.S. Army Human Engineering Laboratory before it. These reports have been obtained from the library archives of these respective organizations.

#### 1.3.3. Unpublished reports.

This type of report was not submitted to the DTIC archive by the originating agency and was obtained from the local files of that organization. These reports are primarily from HEL, ARI, and ARL-HRED file archives and may be either full MANPRINT Assessments covering all 7 of the MANPRINT domains or they may cover only one domain such as human factors or safety. Many of these reports contain no distribution instructions. Requests for copies of these reports can be made to the Director ARL-HRED.

#### 1.4. Report availability.

Most of the documents listed in this bibliography can be obtained from multiple sources. All documents with a DTIC control number can be obtained directly from NTIS either as a PDF document that can be downloaded directly, or in hardcopy form for a processing fee. All of the unpublished reports listed in this bibliography can be obtained from ARL-HRED subject to the approval of that agency.

#### 1.5. How To Use This Bibliography.

This report is designed to facilitate both manual use and automated searches of computer databases.

##### 1.5.1. Using the electronic version of the bibliography.

This report is structured so that it can be effectively used in its hardcopy format but it is designed for optimal use in electronic format. Attached to the back cover of Volume I of the hardcopy



version of the report is a CD containing all 3 volumes of the bibliography in a single PDF file. This PDF file supports electronic searches to quickly locate a desired study report regardless of how much or how little information is known about the report's date, title, system short or long name, or report type.

In addition, the CD contains a complete library of all known MANPRINT related reference documents and all the regulations, pamphlets, directives, and publications that could be identified as being MANPRINT related. This CD is included with the bibliography to provide the reader with a complete reference of MANPRINT reference materials in addition to the electronic copy of the bibliography. All of the documents in the CD are in full text PDF format.

#### 1.5.2. Using the hardcopy version of the bibliography.

If the PDF version of the bibliography is not available then the reference listings in Volume I can be used to support a manual search for the desired system report(s). The listings in sections 2 and 3 support this type of manual reference search. If all of the reports conducted during a certain year are of interest then the tables in paragraph 2.1 can be used. If only the short name of the system is known then the paragraph 2.2 tables can be used. Paragraph 2.3's tables list all of the reports in order by system short name categorized by system type. Paragraph 2.4's tables list all of the reports in order by the system long name. Finally, if it is desired to find all of the reports from a particular author or investigator then paragraph 3 can be used which lists all of the reports in order by the first author or principal investigator in a standard bibliographic reference format.

The annotated bibliographies for all the reports identified by this publication are in Volume II and Volume III. Volume II contains the annotated references for all of the MANPRINT Assessments developed for the DA G1 for MANPRINT. It is preceded by a one line listing for only these reports in order by System Short Name Categorized, System Short Name, System Long Name, and Year of the report. The annotated bibliography then follows in the same order in the format shown in the Table below.

Volume III contains the annotated references for all of the MANPRINT Assessments developed by the Test & Evaluation community. It is preceded by a one line listing for only these reports in order by System Short Name Categorized, System Short Name, System Long Name, and Year of the report. The annotated bibliography then follows in the same order in the format shown in the Table below.

If the reader is unable to find the report of interest using these tables, they are then referred to the index in Chapter 5 of Volume I which shows the page numbers from the total 3 volume bibliography for each system reported in the bibliography.

Table: Format of the Annotated Report Listings in this Bibliography

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**System Short Name:** *Type of Report, Short Name by Category of the System*

**Reference** (*Inline citation for the reference*):

Full reference of the reference in human factors reference format:

Author name- Last name first (year). Title of Study. Institution or agency performing study.  
Agency Report Number. DTIC report Number

**Key Words:**

Key words from the study for search purposes.

**System Description:**

A description of the system evaluated in the study

**Report Availability:**

Distribution restrictions or limitations of the report. For reports with no limitations this statement is:

Approved for Public Release; Distribution is Unlimited:

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### 1.5.3. Using the bibliography With Endnote™.

This document was prepared with Microsoft Word™ 2007 and the bibliographic database program Endnote™<sup>1</sup>, version X1. Once the information for each MANPRINT report was entered into the Endnote™ database, extracting it in a variety of formats was straightforward and was used to generate all of the lists and abstracts in the report. Endnote™ also supports an extensive database search capability which can be used to find reports for the various systems listed in this bibliography. One feature of Endnote™ is that full text PDF versions of the cited reports can be embedded into the database so that Endnote™ not only supports finding information about a MANPRINT report but can also provide a copy of the report itself. This bibliography is supported by a complete Endnote™ bibliography that has had all of the MANPRINT reports inserted into it. Thus, future researchers using Endnote™ version X1 or later can access the database to not only find out whether a particular system has been evaluated by a MANPRINT study in the past, but also to extract the study itself for reference while embarking on a new version of that system or a new system that is similar to a previous one.

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<sup>1</sup> EndNote. (2008). Endnote, Windows Version X1. Berkeley, CA.: ISI ResearchSoft, Inc.

Copies of the Endnote™ version of the MANPRINT bibliography that contains a PDF version of the report, the Endnote™ library, and all of the full documents cited in the bibliography in PDF format can be obtained by MANPRINT practioners from U.S. government agencies with a request to the Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, Aberdeen Proving Ground, Maryland 21001.

#### 1.6. Significance of this Bibliography.

One might reasonably question the significance of a MANPRINT study conducted in 1953 to any current system being evaluated. The earliest MANPRINT report in this bibliography is of the T42 tank that was conducted that year. The T42 tank did not even go into production, however, many of the crewstation concerns and findings from that report are valid for any tank design. Thus, any principal investigator initiating a study on a future tank design would certainly have an interest in becoming familiar with human related issues previously identified in earlier tank designs to ensure that they are not repeated in the new design. For this reason, all U.S. Army MANPRINT reports and studies that were found in any archive or file have been included in this bibliography.

#### 1.7. Distribution Restrictions for this Bibliography.

This document has no distribution restrictions and is authorized for public release. It is noted that many of the reports cited in this bibliography do have restrictions on their distribution to U.S. Government agencies, DOD and their contractors, and several are classified at the confidential and secret level. However, none of the findings or procedures in any of the study reports are included in this bibliography which only contains the name of the system that was evaluated, key words related to the system, year of the evaluation, and a description of that system along with the name of the principle investigator who conducted the study. There is, therefore, no restricted information in this bibliography and there are no limits on its distribution.

## **2. Cross Reference Listings of The Reports in This Bibliography.**

This section is designed to facilitate locating the annotated bibliographic reference for the system of interest and contains listings of the reports in the bibliography that can be used to determine if a study has been performed for the system of interest or one similar to it. For example, if a MANPRINT principal investigator is desiring to determine if any type of MANPRINT analysis has been performed for a certain system in the past they would be interested in finding a copy of that previous work to learn of prior problems and recommended solutions that had been previously identified. If the electronic version of this bibliography is available then an electronic search of the PDF files can quickly determine if the system had been previously studied and then see the full annotated listing for that study containing the names of all the authors, a description of the system, distribution restrictions, if any, for the system, and sources to obtain a copy of the report.

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**An Annotated Bibliography of MANPRINT Related Assessments and  
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**Volume II- MANPRINT Assessment and Evaluations**

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8 December 2009

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## **7. Introduction.**

This volume contains the annotated bibliographies for those categories of reports called a 'MANPRINT Assessment'. These reports are those produced for the Directorate of MANPRINT at DA G1 under the auspices of AR 602-2. A full MANPRINT Assessment is one that has been prepared covering all 7 domains of MANPRINT and has been signed and approved by the DA G1 for MANPRINT. It then becomes a source document for system production decisions by an ASARC Milestone Decision Review council meeting.

Many of the reports in this section are not a full and complete MANPRINT Assessment. For various reasons sometimes only a HFEA or other domain report is funded and performed. All attempts have been made to include both partial and complete approved MANPRINT Assessment documents in this bibliography as a reference resource for future MANPRINT Principal Investigators.

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## 8. Listing of Volume II Reports In Order by Short Name- Long Name- Year.

This section contains an index of systems and terms in this section for reference when being read in hardcopy form.

<b>MANPRINT Reports Ordered by Short Name Categorized- Short Name- Long Name- Year</b>			
<b>Short Name Categorized</b>	<b>Short Name</b>	<b>Long Name</b>	<b>Year</b>
ABCS- A2C2S	A2C2S	Army Airborne Command and Control System (A2C2S) Block 1	2004
ABCS- A2C2S	A2C2S	Army Airborne Command and Control System (A2C2S) System Operator	2004
ABCS- AFATDS	AFATDS	Advanced Field Artillery Tactical Data System (AFATDS)	1995
ABCS- ASAS	ASAS	All Source Analysis System (ASAS) Block I	1993
ABCS- ATCCS	ATCCS	U.S. Army's Tactical Command and Control System (ATCCS)	1997
ABCS- CPOF ver. 3.0.2	CPOF ver. 3.0.2	Command Post of the Future (CPOF)	2008
ABCS- CSSCS	CSSCS	Combat Service Support Control System (CSSCS)	1995
ABCS- CSSCS	CSSCS	Combat Service Support Control System (CSSCS)	1997
ABCS- DTSS	DTSS	Digital Topographic Support System (DTSS)	1993
ABCS- EPLRS	EPLRS	Enhanced position Location Reporting System (EPLRS) Downsize	1996
ABCS- FBCB2	FBCB2	Force XXI Battle Command Brigade and Below (FBCB2)	1997
ABCS- FBCB2	FBCB2	Force XXI Battle Command Brigade and Below (FBCB2)	2004
ABCS- FBCB2	FBCB2	Force XXI Battle Command Brigade And Below (FBCB2)	1999
ABCS- ISYSCON	ISYSCON	Integrated Systems Control (ISYSCON)	1999
ABCS- MCS	MCS	Maneuver Control System (MCS)	2005
ABCS- MCS	MCS	Maneuver Control System (MCS) Block III (v-12.01)	1999
ABCS- SECOMP-I	SECOMP-I	Secure Enroute Communications Package-Improved (Ground Terminal)	2005
ABCS- TACCS	TACCS	Tactical Army Combat Service Support Computer System (TACCS)	1984
ABCS- TACFIRE	TACFIRE	TACFIRE OT 056	1979
ACMES	ACMES	Automated Communications Security (COMSEC) Management and Engineering System (ACMES)	1993
ADAM	ADAM	Air Defense and Airspace Management (ADAM) Cell	2006
AIRCMM	AIRCMM	Advanced Infrared Countermeasure Munitions (AIRCMM)	1994
AIRCMM	AIRCMM	Advanced Infrared Countermeasure Munitions (AIRCMM)	2002
AIRCMM	AIRCMM	Advanced Infrared Countermeasure Munitions (AIRCMM), XM211 and XM212 flares	2006
Aircraft- ATIRCM-CMWS	ATIRCM-CMWS	Advanced Threat Infrared Countermeasure System-Common Missile Warning System (ATIRCM-CMWS)	2005
Aircraft- ATIRCM-CMWS	ATIRCM-CMWS	Advanced Threat Infrared Countermeasures (ATIRCM)	2004

<b>MANPRINT Reports Ordered by Short Name Categorized- Short Name- Long Name- Year</b>			
<b>Short Name Categorized</b>	<b>Short Name</b>	<b>Long Name</b>	<b>Year</b>
Aircraft- ATIRCM-CMWS	ATIRCM-CMWS	Advanced Threat Infrared Countermeasures (ATIRCM) And Common Missile Warning System (CMWS)	2003
Aircraft- ATIRCM-CMWS	ATIRCM-CMWS	Advanced Threat Infrared Countermeasures (ATIRCM) and Common Missile Warning System (MCWS)	2001
Aircraft- ATIRCM-CMWS	ATIRCM-CMWS	Advanced Threat Infrared Countermeasures (ATIRCM) and Common Missile Warning System (MCWS)	2002
Aircraft- ATIRCM-CMWS	ATIRCM-CMWS	Advanced Threat Infrared Countermeasures (ATIRCM)/Common Missile Warning System (CMWS)	1995
Aircraft- Fixed Wing- Cargo- JCA	JCA	Joint Cargo Aircraft (JCA)	2007
Aircraft- Fixed Wing- Intel- ACS	ACS	Aerial Common Sensor (ACS)	2003
Aircraft- Fixed Wing- Observation- OV-1D IDS	OV-1D IDS	Vertical-Scale Instrument Display System for the OV-1D Aircraft	1977
Aircraft- Fixed Wing- Observation- YO-3A	YO-3A	YO-3A Aircraft System	1970
Aircraft- Helicopter- Aircrew- ACABA	ACABA	Anatomically Conforming Aircrew Body Armor System (ACABA)	1973
Aircraft- Helicopter- Aircrew- AW	AW	Air Warrior (AW)	2002
Aircraft- Helicopter- Aircrew- AW	AW	Air Warrior (AW)	2003
Aircraft- Helicopter- Attack- Apache AH-64	Apache AH-64	Apache (AH-64) Attack Helicopter	1989
Aircraft- Helicopter- Attack- Apache- Iranian AH-1J	Apache-Iranian AH-1J	Iranian AH-1J (TOW) Helicopter	1977
Aircraft- Helicopter- Attack- Apache Longbow AH-64D	Apache Longbow AH-64D	AH-64D Longbow Apache	1995
Aircraft- Helicopter- Attack- Apache Longbow AH-64D Block III	Apache Longbow AH-64D Block III	AH-64D Apache Longbow Block III	2006
Aircraft- Helicopter- Attack- Apache Longbow AH-64D Maintenance	Apache Longbow AH-64D Maintenance	AH-64D Apache Longbow	2005
Aircraft- Helicopter- Cargo- CH47F	CH47F	CH-47F Chinook	2004
Aircraft- Helicopter- Recon- ARH	ARH	Armed Reconnaissance Helicopter (ARH)	2005
Aircraft- Helicopter- Recon- Comanche RAH66	Comanche RAH66	RAH66 Comanche	2000
Aircraft- Helicopter- Recon- Comanche RAH66	Comanche RAH66	Reconnaissance Attack Helicopter RAH66 Comanche	2002
Aircraft- Helicopter- Utility- Blackhawk UH60L A2C2S Egress	Blackhawk UH60L A2C2S Egress	Emergency Egress Characteristics of the U.S. Army Airborne Command and Control System (A2C2S)	2006
Aircraft- Helicopter- Utility- Blackhawk UH60L+	Blackhawk UH60L+	UH60L+ Blackhawk Helicopter	2000
Aircraft- Helicopter- Utility- Blackhawk UH60M	Blackhawk UH60M	UH60M Blackhawk Helicopter	2005
Aircraft- Helicopter- Utility- Blackhawk UH60M	Blackhawk UH60M	UH60M Blackhawk Helicopter	2007

<b>MANPRINT Reports Ordered by Short Name Categorized- Short Name- Long Name- Year</b>			
<b>Short Name Categorized</b>	<b>Short Name</b>	<b>Long Name</b>	<b>Year</b>
Aircraft- Helicopter- Utility- Blackhawk UH60M CAAS LEUE	Blackhawk UH60M CAAS LEUE	UH60M Common Avionics Architecture System (CAAS) Crew Station	2005
Aircraft- Helicopter- Utility- Blackhawk UH60M CS LUT	Blackhawk UH60M CS LUT	UH60M Crew Station	2006
Aircraft- Helicopter- Utility- Blackhawk UH60M EUD2	Blackhawk UH60M EUD2	UH60M Crew Station	2005
Aircraft- Helicopter- Utility- Blackhawk UH60Q	Blackhawk UH60Q	UH-60Q Aircraft	1998
Aircraft- Helicopter- Utility- LHX	LHX	Voice Technology for the Light Helicopter Family (LHX)	1985
Aircraft- Helicopter- Utility- LUH- Lakota UH72A	Lakota UH72A	Light Utility Helicopter (LUH)	2005
Aircraft- Helicopter- Utility- LUH- Lakota UH72A	Lakota UH72A	UH72A Light Utility Helicopter (LUH). 14 November 2006	2006
Aircraft- Helicopter- Utility- LUH- Lakota UH72A	Lakota UH72A	UH72A Light Utility Helicopter (LUH). 26 May 2006	2006
Aircraft- Helicopter- Utility- UH-1 Quick Fix	UH-1 Quick Fix	Heliborne Electronic Warfare System (AN/ALQ-151, Quick Fix)	1978
Aircraft- Unmanned- UAV- Aquila	Aquila	Aquila, The Army's Remotely Piloted Vehicle	1989
Aircraft- Unmanned- UAV- Aquila	Aquila	Remotely Piloted Vehicle System (Aquila)	1988
Aircraft- Unmanned- UAV- ER/MP	ER/MP	Extended Range/Multi-Purpose Unmanned Aerial Vehicle (ER/MP UAV)	2005
Aircraft- Unmanned- UAV- g-MAV	g-MAV	g-MAV Micro-Air Vehicle	2007
Aircraft- Unmanned- UAV- SUAS Raven B	SUAS Raven B	Small Unmanned Aerial System (SUAS) (Raven B)	2006
Aircraft- Unmanned- UAV- SUAV	SUAV	Small Unmanned Aerial Vehicle (SUAV)	2006
Aircraft- Unmanned- UAV- TUAV	TUAV	Tactical Unmanned Aerial Vehicle (TUAV)	2000
Aircraft- Unmanned- UAV- TUAV Shadow	TUAV Shadow	Tactical Unmanned Aerial Vehicle (TUAV) SHADOW 200	2002
AMG	AMG	Antenna Mast Group (AMG)	2006
AMMPS	AMMPS	Advanced Medium-Size Mobile Power Source (AMMPS)	2003
AMMPS	AMMPS	Advanced Medium-size Mobile Power Sources (AMMPS)	2004
AOBS	AOBS	Antipersonnel Obstacle Breaching System (AOBS)	1992
APKWS II	APKWS II	Advanced Precision Kill Weapon System (APKWS) II	2006
APLA	APLA	Anti-Personnel Landmine Alternative (NSD-A APLA)	1999
APOBS	APOBS	Demolition Kit, Breaching System, Anti-Personnel Obstacle, Mk 7 Mod 1 (Anti-Personnel Obstacle Breaching system - APOBS). 8 April 2001	2001
ARISS	ARISS	Army Recruiting Information Support System (ARISS)	1999
Artillery- 105mm- Cartridge- DPICM XM915/XM916	DPICM XM915/XM916	Cartridge, 105MM, XM915/XM916, Dual Purpose Improved Conventional Munition Projectile (DPICM)	1997

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Artillery- 105mm- Cartridge- HE PFF XM1130	HE PFF XM1130	XM1130 Base Bleed [Denel XM0125A], 105mm High Explosive Pre-formed Fragment (HE PPP) Cartridge	2008
Artillery- 105mm- Cartridge- XM1064 IRILL	XM1064 IRILL	XM1064, 105mm Infrared (IR) Illumination (IRILL) Cartridge	2008
Artillery- 105mm- Computer- GLPS	GLPS	Gun Laying and Positioning System (GLPS)	1996
Artillery- 155mm- Charge- MACS	MACS	Modular Artillery Charge System (MACS)	1996
Artillery- 155mm- Charge- MACS	MACS	Modular Artillery Charge System M232E1 (MACS)	2005
Artillery- 155mm- Charge- MACS	MACS	XM231 Modular Artillery Charge System (MACS)	1999
Artillery- 155mm- Charge- MACS	MACS	XM232 Modular Artillery Charge System (MACS)	2000
Artillery- 155mm- Charge- MACS XM231	MACS XM231	Modular Artillery Charge System (MACS) XM231	1997
Artillery- 155mm- Charge- MACS XM232	MACS XM232	XM232 Modular Artillery Charge System (MACS)	2001
Artillery- 155mm Charge- SPS Unicharge XM230	SPS Unicharge XM230	XM230 Solid Propellant System (Unicharge)	1994
Artillery- 155mm- Computer- TAD DFCS	TAD DFCS	Towed Artillery Digitization Digital Fire Control System (TAD DFCS)	1999
Artillery- 155mm- Computer- TAD DFCS	TAD DFCS	Towed Artillery Digitization Digital Fire Control System (TAD DFCS)	2000
Artillery- 155mm- Fuze- ETAF M762E1	ETAF M762E1	M762E1/M767E1 Electronic Time Artillery Fuze (ETAF)	2000
Artillery- 155mm- Fuze- MOFA	MOFA	XM782 Multi-Option Fuze for Artillery (MOFA)	1999
Artillery- 155mm- Fuze- PGK	PGK	Fuze, Multioption, Precision Guidance Kit (PGK), XM1156	2009
Artillery- 155mm- Fuze- PGK	PGK	Precision Guidance Kit (PGK)	2006
Artillery- 155mm- Fuze- PGK	PGK	XM1156 Precision Guidance Kit (PGK)	2007
Artillery- 155mm- Fuze- T197E2	T197E2	Fuze Setting for Fuze, Mtsq, T197E2	1963
Artillery- 155mm- Fuze- XM765	XM765	XM762 and M577 Fuzes	1990
Artillery- 155mm- Projectile- BDM XM141	BDM XM141	Bunker Defeat Munition (BDM) XM141	1998
Artillery- 155mm- Projectile- DPICM XM982	DPICM XM982	XM982, Extended Range, Dual Purpose Improved Conventional Munition (DPICM) Projectile	1997
Artillery- 155mm- Projectile- Excalibur	Excalibur	Precision Engagement Projectile, 155mm, Excalibur Unitary Projectile (XM982) Block Ia-2	2007
Artillery- 155mm- Projectile- Excalibur	Excalibur	XM982 Precision Guided Extended Range 155mm Artillery Projectile, Excalibur	2005
Artillery- 155mm- Projectile- Excalibur XM892	Excalibur XM892	XM982 Excalibur 155mm Precision Guided Extended Range Artillery Projectile	2004
Artillery- 155mm- Projectile- SADARM	SADARM	Sense and Destroy Armor (SADARM), XM898 Projectile	1994
Artillery- 155mm- Projectile- XM1066 IRILL	XM1066 IRILL	Projectile, 155mm Infrared (IR) Illuminating, XM1066	2009
Artillery- Computer- BCS	BCS	Battery Computer System (BCS) Human Factors Field Evaluation	1984
ATASs	ATASs	Portability Test and Human Factors Evaluation of Ten Antiarmor Systems (ATASs)	1984
ATG-MIP	ATG-MIP	AN/TPQ-37 Antenna Transceiver Group (ATG) Mobility Improvement Program (MIP)	1994

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ATIRCM	ATIRCM	AN/ALQ-212 Advanced Threat Infrared Countermeasures (ATIRCM)	2001
ATRS	ATRS	Automatic Test And Repair System (ATRS) [AN/MSM-105(V)1]	1984
BASIC	BASIC	Body Armor Set, Individual Countermine (BASIC)	1993
BAT	BAT	Brilliant AntiArmor Submunition (BAT)	1998
BCIS	BCIS	Battlefield Combat Identification System (BCIS)	1993
BCP	BCP	Stryker - Battery Command Post (BCP)	2007
BDAR	BDAR	Battle Damage Assessment and Repair (BDAR) System	2005
BESS- Omega 60	BESS-Omega 60	Battlefield Effect Simulator System (BESS): Omega 60 Launcher with the Pyrotechnic, Hostile Fire - XM34, and the Pyrotechnic, White Star - XM35	2006
Body Armor- Armored Vest M1955	Armored Vest M1955	USMC M1955 Armored Vest and the Proposed Titanium Nylon Improved Conventional Munitions Protective Armored Vest (48 Plate)	1973
Bofors ATWS	Bofors ATWS	Bofors Infantry Light and Lethal (BILL) Antitank Weapon System (ATWS)	1989
Breacher	Breacher	M1 Breacher (Grizzly)	1996
C3I2	C3I2	C3I Test Instrumentation (C3I2) system (Data Collection Subsystem)	1990
C3I2 DCS	C3I2 DCS	C3I Test-Instrumentation System: Data Reduction Subsystem (DRS)	1992
CABS	CABS	Cockpit Air Bag System (CABS). 12 March 2001	2001
Cannon- 105mm- Cartridge- APC Canister XM1040	APC Canister XM1040	Cartridge, 105mm: Canister, XM1040	2005
Cannon- 105mm- Cartridge- APC Canister XM1040	APC Canister XM1040	Cartridge, 105mm: Canister, XM1040	2006
Cannon- 105mm- Cartridge- HERA	HERA	Cartridge, 105mm: High Explosive Rocket Assist (HERA), M927	2007
Cannon- 105mm- Cartridge- HERA	HERA	Cartridge, 105mm: High Explosive Rocket Assist (HERA), XM913/XM927M927	1990
Cannon- Cartridge- 120mm- APFSDS-T AKE M829E4	APFSDS-T AKE M829E4	Armor Piercing Fin Stabilized, Discarding Sabot, with Tracer (APFSDS-T) Advanced Kinetic Energy (AKE) Cartridge, 120mm, M829E4	2009
Cannon- Cartridge- 120mm- APFSDS-T M829A2	APFSDS-T M829A2	Cartridge, 120mm, Armor Piercing, Fin Stabilized, Discarding Sabot - Tracer (APFSDS-T), M829A2	1994
Cannon- Cartridge- 120mm- APFSDS-T M829E3	APFSDS-T M829E3	Armor Piercing Fin Stabilized, Discarding Sabot, with Tracer (APFSDS-T) Cartridge, 120mm, M829E3	2002
Cannon- Cartridge- 120mm- Canister XM1028	Canister XM1028	Cartridge, 120mm, Canister, XM1028	2004
Cannon- Cartridge- 120mm- Canister XM1028	Canister XM1028	Cartridge, 120mm, Canister, XM1028	2006
Cannon- Cartridge- 120mm- HEAT MP-T M830E1	HEAT MP-T M830E1	M830E1, 120mm, High Explosive AntiTank-Multipurpose - Tracer, Cartridge (HEAT MP-T)	1994
Cannon- Cartridge- 120mm- KE-WA1	KE-WA1	Cartridge, 120mm, KE-WA1 for Foreign Military Sale to the Government of Egypt (GOE)	2000
Cannon- Cartridge- 120mm- MRM	MRM	Cartridge, 120mm, Mid-Range Munition (MRM)	2004
Cannon- Cartridge- 120mm- TPMP-T XM1002	TPMP-T XM1002	Cartridge, 120mm, TPMP-T (Target Practice Multi-Purpose With Tracer)	2003

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Cannon- Cartridge- 120mm- TPMP-T XM1002	TPMP-T XM1002	Cartridge, 120mm, TPMP-T (Target Practice Multi-Purpose with Tracer) XM1002	2004
Cannon- Cartridge- 120mm- TPMP-T XM1002	TPMP-T XM1002	Cartridge, 120mm, TPMP-T (Target Practice Multi-Purpose with Tracer) XM1002	2006
Cannon- Cartridge- 120mm- TP-T M831E2	TP-T M831E2	M831E2, 120mm, Target Practice with Tracer Cartridge (TP-T)	1994
CCMCK	CCMCK	Close Combat Mission Capabilities Kit (CCMCK)	2008
CCTT	CCTT	Close Combat Tactical Trainer (CCTT)	1998
Computer- AIS- RCAS	RCAS	Reserve Component Automation System (RCAS)	1996
CORPS SAM	CORPS SAM	Corps Surface-to-Air Missile (CORPS SAM)	1993
CROWS XM101	CROWS XM101	XM101 Common Remotely Operated Weapons Station (CROWS)	2005
CTASC-II	CTASC-II	Corps/Theater Automated Data Processing (ADP) Service Center - II (CTASC-II)	1995
CVCCS HCW	CVCCS HCW	Proposed Ground Combat Vehicle Crewmember Clothing System (CVCCS), Hot and Cold Weather	1980
CWHW	CWHW	Cold-Wet Handwear (CWHW)	1972
DAGR	DAGR	Defense Advanced Global Positioning System Receiver (DAGR)	2004
DCGS-A	DCGS-A	Distributed Common Ground System-Army (DCGS-A)	2004
EBIST	EBIST	Exoskeleton Boot Interface Sole Thickness (EBIST)	2006
ECWCE	ECWCE	Experimental Reversible Extreme Cold Weather Clothing Ensemble	1977
EETF	EETF	Evaluation of Selected MANPRINT Issues for the Product Improvement Program of the OQ-290(V)1 Electronic Equipment Test Facility (EETF)	1988
ENVG	ENVG	Enhanced Night Vision Goggle (ENVG)	2005
EPIAFS	EPIAFS	Enhanced Portable Inductive Artillery Fuze Setter (EPIAFS)	2006
EPIAFS	EPIAFS	Enhanced Portable Inductive Artillery Fuze Setter (EPIAFS)	2007
Explosives- Bangalore BTDK	Bangalore BTDK	2.5 Ft. Bangalore Torpedo Demolition Kit (BTDK); MIA3	2008
Explosives- DBK XM303	DBK XM303	Demolition Kit, Blasting (DBK): XM303, Special Operation Forces.	1998
Explosives- FPE	FPE	Fighting Position Excavator (FPE)	1996
Explosives- HE WAM XM93	HE WAM XM93	Basic Hand Emplaced Wide Area Munition (Basic HE-WAM), XM93, and the Basic HE-WAM Individual (XM98) and Collective XM97) Training Devices	1999
Explosives- IMS	IMS	Intelligent Munitions System (IMS)	2005
Explosives- MDI	MDI	Modernized Demolition Initiators (MDI) tactical components (XM19, XM21, and XM23), and the inert training devices (XM20 and XM22)	2002
Explosives- MOF	MOF	M734E1 Multi-Option Fuze for Mortars	1996
Explosives- RAMS	RAMS	XM85 Training Device and the M17 Receiver of the Remote Activation Munition System (RAMS)	2004



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Explosives- RAMS MI	RAMS MI	Magneto Inductive Remote Activation Munition System (MI-RAMS), M156	2008
Explosives- RAMS MI	RAMS MI	Magneto Inductive Remote Activation Munition System (MI-RAMS), XM156	2006
Explosives- SDK	SDK	Special Operations Forces Demolition Kit (SDK) M303	2005
Explosives- SLAM	SLAM	M4E1 Selectable Lightweight Attack Munition (SLAM) and the M320E1 SLAM Improved Functional Trainer	2008
Explosives- SLAM- XM2/XM3/XM299	SLAM- XM2/XM3/XM299	XM2 Selectable Lightweight Attack Munition; XM3 Demolition Attack Munition; and XM299 Training Kit, Selectable Lightweight Attack Munition	1994
Explosives- SMB	SMB	Standoff Minefield Breacher (SMB)	1994
Explosives- Spider XM7	Spider XM7	Non-Self Destruct- Alternative (NSD-A), (SPIDER), Project No. 69-MP-2641-04	2004
Explosives- Spider XM7	Spider XM7	Spider XM7, Dispensing Set, Network Command Munition (NCM)	2006
Explosives- Spider XM7	Spider XM7	Spider XM7, Dispensing Set, Network Command Munition (NCM)	2009
Explosives- TD-SYDET	TD-SYDET	Firing Device, Demolition: XM153 Time Delay-Sympathetic Detonator (TD-SYDET) and XM316 Trainer Kit	2005
FAAD-C2I	FAAD-C2I	Forward Area Air Defense (FAAD) Command, Control and Intelligence (C2I)	1995
FAMTG XM24E1	FAMTG XM24E1	Simulator, Flash Artillery Main Tank Gun (FAMTG), XM24E1	1991
FCS- NLOS-C	NLOS-C	FCS Non-Line of Sight Cannon (NLOS Cannon)	2009
FDD	FDD	Firing Device, Demolition: Delay Type Electronic M147 and the Timer, Interval, Training Kit: M45	1995
FED	FED	Forward Entry Device (FED)	1991
FFW	FFW	Future Force Warrior Technologies	2007
FHMUX	FHMUX	Frequency Hopping Multiplexer (FHMUX)	1996
FLASH	FLASH	Close Combat Cueing System (FLASH Simulator)	1993
FPS	FPS	Proposed Army Infantry/Marine Fragmentation Protective Systems (FPS)	1974
FRPC	FRPC	XM931 120mm Mortar Full Range Practice Cartridge (FRPC)	1996
GB2 Baseplate	GB2 Baseplate	Redesigned Baseplate and Baseplate Wrench for the M687, 155mm, GB2 Binary Projectile	1987
GEN II FLIR	GEN II FLIR	Second Generation Forward Looking Infrared System (Gen II FLIR)	1994
Generator- MTG-2KW	MTG-2KW	2kW Military Tactical Generator (MTG)	1998
Generator- QRG- Corps/Div	QRG-Corps/Div	Quiet Reliable Generators For Corps And Division Headquarters	1987
Generator- TMSS-M	TMSS-M	Trailer Mounted Support System-Medium (TMSS-M)	2005
Generator- TQG 100/200 KW	TQG 100/200 KW	100 kW and 200 kW Tactical Quiet Generator (TQG)	1998
Generator- TQG 100/200 KW	TQG 100/200 KW	100 kW and 200 kW Tactical Quiet Generator (TQG)	2004
Generator- TQG 3KW	TQG 3KW	3KW Tactical Quiet Generator (TQG-3KW)	1999
GFEBs	GFEBs	General Fund Enterprise Business System (GFEBs)	2009

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GoldenEye-50 OCU	GoldenEye-50 OCU	GoldenEye-50 Operator Control Unit (OCU)	2005
Grenade- Hand- Non Lethal Bursting NLBHG XM104	Non Lethal Bursting NLBHG XM104	XM 104 Non-Lethal Bursting Hand Grenade (NLBHG)	2008
Grenade- Hand- Practice Stun RSPHG XM102	Practice Stun RSPHG XM102	Reloadable, Stun, Practice Hand Grenade (RSPHG), XM102	1998
Grenade- Hand- Stun SHG XM84	Stun SHG XM84	Stun Hand Grenade (SHG), XM84	1998
Grenade Launcher- 40mm- Automatic- ALC XM174	ALC XM174	XM-174 Automatic Grenade Launcher	1968
Grenade Launcher- 40mm- Cartridge- AP-IS M81A1E1	AP-IS M81A1E1	Cartridge, 40mm, Armor Piercing with Impact Signature (AP-IS), M81A1E1	1999
Grenade Launcher- 40mm- Cartridge- ASLM	ASLM	XM320 Area Suppression Lethality Module (ASLM)	2006
Grenade Launcher- 40mm- Cartridge- CDC	CDC	40mm Crowd Dispersal Cartridge, XM1029. 21 March 2001	2001
Grenade Launcher- 40mm- Cartridge- CS Munition	CS Munition	E24 CS Munition	1965
Grenade Launcher- 40mm- Cartridge- Dummy M922A1	Dummy M922A1	40mm, M922A1 Dummy Cartridge	1993
Grenade Launcher- 40mm- Cartridge- HEDP	HEDP	40mm, M430A1, High Explosive Dual Purpose (HEDP) Cartridge	1994
Grenade Launcher- 40mm- Cartridge- NLC XM1006	NLC XM1006	40mm Non Lethal Cartridge, XM1006	1998
Grenade Launcher- 40mm- Cartridge- NLM (NLSRM)	NLM (NLSRM)	XM1 044 Non-Lethal Munition (NLM) for the MK19 Grenade Machine Gun (NLM / NLSRM)	2006
Grenade Launcher- 40mm- GLM XM320	GLM XM320	XM320 / XM320E1 Grenade Launcher Module (GLM)	2008
Grenade Launcher- Automatic- Sight Bracket MK19	Sight Bracket MK19	Three Adjustable Sight Brackets For The MK 19 Automatic Grenade Launcher	1998
GSE/GSS	GSE/GSS	Ground Soldier Ensemble (GSE) / Ground Soldier System (GSS)	2008
HC3	HC3	High Capacity Communications Capability (HC3)	2007
HDSB	HDSB	Heavy Dry Support Bridge (HDSB)	2000
Heater- IECU 60k	IECU 60k	60,000-Btu/hr Improved Environmental Control Unit (60K IECU)	2008
Helmet- ACVC	ACVC	Advanced Combat Vehicle Crewman (ACVC) Helmet	1995
Helmet- CVC	CVC	DH-132 Helmet, Combat Vehicle Crewman (CVC)	1975
HENLM-TAPM	HENLM-TAPM	Hand Emplaced Non-lethal Munition-Taser Anti-Personnel Munition (HENLM-TAPM)	2005
HNVS	HNVS	Helicopter Night Vision System (HNVS) Simulation Test Program	1980
Howitzer- LW155 UFH- XM777	LW155 UFH- XM777	Baseline Human Factors Engineering Evaluation for the 155mm, Ultralightweight Field Howitzer (Howitzer- LW155 UFH) (XM777)	1997
HSTAMIDS	HSTAMIDS	AN/PSS-14 Handheld Mine Detector (Handheld Standoff Mine Detector System (HSTAMIDS))	2003
HSTAMIDS	HSTAMIDS	Handheld Standoff Mine Detection System (HSTAMIDS)	1995
HSTAMIDS	HSTAMIDS	Handheld Standoff Mine Detection System (HSTAMIDS)	2000

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HTI-SGF	HTI-SGF	Horizontal Technology Insertion (HTI) Second Generation Forward Looking Infrared (SGF)	1999
HTI-SGF	HTI-SGF	Horizontal Technology Insertion (HTI) Second Generation Forward Looking Infrared (SGF)	2000
ICAP	ICAP	Improved Cobra Armament Program (ICAP)	1973
ICH	ICH	Improved Cargo Helicopter ( ICH)	1997
IEWTPT	IEWTPT	Intelligence Electronic Warfare Tactical Proficiency Trainer (IEWTPT)	1994
IMF	IMF	Improved Message Facility (IMF)	1984
IVCS	IVCS	Infiltrator Vest Combat System 7 (IVCS)	1977
JLCCTC	JLCCTC	Joint Land Component Constructive Training Capability (JLCCTC)	2007
JLCCTC	JLCCTC	Joint Land Component Constructive Training Capability (JLCCTC) formerly the Army Constructive Training Federation (ACTF)	2006
JLENS	JLENS	Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS)	2005
JLENS	JLENS	Joint Land Attack Cruise Missile Defense Elvated Netted Sensor System (JLENS)	2005
JNMS	JNMS	Joint Network Management System (JNMS)	2005
JNN-N	JNN-N	Joint Network Node-Network (JNN-N) Program	2007
JRISS	JRISS	Joint Recruiting. Information Support System (JRISS)	1997
JSTDS-SS	JSTDS-SS	Joint Service. Transportable Decontamination System-Small Scale (JSTDS-SS)	2008
JSTDS-SS	JSTDS-SS	Joint Service. Transportable Decontamination System-Small Scale (JSTDS-SS)- Addendum for Increment I	2009
JTAGS	JTAGS	Joint Tactical Ground Station (JTAGS)	1995
JTIDS	JTIDS	Army Class 2M Joint Tactical Information Distribution System (JTIDS) Program	1995
JTIDS	JTIDS	Joint Tactical Information Distribution System (JTIDS)	1988
JTIDS	JTIDS	Joint Tactical Information Distribution System (JTIDS)	1994
Land Combat Models	Land Combat Models	High Resolution Land Combat Models	1989
Laser- FS3	FS3	Fire Support Sensor System (FS-3)	2003
Laser- LLDR	LLDR	Lightweight Laser Designator Rangefinder (LLDR)	2001
Laser- MELIOS	MELIOS	Mini Eyesafe Laser Infrared Observation Set (MELIOS)	1993
Laser- MILES	MILES	Multiple Integrated Laser Engagement System in an Operational Environment (MILES)	1980
LCS	LCS	Prototype Load-Carrying System	1985
LGH	LGH	Launched Grapnel Hook (LGH)	1995
LKMD	LKMD	Lighting Kit, Motion Detector (LKMD)	2009
LOGMARS	LOGMARS	Logistics Application of Automated Marking and Reading Symbols (LOGMARS)	1985

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LRAS3	LRAS3	Long Range Advanced Scout Surveillance System (LRAS3)	1999
LRAS3	LRAS3	Long Range Advanced Scout Surveillance System (LRAS3)	2000
LTV	LTV	Light Tactical Vehicle (LTV)	1997
LVOSS	LVOSS	Light Vehicle Obscuration Smoke System (LVOSS)	1996
LW	LW	Land Warrior (LW)	2007
LW	LW	Land Warrior System (LW)	1994
LW	LW	Land Warrior, Version 1.0	2004
LWGM XM192	LWGM XM192	Lightweight Ground Mount (LWGM) XM192	2004
LWP	LWP	Lightweight Water Purifier (LWP)	1996
LWP	LWP	Lightweight Water Purifier (LWP)	1997
Mask- Cold Weather- Face- CWFM	CWFM	Cold Weather Face Masks (CWFM)	1972
Mask- Cold Weather- Headgear- CWHG	CWHG	Cold Weather Headgear (CWHG)	1975
Mask- Protective- CVC- SPFM	SPFM	Combat Vehicle Crewmember (CVC) Spall Protective Face Masks (SPFM)	1982
MBCOTM	MBCOTM	Mounted Battle Command on the Move (MBCOTM) Program	2007
MCF	MCF	Modular Causeway Ferry (MCF)	1993
MDARS	MDARS	Mobile Detection Assessment and Response System-Interior (MDARS-I)	2002
MDARS	MDARS	Mobile Detection, Assessment, and Response System (MDARS)	1996
MDARS-E	MDARS-E	Mobile Detection Assessment Response System-Exterior (MDARS-E). 11 March 2001	2001
MDARS-I	MDARS-I	Mobile Detection Assessment and Response System - Interior (MDARS-I)	2003
MDARS-I	MDARS-I	Mobile Detection Assessment and Response System-Interior (MDARS-I)	1998
MDARS-I	MDARS-I	Mobile Detection Assessment Response System Interior (MDARS-I)	1997
MDI	MDI	XM151/XM152 Det Cord Components of the Modernized Demolition Initiators (MDI) System	1999
Medical- BMIS-T	BMIS-T	Battlefield Medical Information System -- Telemedicine (BMIS-T) AN/TYQ-105	2004
Medical- BMIS-T	BMIS-T	Speech Recognition Enhancement to the AN/TYQ-105, Battlefield Medical Information System - Tactical (BMIS-T)	2006
Medical- TAMMIS	TAMMIS	Theater Army Medical Management Information System (TAMMIS)	1989
MFCE	MFCE	Male Field Clothing Ensembles (MFCE) Worn by Female Soldiers (Hot-Dry, Hot-Wet and Cold-Wet Environments)	1979
MFCS-D	MFCS-D	Mortar Fire Control System - Dismounted (MFCS-D), M150/M151	2009
Missile- ABM- GMD TXBR	GMD TXBR	Ground Based Mid-Course (GMD) Test X-Band Radar (TXBR)	2004

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Missile- ABM- GMDS	GMDS	Ground Based Mid-Course Defense (GMDS) System	2005
Missile- ABM- NMD	NMD	National Missile Defense (NMD)	2000
Missile- ABM- NMD	NMD	National Missile Defense (NMD) System	1997
Missile- ABM- NMD	NMD	National Missile Defense (NMD) System	1998
Missile- ABM- THAAD	THAAD	Theater High Altitude Air Defense (THAAD) System	2000
Missile- ABM- THAAD	THAAD	Theater High Altitude Area Defense (THAAD) System	1996
Missile- Air Defense- Hawk BCC	Hawk BCC	Improved Hawk Battery Control Central	1971
Missile- Air Defense- IAMD	IAMD	Integrated Air and Missile Defense (IAMD) System	2007
Missile- Air Defense- IAMD	IAMD	Integrated Air and Missile Defense (IAMD) System	2009
Missile- Air Defense- IM-99B	IM-99B	IM-99B Weapon System	1961
Missile- Air Defense- Nike Zeus	Nike Zeus	Nike Zeus Missile System	1962
Missile- Air Defense- PATRIOT	PATRIOT	Patriot	2007
Missile- Air Defense- PATRIOT	PATRIOT	PATRIOT Air Defense Missile System	1982
Missile- Air Defense- PATRIOT ECS ICC	PATRIOT ECS ICC	PATRIOT Engagement Control Station (ECS) and Information Coordination Central (ICC) Operability	1981
Missile- Air Defense- PATRIOT EPP	PATRIOT EPP	Patriot Electric Power Plant (EPP) III	1996
Missile- Air Defense- PATRIOT MEADS	PATRIOT MEADS	Medium Extended Air Defense System (MEADS)	1999
Missile- Air Defense- PATRIOT MEADS	PATRIOT MEADS	Patriot-MEADS Combined Aggregate Program (CAP)	2004
Missile- Air Defense- PATRIOT MEADS (Revised)	PATRIOT MEADS (Revised)	Patriot-MEADS Combined Aggregate Program (CAP) (Revised)	2004
Missile- Air Defense- PATRIOT MMM	PATRIOT MMM	PATRIOT Multimode Missile (MMM)	1993
Missile- Air Defense- PATRIOT PAC3	PATRIOT PAC3	PATRIOT Advanced Capability Phase III (PAC-3) System	1997
Missile- Air Defense- PATRIOT PAC3	PATRIOT PAC3	PATRIOT Advanced Capability Phase III (PAC-3) System	1998
Missile- Air Defense- PATRIOT PAC3	PATRIOT PAC3	Patriot PAC-3 Block 2002 Missile	2002
Missile- Air Defense- Stinger	Stinger	Stinger Human Factors Engineering	1976
Missile- Air-to-Air- SLAMRAAM	SLAMRAAM	Surface Launched Advanced Medium Range Air-to-Air Missile (SLAMRAAM) System	2003
Missile- Air-to-Air- SLAMRAAM	SLAMRAAM	Surface Launched Advanced Medium Range Air-to-Air Missile (SLAMRAAM) System	2009
Missile- Air-to-Ground- JCM	JCM	Joint Common Missile System (JCM)	2004
Missile- Air-to-Ground- JCM	JCM	Joint Common Missile System (JCMS)	2003
Missile- Antitank- 84mm- AT4-CS-RS	AT4-CS-RS	AT4-Confined Space (CS) - Reduced Sensitivity (RS) 84mm Light Anti-Tank Weapon for Confined Space	2009
Missile- Antitank- 84mm- ATW	ATW	AT4-CS (Confined Space)-RS (Reduced Sensitivity) 84mm Light Anti-Tank Weapon for Confined Space	2004
Missile- Antitank- AAWS-M	AAWS-M	Advanced Antitank Weapon Systems-Medium (AAWS-M) Candidates	1990
Missile- Antitank- ATGM SS-11	ATGM SS-11	SS-11 Antitank Guided Missile	1960

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Missile- Antitank- FOG-M	FOG-M	FOG-M (Fiber Optic Guided Missile) Embedded Training Demonstration Model FOG-M-4-30-RG-511	1986
Missile- Antitank- JAVELIN	JAVELIN	Advanced Anti-Tank Weapon System - Medium (JAVELIN) System	1997
Missile- Antitank- JAVELIN	JAVELIN	JAVELIN Advanced Antitank Weapon System	1994
Missile- Antitank- JAVELIN	JAVELIN	Mobility, Portability, and Human Factors Evaluation of the JAVELIN Antitank Weapon System	1993
Missile- Antitank- LOSAT	LOSAT	Line of Sight Antitank (LOSAT)	2000
Missile- Antitank- LOSAT	LOSAT	Line of Sight Antitank (LOSAT)	2004
Missile- Antitank- MILAN 2	MILAN 2	MILAN 2 Antiarmor System	1987
Missile- Antitank- TOW 2B AERO GEN 2	TOW 2B AERO GEN 2	TOW 2B AERO and TOW 2B AERO GEN 2 Missiles	2005
Missile- Antitank- TOW 2B AERO GEN 2	TOW 2B AERO GEN 2	TOW 2B Aero Gen 2 Missile	2004
Missile- Antitank- TOW BB	TOW BB	TOW Bunker Buster Missile (TOW BB)with Fragmentation Mitigation Disk	2005
Missile- Antitank- TOW BB	TOW BB	TOW Bunker Buster Missile Program	2002
Missile- Antitank- TOW FF	TOW FF	TOW Fire and Forget (TOW FF) System	2000
Missile- Antitank- TOW FOTT	TOW FOTT	Follow-On-To TOW (FOTT) Missile	1998
Missile- Antitank- TOW FOTT	TOW FOTT	Follow-On-To-TOW (FOTT) System	1997
Missile- Antitank- TOW ITAS	TOW ITAS	Improved Target Acquisition System (ITAS)	1996
Missile- Antitank- TOW ITAS	TOW ITAS	Improved Target Acquisition System (ITAS)	1997
Missile- TBM- ATACMS	ATACMS	Army Tactical Missile System (Army TACMS) "Quick Reaction" Unitary Missile Program	2002
Missile- TBM- ATACMS	ATACMS	Army Tactical Missile System (ATACMS) Block II	1999
Missile- TBM- ATACMS	ATACMS	Army Tactical Missile System (TACMS) Block 1A	1997
Missile- TBM- ATACMS	ATACMS	Army Tactical Missile System· (ATACMS) 2000 (I2K) Unitary Missile	2007
Missile- TBM- ATACMS BAT	ATACMS BAT	Army Tactical Missile System (Army TACMS) Block II Brilliant Anti-Armor (BAT) Submunition Missile Program. 6 February 2001	2001
Missile- TBM- ATACMS P3I APAM	ATACMS P3I APAM	Army Tactical Missile System (Army TACMS) (ATAMCS) Pre-Planned Product Improvement (P3I) Anti-Personnel/Anti-Materiel (APAM) Program	1993
Missile- TBM- ATACMS T2K	ATACMS T2K	Army Tactical Missile System (ATACMS) 2000 (T2K) Unitary Missile	2008
Missile- TBM- ATACMS Unitary	ATACMS Unitary	Army Tactical Missile System· (ATACMS) Unitary Missile	2006
Missile- TBM- ATACMS-BAT	ATACMS-BAT	Army Tactical Missile System (Army TACMS) and Brilliant Anti-armor Submunition (BAT) Block II	1994
Missile- TBM- ATACMS-BAT	ATACMS-BAT	Army Tactical Missile System (Army TACMS) and Brilliant Anti-armor Submunition (BAT) Block II Program	1995
Missile- TBM- Lacrosse	Lacrosse	Lacrosse Missile System	1960
Missile- TBM- Lance SU	Lance SU	Lance Sight Unit	1979
Missile- TBM- Pershing COM Pack	Pershing COM Pack	Pershing Weapon System: Communications Pack (AN/TRC-80)	1961

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Missile- TBM- Pershing PPP	Pershing PPP	PERSHING Missile System. Primary Power Pack - Near Field Noise	1961
Missile- TBM- Pershing SNE	Pershing SNE	PERSHING Weapon System: System Noise Evaluation	1962
Missile- TBM- Pershing TEL	Pershing TEL	PERSHING Weapon System: Transporter- Erector-Launcher and Ground Handling Equipment	1961
ModCS	ModCS	Modular Causeway System (ModCS)	1999
MOLLE	MOLLE	Modular Lightweight Load-Carrying Equipment (MOLLE) System	2001
Mortar- 120mm- Cartridge- BMS XM930	BMS XM930	120mm Battalion Mortar System XM930 Visible Illuminating and XM983 Infrared Illuminating Cartridges	1998
Mortar- 120mm- Cartridge- FCS BLOS- MRM	FCS BLOS-MRM	Mid Range Munition (MRM)	2007
Mortar- 120mm- Cartridge- M313 STI	M313 STI	Cartridge, 120mm, M313, Mortar Subcaliber Training Insert (81mm Insert Program)	2006
Mortar- 120mm- Cartridge- M313 STI	M313 STI	M313, 120mm Mortar Subcaliber Training Insert (81mm Insert Program)	2005
Mortar- 120mm- Cartridge- M313 STI	M313 STI	XM313 81mm Subcaliber Training Insert (STI)	2004
Mortar- 120mm- Cartridge- M933E1	M933E1	Cartridge, 120mm Mortar: High Explosive, M933E1	2007
Mortar- 120mm- Cartridge- M934A1E1	M934A1E1	Cartridge, 120mm: High Explosive (HE) M934A1E1, with Fuze Multi-Option, M734A1 for Mortars and PA174 Monopack	2006
Mortar- 120mm- Cartridge- M934A2	M934A2	Health Hazard Assessment Report (HHAR) on the Cartridge, 120mm, High Explosive (HE), M934A2 Mortar Cartridge	2005
Mortar- 120mm/107mm/81mm/60mm- Computer- IMBC	IMBC	XM30 Improved Mortar Ballistic Computer (IMBC)	1996
Mortar- 120mm/107mm/81mm/60mm- Computer- LHMBC XM32	LHMBC XM32	Lightweight Handheld Mortar Ballistic Computer (LHMBC) XM32	2005
Mortar- 120mm/107mm/81mm/60mm- Computer- MFCS	MFCS	XM95/XM96 Mortar Fire Control System (MFCS)	2003
Mortar- 120mm/107mm/81mm/60mm- Computer- MFCS D120	MFCS D120	Mortar Fire Control System - Dismounted 120mm (MFCS - D120)	2008
Mortar- 120mm/107mm/81mm/60mm- Computer- MFCS-H	MFCS-H	Mortar Fire Control System- Heavy, XM95/XM96 (MFCS-H)	2003
Mortar- 4.2 In- T201	4.2 In-T201	4.2 Inch Mortar, T201	1961
Mortar- 60mm- Cartridge- Full Range	Full Range	Insensitive Cartridge, 60mm Mortar HE (XM768), with the XM783 Point Detonating (PD) Fuze. 22 June 2001	2001
Mortar- 60mm- Cartridge- HE M720A1 & M768	HE M720A1 & M768	Health Hazard Assessment Report (RCS MED 388) ON THE 60mm, HE M720A1 AND HE M768 Mortar Cartridges 69-37-6972-03 December 2002	2002
Mortar- 60mm- Cartridge- HE M720E1	HE M720E1	Insensitive Cartridge, 60mm Mortar HE (M720E1), with the M734A1 Multi-option Fuze.	2001

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Mortar- 60mm- Cartridge- MAPAM XM1061	MAPAM XM1061	60mm Mortar Anti-Personnel Anti-Materiel (MAPAM) XM1061/XM1046	2006
Mortar- 60mm- Cartridge- MAPAM XM1061	MAPAM XM1061	XM1061/XM1046 60mm Mortar, Anti-Personnel, Anti-Materiel Mortar Cartridges	2005
Mortar- 60mm- Cartridge- PDF XM768	PDF XM768	Insensitive Cartridge, 60mm Mortar HE (XM768), with the XM783 Point Detonating (PD) Fuze	2001
Mortar- 60mm- Cartridge- WP M722E1	WP M722E1	Cartridge, 60mm Mortar WP Smoke (M722E1, with the XM783 Point Detonating (PD) Fuze	2001
Mortar- 81mm- Cartridge- HEMC	HEMC	M821A1/M889A1 High Explosive (HE) 81mm Mortar Cartridges (HEMC)	1996
Mortar- 81mm- Cartridge- HEMC	HEMC	M821A2 and M889A2 High Explosive 81mm Mortar Cartridges	2008
Mortar- 81mm- Cartridge- HEMC M889A1E1	HEMC M889A1E1	M889A1E1 81-mm Mortar High Explosive Cartridge (HEMC)	2006
Mortar- 81mm- Cartridge- IRILL XM816	IRILL XM816	Cartridge, 81mm Mortar, Infrared Illuminating, XM816. 1 May 2001	2001
Mortar- 81mm- Cartridge- M821A2 / M889A2 HE	M821A2 / M889A2 HE	M821A2 And M889A2 High Explosive 81mm Mortar Cartridges	2009
Mortar- 81mm- Cartridge- WP	WP	Screening Smoke Cartridge, 81mm, White Phosphorus Wicks, XM834	1982
MOUT	MOUT	Military Operations on Urbanized Terrain (MOUT) Fuze (Fuze, Point Detonating/Delay, Mk399 MOD1 for Artillery MOUT Applications)	1999
MPCV	MPCV	Mine Protected Clearance Vehicle (MPCV)	2001
MSS	MSS	Mounted Soldier System (MSS)	2007
MSU	MSU	M67 Mortar Sight Unit (MSU)	1996
MTS	MTS	Movement Tracking System (MTS)	2000
MTS	MTS	Movement Tracking System (MTS). 17 November 2001	2001
MVS	MVS	Muzzle Velocity System (MVS)	1996
NBC- Decon- JSTDS-SS	JSTDS-SS	Joint Service Transportable Decontamination System-Small Scale (JSTDS-SS)	2006
NBC- Decon- MDS	MDS	Modular Decontamination System (MDS)	1993
NBC- Decon- Sorbent	Sorbent	Sorbent Decontamination system (SDS)	2000
NBC- Detector- BIDS	BIDS	Biological Integrated Detection System (BIDS)	1994
NBC- Detector- BIDS	BIDS	Biological Integrated Detection System (BIDS)	1995
NBC- Detector- JCBRAWM	JCBRAWM	Joint Chemical, Biological, and Radiological Agent Water Monitor (JCBRAWM) Kit	2008
NBC- Gloves- CB Protective	CB Protective Gloves	Two Types of Rubber CB Protective Gloves	1980
NBC- Mask- JSMLT	JSMLT	Joint Service Mask Leakage Tester (JSMLT)	2005
NBC- Mask- Protective- Aircrew- ACPM XM45	ACPM XM45	XM45 Aircrew Protective Mask (ACPM)	1996
NBC- Mask- Protective- Aircrew- APM	APM	XM45 Aircrew Protective Mask (APM)	1996
NBC- Mask- Protective- Aircrew- JSAM	JSAM	Joint Service Aircrew Mask (JSAM) Type IA MPU-6/P	2009
NBC- Mask- Protective- Hood- CBPH	CBPH	Chemical-Biological Protective Hood (CBPH) for the XM-29 Protective Mask	1978



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NBC- Mask- Protective- M40	Protective Mask M40	M40 Protective Mask	1994
NBC- Mask- Protective- XM30	Protective Mask- XM30	XM30 Engineering Design	1983
NBC- MOPP Procedures	MOPP Procedures	Mission-Oriented Protective Posture (MOPP) Exchange Procedures	1990
NBC- Suit- CB	Suit-CB	Chemical Biological (CB) Suit and Associated Equipment in Combination with Field Clothing Ensembles Worn by Male Soldiers	1980
NBC- Suit- CVCCS	Suit-CVCCS	Chemical Biological Suit and Associated Equipment in Combination with the Combat Vehicle Crewmember Clothing System (CVCCS)	1980
NBC- Suit- MOPP ACE	MOPP ACE	MOPP Exchange Procedure for the Aircrew Ensemble (MOPP ACE)	1991
NEO	NEO	Network Enabled Operations (NEO)	2006
NVG AN/PVS-7A	NVG AN/PVS-7A	Night Vision Goggle (NVG) AN/PVS-7A	1988
NVG AN/PVS-7B	NVG AN/PVS-7B	Night Vision Goggle (NVG) AN/PVS-7B	1988
OCU	OCU	Omnitech Operator Control Unit (OCU)	1998
OCU II	OCU II	Omnitech D7G Mark II Operator Control Unit (OCU II)	1998
OICW	OICW	Objective Individual Combat Weapon (OICW)	1999
Parachute- ATPS	ATPS	T-11 Advanced Tactical Parachute System (ATPS)	2009
Parachute- Mask- POM	POM	Parachutist Oxygen Mask (POM)	2009
PASGT	PASGT	Personnel Armor System, Ground Troop (PASGT) for Airborne Use	1977
PGMM	PGMM	Precision Guided Mortar Munition, XM395	2003
PIAFS	PIAFS	XM1155 Portable Inductive Artillery Fuze Setter (PIAFS)	2000
Pistol- 9mm- XM10	Pistol- XM10	XM10 Pistol Candidates	1990
PLGR	PLGR	Precision Lightweight GPS Receiver (PLGR)	1994
PLRS	PLRS	Position Location Reporting System (PLRS) OT II Human Factors And Training Evaluation	1984
PLRS-JTIDS	PLRS-JTIDS	PLRS-JTIDS Hybrid (PJH)	1986
PLS	PLS	Palletized Loading System (PLS)	1990
PQA	PQA	Petroleum Quality Analysis (PQA) System	1994
Profiler-MMS-P	Profiler-MMS-P	Meteorological Measuring Set-Profiler (MMS-P) AN/TMQ-52	2005
Profiler-MMS-P (Revised)	Profiler-MMS-P (Revised)	Meteorological Measuring Set-Profiler (MMS-P) AN/TMQ-52	2005
PVAB	PVAB	Portable Vehicle Arresting Barrier (PVAB), XM1	1999
PVAB	PVAB	Portable Vehicle Arresting Barrier, XM1 (PVAB) formerly known as Portable Vehicle Immobilization System (PVIS)	2000
Quick Stow- QSS	QSS	XM326 120mm Stowage Kit (Quick Stow)	2007
Quick Stow- QSS	QSS	XM326 120mm Stowage Kit (Quick Stow)	2008
Radio- JTRS	JTRS	Joint Tactical Radio System (JTRS)	2002
Radio- JTRS	JTRS	Joint Tactical Radio System (JTRS) Cluster 5	2004

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Radio- SINCGARS	SINCGARS	Single Channel Ground and Airborne Radio System (SINCGARS) AN/ARC-201 (ABN)	1988
Radio- SINCGARS ICOM	SINCGARS ICOM	SINCGARS ICOM Radio	1987
Radio- SINCGARS ICOM	SINCGARS ICOM	Single Channel Ground and Airborne Radio System (SINCGARS) Integrated COMSEC (ICOM)	1993
Radio- SINCGARS-V	SINCGARS-V	SINCGARS-V Maturity Operational Test: Human Factors Evaluation (Synopsis)	1985
Radio- Troposcatter RS	Troposcatter RS	AN/TRC-170 Digital Troposcatter Radio System	1989
Radio- WIN-T	WIN-T	Warfighter Information Network-Tactical (WIN-T) Program	2003
Rifle- 5.56mm- Carbine- M4A1	M4A1	Carbine, 5.56mm, M4E1 (M4A1)	1994
Rifle- 5.56mm- Carbine- XM8	XM8	Initial Impressions for the XM8 Carbine	2004
Rifle- 5.56mm- Cartridge- LFS	LFS	Cartridge, 5.56 mm, ball, Lead Free Slug (LFS), M855LFS	2009
Rifle- 5.56mm- Cartridge- RLEM	RLEM	Rifle Launched Entry Munition (RLEM), XM100, and RLEM Trainer, XM101	2002
Rifle- 5.56mm- Cartridge- RLNLM XM95	RLNLM XM95	5.56mm Rifle Launched - Non-Lethal Munition (5.56mm NLN), XM95	1999
Rifle- 5.56mm- M16/M4A1- MWS	MWS	Modular Weapon System (MWS)	1997
Rifle- 5.56mm- Machine Gun- SAW M249	SAW M249	Squad Automatic Weapon (SAW) System	1980
Rifle- 50 Cal- LRSR XM107	LRSR XM107	XM107, .50 Caliber, Long Range Sniper Rifle	2003
Rifle- 50 Cal- Machine Gun- Cartridge- SLAP	SLAP	Cartridge, Caliber .50, Saboted, Light Armor Penetrator (SLAP), XM903 and XM962 Tracer	1993
Rifle- 50 Cal- Machine Gun- Cartridge- SLAP	SLAP	M903 and M962 Caliber .50 Sabot Light Armor Penetrator (SLAP) Cartridges	1996
Rifle- 7.62mm- Cartridge- APC	APC	Cartridge, 7.62MM Armor Piercing (ACP), XM993	1995
Rifle- 7.62mm- Cartridge- RLRP	RLRP	Rifle-Launched Rocket Projectile (RLRP)	1975
Rifle- 7.62mm- Cartridge- SRTA	SRTA	Rifle- 7.62mm, Cartridge- Short Range Training Ammunition	1993
Rifle- 7.62mm- Cartridge- Tracer	Tracer	Rifle- 7.62mm, Cartridge- Dim Tracer, XM276	1992
Rifle- 7.62mm- Machine Gun- M240E4	M240E4	M240E4 Medium Machine Gun and M122E1 Machine Gun Mount (MGM)	1996
Rifle- 7.62mm- Machine Gun- M240E5	M240E5	M240E5 Machine Gun (Aviation Variant) Mounted on the M144 Mounting Arm for the UH-60, and the M24 and M41 Mounts for the CH-47	2004
Rifle- 7.62mm- Machine Gun- M240E6	M240E6	M240E6 Lightweight Medium Machine Gun (LMMG) (M240E6)	2007
Rifle- 7.62mm- Machine Gun- M73C	M73C	M73C Tank Machine Gun	1961
Rifle- 7.62mm- SASS	SASS	XM110 Semi Automatic Sniper System (SASS) and XM151 Sniper Spotting Scope (SSS)	2006
Rifle- 7.62mm- Stoner G3	Stoner G3	Stoner G3 Assault Rifle	1964
Rocket- 2.75" Smoke Warhead	2.75" Smoke Warhead	Warhead, 2.75 Inch Rocket, Smoke: Screening, RP, XM264	1993
Rocket- Davy Crockett GFS	Davy Crockett GFS	Davy Crockett Graphical Firing Scale (FRE 24776)	1961
Rocket- Direct Attack Guided Rocket	Direct Attack Guided Rocket	Direct Attack Guided Rocket	2002

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Rocket- GLMRS UR	GLMRS UR	Guided Multiple Launch Rocket System (GMLRS) Unitary Rocket	2008
Rocket- GMLRS	GMLRS	Guided Multiple Launch Rocket System (GMLRS)	1997
Rocket- GMLRS	GMLRS	Guided Multiple Launch Rocket System (GMLRS)	1998
Rocket- GMLRS	GMLRS	XM30 Guided Multiple Launch Rocket System (GMLRS) in the Combined High Mobility Artillery Rocket System (HIMARS)	2007
Rocket- GMLRS UR	GMLRS UR	Guided Multiple Launch Rocket System (GMLRS) Unitary Rocket (UR)	2003
Rocket- GMLRS UR	GMLRS UR	Guided Multiple Launch Rocket System (GMLRS) Unitary Rocket (UR) Full Rate Production Decision	2008
Rocket- GMLRS XM30	GMLRS XM30	Guided Multiple Launch Rocket System (GMLRS) XM30 Rocket	2005
Rocket- GMLRS-DPICM	GMLRS-DPICM	Guided Multiple Launch Rocket System (GMLRS) Dual Purpose Improved Conventional Munitions (DPICM)	2003
Rocket- Grenade- 66mm- LAW XM72	LAW XM72	Infantry Assault Weapon, Light (LAW) Rocket Grenade, 66mm, XM-72	1961
Rocket- LAW AT4	LAW AT4	Modified AT-4 Light Antiarmor Weapon	1984
Rocket- Little John	Little John	Little John Launchers, XM34 and XM80	1960
Rocket- MLRS	MLRS	Multiple Launch Rocket System (MLRS) in Operational Test III	1984
Rocket- MLRS FCS	MLRS FCS	Personnel and training Evaluation for the M270A1 Multiple Launch Rocket System (MLRS) Fire Control System (FCS)	2002
Rocket- MLRS M270A1	MLRS M270A1	Multiple Launch Rocket System (MLRS) M270A1 Launcher	2002
Rocket- MLRS RRPR M28A2	MLRS RRPR M28A2	Multiple Launch Rocket System M28A2 Reduced Range Practice Rocket	2004
Rocket- MLRS-IFCS	MLRS-IFCS	Multiple Launch Rocket System (MLRS) Improved Fire Control System (IFCS)	1997
Rocket- MLRS-RRPR	MLRS-RRPR	Multiple Launch Rocket system (MLRS) M28A2 Reduced Range Practice Rocket (RRPR)	2005
Rocket- MRL M91	MRL M91	M91, 115mm Multiple Rocket Launcher	1962
Rocket- SMAW	SMAW	Mobility, Portability, and Human Factors Evaluation of the Shoulder-Launched Multipurpose Assault Weapon (SMAW) MK 153 MOD 1	1992
RSCCE	RSCCE	Replacement Satellite Communication Configuration Control Element (RSCCE)	1994
RWBK	RWBK	Rapid Wall Breaching Kit (RWBK XM322, Force on Force Trainer, XM323, and the Inert Trainer XM324	2004
SAFEGUARD	SAFEGUARD	SAFEGUARD Intrasite Communications Subsystem	1972
SASRD	SASRD	Small-Arms Soft-Recoil Device	1965
SCS-CGCP	SCS-CGCP	Special Communications System (SCS) AN/GSC-40 Combined Ground Command Post Terminal (CGCP)	1984
SDRI	SDRI	Seven Digital Readout Indicators (SDRI)	1960
SFC	SFC	Soldier Fighting Cover (SFC)	1994
SHF-TSST	SHF-TSST	Phoenix Tactical Super High Frequency (SHF) Satellite Terminal (TSST)	2005

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Shotgun- 12 Gauge- MASS	MASS	XM26 Modular Accessory Shotgun System (MASS)	2006
Shotgun- 12 Gauge- MASS	MASS	XM26 Modular Accessory Shotgun System (MASS) (Revised)	2007
SICPS	SICPS	Standardized Integrated Command Post System (SICPS)	2003
SICPS	SICPS	Standardized Integrated Command Post System (SICPS)	2005
SICPS	SICPS	Standardized Integrated Command Post System (SICPS)	2006
SIDPERS	SIDPERS	Standard Installation/Division Personnel System - 3 (SIDPERS-3)	1996
SIIRCM	SIIRCM	Suite of Integrated Infrared Countermeasures (SIIRCM)	2001
Snowshoes- Assault	Snowshoes	Mobility and Human Factors Evaluation of Three Prototype Assault Snowshoes	1994
SNS	SNS	Sniper Night Sight (SNS)	1994
SPIW- 3 Prototypes	SPIW	Three Special Purpose Infantry Weapons (SPIW) Prototype Weapons	1964
SPIW- 3 SP Prototypes	SPIW	Three Prototype Special Purpose Infantry Weapons (SPIW)	1964
SRAT	SRAT	Armor System Stryker Reactive Annor Tiles (SRAT)	2006
Stab Bino XM25	Stab Bino XM25	XM25 Stabilized Binocular	1998
STANO	STANO	Selected STANO Devices Employed In A Mechanized Infantry Platoon	1980
TACJAM	TACJAM	Tactical Jamming System (AN/MLQ-34, TACJAM)	1979
TASER	TASER	TASER® X26E	2008
TC-AIMS II	TC-AIMS II	Transportation Coordinators' - Automated Information for Movement System II (TC-AIMS II) Block 3	2007
TC-AIMS II	TC-AIMS II	Transportation Coordinators'- Automated Information for Movement System II (TC-AIMS II) Block 3	2008
TC-AIMS II	TC-AIMS II	Transportation Coordinators Automated Information for Movements System II (TC-AIMS II)	2000
TC-AIMS II	TC-AIMS II	Transportation Coordinators Automated Information for Movements System II (TC-AIMS II)	2003
TC-AIMS II	TC-AIMS II	Transportation Coordinators Automated Information for Movements System II (TC-AIMS II)	2004
TCD	TCD	Threat Cue Devices (TCD)	1992
TCF- Coltano, Italy	TCF	Automated Quality Monitoring and Reporting Subsystem in the Technical Control Facility at Coltano, Italy	1971
TeamMATE	TeamMATE	TeamMATE System for Dismounted embedded Training and Mission Rehearsal	2008
Trailblazer	Trailblazer	The Trailblazer Special Purpose Detecting System	1978
TSST	TSST	Phoenix Tactical Super High Frequency (SHF) Satellite Terminal (TSST)	2004
TSV	TSV	Theater Support Vessel (TSV)	2004
Uniform- Clothing of Viet Nam	Clothing of Viet Nam	Clothing and Personal Equipment in Thailand and the Republic of Viet Nam	1963
USNS Corpus Christi Bay	USNS Corpus Christi Bay	USNS Corpus Christi Bay	1966

<b>MANPRINT Reports Ordered by Short Name Categorized- Short Name- Long Name- Year</b>			
<b>Short Name Categorized</b>	<b>Short Name</b>	<b>Long Name</b>	<b>Year</b>
Vehicle- Tracked- APC- T113 & T117 APC	T113 & T117 APC	Armored Personnel Carriers T113 & T117	1958
Vehicle- Tracked- APC- T113 and T117 APC	T113 and T117 APC	Armored Personnel Carriers T113 and T117	1957
Vehicle- Tracked- Artillery- 155mm- Howitzer AFAS/FARV	Howitzer AFAS/FARV	Advanced Field Artillery System (AFAS) and Future Armored Resupply Vehicle (FARV)	1994
Vehicle- Tracked- Artillery- 155mm- Paladin M109A6	Paladin M109A6	M109A6, 155-mm Self Propelled Howitzer	1993
Vehicle- Tracked- Artillery- 155mm- Paladin M99A2	Paladin M99A2	Transfer of Ammunition from the M992A2 Field Artillery Ammunition Support Vehicle into the M109A6 Paladin Self-Propelled Howitzer	2003
Vehicle- Tracked- ARV- HERCULES	HERCULES	HERCULES M88A1E1 Armored Recovery Vehicle (ARV)	1996
Vehicle- Tracked- C2V	C2V	Command and Control Vehicle (C2V)	1996
Vehicle- Tracked- CCP XM577 SNE	CCP XM577 SNE	Carrier, Command Post, (CCP) Light, Tracked XM577	1963
Vehicle- Tracked- DIVAD	DIVAD	Division Air Defense (DIVAD) Gun Systems	1981
Vehicle- Tracked- DIVAD	DIVAD	Division Air Defense (DIVAD) Gun Systems	1984
Vehicle- Tracked- DIVAD Sgt York	DIVAD Sgt York	DIVAD System: Volume I. Sgt York	1988
Vehicle- Tracked- DIVAD Sgt York FOE	DIVAD Sgt York FOE	Future Systems. FAADS Design Criteria Evolving from the Sgt. York Follow-On Evaluation I	1989
Vehicle- Tracked- Engineer- R028 Scraper	R028 Scraper	R028 Scraper	1984
Vehicle- Tracked- Engineer- R038 Grader	R038 Grader	R038 Grader	1984
Vehicle- Tracked- FCS- 155mm- NLOS-C	NLOS-C	Manpower, Personnel Capabilities and Training (MPT) Domain Assessment for the Non-Line of Sight Cannon (NLOS Cannon)	2008
Vehicle- Tracked- FCS FOV	FCS FOV	Future Combat System (FCS)	2003
Vehicle- Tracked- FCS FOV	FCS FOV	Future Combat System (FCS)	2004
Vehicle- Tracked- IFV- BMP-A	BMP-A	Soviet BMP-A Armored Infantry Combat Vehicle	1982
Vehicle- Tracked- IFV- Bradley BFIST Striker	Bradley BFIST Striker	Striker XM707 Fire Support Vehicle	1998
Vehicle- Tracked- IFV- Bradley BFVS A3	Bradley BFVS A3	Bradley Fighting Vehicle Systems A3 (BFVS A3)	1997
Vehicle- Tracked- IFV- Bradley BFVS BFIST	Bradley BFVS BFIST	Bradley Fire Support Vehicle (BFIST)	1994
Vehicle- Tracked- IFV- Bradley BFVS BFIST	Bradley BFVS BFIST	Bradley Fire Support Vehicle (BFIST)	1995
Vehicle- Tracked- IFV- Bradley BFVS BFIST	Bradley BFVS BFIST	Bradley Fire Support Vehicle (BFIST)	1997
Vehicle- Tracked- IFV- Bradley BFVS Linebacker M-6	Bradley BFVS Linebacker M-6	Bradley Linebacker (BL)	1996
Vehicle- Tracked- IFV- Bradley BFVS M2A3/M3A3	Bradley BFVS M2A3/M3A3	Bradley Fighting Vehicle (BFVS) M2A3/M3A3	1993
Vehicle- Tracked- IFV- Bradley BFVS M2A3/M3A3	Bradley BFVS M2A3/M3A3	Bradley Fighting Vehicle Systems A3 (BFVS A3). 6 February 2001	2001
Vehicle- Tracked- ITV	ITV	Improved Tow Vehicle (ITV) During OT/DT III	1980

<b>MANPRINT Reports Ordered by Short Name Categorized- Short Name- Long Name- Year</b>			
<b>Short Name Categorized</b>	<b>Short Name</b>	<b>Long Name</b>	<b>Year</b>
Vehicle- Tracked- LAVM/RV	LAVM/RV	Light Armored Vehicle, Maintenance/Recovery Vehicle (LAVM/RV)	1986
Vehicle- Tracked- MAULER SNE	MAULER SNE	MAULER Weapon System	1963
Vehicle- Tracked- Medical- Bradley AMEV	Bradley AMEV	Armored Medical Evacuation Vehicle (AMEV)	1999
Vehicle- Tracked- MICV	MICV	Infantry Fighting Vehicle (IFV)	1978
Vehicle- Tracked- Tank- Abrams M1	Abrams M1	M1 Combat Tank	1984
Vehicle- Tracked- Tank- Abrams M1 EDC	Abrams M1 EDC	Tank Design Criteria Evolving from the M1 Tank Operational Test III	1984
Vehicle- Tracked- Tank- Abrams M1A1	Abrams M1A1	M1A1 Abrams 120mm Gun Tank, Follow on Evaluation	1988
Vehicle- Tracked- Tank- Abrams M1A2	Abrams M1A2	M1A2 Abrams Tank	1994
Vehicle- Tracked- Tank- Abrams M1A2 ARAT XM19	Abrams M1A2 ARAT XM19	XM19 Abrams Reactive Armor Tiles (ARAT)	2008
Vehicle- Tracked- Tank- Abrams M1A2 ARAT XM19	Abrams M1A2 ARAT XM19	XM19 Abrams Reactive Armor Tiles (ARAT)	2009
Vehicle- Tracked- Tank- Abrams M1A2 TMS	Abrams M1A2 TMS	Abrams System Enhancement Package Thermal Management System (TMS)	1997
Vehicle- Tracked- Tank Driving From Turret	Tank Driving From Turret	Tank Driving From A Turret Position (U)	1966
Vehicle- Tracked- Tank GPFU	Tank GPFU	Control Panel for the Gas-Particulate Filter Unit (GPFU), E49	1965
Vehicle- Tracked- Tank- HAB- Wolverine M1A2 SEP	Wolverine M1A2 SEP	Heavy Assault Bridge (HAB), Wolverine	1997
Vehicle- Tracked- Tank- HAB- Wolverine M1A2 SEP	Wolverine M1A2 SEP	Heavy Assault Bridge (HAB), Wolverine, XM104	2000
Vehicle- Tracked- Tank- Patton M48	Patton M48	M48 TANK	1956
Vehicle- Tracked- Tank- Patton M48A5	Patton M48A5	Scheduled and Proposed Modifications to M48A1, M48A2 and M48A3 Tanks for Conversion to M48A5	1978
Vehicle- Tracked- Tank- Patton M60	Patton M60	Tank, Combat Full Tracked: 105mm Gun, M60	1961
Vehicle- Tracked- Tank- Patton M60 Tank	Patton M60 Tank	M60 Main Battle Tank	1960
Vehicle- Tracked- Tank- Patton M60E1	Patton M60E1	Main Battle Tank, 105mm Gun, M60E1	1962
Vehicle- Tracked- Tank- T42 Tank	T42 Tank	Tank, 90mm Gun, T42	1953
Vehicle- Tracked- Tank- Walker Bulldog M41A1 Tank	Walker Bulldog M41A1 Tank	Tank, 76mm Gun, M41A1	1957
Vehicle- Wheeled- Artillery- 155mm- Howitzer- IAV	IAV	Interim Armored Vehicle (IAV)	2000
Vehicle- Wheeled- Artillery- 155mm- Howitzer- IAV	IAV	Interim Armored Vehicle (IAV). 31 January 2001	2001
Vehicle- Wheeled- Cargo- FMTV	FMTV	Family of Medium Tactical Vehicles (FMTV)	1995
Vehicle- Wheeled- Cargo- HEMTT-LHS	HEMTT-LHS	Heavy Expanded Mobility Tactical Truck-Load Handling System (HEMTT-LHS)	2000
Vehicle- Wheeled- Cargo- HETS	HETS	Heavy Equipment Transport System (HETS), Which Includes M1000 Semitrailer and the M1070 Truck Tractor	1993

<b>MANPRINT Reports Ordered by Short Name Categorized- Short Name- Long Name- Year</b>			
<b>Short Name Categorized</b>	<b>Short Name</b>	<b>Long Name</b>	<b>Year</b>
Vehicle- Wheeled- Cargo- HETS	HETS	Heavy Equipment Transporter System (HETS), Which Includes the M1000 Semitrailer and the M1070 Truck Tractor	1994
Vehicle- Wheeled- Cargo- TT-LET M916A2	TT-LET M916A2	M916A2 Truck Tractor, Light Equipment Transporter, 34-Ton Gross Vehicle Weight Rating (GVWR) 6 x 6 with Winch	1997
Vehicle- Wheeled- Engineer-Forklift- ATLAS	ATLAS	Truck, Lift, Fork Variable Reach, Rough Terrain, 10,000-Pound Capacity, Formally Known as the All Terrain Lifter Articulated System (ATLAS)	1994
Vehicle- Wheeled- Engineer-Forklift- ATLAS	ATLAS	Truck, Lift, Fork, Variable Reach, Rough Terrain, 10,000-Pound Capacity, Formally Known as the All Terrain Lifter Articulated System (ATLAS)	1993
Vehicle- Wheeled- Engineer-IVMMD	IVMMD	Interim Vehicle Mine Mounted Detection (IVMMD)	2007
Vehicle- Wheeled- HMMWV ASV	HMMWV ASV	Armored Security Vehicle (ASV)	1999
Vehicle- Wheeled- HMMWV FAAD-GBS	HMMWV FAAD-GBS	Forward Area Air Defense (FAAD) System Ground Based Sensor (GBS) High Mobility MultiPurpose Wheeled Vehicle (HMMWV)	1995
Vehicle- Wheeled- IFV- 120mm-Stryker Mortar Carrier-B	Stryker Mortar Carrier-B	Stryker- Mortar Carrier-B (Mounted)	2004
Vehicle- Wheeled- IFV- Stryker FOV	Stryker FOV	Stryker Family of Vehicles (FOV)	2002
Vehicle- Wheeled- IFV- Stryker ICV	Stryker ICV	Stryker- Infantry Carrier Vehicle (ICV) and Seven Configurations	2004
Vehicle- Wheeled- IFV- Stryker MGS	Stryker MGS	Stryker Mobile Gun System (MGS)	2008
Vehicle- Wheeled- IFV- Stryker MGS	Stryker MGS	Stryker- Mobile Gun System (MGS)	2004
Vehicle- Wheeled- IFV- Stryker NBCRV	Stryker NBCRV	Stryker - Nuclear, Biological, and Chemical Reconnaissance Vehicle (NBCRV)	2007
Vehicle- Wheeled- IFV- Stryker NBCRV	Stryker NBCRV	Stryker- NBCRV	2004
Vehicle- Wheeled- MFS	MFS	Mini-Flail System (MFS)	1996
Vehicle- Wheeled- MRAP- MPCV Buffalo	MPCV Buffalo	Mine Protected Clearance Vehicle, MPCV (BUFFALO)	2007
Vehicle- Wheeled- MRAP- MPCV Buffalo Hatch	MPCV Buffalo Hatch	Buffalo Mine Protection Clearance Vehicle (MPCV) Roof Hatch	2007
Vehicle- Wheeled- Rocket-HIMARS	HIMARS	High Mobility Artillery Rocket System (HIMARS)	2003
Vehicle- Wheeled- Rocket-HIMARS	HIMARS	High Mobility Artillery Rocket system (HIMARS)	2005
Vehicle- Wheeled- Rocket-HIMARS	HIMARS	High Mobility Artillery Rocket System (HIMARS) in the Combined HIMARS-Guided Multiple Launch Rocket System (GMLRS)	2007
Vehicle- Wheeled- Utility HMMWV-HV	Utility HMMWV-HV	High Mobility Multipurpose Wheeled Vehicle Heavy Variant (HMMWV-HV)	1988
Vehicle- Wheeled- Utility-HMMWV HV	HMMWV HV	High Mobility Multipurpose Wheeled Vehicle-Heavy Variant (HMMWV-HV)	1990
Vehicle- Wheeled- Utility-HMMWV SICPS Variant	HMMWV SICPS Variant	Standardized Integrated Command Post System (SICPS) HMMWV Variant	1994

<b>MANPRINT Reports Ordered by Short Name Categorized- Short Name- Long Name- Year</b>			
<b>Short Name Categorized</b>	<b>Short Name</b>	<b>Long Name</b>	<b>Year</b>
Vehicle- Wheeled- Utility- Jeep M151A2 ROPS	Jeep M151A2 ROPS	Soldier-Machine Interface (SMI) for Rollover Protection System (ROPS) on M151A2 Vehicles	1988
Vehicle- Wheeled- Utility- Jeep- XM151	Jeep-XM151	Truck, 1/4 Ton, 4x4, XM151 (Jeep)	1956
VLAD	VLAD	Vehicle Lightweight Arresting Device (VLAD)	2004
Volcano- Towed	Towed	Mounting Kit, Mine Dispenser: VOLCANO, 2 1/2 Ton Trailer Towed with Track-Mobility Kit	2002
WPS	WPS	Worldwide Port System (WPS) MAISRC III C	1994
WRAP	WRAP	Seven FY98 Warfighting Rapid Acquisition Program (WRAP) Candidates	1997
WRUE	WRUE	Water Recovery Unit from Exhaust (WRUE), Project No. 69-MP-02SY-05	2003



## 9. MANPRINT Assessment & Evaluation Reports- Annotated Bibliography.

This section contains the bibliographic listings for all the MANPRINT documents in this report in order by system short name.

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**System Short Name:** MANPRINT- ABCS- A2C2S

**Reference** (Havir, 2004):

Havir, T. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Army Airborne Command and Control System (A2C2S) Block 1. Redstone Arsenal, AL.; U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The A2C2S is specifically designed to meet the maneuver commander's requirement for an airborne command and control vehicle (aerial Command Post (CP)). The A2C2S will provide the commander with the ability to "see" his area of operation through selected Army Battle Command Systems (ABCS), exercise command and control of subordinate units, coordinate with adjacent units, and rapidly respond to fluid combat situations. The A2C2S will provide the maneuver commander with an airborne Tactical Command Post (TAC) with similar capabilities to a ground TAC. This aerial CP will allow the commander to exploit the third dimension of the battlespace as he commands and controls his units.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- ABCS- A2C2S

**Reference** (Havir and Durbin, 2004):

Havir, T. J., & Durbin, D. B. (2004). Manpower and Personnel Integration (MANPRINT) Assessment: Initial Assessment of the Manpower Requirements for the Army Airborne Command and Control System (A2C2S) System Operator Via the Improved Performance Research Integration Tool (IMPRINT). Aberdeen Proving Ground, MD: U.S. Army Research Laboratory, Human Research and Engineering Directorate. Aberdeen Proving Ground, MD. ARL Technical Report ARL-TR-3317.

**Key Words:**

A2C2S, IMPRINT, manpower, system operator

**System Description:**

The Army airborne command and control system (A2C2S) is an airborne C2 system that commanders will use to command and control units engaged in military operations ranging from humanitarian support and homeland security through high-intensity conflict. The A2C2S will allow the commander and staff to quickly traverse the battlefield while exercising command and control over forces in joint, interagency, and multinational environments. The U.S. Army Training and Doctrine Command System Manager-Battle Command (TSM-BC) requested the U.S. Army Research Laboratory's Human Research and Engineering Directorate to perform an IMPRINT analysis to determine the manpower requirements for the A2C2S system operator. The model was constructed with engineering estimates of the reliability data for the system, and the wartime scenario was based on the operational mission profile for the system. The model

was executed ten times as a baseline and ten times with stressors including temperature, humidity, mission-oriented protective posture level, sleepless hours, and noise. The model results indicated that the system operator man-hour requirement was 2056.71 hours per A2C2S. This time consisted of maintenance man-hours required to perform unscheduled maintenance and mission time since the system operator is required to participate as a member of the A2C2S during missions. Based on the results of this model, one system operator is required for each A2C2S to adequately perform unscheduled maintenance and to participate as a member of the A2C2S during missions. Several opportunities for future research are available to complement the findings in this report. As system development continues and more accurate RAM (reliability, availability, maintainability) data become available, the model should be revised to reflect the most current data. Also, the amount of scheduled maintenance anticipated on the systems should be estimated. Adding the scheduled maintenance requirements to the existing data would provide a very accurate estimate of the total number of system operator man-hours that are required to operate and maintain the A2C2S.

Descriptive Note: 2001-2003

Dist./Avail. Stmt.: Approved for public release; distribution unlimited.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- ABCS- AFATDS

**Reference** (Howell, 1995):

Howell, M. (1995). Manpower and Personnel Integration (MANPRINT) Assessment for the Advanced Field Artillery Tactical Data System (AFATDS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The mission of the Advanced Field Artillery Tactical Data System (AFATDS) is to be the Fire Support (FS) command, control and coordination system which will perform the United States Army and United States Marine Corps (USMC) fire support functional area responsibilities during the 1994-2010 timeframe. AFATDS is a multi-service development initiated in response to Congressional direction to develop a modern, responsive and cost-effective successor to the Tactical Fire Direction (TACFIRE) system. AFATDS is being designed to accommodate evolving doctrine while ensuring compatibility with current doctrine.

a. A Mission Need Statement was developed and approved on 16 March 1981. A revised Required Operational Capability defining the objective system's requirements was approved in January 1991. An AFATDS Operational Requirements Document (ORD) was subsequently approved in September 1993. (Reference 2)

b. AFATDS will utilize Army Tactical Command and Control Systems (ATCCS) Common Hardware Software (CHS) and the SICPS. AFATDS will share information with other ATCCS Battlefield Functional Area Systems (e.g. Combat Service Support Control System, Maneuver Control System, Forward Area Air Defense Command, Control and Intelligence and All Source Analysis System). The AFATDS will provide FS information needed to support the Maneuver Commander's concept of operations. FS organizational elements will be able to operate independently or can be linked to other elements in a network at the same, higher, or lower echelons.

c. The system requires that maximum advantage be taken of new software technology and use of the DOD established software language Ada to expand the percentage of FS functions that are wholly or partially automated, to include target acquisition functions, attack system functions, and field artillery mission support functions. The system will provide access to, and maintenance of, the command database, inter-operate with other Battlefield Functional Area control systems, and when required, function as the force headquarters for the Army Tactical Command and Control System Continuous Operations (CONOPS).

d. AFATDS is a software driven automated decision support system which will be located at maneuver Fire Support Elements (FSE) and field artillery organizations. The system will have the flexibility to respond to rapid changes in the tactical situation and shall support the Force Commander in the conduct of close, rear and deep operations. All available FS assets are considered for use in attacking targets which in turn must be prioritized based upon the highest payoff targets as determined by commanders guidance and restraints. The AFATDS will provide automation to those units currently without an automated system in order to improve the Army FS Systems.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- ABCS- ASAS

**Reference** (McCommons, 1993):

McCommons, R. B. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the All Source Analysis System (ASAS) Block I: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

1. The Block I ASAS is a computer-based intelligence system designed to support tactical commanders in peacetime, during transition to war, and in combat. ASAS provides a near real-time assessment of data to assist commanders in the decision making process. It receives the commander's intelligence information requirements; performs collection requirement/mission/asset management and tasking; accepts, evaluates, processes, correlates, displays, and disseminates intelligence from all sources; and produces situation assessments and target nominations. The ASAS Block I performs these functions using various configurations of hardware subsystems, modules, and software.
2. The individual Block I system components are variously grouped into enclave configurations which create an interactive system capable of performing intelligence processing, system operation, and communications processing and interfacing. An enclave is defined as two or more hardware modules and their associated software grouped by a Local Area Network (LAN) into an integrated operating unit designed to carry out specified missions and functions.
3. The Block I ASAS will be fielded as two enclaves: the Tactical Operations Center (TOC) Support Element (TSE) enclave and the Technical Control and Analysis Element (TCAE) enclave. The Army will deploy these enclaves at the Corps TSE (CTSE), Military Intelligence Brigade (MI BDE), TOC TCAE, Division TSE (DTSE), and MI Battalion (BN) TCAE.
4. The principal Block I ASAS hardware modules are the Data Processor Set (DPS), AN/TYQ-36(V)3; Communications Control Set (CCS), AN/TYQ-40(V)2; Workstation, Computer Graphics (WCG), AN/TYQ-37(V)5; TCAE Analyst Workstation, Computer Graphics, TCAE WCG, AN/TYQ-52(V)1/2; and the Supplementary Equipment, Electronic (SEE), AN/TYQ-42(V)13-14. The DPS provides the interconnectivity required for message processing and the interfaces for the databases distributed among the DPSs and up to 6 WCGs. The CCS serves as an intelligence message concentrator and communications interface to deployed Intelligence/Electronic Warfare (IEW) sensors and the TCAE and TSE Enclaves. It supports intelligence collection and the coordination and control of forward area sensors. Both the DPS and CCS consist of a suite of computers, computer peripherals, and communications equipment. They are housed in S-250 shelters and are transported on the M1028 Commercial Utility Cargo Vehicle (CUCV). The TSE and TCAE WCGs provide the primary means of interface between the analyst and Military Intelligence (MI) data sources. These workstations consist of computers, monitors, peripherals, and various software modules. The SEE includes all the support items and equipment required to integrate the DPS, CCS, and WCG into the various enclave configurations. Included are the power subsystem, vehicles, communications equipment (secure and non-secure voice and data), printers, and cables.

5. The Block I ASAS software for the TSE and TCAE falls into three categories: system, applications, and communications. The system software provides the operating system, security and control mechanisms, system services, and system utilities required to support the operations of the applications and communications software. The TSE applications functionality provides the capabilities associated with tasking and managing intelligence collection assets, analyzing reported intelligence information, and generating intelligence products. It is divided into four functional subcategories: supervision and control, intelligence analysis and production, intelligence support services, and message processing support. The TCAE applications software provides the supervisor/administrator or analyst/operator with the ability to process incoming intelligence messages, to distribute the intelligence data contained in them to the appropriate analysts, to analyze the intelligence data, and to generate the appropriate outgoing intelligence products. The communications software provides the external communications interface for the TSE and TCAE Enclaves. It includes the functionality, controls, and security measures necessary to support these communications interfaces.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- ABCS- ATCCS

**Reference** (ARL-HRED, 1997):

ARL-HRED. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the U.S. Army's Tactical Command and Control System (ATCCS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The U.S. Army's Tactical Command and Control System (ATCCS) is designed to provide interoperability within command and control functions for the tactical Army. When completely fielded, the ATCCS will give commanders a common picture of the battlefield to allow synchronization of the combat forces. The common protocols, system languages, report formats, and interfaces will provide rapid acquisition and integration of information to the maneuver commander and staff officers. The ATCCS consists of five major Battlefield Functional Areas (BFA). These are:

- Combat Service Support Control System (CSSCS)
- Forward Area Air Defense C3I (FAAD C3I) System
- All Source Analysis System (ASAS)
- Advanced Field Artillery Tactical Data System (AFATDS)
- Maneuver Control System (MCS)

The five BFAs are in various stages of development. These were evaluated during the Division Advanced Warfighting Experiment (DAWE) conducted at Fort Hood, Texas (5-13 Nov 97).

The Human Factors portion of the evaluation was conducted by the Army Research Laboratory Human Research and Engineering Directorate (ARL-HRED). The program within ARL-HRED which researches questions related to human factors or human performance in applied settings supports the DA DCSPER Manpower and Personnel Integration (MANPRINT) program. The program is concerned with soldier performance issues in seven domains: Manpower, Personnel, Training, Human Factors Engineering, System Safety, Health Hazards, and Soldier Survivability. The remainder of this report deals with the MANPRINT Assessments of four of the BFAs (CSSCS, FAAD C3I, ASAS, and AFATDS). The most pervasive, MCSIP, is being assessed through a long-standing arrangement with TEXCOM for the trial application of measures developed in the ARL-HRED "Performance Metrics" STO R&D project.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- ABCS- CPOF ver. 3.0.2

**Reference** (Middlebrooks, 2008):

Middlebrooks, S. E. (2008). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Assessment (HFEA) for the Command Post of the Future (CPOF). Fort Hood, Texas: U.S. Army Research Laboratory, Human Research and Engineering Directorate, Fort Hood Field Element, Fort Hood, Texas 76544. ARL Reprint Report ARL-RP-0209. DTIC ADB340344.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA  
Fields and Groups:

250500 - Command, Control and Communications Systems

120600 - Computer Hardware

120700 - Computer Systems

Descriptors:

(U) \*COMMAND AND CONTROL SYSTEMS, \*DECISION SUPPORT SYSTEMS, DECISION MAKING, SITUATIONAL AWARENESS, DATA ACQUISITION, PLANNING

Declassification:

3 May 2016

Identifiers:

(U) CPOF(COMMAND POST OF THE FUTURE), OPERATIONAL ASSESSMENT, SHARED WORKSPACES, SHARED OPERATIONAL PICTURE, COLLABORATIVE TOOLS

**System Description:**

The Command Post of the Future (CPOF) is a technical insertion into the Maneuver Control System (MCS) as an acquisition category 1AC program, with Office of the Secretary of Defense oversight. CPOF (PdM-CPOF, 2006a) is an executive level Command and Control (C2) and decision support system providing situational awareness and collaborative tools to support decision-making. CPOF supports visualization, information analysis and collaboration in a single integrated environment that enables the commanders and decision makers to analyze information, share thoughts and evaluate courses of action. CPOF also supports parallel, synchronous and asynchronous cross-functional planning and execution. CPOF is deployed at Corps to Battalion levels, enabling commanders to discuss and collaborate when processing information, share ideas, and attend virtual meetings without assembling at one place. The system has advanced visualization tools such as audio conferencing and other collaboration tools, allowing commanders to communicate, collaborate and share information.

CPOF uses a Spiral Development Strategy of releasing new capabilities in a software release in January of each year. These software releases feed into Army Software Blocks that are lab tested for interoperability and field-tested in conjunction with the Army test organizations, usually in conjunction with a Military Readiness Exercise (MRX).

The system is maintained as "liquid information" in database format, which separates the data from the viewing space. This method enables faster visualization and optimal maintenance of large volumes of constantly changing information. The system gathers real-time and near-real-time feeds from multiple C2 applications. Constant monitoring of the battlefield is provided, by tracking the combat elements on maps or satellite photos and video feeds from battlefield sensors, following enemy forces through intelligence reports, ground observations, forward units or unmanned aerial vehicles (UAVs). Commanders no longer have to call on the radio to check the status of each unit. CPOF supports commercial presentation style briefings, including maps, photos, and video. The participants can respond sketching out their comments on the shared "Battle board" presented in each location and at the central Command Post (CP) video wall.

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies only. Other requests shall be referred to U.S. Army Research Laboratory, ATTN: AMSRL-HR-SC. Aberdeen Proving Ground, MD 21005-5425. :

**System Short Name:** MANPRINT- ABCS- CSSCS

**Reference** (McCommons, 1995):

McCommons, R. B. (1995). Manpower and Personnel Integration (MANPRINT) Assessment for the Combat Service Support Control System (CSSCS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The Combat Service Support Control System (CSSCS) is a computer software system designed to assist commanders and their staffs in the planning and execution of logistics operations. The CSSCS will rapidly collect, analyze, and disseminate critical CSS information to support the functions of command, control and resource management. CSS commanders and staffs are currently participating in the force level planning and decision-making processes through a manual effort of gathering, correlating, and analyzing volumes of technical data from the existing Standard Army Management Information Systems (STAMIS). CSSCS will provide timely situational awareness and force projection to determine capability to support current operations and sustain future operations. The CSSCS will extract summary information from the CSS STAMIS, accept input from other elements of the community, and exchange information with other automated systems to evaluate CSS information with respect to the force level commander's tactical courses of actions. CSSCS will be organic to CSS units and headquarters staffs within the maneuver Brigades, separate Brigades, Armored Cavalry Regiments, Divisions, Corps and Echelons Above Corps (EAC) .
2. The CSSCS is comprised of transportable computer units (TCUs) procured through the Project Manager (PM) Common Hardware/Software (CHS), Common ATCCS Support Software (CASS) and CSSCS-unique software. The CSSCS will be housed in the family of Standardized Integrated Command Post System (SICPS) shelters provided by PM CHS.
3. Because they have already been evaluated separately, the DA MANPRINT Office decided that the various SICPS enclosures-with the exception of the tent because it will routinely be issued with the rest of the CSSCS equipment--would not be subjects of this HEA. Thus, the items assessed were the SICPS tent, CSSCS computer and peripheral hardware, and the common and unique CSSCS software.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- ABCS- CSSCS

**Reference** (McCommons, 1997):

McCommons, R. B. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Combat Service Support Control System (CSSCS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Combat Service Support Control System (CSSCS).

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- ABCS- DTSS

**Reference** (McCommons, 1993):

McCommons, R. B. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the Digital Topographic Support System (DTSS). Picatinny Arsenal, NJ: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The DTSS is an assemblage of computers, computer peripherals, system and applications software, communications equipment, environmental control units, and NBC protective equipment. It is integrated in an S-280 shelter and is carried on an Army standard 5-ton truck. Power is provided by a towed, Army standard, 30-kw generator.
2. The DTSS is designed to provide automated terrain analysis and Digital Terrain Data (DTD) to the All Source Analysis System (ASAS) and various other command and control, maneuver, weapons, navigation, and guidance systems. It is capable of extracting and processing information from maps, charts, and other sources and translating those data into usable map products. The DTSS is capable of storing, sorting, and retrieving information and producing digital, graphic, and non-graphic products on a variety of media. It will be co-located with the ASAS and will be operated and maintained by Army personnel using the standard Army supply and maintenance system. The system will be operated by Military Occupational Specialty (MOS) 81Q, Terrain Analyst, and maintained by MOS 33T, Electronic Warfare/Intelligence (EW/I), Tactical System Repairer. The DTSS will be located at Echelons above Corps, Corps, and Division levels.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- ABCS- EPLRS

**Reference** (Martin, 1996):

Martin, J. H. (1996). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Analysis (HFEA) for the Enhanced Position Location Reporting System (Eplrs) Downsize. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

MEMORANDUM FOR CDR, HQ U.S. Army CECOM and Fort Monmouth ATTN: SFAE-C3S-TRC-EPLRS (LTC John W. Weinzettle) SUBJECT: Human Factors Engineering Analysis (HFEA) for the Enhanced position Location Reporting System (EPLRS) Downsize

1. Reference: Memorandum, Assessment Memorandums for the MS III Decision Review (MDR) , SFAE-C3S-TRC-EPLRS, 14 November 96
2. Background. On 5 June 1995, at the request of Mr. Ed Patches, ILS manager for the EPLRS, I participated in an ILS/MANPRINT working group meeting in Washington, D.C. At that meeting, Mr. John

Crawford, DCSPER, MANPRINT Office stated that a MANPRINT Assessment would be required for the upcoming Milestone III Decision Review. An HFEA is a feeder document to the MANPRINT Assessment and is prepared by the ARL, Human Research and Engineering Directorate's Field Element at CECOM. Upon returning, I informed the EPLRS project office that since we were not currently supporting the EPLRS system the only way that I could complete the HFEA was through my support contractor. I submitted a Functional Support Agreement to the program office with a cost estimate for the HFEA. Mr. Patches and I have spoken several times since then and each time I indicated that I could not have work begin until funding arrived and it was imperative that work commence soon. Last week I spoke with Mr. Graciano Nikolich of the EPLRS project office and he told me that I would be notified by 25 November as to if funding would be provided. To date, no funding has arrived.

3. Purpose. In response to the referenced memorandum, this is to inform you that this office will not be able to complete an HFEA in time for your 20 December 1997 deadline.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- ABCS- FBCB2

**Reference** (McCommons, 1997):

McCommons, R. B. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Force XXI Battle Command Brigade and Below (FBCB2). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The FBCB2 is a battle command information system which is supported by existing and emerging communications, sensors, and electrical power sources. It is a component of the Army Battle Command System (ABCS) and will be used to provide situational awareness (SA), Command and Control (C2) and weather information to organizations at Brigade (BDE) and below. FBCB2 is a system of systems consisting of organic, attached, direct and general support units, and elements which will provide computerized networking throughout the BDE organization with links to higher echelons within the ABCS. FBCB2 will be installed in numerous vehicles and weapon platforms and will provide integration of the data and information generation and processing capabilities of individual soldiers as well as weapons, sensors, and support platforms. As a component of ABCS, it will interoperate with and exchange data and information with other Army, Service, and Joint Battlefield Automated Systems (BAS) in compliance with the Global Command and Control Systems (GCCS) mandates. Major components of the FBCB2 are the Control Display Units (CDU), detachable keyboards, position entry devices, Central Processing Units (CPU), and installation kits tailored to the various individual host platforms.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- ABCS- FBCB2

**Reference** (Strub, 1999):

Strub, M. H. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the Force XXI Battle Command Brigade and Below (FBCB2) U.S. Army Research Laboratory, Field Element, Fort Belvoir, VA for Program Manager, Force XXI Battle Command Brigade and Below (FBCB2), Fort Monmouth, NJ.



**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. FBCB2 is a digital, battle command information system that provides mounted and dismounted tactical combat, combat support and combat service support commanders, leaders and soldiers integrated, on-the-move, real-time and near realtime, battle command information and situational awareness from brigade down to the soldier-platform level across all Battlefield Functional Areas (BFAs). FBCB2 is a sub-element and a key component of the Army Battle Command System (ABCS). As a key component of the ABCS, it interfaces with the Army Tactical Command and Control Systems (ATCCS) located within the Brigade and Battalion.
2. The hardware consists of an Applique+ computer installed in tactical vehicles and weapons platforms to provide situational awareness and command and control at the lowest levels of the army tactical forces. The Applique + computer is comprised of a Processor Unit (ANIUYK-128) and Display Unit (flat panel color display and touch screen input capability) with backlit keyboard.
3. The FBCB2 is now an ACAT III program. Prior to the completion of the Milestone I-IT decision, it was an ACAT III program. Planning calls for an ASARC in October 1999 to close out Milestone I-II and enter LRIP (Low Rate Initial Production) of 5,119 items. Therefore, the decision to progress (or not to progress) to LRIP will impact several thousand items.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- ABCS- FBCB2

**Reference** (Savage-Knepshield, 2004):

Savage-Knepshield, P. (2004). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Assessment for the Force XXI Battle Command Brigade and Below (FBCB2): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland. ARL Reprint Report ARL-RP-159.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Force XXI Battle Command Brigade and Below (FBCB2) is a digital, battle command information system that provides commanders, leaders and soldiers integrated, on-the-move, real-time or near real time, battle command information, and situational awareness (SA) from brigade down to the soldier platform level across all battlefield functional areas (BFA). It provides the capability to 1) receive and input status information provided by weapons systems, sensors, and support platforms, 2) prepare and distribute orders, graphics, reports, and free-text messages, and 3) visually display maps, imagery, and entity data such as friendly, hostile, neutral, and unknown position locations as well as other entity data (including bridges, minefields, and hazard areas) creating a common tactical picture and enhancing soldiers' situational awareness. FBCB2 is dependent upon a communications infrastructure called the tactical internet (TI) made up of existing Army radio communications systems.

**Report Availability:**

Distribution is authorized to U.S. Government agencies only; critical technology (January 2007). Other requests for this document shall be referred to the Product Manager for FBCB2, ATTN SFAE C3T FB BMD, Fort Monmouth, NJ 07703. :

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**System Short Name:** MANPRINT- ABCS- ISYSCON

**Reference** (Waters, 1999):

Waters, P. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the Integrated Systems Control (ISYSCON). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Integrated System Control (ISYSCON) is a comprehensive planning and management tool that supports the entire life cycle of a mission from a signal command and control (C2) perspective. At Division and Corps levels, ISYSCON serves as the battlefield-wide signal management system. ISYSCON automates and integrates essential network management functions to provide the signal commander and staff the capability to plan, monitor, and control communications systems (primarily Mobile Subscriber Equipment) in support of combat forces, weapon systems, and battlefield automated systems. The ISYSCON also supports independent task force operations.

The ISYSCON is an Acquisition Category III (ACAT III) non-major system that falls under the guidelines of an InProcess- Review (IPR) Milestone Decision Authority (MDA). The MDA is the Program Executive Office (PEO) Command, Control, Communications Systems (C3S). The ISYSCON is an evolutionary system that will be fielded in planned phases. The software tested during Operational Testing is referred to as PI+. The software will continue incremental development described as P2, Increments 1, 2, and 3 through at least the year 2002. The ISYSCON is primarily the assembly and integration of Non Developmental Item (NDI) and Government Furnished Equipment (GFE), the majority of which are Common Hardware Software-2 (CHS-2) products.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- ABCS- MCS

**Reference** (Martin, 1999):

Martin, J. M. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the Maneuver Control System (MCS) Block III (V-12.01) (Draft- Not Submitted). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The MCS (v-12.01) is a subsystem component of the Army Battlefield Command System (ABCS). The MCS is the tactical computer system for the maneuver BFAs. Commanders and staffs at Corps through battalion use MCS to assist with both the planning and execution of operations. The maneuver BFA includes armor, infantry, aviation, engineer, signal, military police and chemical subordinate systems. It replaces the currently fielded non-developmental item (NDI) computers with ATCCS common hardware and software, (CHS II) (v-2.0) and MCS application modules.

2. It can communicate over existing Army communications systems such as Mobile Subscriber Equipment (MSE). MCS is fielded without the authorization of additional personnel or vehicles to receiving units. MCS provides automated C2 support for maneuver, mobility and survivability and C2 Battlefield Operating Systems (BOS) in both tactical and garrison environments.

a. The MCS (v-12.01) is intended to enhance the quality and shorten the duration of operational decisions. It is a decision support tool that responds to the Commander's critical information requirements by providing information in both textual and graphical formats. MCS 12.01 functions include battlefield map graphics, unit status reports, message reporting and graphical MCS interoperation with the other BFA systems. These systems are: Advanced Field Artillery Tactical Data System (AFATDS),

All Source Analysis System (ASAS), Combat Service Support Control System (CSSCS) and Forward Area Air Defense Command, Control, Communication and Intelligence (FAADC3I).

b. The MCS is also the primary tactical interface system to the Global Command and Control System for the operational level common picture and the Force XXI (FXXI) Battle Command Brigade and Below (FBCB2) System. MCS integrates information from subordinate and higher maneuver and combat support elements with information from fire support, intelligence and electronic warfare, air defense and combat service support units. Thus, in addition to being the automation system for the maneuver BOS, MCS is the tactical information system the maneuver Commander and staff use for force level control.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- ABCS- MCS

**Reference** (Middlebrooks, 2005):

Middlebrooks, S. E. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Maneuver Control System (MCS). Fort Hood, Texas: U.S. Army Research Laboratory, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland. ARL Technical Report ARL-RP-113.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA  
MANPRINT Assessment, HFEA

**System Description:**

The Maneuver Control System (MCS) is an integrated system of hardware, software, platforms, personnel, and procedures used at corps, division, brigade, and battalion echelons, as well as at selected companies. The MCS provides commanders and their staffs with the capability to swiftly collect, coordinate, and act on near real-time battlefield information. The system allows the commander to readily access information and display current situation reports that assess enemy strength and movement, as well as the status of friendly forces. The MCS provides the commander the Common Operating Picture (COP) by horizontal and vertical integration of information from the MCS and other Battlefield Functional Area control systems (BFACS). It also aids in the efficient production and rapid dissemination of the commander's orders and plans. The MCS provides two major functional capabilities: maneuver functional area information control and force-level information control. The MCS is the Army Battle Command System (ABCS) functional subsystem that directly supports the combined arms force commander and staff by providing automated support for planning, coordinating, controlling, and using maneuver functional area assets and tasks. The MCS coordinates and synchronizes the supporting arms in the conduct of operational planning, field operations, and training.

The MCS has the capability to help fight the battle by providing critical information; by automatically filtering raw data at each echelon; by displaying critical information on electronic overlays and maps; and by disseminating critical and current information to each command post quickly and accurately via direct database exchanges.

The MCS is a tactical automated system that links the command and control cells of each command to its subordinate commands. Its purpose is to assist the commander and his staff in the management of information and the execution of the commander's concept of operation. The MCS is a critical system for Army command and control. The MCS also is the link between critical information being exchanged between the joint and tactical COP.

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies only; Administrative/Operational Use. Other requests shall be referred to Executive, Human Research and Eng. Directorate, U.S. Army Research Laboratory, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- ABCS- SECOMP-I

**Reference** (McDevitt, 2005):

McDevitt, W. M. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Secure Enroute Communications Package-Improved (Ground Terminal). Redstone Arsenal, AL,: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

There are two variants of the Secure Enroute Communications Package-Improved (Ground Terminal); an airborne terminal and a ground terminal. This HHAR addresses the ground terminal only. The SECOMP-I Ground Terminal allows U.S. Army personnel to communicate with other members of the strike force while in a garrison or sheltered field environment. Using Unit-provided Tactical Satellite (TACSAT) radios, the SECOMP-I Ground Terminal provides Very High Frequency/Ultra High Frequency (VHF/UHF) Line Of Sight and UHF Single Channel Tactical Satellite data and voice capabilities to the mission commander and staff from deploying units. Additionally, the SECOMP-I Ground Terminal provides collaborative planning and rehearsal capabilities utilizing International Maritime Satellite data communications over a secure, high-speed network. The system utilizes the Defense Collaborative Tool Suite software package, providing instant messaging, text chatting, white boarding, and video teleconferencing with other collaborative tools in performing Enroute Mission Planning and Rehearsal functions.

**Report Availability:**

Distribution authorized to DoD Components; test and evaluation; Sep 05. Other requests for this document shall be referred to Project Manager- Program Executive Office Command, Control and Communications Tactical, U.S. Army Communications- Electronics Command, Building 2539, Fort Monmouth, NJ 07703-5000. :

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**System Short Name:** MANPRINT- ABCS- TACCS

**Reference** (Smootz, 1984):

Smootz, E. R. (1984). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors and Safety Evaluation of the Tactical Army Combat Service Support Computer System (TACCS): U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. ARI-RN-84-113 Project Number 2Q263739A793. DTIC ADB087654.

**Key Words:**

\*Data processing equipment, Field army, Field equipment, Microprocessors, Transportable, Human factors engineering, Test and evaluation, Safety, Combat support, Operators(Personnel)  
TACCS(Tactical Army Combat Service Support Computer System)

Fields and Groups:

120600 - Computer Hardware

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*Data processing equipment, Field army, Field equipment, Microprocessors, Transportable, Human factors engineering, Test and evaluation, Safety, Combat support, Operators(Personnel)

Identifiers:

(U) TACCS(Tactical Army Combat Service Support Computer System)

**System Description:**

The Tactical Army Combat Service Support Computer System (TACCS) is a collection of microprocessor-based automatic data processing equipment designed to support combat service support operations in the field. The system is easily transportable and will typically be employed with two operators. The US Army Communications-Electronics Board conducted an operational test of the TACCS candidates developed by three different vendors during March and April to 1984. Numerous human factor and safety problems were identified. The results will be used to assist in the reaching a decision as to which vendor's TACCS best meets the Army's needs in the area of combat service support.

Unclassified

**Report Availability:**

Distribution limited to DoD only; Premature Dissemination; 5 Dec 84. Other requests must be referred to USACEBD, Fort Gordon, GA 30905. 04 - DOD ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- ABCS- TACFIRE

**Reference** (Griffith, 1979):

Griffith, D. (1979). Manpower and Personnel Integration (MANPRINT) Assessment: TACFIRE OT 056 Human Factors Evaluation: U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. ARI-RES PROBLEM REV-79-5 Project Number 2Q263743A775. DTIC ADA076636.

**Key Words:**

\*artillery fire, battalion level organizations, army personnel, army training, shelters, human factors engineering, command and control systems, space(room), operators(personnel), message processing, acceptability, data processing equipment, fire contro

S-280 shelters, TACFIRE(Tactical Fire Direction System), PE63743A, AS775

Fields and Groups:

190500 - Fire Control and Bombing Systems

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*ARTILLERY FIRE, BATTALION LEVEL ORGANIZATIONS, ARMY PERSONNEL, ARMY TRAINING, SHELTERS, HUMAN FACTORS ENGINEERING, COMMAND AND CONTROL SYSTEMS, SPACE(ROOM), OPERATORS(PERSONNEL), MESSAGE PROCESSING, ACCEPTABILITY, DATA PROCESSING EQUIPMENT, FIRE CONTROL COMPUTERS, FIRE CONTROL SYSTEM COMPONENTS

Identifiers:

(U) S-280 shelters, TACFIRE(Tactical Fire Direction System),

**System Description:**

This research was conducted as a human factors evaluation of the Tactical Fire Direction System (TACFIRE) command and control system for the field artillery. This report supplements the TCATA OT 056 test report. It provides a human factors evaluation of equipment, tasks and operating procedures, training, and personnel selection requirements. The following are among the HFE findings: The battalion S-280 shelter is regarded as unacceptable by battalion Fire Direction Center personnel. The major problem areas are the shortage of space within the shelter, the configuration of equipment within this limited space, the quality of the air, and the noise level. With the exception of the Digital Message Device and the Digital Plotter Map, there is widespread acceptance of individual TACFIRE equipments. Although operators maintain that their tasks, on the average, are easy, the consensus of operators is that TACFIRE training must be conducted frequently if skills are to be maintained. Estimates of time required to train averaged about 2 days a week at the computer Fire Direction Center and Variable Format Message Entry Device sites and 1 day a week at Digital Message Device sites. Moreover, indications are that more emphasis needs to be placed on maintenance training.

Unclassified

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- ACMES

**Reference** (Martin, 1993):

Martin, J. M. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the Automated Communications Security (Comsec) Management and Engineering System (ACMES): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The ACMES (Phase I) involves the Revised Battlefield Electronics Communications-Electronics Operation Instruction (CEOI) System (RBECS) and was designed to meet a requirement for a decentralized and automated nondevelopmental item (NDI) system to generate both single channel CEOI and frequency hopping information. As an integral subsystem of SINGARS, and other very high frequency (VHF) AM/FM, ultra high frequency (UHF), and high frequency (HF) radio systems, the RBECS will enable each major field organization to generate its own CEOI and frequency hopping information based on its particular net lists and frequency allocations.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- ADAM

**Reference** (Mares, 2006):

Mares, A. L. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the Air Defense and Airspace Management (Adam) Cell: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Air Defense and Airspace Management (ADAM) Cell.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- AIRCMM

**Reference** (Jee, 1994):

Jee, L. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Advanced Infrared Countermeasure Munitions (AIRCMM): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The basic system, which consists of the M130 Dispenser, General Purpose Aircraft, has dispensed similar infrared flares and units of chaff from U.S. Army aircraft for over 13 years. The AIRCMM flares being developed as possible future countermeasures are the XM206, the XM208, the XM209 and the XM210.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- AIRCMM

**Reference** (Gunn, 2002):

Gunn, K. (2002). Manpower and Personnel Integration (MANPRINT) Assessment for the Advanced Infrared Countermeasure Munitions (AIRCMM): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Advanced Infrared Countermeasure Munitions (AIRCMM).

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- AIRCMM

**Reference** (Gunn, 2006):

Gunn, K. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the Advanced Infrared Countermeasure Munitions (AIRCMM), Xm211 and Xm212 Flares: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Advanced Infrared Countermeasure Munitions (AIRCMM), XM211 and XM212 flares.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- ATIRCM-CMWS

**Reference (Hodges, 1995):**

Hodges, J. (1995). Manpower and Personnel Integration (MANPRINT) Assessment for the Advanced Threat Infrared Countermeasures (ATIRCM)/Common Missile Warning System (CMWS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

ATIRCM is part of a Suite of Integrated Infrared Countermeasures (SIIRCM). The ATIRCM/CMWS has recently been designated a Category I (major) program, with Army lead. While ATIRCM is an Army developed and managed program, the CMWS is a joint system that will be used by Army, Navy/Marine Corps, and Air Force.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

---

**System Short Name:** MANPRINT- Aircraft- ATIRCM-CMWS

**Reference (Durbin, 2001):**

Durbin, D. (2001). Manpower and Personnel Integration (MANPRINT) Assessment for the Advanced Threat Infrared Countermeasures (ATIRCM) and Common Missile Warning System (MCWS): Unpublished report , U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Advanced Threat Infrared Countermeasures (ATIRCM) and Common Missile Warning System (MCWS) (ATIRCM-CMWS) is the next generation infrared threat countermeasure system for Army aircraft. It is being developed to enhance aircraft survivability against an increasing worldwide proliferation of advanced infrared (IR) guided missiles. The system will provide threat weapon detection and active countermeasures for threat suppression.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- ATIRCM-CMWS

**Reference (Durbin, 2002):**

Durbin, D. (2002). Manpower and Personnel Integration (MANPRINT) Assessment for the Advanced Threat Infrared Countermeasures (ATIRCM) and Common Missile Warning System (MCWS): Unpublished report , U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA



**System Description:**

The Advanced Threat Infrared Countermeasures (ATIRCM) and Common Missile Warning System (MCWS) (ATIRCM-CMWS) is the next generation infrared threat countermeasure system for Army aircraft. It is being developed to enhance aircraft survivability against an increasing worldwide proliferation of advanced infrared (IR) guided missiles. The system will provide threat weapon detection and active countermeasures for threat suppression.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- ATIRCM-CMWS

**Reference (Durbin, 2003):**

Durbin, D. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the Advanced Threat Infrared Countermeasures (ATIRCM) and Common Missile Warning System (CMWS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Advanced Threat Infrared Countermeasures (ATIRCM) And Common Missile Warning System (CMWS) (ATIRCM-CMWS) is the next generation infrared threat countermeasure system for Army aircraft. It is being developed to enhance aircraft survivability against an increasing worldwide proliferation of advanced infrared (IR) guided missiles. The system will provide threat weapon detection and active countermeasures for threat suppression.

**Report Availability:**

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**System Short Name:** MANPRINT- Aircraft- ATIRCM-CMWS

**Reference (Durbin, 2004):**

Durbin, D. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Advanced Threat Infrared Countermeasures (ATIRCM). Redstone Arsenal, AL,: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Advanced Threat Infrared Countermeasures (ATIRCM) is the next generation infrared threat countermeasure system for Army aircraft. It is being developed to enhance aircraft survivability against an increasing worldwide proliferation of advanced infrared (IR) guided missiles. The system will provide threat weapon detection and active countermeasures for threat suppression.

**Report Availability:**

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**System Short Name:** MANPRINT- Aircraft- ATIRCM-CMWS

**Reference** (Durbin, 2005):

Durbin, D. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Advanced Threat Infrared Countermeasure System-Common Missile Warning System (ATIRCM-CMWS). Redstone Arsenal, AL,: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

ATIRCM-CMWS is the next generation infrared threat countermeasure system for Army aircraft. It is being developed to enhance aircraft survivability against an increasing worldwide proliferation of advanced infrared (IR) guided missiles. The system will provide threat weapon detection and active countermeasures for threat suppression.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Fixed Wing- Cargo- JCA

**Reference** (Minninger, 2007):

Minninger, J. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the Joint Cargo Aircraft (JCA): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The JCA System is a joint non-developmental program with the Air Force for the procurement of approximately 145 aircraft.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Fixed Wing- Intel- ACS

**Reference** (Martin, 2003):

Martin, J. M. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the Aerial Common Sensor (ACS): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Aerial Common Sensor (ACS) will modernize the Army's intelligence collection system for the Objective Force. It will integrate Signals Intelligence (SIGINT), Communications Intelligence (COMINT), Electronic Intelligence (ELINT), Imagery Intelligence (IMINT), Multiple-Intelligence (MULTIINT), and Measurement and Signature Intelligence (MASINTR) sensors onto commercial business jet aircrafts. These airborne platforms are to provide Reconnaissance, Intelligence, Surveillance, and Target Acquisition (RISTA) data and analysis immediately upon deployment in theater. The Ground Processing Facility (GPF)-Distributed Common Ground Station-Army (DCGS-A), will assume analysis of data, and will provide interoperability with the All-Source Analysis System (ASAS), the Digital Topographic Support System (DTSS), and the Army Battle Command System (ABCS).

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies only. FOR OFFICIAL USE ONLY / Competition Sensitive. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Aircraft- Fixed Wing- Observation- OV-1D IDS

**Reference** (Stowell and Poston, 1977):

Stowell, H. R., & Poston, A. M. (1977). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of a Vertical-Scale Instrument Display System for the OV-1D Aircraft: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-4-77. DTIC ADA036050.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*cockpits, \*human factors engineering, \*display systems, \*flight instruments, \*observation aircraft, vertical orientation, night vision devices, workplace layout, instrument panels, indicator lights, dark adaptation vertical scale, instrument display system, light distribution, ov- 1d aircraft

Fields and Groups:

010304 - Patrol and Reconnaissance Aircraft

010400 - Flight Control and Instrumentation

230200 - Human Factors Engineering & Man Machine System

250300 - Non-radio Communications

Descriptors:

(U) \*COCKPITS, \*HUMAN FACTORS ENGINEERING, \*DISPLAY SYSTEMS, \*FLIGHT INSTRUMENTS, \*OBSERVATION AIRCRAFT, VERTICAL ORIENTATION, NIGHT VISION DEVICES, WORKPLACE LAYOUT, INSTRUMENT PANELS, INDICATOR LIGHTS, DARK ADAPTATION

Identifiers:

(U) VERTICAL SCALE, INSTRUMENT DISPLAY SYSTEM, LIGHT DISTRIBUTION, OV- 1D AIRCRAFT

**System Description:**

Because of the increased importance of conserving aircraft instrument-panel space, vertical-scale instrument displays are being given greater consideration. In an effort to identify any potential problems associated with vertical-scale instrument displays, a human-factors evaluation was performed on the production prototype of the vertical-scale instrument display for the OV-1D. Some of the factors considered in the investigation include light distribution, spectral analysis, impact on dark adaptation, high- ambient conditions, and night-vision-goggle compatibility. Recommendations have been made with respect to the light distribution and marking sizes.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Aircraft- Fixed Wing- Observation- YO-3A

**Reference** (Moreland and Erickson, 1970):

Moreland, S., & Erickson, J. A. (1970). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Evaluation of the YO-3A Aircraft System: U.S. Army Directorate of Flight Standards and Qualification Research, St. Louis, MO. FS/Q-TR-70-1 USAAVSCOM-TR-11. DTIC AD0878194.

**Key Words:**

\*human factors engineering, \*observation aircraft, display systems, environments, cockpits, standards crashworthiness, o-3 aircraft, quiet observation aircraft, yo-3a aircraft

Fields and Groups:

010304 - Patrol and Reconnaissance Aircraft

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*OBSERVATION AIRCRAFT, DISPLAY SYSTEMS, ENVIRONMENTS, COCKPITS, STANDARDS

Identifiers:

(U) CRASHWORTHINESS, O-3 AIRCRAFT, QUIET OBSERVATION AIRCRAFT, YO-3A AIRCRAFT

**System Description:**

YO-3A Aircraft System.

**Report Availability:**

Distribution: Controlled: all requests to Commanding General, Army Aviation Systems Command, Attn: Flight Standards and Qualification Directorate. P. O. Box 209, St. Louis, Mo. 63166. 05 - CONTROLLED; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Aircrew- ACABA

**Reference** (Corona and Jones, 1973):

Corona, B. M., & Jones, R. D. (1973). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Assessment of an Anatomically Conforming Aircrew Body Armor System (ACABA): U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-9-73. DTIC AD0766296.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

(\*body armor, flight crews), compatibility, army research

Fields and Groups:

190400 - Armor

Descriptors:

(U) (\*BODY ARMOR, FLIGHT CREWS), COMPATIBILITY, ARMY RESEARCH

**System Description:**

ORIES, WAS ASSESSED TO DETERMINE ITS COMPATIBILITY WITH Army aviator body sizes, flight task requirements and aircrew station geometry. As a base for all comparisons the standard three-size, aircrew body armor (SBA) system was used. Where possible an attempt was made to integrate and utilize

elements of the HEL Armor System Development/Evaluation Guideline, TM 18-69. Thirty enlisted men and six officer pilots were used as subjects. As a result of this HFE assessment it has been determined that the ACBA system was not suitable as proposed, the SBA system has serious shortcomings, and the HEL TM 18-69 cannot be utilized for the development or evaluation of body-worn armor systems.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Aircrew- AW

**Reference** (PdM-AW, 2002):

PdM-AW. (2002). Manpower and Personnel Integration (MANPRINT) Assessment for the Air Warrior (AW): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Air Warrior (AW) is conceptualized as a mission tailorable system that will standardize, integrate, and achieve an optimum synergy of benefits for several types of rotary-wing aviation life support equipment (ALSE) and clothing and individual equipment (CIE). The AW system will be used by aviation personnel in combat, combat support and combat service support roles. AW will focus on state-of-the-art aircrew mission equipment and CIE which are primarily aircrew-mounted. Some portions of the system will interface with aircraft-mounted equipment and integration will be through a common interface and designed-in compatibility. The AW system will provide the aircrew with state-of-the-art: heads-up displays, night vision enhancement, micro-climatic conditioning, crash survivability, and camouflage. It will provide aircrew members with protection from several bodily threats, including chemical and biological (CB) agents, harmful noise, ballistic projectiles and spall, mechanical forces, heat and flame, nuclear flash, directed energy, and naturally occurring environmental elements. The AW system design will improve crew comfort, aircrew-crewstation interface, mission performance, and safety of flight. It will also provide for the integration of aircrew's personal protective gear with other essential functions, such as visual enhancement, physiological comfort and hygiene, escape, evasion and survival.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Aircrew- AW

**Reference** (Minninger, 2003):

Minninger, J. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the Air Warrior (AW): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Air Warrior (AW) is a joint service interest Acquisition Category (ACAT) III program. AW is a mission tailorable system that will standardize, integrate, and achieve an optimum synergy of benefits for aviation life support equipment (ALSE) and clothing and individual equipment (CIE). Aviation personnel in combat, combat support, and combat service support roles while mounted and dismounted will use AW.

AW focuses on state-of-the-art aircrew mission equipment and CIE. Some portions of the system will interface with aircraft-mounted equipment and integration through a common interface. The AW system will improve crew comfort, aircrew-crew station interface, mission performance, and safety of flight. It will also provide for the integration of aircrew's personal protective gear with other essential functions, such as visual enhancement, physiological comfort and hygiene, escape, evasion and survival. A three-block approach is being pursued in the development and fielding of the AW system. Block I is directed toward currently available technology. Block II and Block III will focus on the insertion of emerging technologies.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Attack- Apache AH-64

**Reference** (Buckalew, 1989):

Buckalew, L. W. (1989). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors and Safety Evaluation of Apache (AH-64) Attack Helicopter: U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. ARI-RP-89-17. DTIC ADB141962.

**Key Words:**

\*attack helicopters, antennas, armor, army research, army training, artillery, canopies, confidence level, damage, deficiencies, display systems, experimental design, forward areas, glare, ground crews, ground level, gunners, helmets, human factors engi

PE63007A, AH-64 Aircraft, H-64 Aircraft.

Fields and Groups:

010301 - Helicopters

010303 - Attack and Fighter Aircraft

230200 - Human Factors Engineering & Man Machine System

131200 - Safety Engineering

Descriptors:

(U) \*ATTACK HELICOPTERS, ANTENNAS, ARMOR, ARMY RESEARCH, ARMY TRAINING, ARTILLERY, CANOPIES, CONFIDENCE LEVEL, DAMAGE, DEFICIENCIES, DISPLAY SYSTEMS, EXPERIMENTAL DESIGN, FORWARD AREAS, GLARE, GROUND CREWS, GROUND LEVEL, GUNNERS, HELMETS, HUMAN FACTORS ENGINEERING, INTEGRATED SYSTEMS, INTERCOMMUNICATION SYSTEMS, LETHAL AGENTS, LOCKING(MECHANICS), MILITARY OPERATIONS, OPERATIONAL EFFECTIVENESS, PILOTS, PLANNING, POSITION(LOCATION), QUESTIONNAIRES, REFLECTION, SAFETY, SWITCHES, TAIL ASSEMBLIES, TEST AND EVALUATION, TEXAS, VENTILATION, VISIBILITY, VULNERABILITY, WARFARE, WEAPON SYSTEMS, WHEELS

**System Description:**

The AH-64 Apache Attack Helicopter is a sophisticated and lethal weapon system capable of supporting combat ground operations and engaging targets behind enemy lines and beyond the range of armor and artillery. Developmental and operational testing of the AH-64 indicated a number of human factors and safety deficiencies. As fielding of the Apache began in 1986, it became important to determine if these deficiencies has been corrected, a task encompassed within the Attack Helicopter Battalion Training Validation (AHBTV) conducted at Fort Hood, Texas, in mid-year 1986. The Army Research Institute (ARI) Fort Hood Field Unit was asked to investigate eight areas of deficiency: (a) operation of tail wheel locking mechanism, (b) pilot's forward visibility, (c) seat comfort and ventilation, (d) intercom switch location, (e) reflected glare on canopy, (f) instrument readability, (g) antenna location, and (h) Integrated Helmet and Display System (IHADSS) problems. Air and ground crew confidence in AH-64 systems and equipment was evaluated by ARI, along with over 40 previously identified problems are not addressed in the Test Design Plan. Two questionnaires using either dichotomous or scaled response alternatives were administered to 42 pilots and copilots (who also served as gunners) and 23 ground crewmen following their unit's Army Training Evaluation Program to obtain evaluations of the existence and severity of

identified problems. A large number of perceived problems were recorded for pilot forward visibility, seat comfort, and reflected glare and reflection on the canopy. Several helmet (IHADSS) problems were perceived, and one antenna was viewed as susceptible to damage.

Unclassified

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies and their contractors; Administrative/Operational Use; 1 Jun 89. Other requests shall be referred to Chief, U.S. Army Research Inst. Field Unit, Attn: PERI-SH, Fort Hood, TX 76544. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Attack- Apache- Iranian AH-1J

**Reference** (Greene and Davis, 1977):

Greene, J. T., Jr., & Davis, J. (1977). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Iranian AH-1J (TOW) Helicopter: U.S. Navy Air Test Center, Patuxent River, MD. DTIC ADB261509.

**Key Words:**

Fields and Groups:

010301 - Helicopters

160401 - Air- and Space-launched Guided Missiles

Descriptors:

(U) \*COMBAT EFFECTIVENESS, \*HUMAN FACTORS ENGINEERING, GUIDED MISSILE LAUNCHERS, PERFORMANCE(ENGINEERING), HELICOPTERS, IRAN, WIRE GUIDANCE

Identifiers:

(U) \*AH-1J AIRCRAFT, TOW(TUBE LAUNCHED OPTICALLY TRACKED WIRE GUIDED), TOW MISSILES

**System Description:**

The TOW (Tube-launched, Optically-tracked, Wire-guided) missile-configured AH-1J Cobra is a tandem two-place, twin-power-section helicopter similar to the basic Iranian AH-1J, with the addition of airframe changes to install the TOW missile and helmet sight subsystems and associated hardware. The addition of the TOW Missile System (TMS) provides the AH-1J helicopter with the capability to defeat armored vehicles, fixed-fortified emplacements, and other hard-point targets. Operational experience with, and previous test programs of, the AH-1J aircraft have identified crew station and weapons delivery system-related deficiencies which degrade mission effectiveness and flight safety. Upon the addition of the TMS to the AH-1J, a navy evaluation including human factors was requested. Quantitative and qualitative human factors tests were conducted. The purposes of these tests were to evaluate the man-machine interface to assure compatibility with human limitations and to assure that the changes to the aircraft did not result in exposure of personnel to unsafe conditions and/or psychophysiological stresses. The evaluation included aircrew station design, cockpit lighting, information displays, and ingress/egress. Particular emphasis was placed on crew station geometry, arrangement and location of controls and displays, control-display integration, adequacy of indicators and warning lights, and characteristics of the TMS.

**Report Availability:**

Distribution limited to U.S. Government agencies only; Test and Evaluation; April 1977. Other requests for this document must be referred to Commander, Naval Air Test Center, Patuxent River, Maryland 20670:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Attack- Apache Longbow AH-64D

**Reference** (Mance, 1995):

Mance, A. (1995). Manpower and Personnel Integration (MANPRINT) Assessment for the AH-64D Longbow Apache. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Longbow Apache Program as Mission Design Series "AH-64D:" is a technology improvement program designed to enhance the overall system performance of the AH-64 "A-Model" helicopter by incorporating a multi-mode millimeter wave (MMW) sensor capability for rapid and automatic target detection, classification, prioritization and neutralization of multiple ground and air threats in adverse weather and under battlefield obscurant conditions. The Fire Control Radar (FCR) System is the key ingredient to the LBA Program. It is accompanied by the Longbow Hellfire Modular Missile System (LBHMMS) and other coordinated program upgrades. The LBA program is currently projected to modify 758 aircraft for conversion to the "D-Model" configuration, with 227 of these aircraft designated to receive the "full-up" LBA changeover consisting of the FCR Mission Kit and T-700-GE-701C engines (1699 shp). The remaining 531 aircraft will contain the "base configuration:" consisting of "provisions" for the FCR and the T-700-GE-701 engines (1546 shp).

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Attack- Apache Longbow AH-64D Block III

**Reference** (Durbin, 2006):

Durbin, D. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the AH-64D Apache Longbow Block III: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Apache Longbow Block III is a multi-role, advanced technology helicopter for the US Army, with a projected evolutionary/spiral application strategy of selected upgrades. The Apache Longbow Block III will employ Air-to-Ground Missile Systems (AGMS) including the family of Hellfire missiles, the Joint Common Missile (JCM) , the Advanced Precision Kill Weapon System (APKWS) II, Air-to-Air (ATA) missiles, and a 30mm gun. Block III aircraft will be designed-and equipped with an open systems architecture that will facilitate incorporation of the latest available communication, navigation, sensor, and weapon systems. The AH-64D Apache Longbow will receive upgrades and sustainment improvements with the Block III enhancements. Beginning in August 2009, Block I Apache Longbow aircraft, identified as Lots 1-6 will be inducted, starting at 3 per month, to become Apache Longbow Block III aircraft. The AH-64D Block III modification baseline is the Block I aircraft upgraded to a Lot 10 (Block II) aircraft functionality and will incorporate additional product improvements. Apache Longbow Block III upgrades will include Open System Architecture (OSA) , System-of-Systems Common Operating Environment (SoSCOE), Composite Main Rotor Blades, Communication System Upgrades such as the Alternate Communication Suite and Blue Force Tracker (BFT) , Modernized Signal Processor Unit (MSPU), Instrument Meteorological Conditions (IMC)/Instrument Flight Rules (IFR), Condition Based Maintenance (CBM) on Aircraft, tri-mode laser, RFI Frequency extension, Image Fusion, Advanced Technology Demonstration (ATD) , 701D Engine, Drive System Upgrades, Maritime Targeting Mode, Cognitive Decision Aiding System (CDAS), IETM enhancements, Parts Marking (AIT/UID), Condition Based Maintenance (CBM) (Off-Aircraft), ED/EP Data Transfer, System Level Embedded Diagnostics, Fire Control Radar (FCR) Range Extension, Radio Frequency Interferometer (RFI) Passive Ranging, and Text to Speech.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director,



Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Attack- Apache Longbow AH-64D Maintenance

**Reference** (Havir et al., 2005):

Havir, T. J., Durbin, D. B., & Hicks, J. S. (2005). Manpower and Personnel Integration (MANPRINT) Assessment: The AH-64D Apache Longbow MANPRINT Program: The Effect on Unscheduled Maintenance Hours. Aberdeen Proving Ground, MD: U.S. Army Research Laboratory, Human Research and Engineering Directorate. Aberdeen Proving Ground, MD. ARL Technical Report ARL-TR-3403.

**Key Words:**

AH-64D, Apache Longbow, maintainability, MANPRINT

**System Description:**

In the mid-1980's, the U.S. Army's Manpower and Personnel Integration (MANPRINT) program was developed in an attempt to ensure that future systems, once fielded, would be able to perform their assigned training and operational missions and be reliable, maintainable, and supportable during combat conditions. In 1990, a MANPRINT program was established for the AH-64 Apache program. The MANPRINT program involved regularly scheduled meetings to identify and resolve MANPRINT issues. Many issues identified during this process were maintainability issues that, when resolved, would result in improved maintenance times and decreased failure rates. Total savings as a result of these individual improvements have never been calculated. The purpose of this study was to determine the unscheduled maintenance man-hours saved as a result of the AH-64D Apache Longbow MANPRINT program. These data will help justify the importance of the Army's MANPRINT program on future acquisition programs. The study was conducted by the construction of an IMPRINT maintenance model using reliability, availability, and maintainability (RAM) estimates for the aircraft components. Two models were constructed. Model 1 was constructed with the most current RAM data available. These data represented maintainability characteristics of aircraft components after MANPRINT issues were resolved. This model was then modified, based on subject matter expert estimates of maintenance improvements as a result of MANPRINT issues being resolved. The resulting model, Model 2, represented maintainability characteristics before MANPRINT issues were resolved. The two models were executed with peacetime and wartime scenarios. The results of the models showed that the MANPRINT program for the Apache helicopter affected 9.53% of the aircraft's line-replaceable units and resulted in annual savings per battalion of 597.69 man-hours in peacetime and 3266.53 hours in wartime. When these savings were converted to man-years, they showed that the MANPRINT process resulted in a savings of 0.287 man-year per battalion per year in peacetime and 0.746 man-year per battalion per year in wartime. Additional savings would be discovered if future studies were conducted to determine the impact of the MANPRINT program on scheduled maintenance and depot-level maintenance. The final conclusion of this study was that the MANPRINT program has the potential to contribute a significant benefit to Army acquisition programs if implemented properly in the early stages of the acquisition process.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Cargo- CH47F

**Reference** (Minninger, 2004):

Minninger, J. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the CH-47F Chinook. Redstone Arsenal, AL.; U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. General. The CH-47F is a recapitalization, rebuild and selected upgrade program for the current CH-47D fleet. The CH-47F will continue to transport personnel, supplies, and equipment across the battlefield. CH-47F capabilities enable it to meet time sensitive transport requirements, and will deliver to locations not accessible by surface transport systems. The CH47F will support world-wide combined arms or joint combat operations conducted by U.S. forces. The CH-47F can be deployed worldwide. The primary mission of the CH-47F is transportation of ground forces, supplies, and battle critical cargo in support of all contingencies. These missions will be conducted during day and night, under adverse weather and extreme environmental conditions across the range of operations, from support of friendly host nations, to primary regional conflicts, to high intensity battlefield operations. The CH-47F will continue to provide support and force sustainment until a viable replacement system is fielded.

2. The CH-47F is a heavy lift helicopter which will extend the service life of the current cargo fleet by 20 years. The CH-47F will be built on the CH-47D airframe concept, incorporate improvements to airframe reliability and maintainability, provide an avionics architecture compatible with Joint Technical Architecture - Army (JTA-A), be interoperable with Department of Defense (DoD) systems, and comply with emerging Global Air Traffic Management (GATM) requirements. To achieve its intended capability, the ORO provides three stages of requirements implementation, or Blocks. Block I is the initial capability to be demonstrated during EMD and Low Rate Initial Production (LRIP). Block 2 is the production version providing commanders in the field with the full CH-47F capability. Block 3 is less defmed but acknowledges the need for growth and the advancement of technology. The Block I capability demonstrated during EMD is not the capability currently scheduled for LRIP.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Recon- ARH

**Reference** (Minninger, 2005):

Minninger, J. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Armed Reconnaissance Helicopter (ARH). Redstone Arsenal, AL,: U.S. Army Research Laboratory, Human Research and Engineering Directorate, Redstone Arsenal, Alabama.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Armed Reconnaissance Helicopter (ARH) is a derivative of a commercial aircraft currently in production which traces its lineage back to an aircraft proposed to satisfy the Anny's original scout helicopter requirement from 1962. The ARH is a two pilot, single engine aircraft, with a minimum operational range of 212 km.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Recon- Comanche RAH66

**Reference** (Armstrong, 2000):

Armstrong, R. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the RAH66 Comanche. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The RAH66 Comanche is a twopilot, lightweight, twin engine, advanced technology helicopter that will replace the current fleet of OH-58 and AH-1 helicopters for armed reconnaissance and light attack missions. It will modernize the Army's corps and division light fleet scout and attack assets. The fuselage will be constructed primarily of advanced composite materials and will include survivability features such as Electromagnetic Environmental Effects (E3) protection and low Radar Cross Section (RCS). The five-bladed main rotor system will minimize acoustic signature, visual detection, and vibration characteristics. A triple redundant, digital fly-by-wire, flight control system will incorporate a right hand side arm controller for pitch, roll, yaw and limited authority vertical inputs. The main and tail wheel landing gear will be retractable to reduce drag and minimize RCS. An environmental control system (ECS) will provide the aircrew with cooling, ventilation and Nuclear, Biological and Chemical (NBC) protective pressurization and filtration. Armament will consist of Hellfire and Stinger missiles, Hydra 70 Rockets, and a 20mm turreted gun system. Survivability features will include ballistic, nuclear weapons effects, electromagnetic hardening, laser protection for crew and aircraft, and wire-strike protection. The RAH66 Comanche is being designed and developed by a joint venture of Boeing Defense and Space Group, Helicopters Division and the Sikorsky Aircraft Division of the United Technologies Corporation.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Recon- Comanche RAH66

**Reference (Durbin, 2002):**

Durbin, D. (2002). Manpower and Personnel Integration (MANPRINT) Assessment for the Reconnaissance Attack Helicopter RAH66 Comanche: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The RAH66 Comanche is a two-pilot, lightweight, twin engine, advanced technology helicopter that will replace the current fleet of OH-58 and AH-1 helicopters for armed reconnaissance and light attack missions. It will modernize the Army's corps and division light fleet scout and attack assets. The fuselage will be constructed primarily of advanced composite materials and will include survivability features such as Electromagnetic Environmental Effects (E3) protection and low Radar Cross Section (RCS). The five-bladed main rotor system will minimize acoustic signature, visual detection, and vibration characteristics. A triple redundant, digital fly-by-wire, flight control system will incorporate a right hand side arm controller for pitch, roll, yaw and limited authority vertical inputs. The main and tail wheel landing gear will be retractable to reduce drag and minimize RCS. An environmental control system (ECS) will provide the aircrew with cooling, ventilation and Nuclear, Biological and Chemical (NBC) protective pressurization and filtration. Armament will consist of Hellfire and Stinger missiles, Hydra 70 Rockets, and a 20mm turreted gun system. Survivability features will include ballistic, nuclear weapons effects, electromagnetic hardening, laser protection for crew and aircraft, and wire-strike protection. The RAH66 Comanche is being designed and developed by a joint venture of Boeing Defense and Space Group, Helicopters Division and the Sikorsky Aircraft Division of the United Technologies Corporation.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Utility- Blackhawk UH60L A2C2S Egress

**Reference** (Havir and Kozycki, 2006):

Havir, T. J., & Kozycki, R. W. (2006). Manpower and Personnel Integration (MANPRINT) Assessment: An Assessment of the Emergency Egress Characteristics of the U.S. Army Airborne Command and Control System (A2C2S). Aberdeen Proving Ground, MD: U.S. Army Research Laboratory, Human Research and Engineering Directorate. Aberdeen Proving Ground, MD. ARL Technical Report ARL-MR-0635. DTIC ADA443464.

**Key Words:**

Fields and Groups:

010200 - Military Aircraft Operations

010301 - Helicopters

230200 - Human Factors Engineering & Man Machine System

250500 - Command, Control and Communications Systems

Descriptors:

(U) \*EMERGENCIES, \*HUMAN FACTORS ENGINEERING, \*HELICOPTERS, \*EVACUATION, \*UTILITY AIRCRAFT, \*AVIATION SAFETY, \*COMMAND AND CONTROL SYSTEMS, SCENARIOS, CONFINED ENVIRONMENTS, EXITS, MODEL TESTS, FLIGHT CREWS, TIME STANDARDS, ARMY PERSONNEL, MILITARY REQUIREMENTS

Identifiers:

(U) \*EMERGENCY EGRESS, A2C2S(AIRBORNE COMMAND AND CONTROL SYSTEM), UH-60 AIRCRAFT, UH-60L AIRCRAFT

**System Description:**

The U.S. Army Airborne Command and Control System (A2C2S) is a command and control (C2) system consisting of an A-kit and a B-kit and will be hosted by the utility helicopter (UH)-60L (and newer) Blackhawk. The A2C2S Product Manager (PM) requested the U.S. Army Research Laboratory's (ARL's) Human Research and Engineering Directorate to perform an evaluation of the emergency egress characteristics of the A2C2S to help support the low rate initial production (LRIP) milestone decision. ARL and the PM developed a plan to evaluate the emergency egress characteristics of the A2C2S using a combination of human figure modeling and egress testing. The evaluation plan used human figure modeling to perform a detailed analysis of all egress routes to identify whether the larger end of the male Soldier population, with equipment, could fit through the egress routes and to identify design characteristics of the A2C2S that enhance or degrade the Soldier's ability to egress the aircraft. The emergency egress test was used to validate the results of the model, verify that the egress could meet the time requirements, and identify additional safety concerns that may be encountered during actual egress trials. The results of the egress modeling identified some shortcomings with the egress characteristics of the A2C2S; however, the results were favorable. The results of the egress testing validated the modeling that was performed. In addition, all egress trials successfully met or exceeded the 30-second time standard for emergency egress. The results and recommendations from the modeling and testing were provided to the PM to help drive design modifications that, if implemented, could enhance the emergency egress characteristics of the A2C2S.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Utility- Blackhawk UH60L+

**Reference** (Armstrong, 2000):

Armstrong, R. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the UH60L+ Blackhawk Helicopter. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The UH-60L+ BLACK HAWK Helicopter is an Acquisition Category IC :program. Upon completion of the Milestone 1/11, the system will proceed to the streamlined Integration and Qualification (I&Q) phase of development. During the I&Q phase, current UH-60A and UH-60L aircraft will be remanufactured to the UH-60L+ or UH-60L+ MEDEVAC configuration. Additionally current UH-60Q MEDEVAC aircraft will be remanufactured to a UH-60L+ MEDEVAC configuration.

1. The UH-60L+ BLACK HAWK helicopter is an upgraded utility helicopter configuration with improvements to airframe, electrical system, main rotor blades, Flight Control Computer (FCC), crew station and avionics. A description of the UH-6dL+ improvements is listed below: a. Airframe improvements include refurbishment or replacement of cabin components, refurbishment of tailcone, stabilator, troop seats, and crew seats. Major airframe load paths have been strengthened as required to accommodate the increased Wide Chord Blade (WCB) capability.

b. Electrical wiring will be replaced with improvements for Electromagnetic Interference (EMI) performance.

c. The UH-60L+ improvements to the flight control system will be one Dual Use Application Program (DUAP) Flight Control Computer (FCC). This computer replaces the one existing digital computer in the UH-60A.

d. The UH-60L+ will be equipped with Wide Chord Blades (WCB) to provide additional lift.

e. There are no changes to the overall flight control system functionality from the UH-60A. However, due to the increase in the mission gross weight and the addition of the wide chord blades, the UH-60L+ handling qualities may change.

f. As a minimum, the avionics upgrade will include the UH-60Q avionics baseline configuration which incorporates a communications-navigation MIL-STD-1553 data bus, control display units (CDU), two multifunction displays (MFDs), and a stormscope. Additionally, the system will include a Cockpit Voice Recorder-Flight Data Recorder (CVR-FDR). A trade-off study will be conducted to determine potential enhancements to this design, including replacement of the current two MFDs with four MFDs.

g. An improved Infrared Suppression System (IRSS) will be installed to provide increased survivability against infrared threats. The improved IRSS will be provided to reduce the infrared (IR) signature and weight concurrently. Present plans are to include the Suite of Integrated Infrared Countermeasures (SIIRCM) and Suite of Integrated Radio Frequency Countermeasures (SIRFC), as they become available.

h. An improved external auxiliary fuel tank will be provided to increase crash survivability.

i. The UH-60L+ design will be compatible with the future Air Warrior Life Support Equipment, including the Micro-Climatic Cooling System.

2. The UH-60L+ Medical Evacuation Helicopter (MEDEVAC). The UH-60L+ MEDEVAC will be the medically equipped version of the UH-60L+. The UH-60L+ MEDEVAC will be an air ambulance capable of providing aeromedical evacuation, medical personnel movements and medical resupply missions. The UH-60L+ MEDEVAC includes the basic UH-60L+ configuration with additional communication and medical equipment not included in the basic UH-60L+ configuration.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Utility- Blackhawk UH60M

**Reference** (Havir, 2005):

Havir, T. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the UH60M Blackhawk Helicopter. Redstone Arsenal, AL,; U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The UH-60 Blackhawk's mission is to project and sustain the force by providing air assault, general support, command and control, and aeromedical evacuation (MEDEVAC) capabilities to the warfighter. Current UH-60AIL helicopters cannot support future battlefield requirements that dictate a digitized fleet that provides increased lift, range, and survivability; reduces operations and support costs; and improves reliability and maintainability. The UH60M program is a recapitalization of existing airframes designed to extend the life of the system, reduce operations and support costs, and increase operational readiness. Additionally, the UH60M will meet future digitization and situational awareness requirements, increase the lift and range capabilities of the current aircraft, and provide an improved platform for multiple mission equipment packages.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Utility- Blackhawk UH60M

**Reference** (Kennedy, 2007):

Kennedy, J. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the UH60M Blackhawk Helicopter. Redstone Arsenal, AL,: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The UH-60 Blackhawk's mission is to project and sustain the force by providing air assault, general support, command and control, and aeromedical evacuation (MEDEVAC) capabilities to the warfighter. Current UH-60AIL helicopters cannot support future battlefield requirements that dictate a digitized fleet that provides increased lift, range, and survivability; reduces operations and support costs; and improves reliability and maintainability. The UH60M program is a recapitalization of existing airframes designed to extend the life of the system, reduce operations and support costs, and increase operational readiness. Additionally, the UH60M will meet future digitization and situational awareness requirements, increase the lift and range capabilities of the current aircraft, and provide an improved platform for multiple mission equipment packages.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Utility- Blackhawk UH60M CAAS LEUE

**Reference** (Havir et al., 2005):

Havir, T. J., Durbin, D. B., & Frederick, L. J. (2005). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Assessment of the UH60M Common Avionics Architecture System (CAAS) Crew Station During the Limited User Evaluation (LEUE). Aberdeen Proving Ground, MD: U.S. Army Research Laboratory, Human Research and Engineering Directorate. Aberdeen Proving Ground, MD. ARL Technical Report ARL-MR-0634. DTIC ADA441422.

**Key Words:**

Fields and Groups:  
010301 - Helicopters

050900 - Personnel Management and Labor Relations  
230200 - Human Factors Engineering & Man Machine System

**Descriptors:**

(U) \*FLIGHT CREWS, \*PERFORMANCE(HUMAN), \*HUMAN FACTORS ENGINEERING, \*HELICOPTERS, \*DISPLAY SYSTEMS, \*INSTRUMENT FLIGHT, TEST AND EVALUATION, METEOROLOGY, INSTRUMENTATION, EYE, SPACE SIMULATION CHAMBERS, MOTION SICKNESS, VISUAL FLIGHT RULES, QUESTIONNAIRES, ARCHITECTURE, WORKLOAD, VISION, USER NEEDS, AVIONICS, TRACKING, PILOTS, STATIONS, COCKPITS

**Identifiers:**

(U) UH-60 AIRCRAFT, H-60 AIRCRAFT, BLACK HAWK

**System Description:**

The UH60M Product Office requested the U.S. Army Research Laboratory's (ARL's) Human Research and Engineering Directorate to participate in the Limited Early User Evaluation (LEUE) of the Common Avionics Architecture System (CAAS) cockpit. ARL conducted a human factors evaluation (HFE) during the LEUE, which assessed workload, situation awareness, simulator sickness, pilot-vehicle interface (PVI), and eye tracker data. The data were used to identify characteristics of the CAAS cockpit that enhance or degrade pilot performance. Characteristics that degrade pilot performance should be considered for design changes at the earliest opportunity. Three utility helicopter (UH)-60 crews (six pilots) each conducted three mission scenarios for a total of nine flights. The three missions consisted of flights in visual meteorological conditions (VMC), instrumented meteorological conditions (IMC), and tactical conditions. The pilots completed the simulator sickness questionnaire before and after each flight. They completed the Bedford Workload Rating Scale, Situation Awareness (SA) Rating Technique, and the PVI Questionnaire after each mission. In addition to pilot data, a tactical steering committee (TSC) was used to perform an independent assessment of workload, situation awareness, and mission success. The TSC completed a survey after each mission. The data were analyzed with the use of the Wilcoxon Signed Ranks Test to compare pilot ratings between seat position and results between instrument flight rule (IFR) and visual flight rule (VFR) flights. The mean workload rating for all tasks was 3.10, indicating that the pilots typically had enough workload capacity for all desirable additional tasks. The mean situation awareness rating provided by the pilots was 25.84. This SA rating indicates that the pilots felt they had moderate levels of situation awareness during the missions.

**Report Availability:**

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Utility- Blackhawk UH60M CS LUT

**Reference** (Havir et al., 2006):

Havir, T. J., Durbin, D. B., Frederick, L. J., & Hicks, J. S. (2006). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Assessment of the UH60M Crew Station During Thhe Limited User Test (LUT). Aberdeen Proving Ground, MD: U.S. Army Research Laboratory, Human Research and Engineering Directorate. Aberdeen Proving Ground, MD. ARL Technical Report ARL-TR-3730. DTIC ADA444913.

**Key Words:**

**Fields and Groups:**

010100 - Aerodynamics  
010304 - Patrol and Reconnaissance Aircraft  
230200 - Human Factors Engineering & Man Machine System

**Descriptors:**

(U) \*FLIGHT TESTING, \*HUMAN FACTORS ENGINEERING, \*HELICOPTERS, ARMY RESEARCH, PERFORMANCE(HUMAN), INTEGRATION, USER NEEDS, WORKLOAD, MOTION SICKNESS, SITUATIONAL AWARENESS, UTILITY AIRCRAFT, MEAN, MISSIONS, MANPOWER, INTERFACES, PILOTS, TRACKING

**Identifiers:**

(U) TSC(TACTICAL STEERING COMMITTEE), UH-60 AIRCRAFT, LIMITED USER EVALUATION, PILOT VEHICLE INTERFACE, PILOT WORKLOAD, MANPRINT(MANPOWER AND PERSONNEL INTEGRATION)

**System Description:**

The utility helicopter (UH)-60M Product Manager requested the U.S. Army Research Laboratory's Human Research and Engineering Directorate to participate in the Limited User Test for the UH60M Black Hawk. ARL conducted a human factors evaluation during the LUT, which assessed workload, situation awareness, simulator sickness, pilot-vehicle interface, and eye tracker data. The data were used to identify characteristics of the UH60M that enhance or degrade pilot performance. Characteristics that degrade pilot performance were included in the Manpower and Personnel Integration (MANPRINT) assessment for the system's milestone decision and should be considered for future design changes at the earliest opportunity. Three UH-60 crews (six pilots) each conducted six mission scenarios for a total of 18 flights. The conditions of each mission were systematically varied and designed to become progressively more difficult as the pilots became more proficient at flying the aircraft. The pilots completed the simulator sickness questionnaire before and after each flight. They completed the Bedford Workload Rating Scale, Situation Awareness Rating Technique, and the Pilot-Vehicle Interface Questionnaire after each mission. In addition to pilot data, a tactical steering committee (TSC) performed an independent assessment of workload, situation awareness, and mission success. The TSC completed a survey after each mission. The data were analyzed with the use of the Wilcoxon Signed Ranks Test to compare pilot ratings between seat position and results between UH60M and UH-60A/L model aircraft. The mean workload rating for all tasks for the UH60M was 2.71, indicating that the pilots typically had enough workload capacity for all desirable additional tasks. The mean situation awareness rating provided by the pilots was 28.25. This SA rating indicates that the pilots felt they had high levels of situation awareness during the missions.

**Report Availability:**

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Utility- Blackhawk UH60M EUD2

**Reference** (Kennedy and Durbin, 2005):

Kennedy, J. S., & Durbin, D. B. (2005). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Assessment of the UH60M Crew Station During the Early User Demonstration No. 2 (EUD2). Aberdeen Proving Ground, MD: U.S. Army Research Laboratory, Human Research and Engineering Directorate. Aberdeen Proving Ground, MD. ARL Technical Report ARL-MR-0607. DTIC ADA430014.

**Key Words:**

EUD, pilot-vehicle interface, pilot workload, situational awareness, UH60M Black Hawk

Fields and Groups:

010301 - Helicopters

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*HELICOPTERS, \*WORKLOAD, \*SITUATIONAL AWARENESS, FLIGHT CREWS, DEMONSTRATIONS, PILOTS, FLIGHT SIMULATORS, MOTION SICKNESS

Identifiers:

(U) UH60M AIRCRAFT

**System Description:**

Pilot workload, situational awareness (SA), and the pilot-vehicle interface (PVI) characteristics associated with the UH60M Black Hawk crew station simulator were assessed during the Early User Demonstration No. 2. Additionally, simulator sickness was assessed to determine if the pilots experienced discomfort during missions and if the discomfort affected their perceived levels of workload and SA. Four highly



experienced utility helicopter (UH)-60 pilots conducted a series of three different mission scenarios over the course of three days. Pilot feedback, which was obtained via a comprehensive questionnaire battery, showed that for the missions flown, workload in the UH60M was comparable to the workload pilots experience in the UH-60A/L. Workload results showed that UH-60 aircrew training manual tasks related to digital messages and electronic radio navigation generated higher perceived workload in the UH60M than in the A/L model. SA was reported to be similar to the UH-60A/L, but major gains were reported from the digital mapping system. The pilots noted several problems with the PVI, which should be resolved. Pilots experienced very mild simulator sickness symptoms. A panel of subject matter experts independently observed and evaluated each mission and reported that pilots experienced low to moderate levels of workload during the missions and moderate levels of SA. Finally, an eye tracker system was used to assess visual gaze during several of the trials. The visual gaze data were used to assess visual workload.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Utility- Blackhawk UH60Q

**Reference (USA-ATTC, 1998):**

USA-ATTC. (1998). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Health Hazard Assessment Report for the UH-60Q Aircraft: U.S. Army Aviation Technical Test Center, Fort Rucker, AL. DTIC ADB237211.

**Key Words:**

\*hazards, \*human factors engineering, \*helicopters, \*aircraft noise, acceptance tests, production, health, acoustic waves, level(quantity), noise, sound pressure, utility aircraft, project management uh-60a aircraft, uh-60q aircraft, uh-60 ecs aircraft, h-60 aircraft, blackhawk helicopter

Fields and Groups:

010301 - Helicopters

230200 - Human Factors Engineering & Man Machine System

240200 - Noise Pollution and Control

Descriptors:

(U) \*HAZARDS, \*HUMAN FACTORS ENGINEERING, \*HELICOPTERS, \*AIRCRAFT NOISE, ACCEPTANCE TESTS, PRODUCTION, HEALTH, ACOUSTIC WAVES, LEVEL(QUANTITY), NOISE, SOUND PRESSURE, UTILITY AIRCRAFT, PROJECT MANAGEMENT

Identifiers:

(U) UH-60A AIRCRAFT, UH-60Q AIRCRAFT, UH-60 ECS AIRCRAFT, H-60 AIRCRAFT, BLACKHAWK HELICOPTER

**System Description:**

The UH-60Q helicopter is a UH-60A Blackhawk Helicopter that has been modified to . perform the MEDEVAC mission. The modifications which can be expected to affect the noise levels in crew occupied areas are the addition of patient transport shelves and the addition of an ECS with intake and outlets near the rear of the crew compartment. The ECS on the aircraft tested was part number 70309-02801-041.

The intake is located on the right side of the aircraft behind the right rear seat. There were no changes to the engines, auxiliary power unit (APU), or airframe. The test system was aircraft #85-24388, located at the Tennessee National Guard facility at Chattanooga Airport, Chattanooga, Tennessee.

An Initial Health Hazard Assessment Report (IHHAR) (reference (ref) paragraph (para) 1 a) has been completed for the UH-60Q medical evacuation helicopter. That IHHAR focused on acoustic energy (noise) and was based on data from the UH-60A helicopter, since no new noise data were available from the UH-60Q. During the Production Qualification Test (PQT) for the UH-60Q, the noise from the environmental conditioning system (ECS) was identified as a "shortcoming" and a potential hazard ( ref paralb). During the PQT, data were only collected in the rear area of the aircraft where the ECS noise levels are the highest. Since the UH-60Q ECS produces significantly higher sound pressure levels than the aircraft noise levels used in the IHHAR, an updated HHAR is required. The Project Manager, Utility Helicopters, requested that additional noise data be collected to support an updated HHAR. The objective

of this test was to measure the noise level inside the UH-60Q with and without the ECS operating and to determine the hearing conservation contour curves external to the UH-60Q aircraft.

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies only; Test and Evaluation; Aug 98. Other requests shall be referred to Commander, US Army Aviation and Missile Command, Attn: AMSAM-DSA-UH, Redstone Arsenal, AL 35898. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Utility- LHX

**Reference** (Malkin and Christ, 1985):

Malkin, F. J., & Christ, K. A. (1985). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Assessment of Voice Technology for the Light Helicopter Family (LHX): U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-9-85 LIMITED. DTIC ADB095952.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*human factors engineering, \*helicopters, \*speech, \*voice communications, display systems, flight crews, cockpits, automation, lightweight, pilots, trade off analysis, aircraft, artificial intelligence, voice communications, detectors, onboard, crews

Fields and Groups:

010301 - Helicopters

250400 - Voice Communications

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*HELICOPTERS, \*SPEECH, \*VOICE COMMUNICATIONS, DISPLAY SYSTEMS, FLIGHT CREWS, COCKPITS, AUTOMATION, LIGHTWEIGHT, PILOTS, TRADE OFF ANALYSIS, AIRCRAFT, ARTIFICIAL INTELLIGENCE, VOICE COMMUNICATIONS, DETECTORS, ONBOARD, CREWS

**System Description:**

This report was written in support of the technology trade-off analysis (TOA) performed for the Light Helicopter Family (LHX). The human factors aspects of applying voice technology to an LHX aircraft with full-scale development in 1987 are addressed. A description of voice technology and its advantages and disadvantages is provided, potential applications for voice technology in an LHX aircraft are discussed, the issues related to voice technology applications are reviewed, and conclusions are drawn. Concepts for the cockpit include a high level of automation which may enable the demanding tasks described above, which are currently performed by two crewmembers, to be performed by a single pilot. This automation would incorporate high-technology sensors and advanced displays and controls using artificial intelligence and voice technology. Voice technology is being considered for the LHX because it provides an alternative means of interacting with onboard systems. It is anticipated that the visual and manual workload of aircrews can be reduced somewhat by converting some of the visual and manual tasks to speech and auditory tasks.

**Report Availability:**

Distribution limited to DoD and DoD contractors only; Critical Technology; Jun 85. Other requests must be referred to Director, U.S. Army Human Engineering Lab., Aberdeen Proving Ground, MD 21005-5001. 16 - DOD AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Utility- LUH- Lakota UH72A

**Reference** (Allen, 2005):

Allen, H. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Light Utility Helicopter (LUH). Redstone Arsenal, AL,: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Light Utility Helicopter (LUH) System is a non-developmental program in which the Army is proposing a commercial, off-the-shelf procurement of approximately 322 aircraft with the milestone decision scheduled for Apr 06. This program will provide many challenges to the MANPRINT Assessment process since the source selection will not be completed until approximately 30 days prior to the milestone decision.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Utility- LUH- Lakota UH72A

**Reference** (Kennedy, 2006):

Kennedy, J. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the UH-72a Light Utility Helicopter (LUH). 14 November 2006: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The LUH is a Department of Defense (DoD) Acquisition Category (ACAT) IC program. LUH will be procured as a Federal Aviation Administration (FAA) certificated, commercially available, non-developmental aircraft. It will be maintained in accordance with FAA, Original Equipment Manufacturer (OEM) and U.S. Army policies, regulations and procedures. The LUH aircraft is to be deployed in non-combat, permissive environments, providing operational capability for focused logistics and full dimensional protection as they relate to Homeland Security (HLS), and support operations. The LUH will facilitate Army Aviation light utility helicopter missions in support of required Army tasks and will provide flexibility to respond to terrorism, conduct civil search and rescue, support damage assessment, support test activities and training centers, perform Medical Evacuation (MEDEVAC) missions, and provide support to counter drug operations. The LUH will operate in permissive environments within the Continental United States (CONUS), Alaska, Hawaii, and all U.S territories and possessions. LUH has sufficient performance and capacity to support lift and cargo missions, as well as, sufficient range and endurance to support security, reconnaissance, and general support operations under HLS and other Federal or Army National Guard (ARNG) state mission requirements. The LUH is a dual pilot, single pilot capable, aircraft that has side-by-side seating, sustains four plus hour missions, and is compatible with select Air Warrior components. LUH is FAA certified as a commercial aircraft for Instrument Flight Rules (IFR) operation.

The Army will acquire 322 UH72As to replace aging UH-1 and OH-58 aircraft and free selected UH-60 aircraft for return to the tactical fleet. The European Aeronautic Defence and Space Company (EADS) North America UH72A offers a best value solution to meet performance requirements. The UH72A is a version of the EC145 helicopter, which has been in production since 2002 serving corporate, law enforcement, paramilitary and security agencies, emergency medical service providers, and offshore operators around the world.

The EADS North America team for manufacture and support of the UH72A system includes Sikorsky Aircraft, which will provide expertise in contractor logistics support (CLS); WestWind Technologies, specializing in helicopter systems integration, engineering, and program management support; and CAE,

specializing in simulation and training. Overall contractor program management will be directed by EADS North America Defense.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Utility- LUH- Lakota UH72A

**Reference** (Minninger, 2006):

Minninger, M. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the UH-72a Light Utility Helicopter (LUH). 26 May 2006: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The LUH is a Department of Defense (DoD) Acquisition Category (ACAT) IC program. The system is currently in Source Selection with selection announcement and contract award scheduled to follow a successful Milestone C review.

It will fulfill an Army Aviation requirement for a helicopter that reduces operating and total ownership costs and is interoperable with Homeland Security (HLS) systems. The LUH will permit divestment of, and correct deficiencies experienced with, the current light fleet of OH-58 and UH-1 aircraft performing light utility missions, provide enhanced operational capability for HLS operations, enhance future growth, and augment the current tactical fleet operational tempo in permissive environments. Acquisition and operating and support (O&S) costs are required to be less than the UH-60 Black Hawk.

LUH will be procured as a Federal Aviation Administration (FAA) certificated, commercially available, non-developmental aircraft. It will be maintained in accordance with FAA, Original Equipment Manufacturer (OEM) and U.S. Army policies, regulations and procedures. The LUH aircraft is to be deployed in non-combat, permissive environments, providing operational capability for focused logistics and full dimensional protection as they relate to Homeland Security (HLS), and support operations. The LUH will conduct Army Aviation light utility helicopter missions in support of required Army tasks and will provide flexibility to respond to terrorism, conduct civil search and rescue, support damage assessment, support test activities and training centers, perform Medical Evacuation (MEDEVAC) missions, and provide support to counter drug operations. The LUH will primarily operate in permissive environments within the Continental United States (CONUS), Alaska, Hawaii, and all U.S territories and their• possessions. LUH will have sufficient performance and capacity to support lift and cargo missions, as well as, sufficient range and endurance to support security, reconnaissance, and general support operations under HLS and other Federal or ARNG state mission requirements. The LUH is a dual pilot, single pilot capable, aircraft that has side-by-side seating, sustains four plus hour missions, is Air Warrior compatible, and can be operated with identical flight controls from either seat. LUH is FAA certified as a commercial aircraft for Instrument Flight Rules (IFR) operation.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Helicopter- Utility- UH-1 Quick Fix

**Reference** (Smutz, 1978):

Smutz, E. R. (1978). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of a Heliborne Electronic Warfare System (AN/Alq-151, Quick Fix): U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. ARI-RES PROBLEM-REV-78-14 Project Number 2Q763743A775. DTIC ADA076718.

**Key Words:**

\*human factors engineering, \*aircraft equipment, \*electronic countermeasures, electronic warfare, direction finding, display systems, helicopters, data reduction, man machine systems, inertial navigation, plasma devices, questionnaires, control panels

\*Quick fix project, \*AN/ALQ-151, UH-1H aircraft, AS775, PE63743A

Fields and Groups:

170400 - Countermeasures

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*AIRCRAFT EQUIPMENT, \*ELECTRONIC COUNTERMEASURES, ELECTRONIC WARFARE, DIRECTION FINDING, DISPLAY SYSTEMS, HELICOPTERS, DATA REDUCTION, MAN MACHINE SYSTEMS, INERTIAL NAVIGATION, PLASMA DEVICES, QUESTIONNAIRES, CONTROL PANELS

Identifiers:

(U) \*Quick fix project, \*AN/ALQ-151, UH-1H aircraft,

**System Description:**

The AN/ALQ-151, Quick Fix system is a recently developed, special-purpose electronic warfare (EW) system that is configured in an UH-1H helicopter. The system has an electronic countermeasures capability that enables it to interfere with enemy radio transmissions and an electronic-surveillance capability that can be used to interrupt and determine the location of enemy emitters. Any military system should be made as effective as possible because of the high stakes involved in an armed conflict. It is even more important, however, that an airborne EW system be as effective as possible because of the limited time it can be in operation because of its vulnerability and fuel limitations. To insure maximum effectiveness in the Quick Fix system, the human factors evaluation presented in this report was conducted while Quick Fix was undergoing an Operational Test II by TCATA at Fort Hood, Tex. The purpose of the research was to identify any man-machine interface problems that might reduce the effectiveness of the system and to develop changes in hardware design, operating procedures, and training programs to optimize the effectiveness of the system. In addition to improving the Quick Fix system, the results of this report can be used to improve the design of similar systems in the future.

(Author)

Unclassified

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Aircraft- Unmanned- UAV- Aquila

**Reference** (Krohn, 1988):

Krohn, G. (1988). Manpower and Personnel Integration (MANPRINT) Assessment: MANPRINT Findings from the OT II Test of the Remotely Piloted Vehicle System (Aquila): U.S. Army Research Institute for the Behavioral & Social Sciences (ARI), 5001 Eisenhower Avenue, Alexandria VA 22333.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Aquila, the Army's Remotely Piloted Vehicle (RPV) , is a relatively small unmanned aircraft that is remotely controlled from a ground station and is designed to carry a payload that can serve target acquisition, designation, reconnaissance and surveillance functions. Development of the system can be

traced back to 1971 when the Defense Science Board recommended that the Army establish a program which would apply mini-RPV technology to the fire support functions of target designation and adjustment of artillery fire. The concept of using pilotless aerial vehicle for military purposes was investigated as early as World War I, albeit with little success (Joint Electronic Warfare Center, 1986). It was looked at again in World War II, and has been under some degree of research and development ever since. Much of the early success was with fairly large target drones which simulated flying aircraft and were used for gunnery exercises. Eventually, the idea of modifying such drones by hanging cameras on them emerged, and this combined with evolving technology created many possibilities for military application. For example, the development of the electronic digital computer, progressive miniaturization of components, and other related developments in the 1960s and 1970s, provided the possibilities for building relatively small air vehicles which could continuously send real time digitized data to a ground station. In addition, it allowed controllers to control actively the flight path or permit the air vehicle to follow a preprogrammed flight path of relatively long duration. Finally, such small vehicles could be easily launched and recovered, and for some requirements procured cheaply enough to be expendable.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Unmanned- UAV- Aquila

**Reference** (Stewart et al., 1989):

Stewart, J. E. I., Smootz, E. R., & Nicholson, N. R. (1989). Manpower and Personnel Integration (MANPRINT) Assessment: MANPRINT Support of Aquila, the Army's Remotely Piloted Vehicle: Lessons Learned. Fort Hood, Texas: U.S. Army Research Institute for the Behavioral and Social Sciences (PERI-SM). 5001 Eisenhower Ave, Alexandria, VA 22333. ARI Research Report 1525. ADA211207.

**Key Words:**

MANPRINT; Operational testing; Human Factors; remotely piloted vehicles; manpower; personnel; Training

Fields and Groups:

010310 - Pilotless Aircraft

050900 - Personnel Management and Labor Relations

Descriptors:

(U) \*ARMY TRAINING, \*MANPOWER, \*REMOTELY PILOTED VEHICLES, TEST AND EVALUATION, LESSONS LEARNED, ARMY RESEARCH, MISSION PROFILES, TASK FORCES, CONCRETE, RESEARCH FACILITIES, OPERATIONAL EFFECTIVENESS, HUMAN FACTORS ENGINEERING, MAINTENANCE PERSONNEL, INTEGRATION, LABORATORIES, PERSONNEL, SYSTEMS ANALYSIS, TARGET DETECTION

Identifiers:

(U) MANPRINT(MANPOWER AND PERSONNEL INTEGRATION)

**System Description:**

Aquila, the Army's Remotely Piloted Vehicle (RPV) , is a relatively small unmanned aircraft that is remotely controlled from a ground station and is designed to carry a payload that can serve target acquisition, designation, reconnaissance and surveillance functions. Development of the system can be traced back to 1971 when the Defense Science Board recommended that the Army establish a program which would apply mini-RPV technology to the fire support functions of target designation and adjustment of artillery fire. The concept of using pilotless aerial vehicle for military purposes was investigated as early as World War I, albeit with little success (Joint Electronic Warfare Center, 1986). It was looked at again in World War II, and has been under some degree of research and development ever since. Much of the early success was with fairly large target drones which simulated flying aircraft and were used for gunnery exercises. Eventually, the idea of modifying such drones by hanging cameras on them emerged, and this combined with evolving technology created many possibilities for military application. For example, the development of the electronic digital computer, progressive miniaturization

of components, and other related developments in the 1960s and 1970s, provided the possibilities for building relatively small air vehicles which could continuously send real time digitized data to a ground station. In addition, it allowed controllers to control actively the flight path or permit the air vehicle to follow a preprogrammed flight path of relatively long duration. Finally, such small vehicles could be easily launched and recovered, and for some requirements procured cheaply enough to be expendable.

**Report Availability:**

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**System Short Name:** MANPRINT- Aircraft- Unmanned- UAV- ER/MP

**Reference (Cook, 2005):**

Cook, T. C. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Extended Range/Multi-Purpose Unmanned Aerial Vehicle (ER/MP UAV). Redstone Arsenal, AL.; U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The ER/MP UAV system consists of several components to include: the system Ground Control Station (GCS) and its related equipment, the Aerial Vehicle (AV), Mission Payload (MP), and communications. The ER/MP UAV system will provide the Corps/Unit of Employment (UE) commander a real-time responsive capability to conduct an array of missions, to include wide area near real-time Reconnaissance, Surveillance and Target Acquisition (RSTA), Command and Control, Communications Relay, Signals Intelligence (SIGINT), Electronic Warfare (EW), Attack, Weapons of Mass Destruction (WMD) detection, and battle damage assessment capability. This will allow execution of the commander's land warfare expeditionary mission, and special operations during peacetime and all levels of war against defended/denied areas over extended periods of time. This desired capability does not currently exist with the Army. The lack of such capability limits the commanders in their flexibility to collect important intelligence information and to conduct RSTA, Command and Control, EW and special operations missions. The ER/MP UAV system will provide more coverage with a single baseline than legacy systems could with five. In addition, the ER/MP UAV system will provide more varied missions over a longer range with a smaller footprint and less logistical strain than legacy systems. It is envisioned that the system will be flexible enough to meet the ever-changing needs of the Corps/UE commander.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Unmanned- UAV- g-MAV

**Reference (Pettitt and Williams, 2007):**

Pettitt, R. A., & Williams, J. (2007). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the G-MAV Micro-Air Vehicle: U.S. Army Research Laboratory, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland. ARL Technical Report ARL-TR-4169. DTIC ADA480081.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment

MA  
HFEA

\*military operations, \*human factors engineering, \*situational awareness, \*military training, army research, risk, missions, proficiency, questionnaires, reconnaissance, operators(personnel), deficiencies, reliability, army personnel, demonstrations

gdt(ground data terminal), mav(micro air vehicle), uav(unmanned aerial vehicle), mua(military utility assessment), ocu(operator control unit), sbl(soldier battle laboratory), actd(advanced concept and technology demonstration), g-mav system, \*gas-powered

Fields and Groups:

150600 - Military Operations, Strategy and Tactics

230200 - Human Factors Engineering & Man Machine System

050800 - Psychology

Descriptors:

(U) \*MILITARY OPERATIONS, \*HUMAN FACTORS ENGINEERING, \*SITUATIONAL AWARENESS, \*MILITARY TRAINING, ARMY RESEARCH, RISK, MISSIONS, PROFICIENCY, QUESTIONNAIRES, RECONNAISSANCE, OPERATORS(PERSONNEL), DEFICIENCIES, RELIABILITY, ARMY PERSONNEL, DEMONSTRATIONS

Identifiers:

(U) GDT(GROUND DATA TERMINAL), MAV(MICRO AIR VEHICLE), UAV(UNMANNED AERIAL VEHICLE), MUA(MILITARY UTILITY ASSESSMENT), OCU(OPERATOR CONTROL UNIT), SBL(SOLDIER BATTLE LABORATORY), ACTD(ADVANCED CONCEPT AND TECHNOLOGY DEMONSTRATION), G-MAV SYSTEM, \*GAS-POWERED MICRO AIR VEHICLES

#### **System Description:**

The g-MAV system consists of two AVs, a ground station (GS) consisting of a ground data terminal (GDT) and an OCU, payload (one electro-optical and one infrared [IR] pod) and an avionics pod for both AVs, and support equipment. The g-MAV is a "proof-of-concept" system capable of supporting a dual video camera system consisting of one forward looking and one downward looking camera. Half of the AVs were equipped with IR cameras and the remaining half with electro-optical (EO) cameras (sensor payloads). However, any AV can use either the IR or EO payload pods since they are interchangeable. The GS includes telemetry interfaces used to control and monitor the AV. Telemetry includes near real-time video sourced from the payload pods and displayed for the operator on the OCU. Operators used the GS to conduct mission planning and to maintain control of the AV during flight. The OCU is the operator's display and data entry device, and the GDT contains the up-link and downlink communications radios, a global positioning system (GPS) receiver, temperature sensor, battery, and power conditioning circuitry. A vibratory alert is also included in the GS package. The support equipment for the system includes a fuel syringe, fuel containers, engine starter assemblies, batteries, an operator tool kit, and an engine-tuning tool.

The modular backpack transport container system holds all components of the g-MAV system during transport and storage. Two backpack containers can be used to transport one g-MAV system. During the MUA, Soldiers transported the system using Stryker vehicles with minimal use of the backpack configuration. Figures 1 through 6 depict component parts of the g-MAV system.

#### **Report Availability:**

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**System Short Name:** MANPRINT- Aircraft- Unmanned- UAV- SUAS Raven B

#### **Reference** (Minninger, 2006):

Minninger, M. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the Small Unmanned Aerial System (SUAS) (Raven B): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

#### **Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA



**System Description:**

- a. The Raven B small unmanned aerial system (SUAS) is a hand launched reconnaissance and surveillance tool. This system is used for over-the-hill surveillance, perimeter monitoring, and urban terrain observation. SUAS transmits live airborne video images, compass headings, and location information to a ground control station (GCS), including laptop if connected, and a remote video terminal (RVT). This capability enables operators to navigate, search for targets, recognize terrain, and record all information for analysis.
- b. The SUAS system consists of three hand-launched air vehicles. one GCS, one RVT, an air vehicle battery charger, batteries, and an Field Repair Kit (FRK). The system is battery powered and weighs less than 25 lbs. The payload contains color and infrared (IR) cameras and a laser illuminator. The GCS is used to control the aircraft, load missions, and display down-linked video. RVTs are used by remote teams requiring access to video and location information. Battery chargers are used to re-charge flight batteries, while deployed, from both DC and AC sources. A FRK is provided to make minor repairs. The SUAS system includes a software simulation package to enable the operator to conduct training by connecting the GCS to a standard laptop computer.
- c. Ground Control Station (GCS): The ground control station includes a telemetry interfaces used to control and monitor the SUAS. Telemetry includes near real time video sourced by the SUAS payloads that is displayed for the operator (or RVT). The ground stations are also used for pre-mission planning. The ground station consists of the Control Unit, antenna & mast, Toughbook laptop Personal Computer (PC), and Receiver/Transmitter (R/T). The control unit is the operator's display and entry/control device. The RIT contains the uplink and downlink communications radios, while the PC is used for mission planning.
- d. Air Vehicle (A/V): The air vehicle is a modular Kelar composite weighing less than 4.51bs. With a wing span of 554 in. The A/V is powered using either single-use LiSO2 or rechargeable Li-Ion batteries. Capable of both manual and autonomous flight, the Raven cruises at 13.5m/s (30mph) for up to 90 minutes.

**Report Availability:**

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**System Short Name:** MANPRINT- Aircraft- Unmanned- UAV- SUAV

**Reference** (Minninger, 2006):

Minninger, M. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the Small Unmanned Aerial Vehicle (Suav): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The SUAV is a Department of Defense (DoD) Acquisition Category III (ACAT III) program. The requirement is defined by the United States Special Operations Command (USSOCOM) Rucksack Portable Unmanned Aerial Vehicle (RPUAV) Operational Requirements Document (ORD). The USSOCOM RPUAV ORD was adopted by the U.S. Army Training and Doctrine Command (TRADOC) to meet requirements of the total Army.

The SUAV program is a follow-on to the Raven Interim SUAV Urgent Wartime Requirement which completed fielding in 1QTR FY06. The primary purpose of this system is to provide the small unit, company level and below, a quick reaction and dedicated "over the hill and around the corner" reconnaissance, surveillance, targeting and acquisition (RSTA) capability. The SUAV increases the small unit's capabilities by providing information not readily available using existing imagery and targeting equipment.

The SUAV is capable of being carried, launched, controlled and recovered by a single operator. It provides an aerial day and night imagery and remote force protection situational awareness sensing capability to the small unit. The SUAV provides the small unit with enhanced situational awareness and increased force protection by providing the means for expanded reconnaissance and surveillance coverage of marginal maneuver areas, increased target acquisition capability, and an ability to reduce Soldier exposure in high risk situations. This combination contributes directly to the small unit's success by facilitating maneuver to points of positional advantage with speed and precision in order to conduct decisive operations. The SUAV enables the small unit to see first, understand first, act first and finish decisively.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Unmanned- UAV- TUAV

**Reference** (Ruff, 2000):

Ruff, R. M. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the Tactical Unmanned Aerial Vehicle (TUAV). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

A Tactical Unmanned Aerial Vehicle (TUAV) system consists of four basic components: the Ground Control Stations (GCS) and related equipment; Air Vehicles (AV); Modular Mission Payloads (MMP); and communications.

The system will have sufficient AVs to support wartime operations, as well as a means of launch and recovery, and the necessary transportation and ground support equipment for the operations and maintenance of the system. The system is designed to be easy to launch, operate, recover, and maintain with a minimum of training, logistics, and personnel. It must present a small profile in order to reduce its signature; rapidly tear down, deploy and set up; and minimize any impact on brigade CSS resources. A crew of approximately 14 will operate and maintain a full base line (AVs and two GCSs) augmented with the divisional Mobile Maintenance Facility (MMF) for sustainment beyond the initial 72 hours of operations.

The system is capable of near real time (NRT) transmission of Electro Optic/Infrared (EO/IR) imagery. Initially, the system has a basic EO/IR mission payload, but has a capability for growth to accommodate additional MMPs.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Aircraft- Unmanned- UAV- TUAV Shadow

**Reference** (Cook, 2002):

Cook, T. C. (2002). Manpower and Personnel Integration (MANPRINT) Assessment for the Tactical Unmanned Aerial Vehicle (TUAV) Shadow 200: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Tactical Unmanned Aerial Vehicle (TUAV) is a ground maneuver commander's primary day or night, Reconnaissance, Surveillance, and Target Acquisition (RSTA) system. The TUAV provides the commander with a number of benefits to include: enhanced enemy situational awareness, a target acquisition capability, battle damage assessment (BDA), and enhanced battle management capabilities (friendly situation and battlefield visualization). The combination of these benefits contributes to the commander's dominant situational awareness allowing him to maneuver to points of positional advantage with speed and precision in order to conduct decisive operations. As a command and control enabler for tactical decision making, it's the commander's "dominant eye," allowing him to shape the battlefield to ensure mission success. The TUAV system consists of four basic components: the Ground Control Station (GCS) and its related equipment, the Aerial Vehicle (AV), Modular Mission Payload (MMP), and communications equipment.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- AMG

**Reference** (Mares, 2006):

Mares, A. L. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the Antenna Mast Group (Amg): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Antenna Mast Group (AMG).

**Report Availability:**

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**System Short Name:** MANPRINT- AMMPS

**Reference** (Reinhart, 2003):

Reinhart, J. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the Advanced Medium-Size Mobile Power Source (AMMPS): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Advanced Medium-Size Mobile Power Source (AMMPS) will be electric generator sets of 5, 10, 15, 30 and 60 kilowatt (kW) outputs to replace the current fleet of medium size Military Standard (Mil-Std) and Tactical Quiet Generator (TQG) sets. The AMMPS program will include up to 26 generator set configurations of 50/60 Hz and 400 Hz frequencies and will be skid and trailer mounted. The AMMPS will be more mobile, reliable, and logistically supportable than the TQG sets.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- AMMPS

**Reference** (Reinhart, 2004):

Reinhart, J. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Advanced Medium-Size Mobile Power Sources (AMMPS). Redstone Arsenal, AL.; U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The AMMPS will provide mobile, tactical electric power to operate command, control, communications, computer and intelligence (C4I) systems, fire control-target acquisition, life support and soldier sustainment systems. The requirement for the AMMPS program is the ORO for Tactical Electric Power (TEP) (data source II.C.I.c) which states requirements for generator sets in the 0.5 kW to 200 kW range. AMMPS will consist of a standard family of 5, 10, 15, 30, and 60 kW, 50/60 Hz and 400 Hz output electric generators in both skid and trailer mounted configurations. Smaller and larger generator sets will be procured as separate programs.

2. The AMMPS will replace much of the current fleet of medium size Military Standard (Mil-Std) and Tactical Quiet Generator (TQG) sets in combat, combat support, and combat service support units Army wide. AMMPS will provide improvements over predecessor systems in fuel consumption, size, weight, acoustic signature, mobility, and transportability. They will have fully embedded diagnostics-prognostics, enhanced survivability and supportability. AMMPS Maintainers will be Military Occupational Specialty (MOS) 520 (Power Generation Equipment Repairer) and 63 series for power units and power plants. Operators will be non-MaS specific general purpose users designated by the unit Commander.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- AOBS

**Reference** (Holgate et al., 1992):

Holgate, S. H., Bensel, C. K., Gott, R., & Hennessy, E. R. (1992). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Antipersonnel Obstacle Breaching System (AOBS): U.S. Army Natick Research and Development Center, Clothing, Equipment, and Materials Engineering Laboratory, Natick, MA. NATICK/TR-92/045L. DTIC ADB167883.

**Key Words:**

\*backpacks, \*protective clothing, cargo vehicles, chemicals, cold weather, deployment, grenades, illumination, interfaces, males, military personnel, motors, night, phase, rocket engines, rope, shipping containers, sites, terrain, training, transport, u  
pe62723a, ash98.

Fields and Groups:

230400 - Protective Equipment

Descriptors:

(U) \*BACKPACKS, \*PROTECTIVE CLOTHING, CARGO VEHICLES, CHEMICALS, COLD WEATHER, DEPLOYMENT, GRENADES, ILLUMINATION, INTERFACES, MALES, MILITARY PERSONNEL, MOTORS, NIGHT, PHASE, ROCKET ENGINES, ROPE, SHIPPING CONTAINERS, SITES, TERRAIN, TRAINING, TRANSPORT, UNIFORMS, WARFARE, WEATHER, HUMAN FACTORS ENGINEERING

**System Description:**

The basic components of the Antipersonnel Obstacle Breaching System (APOBS) are two backpacks, which are loaded with grenades strung together on rope, and a container holding a rocket motor and fuze. The system is to be carried and deployed by two-man teams. A human factors evaluation of the APOBS was conducted to examine the system/user interface and to identify changes in design and training likely to improve operation of the system by military personnel. The participants in each of the three phases of the evaluation were 12 male Marines. Testing was conducted under day and night illumination levels and while participants were wearing regular duty uniforms, cold weather clothing, and chemical protective clothing. It was found that two-man teams could deploy the system within 30 sec of reaching the launch site, even after carrying the APOBS a distance of 2 km over rough terrain. However, most deployments required 60 to 90 sec. Participants generally considered deployment to be easy to accomplish, but practice was required for correct execution of the procedure. The APOBS could be carried on and off transport vehicles by two men without difficulty and, when in its shipping container, lifted and carried by four men. Antipersonnel obstacle Breaching System, Human Factors, Breaching, Combat, Backpacks, APOBS, System/User Interface.

Unclassified

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies only; Administrative/Operational Use; Sep 92. Other requests shall be referred to Commanding Officer, Naval Coastal Systems Center (Code 3301), Panama City, FL 32407-5000. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- APKWS II

**Reference (Durbin, 2006):**

Durbin, D. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the Advanced Precision Kill Weapon System (Apkws) II: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The APKWS II is an Acquisition Category 2 program managed by the JAMS Project Office with joint interest from the Navy and Air Force. The Milestone Decision Authority (MDA) is the Program Executive Officer, Missiles and Space (PEO MS). The objective of this program is to quickly produce and field a low cost, mid-range, air-to-ground system capable of defeating targets other than heavy armor. The APKWS II is to provide increased kills and be capable of point target accuracy while minimizing collateral damage. It will fill the gap between the current unguided 2.75-Inch Rocket System and the Hellfire anti-armor system.

There have been two precursors to the current APKWS II; the initial program entitled Low Cost Precision Kill (LCPK) Program and then APKWS. The LCPK program was awarded under contract DAAHOI-00-C-R003 with the Advanced Technology Demonstration (ATD) objective to develop, flight demonstrate, and integrate onto the AH-64 Apache a low cost, accurate guided 2.75-inch rocket that provided a standoff range, surgical strike capability against specified soft point targets. The LCPK successfully completed the ATD in 2002 and transitioned from LCPK to APKWS. The Department of the Army, G-3, validated the requirement for the guided 2.75-inch rocket system by memorandum, 22 August 2002. The APKWS entered into the System Development and Demonstration (SDD) phase in February 2003 under contract DAAHOI-03-C-0010.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- APLA

**Reference** (Mike McDevitt, 1999):

Mike McDevitt. (1999). Manpower and Personnel Integration (MANPRINT) Assessment: Health Hazard Assessment Report on the Non-Self Destruct Alternative to the Anti-Personnel Landmine Alternative (NSD-A APLA). Picatinny Arsenal, NJ: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

- a. The APLA is designed as an alternative to the current inventory of anti-personnel land mines (APLs). It employs final effect devices that are remotely controlled by a soldier using a dedicated command and communication system that is fully integrated with the digital battlefield by way of the tactical internet. The soldier "in-the-loop" decides on every fire action. The APLA uses a number of sensors that cannot initiate firing without a prior soldier decision.
- b. The APLA will allow friendly forces the ability to shape the battlespace by restricting or controlling an enemy's ability to maneuver freely. The APLA will provide all the capabilities currently provided by APLs but not result in life threatening residual risk after hostilities end or warring factions depart an area. This will be accomplished by a self-destruct mechanism.
- c. The a acquisition strategy for the APLA is a downselect approach. Currently three candidate (SAMGL, APLAUS, and RCM1618) systems are being considered. It will be man portable; hand emplaced and provides both lethal and nonlethal munitions. In addition the APLA will have an off function that will permit it to be recovered. This HHAR supports a MS I, Program Definition and Risk Decision.
- d. No previous HHARs were completed for the APLA. A draft Operational Requirements Document (ORD), Safety Assessment Reports, Test and Evaluation Master Plan and other program documents were used to prepare this HHAR (references 5-13). Potential hazards associated with weapons target effects are not addressed in this report. Approximately one million munitions are planned for procurement.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- APOBS

**Reference** (Gunn, 2001):

Gunn, K. (2001). Manpower and Personnel Integration (MANPRINT) Assessment for the Demolition Kit, Breaching System, Anti-Personnel Obstacle, Mk 7 Mod 1 (Anti-Personnel Obstacle Breaching System - APOBS). 8 April 2001. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Anti-Personnel Obstacle Breaching System (APOBS) is a lightweight, self-contained, two-man portable munition designed to create continuous cleared foot lanes through anti-personnel (AP) minefields and wire obstacles. APOBS is a 45-meter long, rocket propelled line charge, composed of 108 fragmentation grenades with interconnecting detonation cord packaged in two 65-pound backpacks. Employed from a standoff position on the near side of an obstacle, it can be fired over the obstacle and detonated in either a command or a delay mode. The system is designed to augment and in some cases replace the Bangalore Torpedo Demolition Kit currently in the inventory. APOBS will provide combat

engineer and infantry units a means for quickly conducting assault breaches of AP obstacles. A certified insensitive munition (IM), APOBS's advantage over the current system include reduced weight and bulk, a standoff employment capability, and reduced susceptibility to sympathetic detonation during transport and emplacement.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- ARISS

**Reference** (Headley, 1999):

Headley, D. B. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the Army Recruiting Information Support System (ARISS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The ARISS is a laptop-based portable workstation which will consist of the following modules: Multimedia Presentations, Packet Projection, Manage Leads and Reports, Guidance Counselor Standard Database, and Headquarters Support System. "ARISS will provide a single system that the service components can use to support recruiting tasks. This system will automate all aspects of recruiting data management and will enable individual recruiters to operate in a stand-alone mode with the ability to contact, interview, screen, and process applicants anywhere and at any time." (from ARISS SMMP, para 1.1). Key functions include CD-ROM video sales presentations, preparation of applicant packets (featuring one-time data entry), automation of updating and distributing of leads information, and automation of recruit management reporting. This assessment looked at the Multimedia Sales and Packet Projection modules; the other modules will be developed in later phases.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- 105mm- Cartridge- DPICM XM915/XM916

**Reference** (Spine, 1997):

Spine, R. J. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 105mm, XM915/XM916, Dual Purpose Improved Conventional Munition Projectile (DPICM). Picatinny Arsenal, NJ: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The 105mm XM915/XM916 projectiles are needed by light forces to provide improved effectiveness for the 105mm weapon systems against both personnel and light armor targets. The particular performance capability is the increased lethal effectiveness over a wider area of the target than is provided by conventional high explosive munitions. This effectiveness is accomplished through the use of dual purpose, anti-personnel and anti-materiel submunitions. The cartridges are compatible with current and developmental 105mm field artillery weapons, propelling charges, and fuzes.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- 105mm- Cartridge- HE PFF XM1130

**Reference** (Lewis, 2008):

Lewis, J. T. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the Xm1130 Base Bleed [Denel Xm0125a1], 105mm High Explosive Pre-Formed Fragment (HE PPP) Cartridge:

Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The XM1130 Cartridge is a Non-Developmental Item (NDI) developed in South Africa by Denel-Naschem. It is a High Explosive Pre-Formed Fragmentation (PFF) cartridge that will incorporate U.S. cartridge cases, M67 propelling charges, and current U.S. PA117 packaging. The XM1130 is a streamlined shape warhead loaded with a high explosive (HE) fill that is designed to be insensitive munitions (IM) compliant, and features a multi-part fragmentation casing with 9,300 preformed tungsten alloy spheres sleeved between inner and outer casings. These features are intended to provide superior performance against personnel, and light armored vehicles. The XM1130 utilizes a base bleed which increases range by allowing a stream of gas and heat to flow out of the base of the projectile. This stream of gas increases base pressure, thereby reducing projectile base drag. The XM1130 was previously known as the XM1025A1 under Denel/GD-OTS nomenclature.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- 105mm- Cartridge- XM1064 IRILL

**Reference** (Lewis, 2008):

Lewis, J. T. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the XM1064, 105mm Infrared (IR) Illumination (Irill) Cartridge: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

1. The XM1064 Cartridge is a Non-Developmental Item (NDI) that will provide light during night operations in order to enhance the use of current Night Vision Devices (NVD). The XM1064 Cartridge utilizes the M67 Propelling Charge and M762/M762A1 Fuzes. The inside of the XM1064 Cartridge is comprised of an expelling charge, illuminant canister and parachute assembly. During flight, the fuze functions at a preset time, igniting the expulsion charge and the IR candle. The expulsion charge separates the IR candle assembly from the projectile body. The parachute and spin brakes deploy, and the IR candle illuminates a target for a minimum of 55 seconds.
2. The XM1064 Cartridge will be employed in an indirect fire mode against enemy targets during periods of darkness or extremely limited visibility. Units will maximize the capability of their NVD by employing IR



illumination. This capability allows ground forces to acquire enemy targets while retaining a high degree of covertness. The IR candle does not generate any ground illumination and only produces a faint visible signature while in the air. However, when the NVD are employed with IR illumination, targets become much clearer; this aids in target detection and identification. The ground coverage of IR illumination provided by the XM1064 Cartridge is 2.5 times greater in diameter than the M314A3 visible illumination cartridge currently in the U.S. inventory.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- 105mm- Computer- GLPS

**Reference** (Reinhart, 1996):

Reinhart, J. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the Gun Laying and Positioning System (GLPS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Gun Laying and Positioning System (GLPS) will provide towed and self propelled non-Paladin firing batteries an all weather, autonomous, positioning and orienting capability. GLPS will ascertain location from the Global Positioning System (GPS) and determine position, azimuth, and deflection of each howitzer to orient the firing battery to the target.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- 155mm- Charge- MACS

**Reference** (Jee, 1996):

Jee, L. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the Modular Artillery Charge System (MACS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Modular Artillery Charge System (MACS).

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- 155mm- Charge- MACS

**Reference** (Zubal, 1999):

Zubal, O. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the XM231 Modular Artillery Charge System (MACS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The XM231 Modular Artillery Charge System (MACS) is an evolution of the Unicharge concept and is being developed as a replacement for the current family of bag charges. The MACS is being optimally designed for use in the highly mechanized Crusader, while maintaining compatibility with the current towed, M198, self-propelled, M109 series, and the XM.777 under development, howitzers. The XM231 is 6.1 inches in diameter and 6 inches long and weighs 4.25 pounds. Increments are fired singly or at most in pairs.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- 155mm- Charge- MACS

**Reference (Zubal, 2000):**

Zubal, O. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the XM232 Modular Artillery Charge System (MACS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The XM232 MACS is an evolution of the Unicharge concept and is being developed as a replacement for the current family of bag charges. The MACS is being optimally designed for use in the highly mechanized Crusader, while maintaining compatibility with the current towed, M198, self propelled, M109 series, and the XM777 under development, howitzers. The XM232 increment is 6.1 inches in diameter and 6 inches long and weighs approximately 5 pounds. Increments are fired in combinations of a minimum of three to a maximum of 5 in the M109, M198 and XM777. The Crusader will be able to fire a maximum of 6 increments.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- 155mm- Charge- MACS

**Reference (Zubal, 2005):**

Zubal, O. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Modular Artillery Charge System M232E1 (MACS). Redstone Arsenal, AL.: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The 232E1 MACS is being designed for use with the current fleet of 155mm howitzers, such as the M198 towed, the M109-series self-propelled, and the M777 lightweight towed howitzers.

1. The 232E1 increment is comprised of a rigid combustible cartridge case. The combustible cartridge case is filled with approximately 5 pounds of M31A2 propelling charge. The ignition train consists of two end igniter bags and a center core igniter; thus, the 232E1 can be ignited from either end once it is emplaced in the breech of the howitzer.

2. The purpose of the modification is to improve the tube life of existing howitzers. The modification will not impact training or any aspect of the existing 232.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- 155mm- Charge- MACS XM231

**Reference** (Schorling, 1997):

Schorling, D. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Modular Artillery Charge System (MACS) XM231. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Modular Artillery Charge System (MACS) XM231 low zone increment.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- 155mm- Charge- MACS XM232

**Reference** (Zubal, 2001):

Zubal, O. (2001). Manpower and Personnel Integration (MANPRINT) Assessment for the XM232 Modular Artillery Charge System (MACS). 18 July 2001. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The XM232 Modular Artillery Charge System (MACS) is an evolution of the Unicharge concept and is being developed as a replacement for the current family of bag charges. The MACS is being optimally designed for use in the highly mechanized Crusader, while maintaining compatibility with the current towed, M198, self propelled, M109 series, and the XM777 under development, howitzers. The XM232 increment is 6.1 inches in diameter and 6 inches long and weighs approximately 5 pounds. Increments are fired in combinations of a minimum of three to a maximum of 5 in the M109, M198 and XM777. The Crusader will be able to fire a maximum of 6 increments.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- 155mm Charge- SPS Unicharge XM230

**Reference** (Jee, 1994):

Jee, L. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Xm230 Solid Propellant System (Unicharge). Alexandria, VA: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The XM230 Solid Propellant System consists of increments of the XM230 Unicharge. A single Unicharge increment is comprised of 4.8 pounds of M30A1 granular propellant loaded into a rigid, combustible Nitrocellulose (NC) case that is approximately six inches in diameter and six inches long. It contains an ignition chain of one ounce of ball powder loaded lengthwise complemented with end mounted ignitor pads containing thirteen grams of the class 3 black powder. The XM230 Solid Propellant System is intended to be a replacement for the current fielded bag charge system utilized on existing 155mm howitzer systems.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- 155mm- Computer- TAD DFCS

**Reference** (Savick, 1999):

Savick, D. S. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the Towed Artillery Digitization Digital Fire Control System (TAD DFCS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Towed Artillery Digitization Digital Fire Control System (TAD DFCS) Lightweight 155mm Automated Howitzer (XM777) improvement program, a joint venture between the Army and the Marine Corps, has developed an experimental Digital Fire Control System (DFCS) to demonstrate the Rapid Forces Projection Initiative (RFPI) concept. The initiative added the DFCS to the existing M198 Howitzer as a test bed. The digitized howitzer will help provide the increased accuracy, responsiveness, lethality, and survivability required by the RFPI concept.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- 155mm- Computer- TAD DFCS

**Reference** (Savick, 2000):

Savick, D. S. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the Towed Artillery Digitization Digital Fire Control System (TAD DFCS). Alexandria, VA: U.S. Army Research

Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Lightweight 155mm Automated Howitzer (XM777) improvement program, a joint venture between the Army and the Marine Corps, has developed an experimental Digital Fire Control System (DFCS) to demonstrate the Rapid Forces Projection Initiative (RFPI) concept. The initiative added the DFCS to the existing M198 Howitzer as a test bed. The digitized howitzer will help provide the increased accuracy, responsiveness, lethality, and survivability required by the RFPI concept.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- 155mm- Fuze- ETAF M762E1

**Reference** (Gunn, 2000):

Gunn, K. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the M762E1/M767E1 Electronic Time Artillery Fuze (ETAF). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

M762E1/M767E1 Electronic Time Artillery Fuze (ETAF).

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- 155mm- Fuze- MOFA

**Reference** (Zubal, 1999):

Zubal, O. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the XM782 Multi-Option Fuze for Artillery (MOFA). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The XM782 Multi-Option Fuze for Artillery (MOFA) is designed for use with all current and developmental 155mm-artillery projectiles. The MOFA includes all the required functions for bursting munitions in a standard fuze contour and incorporates an inductive setting capability.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

**System Short Name:** MANPRINT- Artillery- 155mm- Fuze- PGK

**Reference** (Ehmann, 2006):

Ehmann, R. (2006). Manpower and Personnel Integration (MANPRINT) Assessment: Health Hazard Assessment Report (RCS MED-388) No. 69-MP-060s-07, Precision Guidance Kit (PGK), October 2006: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Health Hazard Assessment Report (RCS MED-388) No. 69-MP-060s-07, Precision Guidance Kit (PGK), October 2006.

**Report Availability:**

Distribution authorized to DOD Components only; test and evaluation; October 2006. Other requests shall be referred to Office of the Project Manager-Combat Ammunition Systems, Program Executive Office-Ammunition, Building 171A, Picatinny Arsenal, NJ 07806-5000.:

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**System Short Name:** MANPRINT- Artillery- 155mm- Fuze- PGK

**Reference** (Urbiola, 2007):

Urbiola, S. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the XM1156 Precision Guidance Kit (PGK): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The XM1156 Precision Guidance Kit (PGK) is a smart artillery fuze, capable of correcting an artillery projectile's trajectory in two-dimensional (2-D) space. The fuze does this by sensing a location with Global Positioning System (GPS) technology and using course correcting surfaces to adjust the projectile's flight. The PGK is to be used initially on 155mm projectiles (Increments 1 & 2) and then on 105mm projectiles (Increment 3). The Enhanced Portable Inductive Fuze Setter (EPIAFS) is required to use the PGK. The EPIAFS shall be used to transfer the GPS keys, the intended fuze function mode and meteorological data to the PGK.
2. The PGK will be fully interoperable with the M109A6 (Paladin) 155mm self propelled howitzers, the M777A1 Joint (Marine Corps & Army) 155mm Light Weight Towed Howitzer, the M119A1 105mm Towed Howitzer, and Non Line of Sight – Cannon (NLOS-C). The PGK shall be compatible with current and developmental U.S. bag (M3A1 through M203A1) and Modular Artillery Charge System (MACS) propellant charges. The PGK shall be employed in geographical areas falling under hot, basic, and cold climatic conditions.

**Report Availability:**

Distribution authorized to DOD Components only; test and evaluation; October 2006. Other requests shall be referred to Office of the Project Manager-Combat Ammunition Systems, Program Executive Office-Ammunition, Building 171A, Picatinny Arsenal, NJ 07806-5000. :

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**System Short Name:** MANPRINT- Artillery- 155mm- Fuze- PGK

**Reference** (Hernandez, 2009):

Hernandez, C. L. (2009). Manpower and Personnel Integration (MANPRINT) Assessment for the Fuze, Multioption, Precision Guidance Kit (PGK), XM1156: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The XM1156 is an electronic fuze that is set using the Enhanced Portable Inductive Artillery Fuze Setter (EPIAFS); transferring power and initialization data (Global Positioning System (GPS) data, gun and target locations, fuze mode, and trajectory algorithms) to the fuze. The Increment 1 configuration is being developed for three types of 155mm unguided, high-explosive artillery projectiles; the M107, M795 and M549A1 with point-detonating (PD) and proximity fuze functions. Follow-on increments will provide additional capabilities in accuracy, GPS antijamming, and compatibility (105-millimeter projectiles). The XM1156 uses GPS guidance and fixed canards mounted on the fuze to make small corrections to the ballistic trajectory and to guide the projectile to the programmed target grid. The XM1156 has a 50-meter or less circular error probable (CEP) requirement. It will not require any scheduled maintenance other than the normal stockpile surveillance.

**Report Availability:**

Distribution authorized to DOD Components only; test and evaluation; October 2006. Other requests shall be referred to Office of the Project Manager-Combat Ammunition Systems, Program Executive Office-Ammunition, Building 171A, Picatinny Arsenal, NJ 07806-5000. :

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**System Short Name:** MANPRINT- Artillery- 155mm- Fuze- T197E2

**Reference** (McGuigan, 1963):

McGuigan, E. J. (1963). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Fuze Setting for Fuze, Mtsq, T197E2: U.S. Army Frankford Arsenal, Philadelphia, PA. FA Report FA-M63-24-1. DTIC AD0298171.

**Key Words:**

\*fuze setters, errors, human factors engineering  
t-197 fuzes

**System Description:**

Fuze, Mtsq, T197E2.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Artillery- 155mm- Fuze- XM765

**Reference** (DeTogni, 1990):

DeTogni, G. R. (1990). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Evaluation of the XM762 and M577 Fuzes: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. HEL-TM-1-90 Project Number 1L162716AH70. DTIC ADB142625.

**Key Words:**

\*fuzes(ordnance), arctic regions, artillery, artillery ammunition, blackout(propagation), blue(color), darkness, daylight, fatigue, floors, gas masks, gloves, green(color), gunners, hands, human factors engineering, inert materials, light, protective eq

pe62716a, ash70.

Fields and Groups:

230200 - Human Factors Engineering & Man Machine System

190100 - Ammunition and Explosives

Descriptors:

(U) \*FUZES(ORDNANCE), ARCTIC REGIONS, ARTILLERY, ARTILLERY AMMUNITION, BLACKOUT(PROPROPAGATION), BLUE(COLOR), DARKNESS, DAYLIGHT, FATIGUE, FLOORS, GAS MASKS, GLOVES, GREEN(COLOR), GUNNERS, HANDS, HUMAN FACTORS ENGINEERING, INERT MATERIALS, LIGHT, PROTECTIVE EQUIPMENT, ROOM TEMPERATURE, TIME, VERTICAL ORIENTATION

**System Description:**

Sixteen artillerymen Military Occupational Specialty 13B set XM762 and M577 fuzes for three time ranges under the following conditions: (1) at room temperature in daylight using bare hands and (2) at -25 F in darkness while wearing arctic plus nuclear, biological, and chemical (NBC) protective equipment, including NBC gloves over arctic fingered gloves and an NBC mask. Inert fuzes were assembled onto inert 155mm projectiles placed vertically on the floor. The artillerymen were trained with both fuzes. Fuze presentation and time ranges were counterbalanced to randomize practice and fatigue effects. Exit interviews were conducted after each fuze data run. Time data were examined using a within-subjects multivariate analysis of variance (MANOVA). Error data were examined using chi-square tests. User comments and design preference from exit interviews are given. Conclusions and recommendations are provided. Keywords: Arctic thermometrics, XM762 Fuzes, M577 Fuze, Blackout conditions, Blue-green light, Gas mask (M25) effects on fuze setting, Fuzes(Ordnance), Handwear effects on fuze setting, Human engineering evaluation, Fuze setting errors, Fuze setting times, Artillery ammunition. (JG) Unclassified

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies and their contractors; Critical Technology; Feb 90. Other requests shall be referred to Director, US Army Human Engineering Lab., Aberdeen Proving Ground, MD 21005-5001. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- Artillery- 155mm- Projectile- BDM XM141

**Reference** (Whalen, 1998):

Whalen, J. B. (1998). Manpower and Personnel Integration (MANPRINT) Assessment for the Bunker Defeat Munition (BDM) Xm141. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Bunker Defeat Munition (BDM) SMAW-D is an ACAT IV program that is intended as an interim system until the Multi-Purpose Individual Munition (MPIM) is placed into service. The BDM will be placed in the Emergency Contingency Stockpile and will only be released to the soldiers in the event of an armed conflict that specifically needs a bunker defeating munition. This system has been Type Classified, Limited Production Urgent, and will remain in the Emergency Contingency Stockpile until the MPIM is Fielded. The BDM has undergone the required Technical and Operational Testing. Several MANPRINT and other problems were identified. These problems have been corrected through re-design and were subjected to a follow-up evaluation.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:



**System Short Name:** MANPRINT- Artillery- 155mm- Projectile- DPICM XM982

**Reference** (Spine, 1997):

Spine, R. J. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the XM982, Extended Range, Dual Purpose Improved Conventional Munition (DPICM) Projectile. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The 155mm XM982 projectile will replace the M864 Dual Purpose Improved Conventional Munition (DPICM) and will provide 155mm howitzers with an extended range, fratricide reducing, accuracy enhancing capability to support Force XXI operations. The XM982 projectile combines the M864's base-burn, the M549's rocket assist and the XM80 bomblet's self-destruct technologies to expand the Field Artillery's cannon DPICM range from 28km to 37km. The longer range capability will permit attack of deeper targets to include control points, air-defense sites, logistical resupply and refuel areas and assembly areas while retaining the ability to attack normal close-in targets of counter battery, light armored vehicles, standing and prone personnel, air defense artillery, and radars. Firing units will have greater survivability and positioning flexibility as they will be able to locate beyond the reach of threat indirect fire weapon systems. The XM982 will have integral fuzing with an inductive set capability, with automatic reset after five minutes. The integral fuzing will eliminate the need for a separate fuze. The XM982 will be compatible with all U.S. currently fielded and developmental howitzers and propelling charges.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- 155mm- Projectile- Excalibur

**Reference** (Ehmann, 2005):

Ehmann, R. (2005). Manpower and Personnel Integration (MANPRINT) Assessment: Health Hazard Assessment Report (RCS MED-388) No. 69-MP-6051-06, XM982 Precision Guided Extended Range 155mm Artillery Projectile, Excalibur, December 2005: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The XM982 is a 155mm cannon delivered, precision engagement; extended range family of indirect fire artillery projectiles that self-guide to a programmed GPS derived location. Target and fuze data is programmed into the projectile via an inductive projectile programmer allowing precise target engagement throughout its range band. It will accommodate follow-on advanced technology submunitions and/or guidance and control packages with minimal integration and/or design changes. The first to be developed is a versatile unitary munition with a high explosive fragmenting warhead.

**Report Availability:**

Distribution authorized to DOD Components only; test and evaluation; December 2005. Other requests shall be referred to Office of the Project Manager-Excalibur, XM982, Combat Ammunition Systems, Building 162S, Picatinny Arsenal, NJ 07806-5000.:

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**System Short Name:** MANPRINT- Artillery- 155mm- Projectile- Excalibur

**Reference** (Gunn, 2007):

Gunn, K. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the Precision Engagement Projectile, 155mm, Excalibur Unitary Projectile (XM982) Block Ia-2, and the Type Classification, Limited Production, and Conditional Materiel Release for Early Fielding of Block Ia-1 to Both the Joint Light Weight 155 Howitzer with Towed Artillery Digitization (M777A2) and the Paladin (M109a6) Platforms. Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The Precision Engagement Projectile, 155mm, Excalibur Unitary Projectile (XM982) is a 155mm artillery munition that consists of three sections: a base assembly, a Unitary warhead section, and a Guidance Navigation and Control (GNC) section. The Excalibur is designed to fly to a Ballistic Impact Point (BIP) and not explode if a set of built-in tests conducted after launch show a failure. The overall Excalibur projectile maximum length is 1 meter and weighs 104 pounds. A nylon slip obturator is located at the forward portion of the base assembly. The obturator engages the rifling of the cannon to seat the Excalibur projectile and prevent it from changing position as the gun is elevated. It also decouples the body of the Excalibur projectile from the rifling, resulting in a low initial spin rate. Tail fins wrap around the base assembly and are restrained by the base hood. Base burner propellant (Block Ia-2) or inert filler (Block Ia-1) is mounted in the aft end of the Excalibur projectile base assembly. The base burner provides a decrease in aerodynamic drag enabling increased range. Upon exiting the tube, the base hood discards and the fins open and lock in position to provide stability. The extended range provided by the base burner, and the internal anti-jamming technology of the Block Ia-2 are the only substantial differences between the Block Ia-1 and Block Ia-2. The development of an Excalibur family of precision-guided projectiles will be incremental for the Unitary designs and evolutionary across all the Excalibur projectile variants and will result in three types of 155mm artillery projectiles. However, this HFEA will address only the Block Ia-1 and the Block Ia-2 Excalibur Unitary Projectiles, hereafter also referred to simply as "Block Ia-1" and "Block Ia-2," and as "Excalibur projectile" when referring to both the Block Ia-1 and the Block Ia-2.

2. Intended Applications For Use: The Capabilities Production Document (CPD) for Excalibur delineates the need for a precision engagement, extended range, family of artillery projectiles capable of eliminating the shortcomings of current area engagement munitions by enabling the maneuver commander to engage critical targets, including fleeting and short dwell targets, with increased precision, range and lethality while minimizing collateral damage in the target area. Excalibur is a Current and Future Force munition that provides the Brigade Combat Team and the Division Level Headquarters an indirect fire, precision engagement capability across the spectrum of operations. The User indicates that a significant percentage of Future Combat System non-line of sight cannon missions will be fired using Excalibur. The Excalibur will initially utilize the capabilities of the Portable Excalibur Fire Control System (PEFCS) for the Block Ia-1 and ultimately the Enhanced Portable Inductive Artillery Fuze Setter (EPIAFS) for the Block Ia-2, the Advanced Field Artillery Tactical Data System (AFATDS), and the Global Positioning System (GPS). The Excalibur will be fired from the Joint Light Weight 155 Howitzer with Towed Artillery Digitization (M777A2), the Paladin (M109A6), and the Future Combat System Non-Line of Sight Cannon (FCS NLOS-C). The M777A2 and the M109A6 will use charges 3 & 4 of the Modular Artillery Charge System (MACS) to fire the Excalibur Block Ia-1 at engagement ranges from 8 km to 24 km. The M777A2 and the M109A6 will use MACS 3, 4 & 5 charges to fire the Block Ia-2 to engagement ranges from 8 km to beyond 35 km, as evidenced during testing. Both Block Ia-1 and Block Ia-2 will be fired against targets, which include dismounted infantry, crews of towed weapons, command posts, air defense radar systems, and structures (20 m x 20 m). The Excalibur projectile will acquire these targets via systems that include the M707 Knight w/FS3, Stryker Fire Support Vehicle (FSV) w/FS3, A/2 A/3 Bradley Fire Support Team (BFIST), and OH-58D rotary aircraft.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director,

Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- 155mm- Projectile- Excalibur XM892

**Reference** (Taylor, 2004):

Taylor, J. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the XM982 Excalibur 155mm Precision Guided Extended Range Artillery Projectile. Redstone Arsenal, AL,; U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

XM982 Excalibur 155mm Precision Guided Extended Range Artillery Projectile

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- 155mm- Projectile- SADARM

**Reference** (Spine, 1994):

Spine, R. J. (1994). Manpower and Personnel Integration (MANPRINT) Assessment: Human Engineering Assessment of the Sense and Destroy Armor (SADARM), XM898 Projectile: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The XM898 SARDAM 155mm projectile is considered to be a Fire and Forget Artillery round. Once the gun crew has successfully fired the round, it follows a ballistic path to the target area, and autonomously completes all other functions. The SARDAM deployment sequence is fully automated. The XM898 SARDAM projectile includes submunitions. One of the most significant requirements imposed on the design of the SARDAM projectile is that it be handled, shipped, stored, and fired utilizing the same procedures and equipment as other standard 155mm artillery projectiles.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- 155mm- Projectile- XM1066 IRILL

**Reference** (Lewis, 2009):

Lewis, J. T. (2009). Manpower and Personnel Integration (MANPRINT) Assessment for the Projectile, 155mm Infrared (IR) Illuminating, Xm1066: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The XM1066 is a non-developmental item (NDI) that will provide infrared (IR) light during night operations to enhance the use of current Night Vision Devices (NVD). Based on the M485A2 Visible Light Illuminating Cartridge, the XM1066 differs in the illuminating candle composition. In addition, ballast is incorporated into the candle to maintain the same physical properties as the M485A2. Like the M485A2, this projectile is a hollow steel shell containing a canister and drogue parachute along with a primary expelling charge. A candle assembly, main parachute, delay and secondary expelling charge are loaded in the canister. In functioning, a dual ejection system is used. The first ejection is caused by fuze functioning, expelling the canister and igniting the delay. The second functioning ejects and ignites the candle from the canister after a delay of 7-9 seconds. The main parachute is also deployed at this time. The drogue chute and fins on the canister reduce spin and decelerate the candle. The main parachute and candle assembly provide effective IR illumination for a minimum of 120 seconds.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Artillery- Computer- BCS

**Reference** (Smootz and Kass, 1984):

Smootz, E. R., & Kass, R. A. (1984). Manpower and Personnel Integration (MANPRINT) Assessment: Battery Computer System (BCS) Human Factors Field Evaluation: U.S. Army Research Institute for the Behavioral and Social Sciences (PERI-OH). 5001 Eisenhower Ave, Alexandria, VA 22333. ARI Research Note 84-108. ADA143425.

**Key Words:**

Human Factors; Human Engineering; Fire Control; Safety

Fields and Groups:

120600 - Computer Hardware

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*COMPUTERS, \*HUMAN FACTORS ENGINEERING, TEST AND EVALUATION, MAINTENANCE, CONTROL SYSTEMS, ARMY RESEARCH, PERFORMANCE(ENGINEERING), FIELD TESTS, TEST METHODS, DISPLAY SYSTEMS, MISSIONS, LOGISTICS, RATINGS, MAN COMPUTER INTERFACE, QUESTIONNAIRES

Identifiers:

(U) BCS(Battery Computer System),

**System Description:**

This report presents the results of a human factors evaluation of the Battery Computer System (BCS). The evaluation was part of a Follow-On Evaluation, Operational Test 706, conducted by the U.S. Army Operational Test and Evaluation Agency (OTEA) in January through March, 1982. Numerous human factors problems were identified. The results were incorporated into the OTEA final report and were used in determining what modifications were needed to the BCS before entering into full scale production. The AN/GYK-29 Battery Computer System consists of the Battery Computer Unit (BCU). which is located in the fire direction center of an artillery battery, the power distribution unit (PDU) which supplies power to the BCU and is located adjacent to the BCU, and one Gun Display Unit (GDU) per howitzer section (up to a maximum of 12 GDU's).

The BCU consists of an 18 bit central processing unit, 128K bytes of random access memory, a keyboard, a plasma panel display, a program load unit, communications terminals and receptacles and a universal mount. The volatile memory of the BCU during short periods of primary power loss can be maintained by rechargeable batteries located in the PDU. The communications terminals and receptacles

of the BCU allow for either wire or radio communications through two external and one internal channel. The two external channels allow for digital as well as voice communications. The GDU consists of one section chiefs assembly (SCA), two gun assemblies (GA), and one control case which distributes power and communications to the SCA and GA's. The SCA is a small hand-held device which receives and displays all fire commands and warning signals from the BCU and provides necessary digital acknowledgements and status reports to the BCU. Voice communications is provided to the BCU operator using a headset connected to the SCA. The GA's are mounted on the howitzer itself near the on-carriage fire control equipment. Each GA displays either deflection or quadrant elevation.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- ATASs

**Reference** (Hanlon et al., 1984):

Hanlon, W. E., Brainerd, S. T., Bruno, R. S., Ellis, P. H., Hickey, C. A., & Woodward, A. A. (1984). Manpower and Personnel Integration (MANPRINT) Assessment: Portability Test and Human Factors Evaluation of Ten Antiarmor Systems (Atass): U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. HEL-TM-6-84. DTIC ADB120427.

**Key Words:**

\*antiarmor ammunition, \*field tests, \*antitank weapons, \*rocket launchers, portable equipment, transportable, protective clothing, bazookas, gunners, ruggedized equipment, army, human factors engineering, infantry  
m17-a1 protective masks, m16-a1 rifles.

Fields and Groups:

190400 - Armor

190700 - Rockets

Descriptors:

(U) \*ANTIARMOR AMMUNITION, \*FIELD TESTS, \*ANTITANK WEAPONS, \*ROCKET LAUNCHERS, PORTABLE EQUIPMENT, TRANSPORTABLE, PROTECTIVE CLOTHING, BAZOOKAS, GUNNERS, RUGGEDIZED EQUIPMENT, ARMY, HUMAN FACTORS ENGINEERING, INFANTRY

Identifiers:

(U) M17-A1 PROTECTIVE MASKS, M16-A1 RIFLES

**System Description:**

A six week field evaluation of ten antiarmor weapon systems was conducted by the US Army Human Engineering Laboratory (USAHEL) at Aberdeen Proving Ground, MD. 'Light and 'Unguided Medium' antiarmor systems were evaluated as a portion of a larger Department of the Army program. The primary objective of this study was to determine the relative portability of each system using the USAHEL's mobility portability course. Other objectives included an assessment of each system's ruggedness/durability; an evaluation to determine the time required for gunners to prepare the systems for firing; and evaluation of each system's compatibility with selected items of protective clothing and equipment; system compatibility with selected infantry carrying vehicles; and an assessment of the human factors design of each system. Keywords: Antiarmor systems, Antitank systems, Antiarmor weapons, Antitank weapons, Portability, Transportability, Human factors engineering, Lightweight antiarmor weapons, Medium weight antiarmor weapons.

Unclassified

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies and their contractors; Specific Authority; 17 OCT 1988. Other requests shall be referred to Commander, US Army Missile Command, Procurement and Production Directorate, Attn: AMSMI-IWD, Redstone Arsenal, AL 35898. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- ATG-MIP

**Reference** (Bergen, 1994):

Bergen, K. J. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the AN/Tpq-37 Antenna Transceiver Group (ATG) Mobility Improvement Program (MIP): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

AN/TPQ-37 Antenna Transceiver Group (ATG) Mobility Improvement Program (MIP).

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- ATIRCM

**Reference** (Durbin, 2001):

Durbin, D. (2001). Manpower and Personnel Integration (MANPRINT) Assessment for the AN/Alq-212 Advanced Threat Infrared Countermeasures (ATIRCM). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Suite of Integrated Infrared Countermeasures (SIIRCM) is an Acquisition Category IC program currently in the engineering and manufacturing development (EMD) phase of procurement. The SIIRCM Joint Program Office (JPO) manages the program. The U.S. Army portion of the joint program is known as ATIRCM and consists of only a portion of the SIIRCM components. ATIRCM will replace the following aircraft survivability equipment on selected Army aircraft: AN/ALQ-144A infrared (IR) countermeasure set, AN/ALQ-156 missile detector, AN/AAR-47 missile detector, and M-130 chaff flare dispenser. The ATIRCM system installed on the MH-60K aircraft includes four electro-optical missile sensors (EOMS), one infrared jam head (IRJH), one infrared jam laser (IRJL), one electronic control unit (ECU), one jam head control unit (JHCV), three smart dispensers (SDs; two with flares, one with chaff), two AN/ALE-47 sequencers, one circuit breaker (CB) panel, one safe/arm control panel, two optical couplers, and associated interconnecting cables and mounting hardware. Power is provided to the ATIRCM system over the aircraft electrical system using standardized power distribution boxes located behind the pilot and copilot's seats. During operation, the pilot has complete control of the automatic and manual chaff and flare countermeasure dispense functions using the safe/arm and bump dispense panels on the center console. Furthermore, the pilots must manually remove the safety switch located behind the ATIRCM system control panels on the center console to dispense flares from the SDs on the ground or in flight. Current plans call for the production of approximately 1,050 ATIRCM systems.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- ATRS

**Reference** (Smootz and Kass, 1984):

Smootz, E. R., & Kass, R. A. (1984). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors and Safety Evaluation of the Automatic Test and Repair System (ATRS) [AN/Msm-105(V)1]: U.S. Army Research Institute for the Behavioral and Social Sciences (PERI-OH). 5001 Eisenhower Ave, Alexandria, VA 22333. ARI Research Note 84-107. DTIC ADA143422.

**Key Words:**

Human Factors; Human Engineering; Safety

Fields and Groups:

090100 - Electrical and Electronic Equipment

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*ELECTRONIC EQUIPMENT, \*TEST EQUIPMENT, \*HUMAN FACTORS ENGINEERING, OPERATIONAL EFFECTIVENESS, REPAIR, SAFETY, AUTOMATIC

Identifiers:

(U) AN/MSM-105(V)1

**System Description:**

This report presents the results of a human factors and safety evaluation of the Automatic Test and Repair System AN/MSM-105(V)1. The evaluation was part of Operational Test III conducted by the U.S. Army Communications-Electronics Board at Fort Hood, Texas in the Fall of 1982. Numerous human factors and safety problems were identified. The results were used in assessing the operational effectiveness and suitability of the system prior to type classification standard action.

The Automatic Test and Repair System [AN/MSM-105(V)1] is a transportable test and repair system for electronic equipment that consists of an electronic test facility (RTF) and an electronic repair facility (ERF) configured in two 35 foot long semi-trailers and designed for use in corps level general support maintenance units. The system is used to automatically test electronic units (assemblies and components) to determine if they perform within specified tolerance limits, and to diagnose and isolate faults. Repair of tested units, such as printed circuit boards, is also accomplished within the system. The system is manned by two operators who operate the test equipment, four repairmen who repair fault isolated units, and a team chief.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- BASIC

**Reference** (Schiller, 1993):

Schiller, E. W. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the Body Armor Set, Individual Countermine (BASIC): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The BASIC is designed to provide the individual soldier protection against small antipersonnel mines and booby traps. It will provide protection to the eyes and lower body of soldiers against conventional and nonconventional antipersonnel (AP) mines using up to 1 ounce of tetryl or equivalent, during reconnaissance, movement to contact, and countermine (detection and neutralization) operations. The system consists of ballistic eye protection, antifragmentation trousers, and protective overboots. This system is worn in conjunction with the Personnel Armor System for Ground Troops (PASGT) helmet and vest, standard weapons, and other equipment. The BASIC is to be used by combat engineer, infantry,

and other troops, as well as Explosive Ordnance Disposal (EOD) personnel, as designated in the Basis of Issue (BOI). It is designed to accommodate and be worn by soldiers in training and combat operations in all climates and geographical areas of the world

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- BAT

**Reference (Ruff, 1998):**

Ruff, R. M. (1998). Manpower and Personnel Integration (MANPRINT) Assessment for the Brilliant Antiarmor Submunition (BAT). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Brilliant AntiArmor Submunition (BAT) submunition will be integrated into Army TACMS missile and will be fired from the M270 launcher.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- BCIS

**Reference (Bergen, 1993):**

Bergen, K. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the Battlefield Combat Identification System (BCIS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The BCIS will provide positive, secure, high confidence, identification of friendly targets to minimize the potential for fratricide. The BCIS will consist of an interrogator system and a transponder system. The BCIS interrogator system, mounted on fighting platforms, such as, tanks, fighting vehicles, and attack helicopters, will operate in conjunction with the host vehicle weapon system to issue challenges, receive replies, and validate friendly target reports. The transponder system, mounted on both fighting platforms and support vehicles, such as, tanks, armored personnel carriers, and reconnaissance vehicles, will provide a self-identification capability to receive challenges and automatically reply to an interrogation with a friend response.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- BCP

**Reference** (Mares, 2007):

Mares, A. L. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the Stryker - Battery Command Post (BCP): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Battery Command Post (BCP)

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- BDAR

**Reference** (Minninger, 2005):

Minninger, J. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Battle Damage Assessment and Repair (BDAR) System. Redstone Arsenal, AL.; U.S. Army Research Laboratory, Human Research and Engineering Directorate, Redstone Arsenal, Alabama.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Battle Damage Assessment and Repair (BDAR) System is structured to provide lightweight, man-portable kits giving Aviation Unit Maintenance and Aviation Intermediate Maintenance (AVUMIAVIM) organizations the capability for expeditious battle damage assessment, deferment, and repair for all Army aircraft. The BDAR kits currently in the field are unit fixes and parts of old kits issued during Desert Storm that are outdated, non-standard, and fail to meet the need for modernized aircraft damage assessment and repair operations. Development and fielding will follow a block strategy. Block I will consist of kits providing electrical, fluid line, and fuel cell repair capabilities. Block II, scheduled for fielding in FY 11, will provide composite structure and fiber optic repair capabilities.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- BESS- Omega 60

**Reference** (Urbiola, 2006):

Urbiola, S. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the Battlefield Effect Simulator System (Bess): Omega 60 Launcher with the Pyrotechnic, Hostile Fire - XM34, and the Pyrotechnic, White Star - Xm35: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Omega 60 Simulator System is a training device which ignites pyrotechnic cartridges on command. When used in conjunction with the SIMULATOR: hostile fire cartridge, XM34 it produces the flash and sound for simulation oftank gunfire at a distance. When used in conjunction with ,the SIMULATOR: target kill, white star, XM35 it produces the . sound and flash simulating impact of a round on an armor target. It can be used in both day and night range exercises for visual and/or acoustic target recognition in combination with Automatic Tank Target System, Armor Moving Target Carrier, and numerous other training devices/systems. The Omega 60 can be installed at either stationary range positions in conjunction with target mechanism or mounted on a moving target platform. The launcher is to be used in a live-fire Force-on-Target (FOT) training scenario, the minimum personnel distance is 300 meters from the firing pit where the launcher will be located.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Body Armor- Armored Vest M1955

**Reference** (Scheetz et al., 1973):

Scheetz, H. A., Corona, B. M., Ellis, P. H., Jones, R. D., & Randall, R. B. (1973). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the USMC M1955 Armored Vest and the Proposed Titanium Nylon Improved Conventional Munitions Protective Armored Vest (48 Plate): U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. HEL-TM-8-73. DTIC AD0759493.

**Key Words:**

(\*body armor, \*human factors engineering), titanium, anthropometry, nylon, performance(human), adaptation(physiology), firing tests(ordnance), performance(human), army equipment  
Fields and Groups:

190400 - Armor

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) (\*BODY ARMOR, \*HUMAN FACTORS ENGINEERING), TITANIUM, ANTHROPOMETRY, NYLON, PERFORMANCE(HUMAN), ADAPTATION(PHYSIOLOGY), FIRING TESTS(ORDNANCE), PERFORMANCE(HUMAN), ARMY EQUIPMENT

**System Description:**

LL,R. Bradley ;HEL-TM-8-73(\*body armor, \*human factors engineering), titanium, anthropometry, nylon, performance(human), adaptation(physiology), firing tests(ordnance), performance(human), army equipmentA human factors evaluation of the Army Simplified 48-Plate Titanium/Nylon Armored Vest and the M1955 USMC Doron Armored Vest was conducted by the U.S. Army Human Engineering Laboratory. The vests were compared as to physical characteristics, anthropometric measurements, vest movement and static exercise, employment of small arms by troops equipped with the vests, and user acceptance. The results yielded many points of contrast between vests, but no overriding superiority of either vest was noted. Recommendations are made to improve the qualities of the Simplified 48-Plate Titanium/Nylon configuration, based on the conclusion that a greater potential for further development is seen in the articulated configuration. (Author)

Unclassified

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Bofors ATWS

**Reference** (Hanlon et al., 1989):

Hanlon, W. E., Bruno, R. S., Ortega, S. V., Jr., & Hickey, C. A., Jr. (1989). Manpower and Personnel Integration (MANPRINT) Assessment: Human Engineering Laboratory Portability and Human Factors Evaluation of the Bofors Infantry Light and Lethal (BILL) Antitank Weapon System (ATWS): U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. HEL-TM-6-89 Project Number 1D463612D308. DTIC ADB135476.

**Key Words:**

\*antitank weapons, \*human factors engineering, antiarmor ammunition, army, army equipment, army operations, army personnel, base lines, compatibility, errors, facilities, field tests, gunners, infantry, infantry personnel, light, maryland, military forc  
pe63612a, as308.

Fields and Groups:

160400 - Guided Missiles

Descriptors:

(U) \*ANTITANK WEAPONS, \*HUMAN FACTORS ENGINEERING, ANTIARMOR AMMUNITION, ARMY, ARMY EQUIPMENT, ARMY OPERATIONS, ARMY PERSONNEL, BASE LINES, COMPATIBILITY, ERRORS, FACILITIES, FIELD TESTS, GUNNERS, INFANTRY, INFANTRY PERSONNEL, LIGHT, MARYLAND, MILITARY FORCES(UNITED STATES), MOVING TARGETS, SIMULATION, TEST AND EVALUATION, TEST METHODS, TRACKING, VEHICLES, WARFARE, WEAPON SYSTEMS

**System Description:**

Bofors Infantry Light and Lethal (BILL) Antitank Weapon System (ATWS).

**Report Availability:**

Distribution: Further dissemination only as directed by Commander, U.S. Army Human Engineering Lab., Attn: SLCHE-CC-LHD, Aberdeen Proving Ground, MD 21005-5001, Jun 89 or higher DoD authority. 05 - CONTROLLED; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Breacher

**Reference** (Singapore, 1996):

Singapore, M. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the M1 Breacher (Grizzly). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The M1 Breacher is a combat support system which will integrate advanced countermine and counter obstacle capabilities into a single survivable system. It will breach natural and man-made, simple and complex obstacles. creating a lane for tracked vehicles to follow. It will integrate the technologies incorporated in the M1 chassis with the Breacher mission modules. The Breacher will incorporate a full width mine clearing blade (MCBI, power driven arm (PDA), and a commanders control system (CCS) on a refurbished M1 tank chassis. The Breacher will have a two-man crew and will replace the M728 Combat Engineer Vehicle (CEV) at a rate of two Breachers for each CEV in selected Active Component units.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- C3I2

**Reference (Palmer, 1990):**

Palmer, R. L. (1990). Manpower and Personnel Integration (MANPRINT) Assessment: C3I Test Instrumentation (C3I2) System (Data Collection Subsystem): MANPRINT Findings. Fort Hood, Texas: U.S. Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA. Fort Hood Field Element, Working Paper WP FH 90-04. DTIC ADA396085.

**Key Words:**

Fields and Groups:

250500 - Command, Control and Communications Systems

250200 - Radio Communications .

Descriptors:

(U) \*COMMAND CONTROL COMMUNICATIONS, \*ACCEPTANCE TESTS, \*COMPUTERS, \*DATA ACQUISITION, MOBILE, ARMY, MESSAGE PROCESSING, TACTICAL COMMUNICATIONS

Identifiers:

(U) MANPRINT, M-880 VEHICLES

**System Description:**

This paper presents MANPRINT findings pertaining to the prototype Command, Control, Communications, and Intelligence (031) Test Instrumentation System (0312). The findings, conveyed to Test and Experimentation Command (TEXCOM) for inclusion in their test report, were obtained during the TEXCOM government acceptance test of the 0312 Data Collection Subsystem at Fort Sill Field Artillery Board during the week of 28 January 1990. Unfortunately, the DCS failed the acceptance test because of a crucial software bug and three crucial MANPRINT findings. The latter were: (a) easy accidental reinitialization of the system by the operator; (b) inadequate presentation of system alerts to the operator; and (c) a possible safety hazard associated with vehicle instability. The developer has resolved the software bug and is currently working on the MANPRINT problems. The complete, detailed results are presented in this report in the format required for inclusion in the TEXCOM test report.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- C3I2 DCS

**Reference (Palmer, 1992):**

Palmer, R. L. (1992). Manpower and Personnel Integration (MANPRINT) Assessment: C3I Test-Instrumentation System: MANPRINT Evaluation of the Data Collection Subsystem (DCS) (with Additional Comments Pertaining to the Data Reduction Subsystem (DRS)): U.S. Army Research Institute for the Behavioral and Social Sciences (PERI-SM). 5001 Eisenhower Ave, Alexandria, VA 22333. ARI Research Report 1619. ADA252655.

**Key Words:**

Fields and Groups:

150400 - Military Intelligence

250500 - Command, Control and Communications Systems

Descriptors:

(U) \*MILITARY INTELLIGENCE, \*COMMAND CONTROL COMMUNICATIONS, TEST AND EVALUATION, MILITARY PERSONNEL, WEATHER, HAZARDS, HEALTH, HUMAN FACTORS ENGINEERING, TECHNICIANS, COLLECTION, ERGONOMICS, ARMY, INSTRUMENTATION, DELAY, OPERATION, SAFETY, MOBILE, MANPOWER, RAPID DEPLOYMENT, TIME, SITES, INTERFACES, SKILLS, DEPLOYMENT, CONTROL, MAINTENANCE

Identifiers:

(U) DCS(DATA COLLECTION SUBSYSTEM).

**System Description:**

The Command, Control, Communications, and Intelligence (C3I) Test/Instrumentation System (C3I2) is a computer-based data collection and analysis tool consisting of two major components, the Data Collection System (DCS) and the Data Reduction System (DRS). The DCS and DRS are mobile computer systems currently housed in separate TEMPEST-certified S-710/M shelters mounted on modified four-wheel-drive H-880 "pickup" trucks with attached trailer-mounted 20 kW generators. Their primary purpose is to provide the capability for automated real-time data collection and data analysis during operational evaluations of Army Tactical Command and Control Systems. C3I2 is an automated instrumentation system capable of recording and analyzing command and control information flow at echelons from battalion to theatre Army.

The DCS is designed to record real-time digital and radio frequency information from a C3I system-under-test, such as AFATDS, ASAS, EPLRS, FAADS, MCS, MSE, SINCGARS, TACFIRE, and others. The DRS will accept the data collected by the DCS and provide the test officer in the field a near real-time "quick-look" analysis to evaluate the progress of the test. In the prototype C3I2 system, the DCS data is recorded on tape and manually transferred to the DRS (which may or may not be collocated) by carrier, where it is copied and analyzed. Extensive posttest data analyses must, however, be performed by the data analysis center of the testing organization rather than by the DRS.

The DCS is the primary focus of this report. The DRS, in a much earlier stage of development, was not available for detailed scrutiny at the time of this research.

The DCS is designed to collect both classified encrypted information and unclassified data transmitted in the clear. It collects data in either a hard-wire or radio frequency mode or in both modes simultaneously. In the hard-wire mode, the DCS is hard-wired to the system-under-test in such a way as not to interfere with the performance of that system during the test.

The DCS shelter includes, among other miscellaneous items and operator interfaces, the following primary equipment: an uninterruptible power source; a "ruggedized" computer with video terminal, keyboard, hard disk, TK50 tape recorder, and high-speed printer, an additional VHS tape recorder; an eightchannel modem with accompanying eight-oscilloscope bank and eight-speaker bank; a geostationary operational environmental satellite receiver; several VRC-12 or SINCGARS radios; a dual 28-volt power supply; KY-57 communications security devices; and a security safe.

C3I2 is being developed by Applied Research Laboratories of the University of Texas at Austin, in accordance with a required-instrumentation-capability document originally submitted in 1985 by the Combined Arms Test Activity (now Test and Experimentation Command [TEXCOM]) of the U.S. Army Training and Doctrine Command [TRADOC]. The current version of the requirements document (22 September 1989) details the basic system requirements as (a) the capability of generating, tagging, tracking, auditing, and analyzing C3I digital and analog messages, (b) the ability to stimulate as well as simulate the system-under-test, and (c) the ability to interoperate with current radios and other communication systems.

The TRADOC program director and manager for C3I2 is the Deputy Chief of Staff for Information, HQ TEXCOM. The operational tester for the system is the Director, Battlefield Automation Test Directorate, HQ TEXCOM. The U.S. Army Research Institute (ARI), Fort Hood Field Unit, conducts the manpower and personnel integration (MANPRINT) evaluations of the system during operational testing by TEXCOM.

The Data Collection Subsystem (DCS) of the Command, Control, Communications, and Intelligence (C3I) Test-Instrumentation System (C3I2) consists of mobile computerized hardware that provides automated data collection during operational tests of C3I systems. This research evaluated DCS-operator interfaces and DCS system documentation for manpower, personnel, training, human factors engineering, safety, and health hazards. Emphasis was on human factors engineering. The research was conducted in conjunction with two system tests conducted by the Army Test and Experimentation Command. The major findings were these: (a) Using contractor technicians as operators is wasteful because their maintenance skills are not exploited. Enlisted military personnel should be considered instead. (b) Because there was no formal training program, a formal training evaluation was not conducted. DCS operations were easy to learn, but there were gaps in operator and maintainer knowledge and performance. Manuals were inadequate. Sixteen training-related findings were documented. (c) Hard-wire setup required 1-1/2 hours; teardown required about 50 minutes. Rapid deployment to a new location would require at least 2 hours 20 minutes, not including transit time, site location and layout, weather delays, and so on.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- CABS

**Reference** (Schiller, 2001):

Schiller, E. (2001). Manpower and Personnel Integration (MANPRINT) Assessment for the Cockpit Air Bag System (CABS). 12 March 2001. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Cockpit Air Bag System (CABS) is a crash-activated inflatable protection system designed to supplement the current webbing restraint systems on helicopters. In a crash scenario, the cockpit airbags will inflate forward and laterally to keep the aviators away from strike hazards. The CABS is comprised of an Electronic Crash Sensor Unit (ECSU), four air bag modules (each with an air bag, cover, housing and gas generator), and the hardware required to install them into the aircraft.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Cannon- 105mm- Cartridge- APC Canister XM1040

**Reference** (Perez, 2005):

Perez, S. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 105mm: Canister, XM1040. Redstone Arsenal, AL,: U.S. Army Research Laboratory, Human Research and Engineering Directorate, Redstone Arsenal, Alabama.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

(1) System components include an aluminum base, nylon obturating band, nylon body, scored aluminum can, frangible aluminum cap, and tungsten spheres. The payload is contained in the front aluminum can and the nylon body. Upon exiting the muzzle, the aluminum can breaks along the scores and releases the payload.

(2) The cartridge uses a M148A1BI steel cartridge case with M14 propellant and M125 thick-walled electric primer, which is the same propellant and primer combination used on the M865 and M83IAI, which are 120mm training rounds. The M148A1BI uses is the same case used on the 105mm M456A3, M490AI, and M900 cartridges.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Cannon- 105mm- Cartridge- APC Canister XM1040

**Reference** (Spine, 2006):

Spine, R. (2006). Manpower and Personnel Integration (MANPRINT) Assessment: Update for the Cartridge, 105mm: Canister, XM1040. Redstone Arsenal, AL: U.S. Army Research Laboratory, Human Research and Engineering Directorate, Redstone Arsenal, Alabama.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

(1) System components include an aluminum base, nylon obturating band, nylon body, scored aluminum can, frangible aluminum cap, and tungsten spheres. The payload is contained in the front aluminum can and the nylon body. Upon exiting the muzzle, the aluminum can breaks along the scores and releases the payload.

(2) The cartridge uses a M148A1BI steel cartridge case with M14 propellant and M125 thick-walled electric primer, which is the same propellant and primer combination used on the M865 and M831AI, which are 120mm training rounds. The M148A1BI uses is the same case used on the 105mm M456A3, M490AI, and M900 cartridges.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Cannon- 105mm- Cartridge- HERA

**Reference** (Cawood, 1990):

Cawood, S. (1990). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 105mm: High Explosive Rocket Assist (Hera), Xm913/Xm927m927: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

a. The XM913 cartridge is designed to provide the Light Infantry Divisions with artillery support to a range of between 18.5 and 19.5 KM. The XM927 cartridge is designed to provide support to a range of between 3 and 15 KM. The cartridges will be fired by direct support howitzers against personnel, trucks, electronic surveillance and target acquisition devices, supply points, command, control and communications installations, personnel carriers and towed and self-propelled. artillery.

b. At a 10 May 85 joint TRADOC/AMCCOM decision briefing on cannon artillery for light forces, the Army Chief of Staff (ACS) approved the lease of LI19, 105MM British Light Guns (MI19) for testing during 1985 and development of a new 105MM rocket assisted projectile. A draft Required Operational Capability (ROC) was distributed for concurrence in Mar 85 for development of a 105MM high fragmentation steel rocket assisted cartridge compatible with the MI19, 105MM, Howitzer.

c. The XM913/XM927 (see AI) is a semifixed 105MM rocket assisted cartridge. The propelling assembly consists of an M14B4 cartridge case, M28B2 percussion primer, and appropriate propelling charge, The XM913 utilizes the M200 Zone 8 charge with flash reducer bag. The XM927 utilizes the M67, 7 Zone, charge. The projectile (XM912) has two distinctive preassembled components. The XM912 warhead is fabricated of high fragmentation (HF1) steel and contains a bulk-filled TNT explosive with a standard TNT Supplementary Charge. A threaded fuze well liner is used to prevent explosive exudation and an insulator is bonded to the warhead base to minimize heat transfer from rocket motor to explosive during motor burn. The rocket motor is fabricated of high strength alloy steel (4340) and contains a segmented grain of solid rocket propellant. Optimal rocket ignition delay is provided by a pyrotechnic delay assembled in the rocket nozzle and secured by a pressed-lead seal. A rocket selector cap provides rocket on/off option. A listing of all explosives, propellants, and pyrotechnics in XM913/XM927 is attached as Appendix B. A shipping plug assembled into the warhead nose to seal and protect during transport and storage.

d. To allow for delay assembly testing without use of expensive development metal parts, standard 105MM, M1 projectiles will be modified for delay test. The modification consists of a bored and taped base hole in an inert loaded M1 projectile, fitted with a steel delay adapter containing a 2 ounce black powder spotting charge (see ell. The modification is similar to that currently used for 8 inch M650 delay assembly testing with modified M106 projectiles. The delay test projectile will utilize the same propelling assembly as the XM913.

e. Both XM913 and the delay test projectile will utilize a M200 propelling charge (With a flash reducer sewn on) assessed to provide a PIMP of 57,000 psi in the M119, 105 Howitzer. The M200, and therefore the XM913 cartridge, is compatible with the M119 howitzer only and is not safe for use in any other standard fielded 105MM Howitzer. The XM927 will utilize an M67 propelling charge and may be fired from any standard 105MM Howitzer.

f. The XM913/XM927 will be tested with the M739PD, M582 MT, M732VT and the XM767ET fuzes.

**Report Availability:**

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---

**System Short Name:** MANPRINT- Cannon- 105mm- Cartridge- HERA

**Reference** (Urbiola, 2007):

Urbiola, S. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 105mm: High Explosive Rocket Assist (Hera), M927: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. M927 consists of a High Explosive warhead containing explosive filler. The rocket motor body is attached at the warhead base. The delay igniter is attached at the rocket motor base. The rocket selector cap is screwed onto the delay igniter. The semi-fixed cartridge is composed of the M14B4 cartridge case. The cartridge case is either brass, steel, or three-piece steel spiral wrapped. The MB2 percussion primer is fitted into the cartridge case base. The M67 propelling charge is inside the cartridge case. A copper rotating band is welded to the rocket motor body. A supplementary charge is in the fuze well cavity. The projectile nose is fitted with a protective plug. The cartridge uses impact, mechanical time, electronic time and short intrusion proximity fuzes. The physical characteristics are as follows:  
Length/closing plug: 32.3 inches

Diameter: 4.1 inches/105 millimeters

Weight: 37.2 pounds

Body Material: High Fragmentation (HF1) Steel Forging

Color: Olive drab w/yellow markings

2. The M927 is identical to the M913 HERA cartridge, which is currently used by the US Army; except the M913 uses the top Zone M229 (zone 8) propelling charge, while the M927 uses the standard M67 (zone 7) propelling charge. The reduced propelling charge pressure allows the M927 Cartridge to be fired on high angle missions continuously without causing death or injury of crew as well as damage to the 105mm howitzers. This meets a mission need for the M119 Howitzer as a result of restrictions with firing the M913 cartridge at elevations above 800 mils. The M927 is also applicable to the M102 Howitzer because the zone 8 M913 cartridge cannot be used in the M102. The M927 provides a dramatic increase in range, area coverage, and lethality without requiring gun modification, and is an improved long range replacement for the older 105mm M1 HE ammunition in inventories today.

**Report Availability:**



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**System Short Name:** MANPRINT- Cannon- Cartridge- 120mm- APFSDS-T AKE M829E4

**Reference** (Aubal, 2009):

Aubal, O. (2009). Manpower and Personnel Integration (MANPRINT) Assessment for the Armor Piercing Fin Stabilized, Discarding Sabot, with Tracer (APFSDS-T) Advanced Kinetic Energy (Ake) Cartridge, 120mm, M829e4: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Advanced Kinetic Energy (AKE) round is a platform-delivered Line of Sight munition that provides the capability for the Current Force's Abrams Heavy Brigade Combat Team (HBCT) and Future Combat System's Brigade Combat Team (FCS BCT) commanders to conduct decisive operations and destroy enemy systems.

The AKE cartridge is the materiel solution for the Abrams and FCS lethality capability and is a 5th generation premier kinetic energy round. The AKE is at Technology Readiness Level 6 and has demonstrated the ability to defeat projected heavy armor threats beyond its predecessor, the M829E3. The AKE is made up of a long rod Depleted Uranium penetrator with a three petal composite sabot. The flight projectile will include an aft end fin with a tracer incorporated. The AKE will also incorporate a data link case base.

Background. The AKE is managed by the Project Manager for Maneuver Ammunition Systems. The Concept Technology Development phase for the AKE has been completed and the system is entering into the Engineering and Manufacturing Development phase. The cartridge is an Acquisition Category III (ACATIII) program. The Project Manager has used the principles and practices described in the government-industrial standard for development and carrying on the program.

**Report Availability:**

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**System Short Name:** MANPRINT- Cannon- Cartridge- 120mm- APFSDS-T M829A2

**Reference** (Gunn, 1994):

Gunn, K. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 120mm, Armor Piercing, Fin Stabilized, Discarding Sabot - Tracer (APFSDS-T), M829a2: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The M829A2 is a 120mm, Armored Piercing, Fin stabilized, Discarding Sabot - Tracer (APFSDS-T) cartridge, designed to be fired from the M256 smooth bore gun of the M1A1 and M1A2 Main Battle Tank. The M829A2 weighs 20.6kg (45.4 pounds) and is 984mm (38.74 inches) in length. The major modifications to the predecessor M829A1 cartridge include changes to the propellant configuration, the sabot materials, and the penetrator. Combined, these modifications increase muzzle velocity to provide for more capable armor penetration and more effective terminal ballistics.

**Report Availability:**

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**System Short Name:** MANPRINT- Cannon- Cartridge- 120mm- APFSDS-T M829E3

**Reference** (Spine, 2002):

Spine, R. J. (2002). Manpower and Personnel Integration (MANPRINT) Assessment for the Armor Piercing Fin Stabilized, Discarding Sabot, with Tracer (APFSDS-T) Cartridge, 120mm, M829E3: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The M829E3 cartridge is a 120mm armor-piercing, fin stabilized, discarding sabot, launched projectile currently entering Product Qualification Testing (PQT) and is scheduled to replace the current service cartridge, M829A2. The M829E3 cartridge is intended for use in the M256 smooth bore gun and is designed to improved accuracy and armor penetration against existing and future threats.

The M829E3 cartridge is a kinetic energy cartridge utilizing a combination of high technology and existing 120mm components. The projectile features a sabot fabricated from composite material (same as M829A2) to reduce the parasitic weight of the projectile. The penetrator, which is dimensionally different from the M829A2 but the same material, is depleted uranium and manufactured the same as the M829A2.

The M829E3 ignition system consists of the M123Al electric primer, currently used on the M830 HEAT cartridge, and a 24 gram black powder base charge. The RPD-380 propellant consists of approximately 18 lb. of 19 perforated stick and 46 perforated hexagonal stick, which is similar in formulation to JA2. JA2 multi-perforated stick is currently used on the M829A2. Its formulation is located in section 4.2.2. The propulsion configuration is similar to the M829A2. The propellant is contained within the nylon obturator, consumable case adapter, combustible cartridge case and the steel case base and seal assembly. All components, except the propellant and an improved spring disc, are currently used on 120mm-tank ammunition.

The subprojectile consists of a penetrator assembly and aluminum fin with tracer. The tracer is currently used on the M86S training cartridge. The penetrator assembly consists of the depleted uranium penetrator and windshield. The subprojectile with annular grooves mates with a three-piece composite sabot having a molded JRTV seal, a nylon obturator band, and a rear retaining ring.

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**System Short Name:** MANPRINT- Cannon- Cartridge- 120mm- Canister XM1028

**Reference** (Spine, 2004):

Spine, R. J. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 120mm, Canister, XM1028. APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

- a. The Tank Cartridge, 120mm, Canister, XM1028, is a tank round comprised of approximately 1150 tungsten balls (tungsten, nickel, and iron mix), which are expelled upon muzzle exit. There is no fuse on this round. While the dispersion pattern increases with range as the velocity of the balls decreases, the dense tungsten balls are used to minimize the velocity fall-off. This round will significantly increase the tank's lethality and enhance the tank crew's survivability. This additional capability will give the Abrams Tank the ability to survive ambushes and to fully support friendly infantry assaults.
- b. The projectile body is made of aluminum and the propellant is JA-2. The projectile propellant bag is the same as the M865 round.

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**System Short Name:** MANPRINT- Cannon- Cartridge- 120mm- Canister XM1028

**Reference** (Spine, 2006):

Spine, R. J. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 120mm, Canister, XM1028. APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

- a. The Tank Cartridge, 120mm, Canister, XM1028, is a tank round comprised of approximately 1150 tungsten balls (tungsten, nickel, and iron mix), which are expelled upon muzzle exit. There is no fuse on this round. While the dispersion pattern increases with range as the velocity of the balls decreases, the dense tungsten balls are used to minimize the velocity fall-off. This round will significantly increase the tank's lethality and enhance the tank crew's survivability. This additional capability will give the Abrams Tank the ability to survive ambushes and to fully support friendly infantry assaults.
- b. The projectile body is made of aluminum and the propellant is JA-2. The projectile propellant bag is the same as the M865 round.

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**System Short Name:** MANPRINT- Cannon- Cartridge- 120mm- HEAT MP-T M830E1

**Reference** (Manasco, 1994):

Manasco, C. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the M830e1, 120mm, High Explosive Antitank- Multipurpose - Tracer, Cartridge (Heat MP-T). Picatinny Arsenal, NJ: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The M830E1 is a 120mm Tank Ammunition Cartridge, High Explosive Anti-Tank (HEAT) with anti-armor and anti-helicopter capabilities. A manually operated proximity switch will allow the selection of the

desired mode of operation. It will be packaged 25 rounds per pallet for the Marine Corps and 30 rounds per pallet for the U.S. Army. The round weights 22.53 kg (49.69 lbs) and is 983.8mm (38.73 inches) long. The M830E1 cartridge projectile has a three petal aluminum sabot and a subcaliber warhead which is detonated by a base element fuze (XM774). The subcaliber projectile includes: a conical nose, a body loaded with Composition A3 Type explosive and copper shape charge liner and a tail configuration with aluminum fin. The fuzing system includes the XM774 base element, flexible communication circuit, Frontal Impact Sensor Assembly (FISA) and XM74 Proximity Sensor. The conical nose of the subprojectile consists of the FISA, which is coupled to the body, and the XM74 Proximity Switch, which is mounted to the FISA. The conical nose has a manual switch which can be set for defense against ground targets, ground mode, or defense against air targets (XM74 Proximity Sensor), air mode. The flexible electrical cable provides the path for the electrical signal to travel between the FISA to the XM774 base element. The propulsion/ignition system includes a M129 primer and solventless JA2 granular propellant contained in a combustible cartridge and steel case base. The propellant/ignition system is identical to that of the M829A1 (except for propellant charge weight). The overall length of the M830E1 cartridge is 983.8 mm (38.73 in), and the weight is 22.53 kg (49.68 lbs)

**Report Availability:**

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**System Short Name:** MANPRINT- Cannon- Cartridge- 120mm- KE-WA1

**Reference** (Gunn, 2000):

Gunn, K. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 120mm, KE-WA1 for Foreign Military Sale to the Government of Egypt (GOE). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Cartridge, 120mm, KE-WA1 for Foreign Military Sale to the Government of Egypt (GOE).

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**System Short Name:** MANPRINT- Cannon- Cartridge- 120mm- MRM

**Reference** (Zubal, 2004):

Zubal, O. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 120mm, Mid-Range Munition (MRM). APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Cartridge, 120mm, Mid-Range Munition (MRM) is an evolution of the Tank Extended Range Munition (TERM) cancelled program and is being developed for use by the Future Combat Systems' (FCS) Mounted Combat System (MCS). The MRM is a 120mm cartridge that is intended to provide Beyond-Line-of-Sight (BLOS) target engagement capability for the MCS. The MRM will employ three modes of

operation: autonomous, designate and designate only. All three modes can be employed against moving or stationary targets while the MCS platform is stationary or moving.

**Report Availability:**

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**System Short Name:** MANPRINT- Cannon- Cartridge- 120mm- TPMP-T XM1002

**Reference (Spine, 2003):**

Spine, R. J. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 120mm, TPMP-T (Target Practice Multi-Purpose with Tracer): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Operational Requirements Document (ORD) for Tank Ammunition, dated 17 Jul 98, includes a requirement for Multipurpose Anti-Tank (MPAT) Training Ammunition, a training cartridge for the tactical 120mm M830A1 Multi-Purpose Anti-Tank with Tracer (MPAT-T) Cartridge. The XM1002 Training Cartridge will provide the materiel solution to meet the ORD requirements. This combined Acquisition Plan / Acquisition Strategy Report addresses the program activities associated with the development and production of the XM1002 trainer for the period FY00 through FY05.

**Report Availability:**

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**System Short Name:** MANPRINT- Cannon- Cartridge- 120mm- TPMP-T XM1002

**Reference (Spine, 2004):**

Spine, R. J. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 120mm, TPMP-T (Target Practice Multi-Purpose with Tracer) XM1002. APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The XM1002 cartridge is a 120mm training round that has a cone stabilized, discarding sabot, launched projectile. The program is currently entering Product Qualification Testing (PQT) and is scheduled to replace the current training cartridge, M831A1. The XM1002 cartridge is intended for use in the M256 smooth bore gun and is designed to better simulate the M830A1 MPAT Tactical cartridge. The XM1002 cartridge is a training cartridge utilizing a combination of proven technology and existing 120mm components. The projectile features a discarding sabot and a simulated nose switch similar to the M830A1 projectile. The exterior is dimensionally the same as the M830A1 cartridge. The XM1002 ignition system consists of the thick wall electric primer currently used on the M831A1 and M865 training cartridges. The M14 single base propellant consists of approximately 16.5 lb. of 7-perforated grains. M14 7-perforated grain propellant is currently used in the M831A1 and M865 cartridges. The M14 chemical formulation is located in MIL-STD-652. The propulsion configuration is similar to the M831 A1 and M865. The propellant is contained within the nylon obturator, cotton propellant

containment bag, consumable case adapter, combustible cartridge case and the steel case base and seal assembly. All components are currently used on 120mm tank ammunition.

The sub-projectile consists of a projectile assembly with aluminum fin and tracer. The tracer is similar in size to that currently used on the M865 training cartridge and contains the ignition mix used on the M830A1. The projectile assembly consists of a plastic simulated nose switch, steel nose, aluminum body, and aluminum tail cone and tracer assembly. The sub-projectile with threaded body mates with a three-piece aluminum sabot having a molded JRTV seal and a nylon obturator band. 4

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**System Short Name:** MANPRINT- Cannon- Cartridge- 120mm- TPMP-T XM1002

**Reference (Spine, 2006):**

Spine, R. J. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 120mm, TPMP-T (Target Practice Multi-Purpose with Tracer) XM1002. APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The XM1002 cartridge is a 120mm training round that has a cone stabilized, discarding sabot, launched projectile. The program is currently entering Product Qualification Testing (PQT) and is scheduled to replace the current training cartridge, M831A1. The XM1002 cartridge is intended for use in the M256 smooth bore gun and is designed to better simulate the M830A1 MPAT Tactical cartridge.

The XM1002 cartridge is a training cartridge utilizing a combination of proven technology and existing 120mm components. The projectile features a discarding sabot and a simulated nose switch similar to the M830A1 projectile. The exterior is dimensionally the same as the M830A1 cartridge.

The XM1002 ignition system consists of the thick wall electric primer currently used on the M831A1 and M865 training cartridges. The M14 single base propellant consists of approximately 16.5 lb. of 7-perforated grains. M14 7-perforated grain propellant is currently used in the M831A1 and M865 cartridges. The M14 chemical formulation is located in MIL-STD-652. The propulsion configuration is similar to the M831 A1 and M865. The propellant is contained within the nylon obturator, cotton propellant containment bag, consumable case adapter, combustible cartridge case and the steel case base and seal assembly. All components are currently used on 120mm tank ammunition.

The sub-projectile consists of a projectile assembly with aluminum fin and tracer. The tracer is similar in size to that currently used on the M865 training cartridge and contains the ignition mix used on the M830A1. The projectile assembly consists of a plastic simulated nose switch, steel nose, aluminum body, and aluminum tail cone and tracer assembly. The sub-projectile with threaded body mates with a three-piece aluminum sabot having a molded JRTV seal and a nylon obturator band.

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**System Short Name:** MANPRINT- Cannon- Cartridge- 120mm- TP-T M831E2

**Reference (Spine, 1994):**

Spine, R. J. (1994). Manpower and Personnel Integration (MANPRINT) Assessment: Update to MANPRINT Assessment for the M831e2, 120mm, Target Practice with Tracer Cartridge (Tp-T). Picatinny

Arsenal, NJ: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The M831E2 cartridge is a fixed 120mm target practice round with tracer (TP-T)., The M831E2 Cartridge with inert projectile is intended for use in the M256 smooth bore cannon and the M1A1 tank. The M831E2 consists of an inert projectile, a combustible cartridge case, combustible case cap, case base and seal assembly (CB&SA), M125 primer, M14 propellant, propellant containment bag, and tracer. The projectile is composed of a steel spike, aluminum body, ring and stabilizer and a nylon obturator. The fin and boom on the present M831 have been replaced by a stabilizer on the M831E2. The M831E2 uses granular M14 propellant instead of M831's DIGL-RP. The combustible cartridge case, case cap, and SB&SA are the same components used in the presently fielded M830 and M831 cartridges. The M125 primer is used in currently fielded 120mm tank ammunition.

**Report Availability:**

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**System Short Name:** MANPRINT- CCMCK

**Reference** (Urbiola, 2008):

Urbiola, S. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the Close Combat Mission Capabilities Kit (CCMCK): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The CCMCK is a user installed weapon modification kit that allows the Soldier to employ his individual weapon at short range (up to 30 meters) using marking ammunition while precluding the weapon from firing standard service ammunition. The CCMCK is a mission rehearsal system that will contribute to the preparation of individual Soldiers, leaders, and organizational employment throughout the theater of operations and under all restrictive terrain environments. The mission rehearsal capability will also enhance lethality and survivability in Close Quarter Combat (CQC) such as clearing buildings, rooms, tunnels, and entrenchments and to conduct/react to ambush situations. The target audience for CCMCK is inclusive to, but not restrictive to the General-Purpose User (GPU), Soldiers of all ranks in Combat Arms (CA), Combat Support (CS), and Combat Service Support (CSS) Military Operational Specialties (MOS). The CCMCK will be issued to units that are conducting mission rehearsal exercises (MREs) in preparation for full spectrum operations in either urban or restrictive terrain environments. The system will provide normal weapon employment cues (aiming, firing, ejection, immediate action, load and re-load, etc.) and immediate target feedback through force-on-force, interactive live fire scenario task and mission execution.
2. The system includes: 5.56mm bolts for the M16 family of rifles, M4 carbines, and M249 SAW, 9mm pistol barrels for the M9/M11 pistols, munitions (XM1042 5.56mm stripper clipped for M16/M4, XM1071 5.56mm linked for M249 SAW, and XM1041 9mm for M9/M11 pistols), and lower face and neck protection. Other required safety equipment includes: earplugs, gloves, knee/elbow protection, eye protection, and groin protection which will be provided as organizational clothing and individual equipment issue items. Procurement of the CCMCK ammunition and weapon adapter kits was full and open competition. It is an ACAT III program under the directive of PM-CSW until Milestone C. At that time, the ammunition component will transition to PEO-AMMO.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- CCTT

**Reference** (Armstrong, 1998):

Armstrong, R. (1998). Manpower and Personnel Integration (MANPRINT) Assessment for the Close Combat Tactical Trainer (CCTT). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Close Combat Tactical Trainer (CCTT) is an interactive network of manned simulators operating on a computer-generated database in a manner that provides training in combat operations for mechanized and armor tactical units, battalion size and below. Manned simulators represent various types of combat vehicles and weapon platforms. The combat vehicles represented include the M1A1 and M1A2 Abrams Tanks, the Bradley Fighting Vehicle, the M981 Fire Support Team Vehicle (FIST-V), the M113A3 Armored Personnel Carrier, and the High Mobility Multi-Purpose Wheeled Vehicle (HMMWV). Also included in the manned simulators is the Dismounted Infantry (DI) module that allows squad and platoon leaders to direct computer-generated ground troops. Battlefield functions not represented by manned simulators are portrayed in the battle through the use of emulators. These emulators were not designed to provide training to their operators, but to allow the operators to act as facilitators and assist in creating a realistic battlefield environment. These emulators include the Unit Maintenance Collection Point (UMCP), the Field Artillery Battalion Tactical Operations Center (FABTOC), the Combat Trains Command Post (CTCP), the Tactical Air Control Party (TACP), the Combat Engineer Station (CES), the Fire Support Element (FSE), the Fire Direction Center (FDC), and the Higher Headquarters.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Computer- AIS- RCAS

**Reference** (Ainsworth, 1996):

Ainsworth, J. S. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the Reserve Component Automation System (RCAS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

RCAS is designed to provide the U.S. Army Reserves (USAR) and the Army National Guard (ARNG) certain data processing capabilities, which include office automation (OA), electronic mail, and mission support functionality. Office automation and electronic mail will be supplied to the user community by integration of commercial-off-the-shelf (COTS) products on commercially available personal computer (pC)-based platforms. Mission support functionality will be provided by the adaptation of government-off-the-shelf (GOTS) products currently executing elsewhere, by the development of other RCAS-specific processes using COTS and development code, and by the interface to other external systems. The overall RCAS architecture is a distributed collection of systems throughout the United States and



overseas. The USAR and ARNG systems are hierarchical in nature and interconnect via telecommunications networks. There are the physical layer and its organization, the software and its interfaces, and the network and its topology.

The basic RCAS design evolves around PC-based workstations connected to servers by local area networks (LANs), and connected upward to the State Area Reserve Command (STARC)/Major U.S. Army Reserve Command (MUSARC) echelons by either dedicated or dial-on-demand communication links. Each unit will have a workstation and a server (depending on unit size). The interconnection among the servers and the management and control of the workstations and their security dictate the use of a network operating system (NOS) to provide system services and administrative control over the installation. The NOS is a Microsoft Windows NT Server Version 3.51 that provides for server and workstation functionality. Both execute on Intel-based hardware platforms.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- CORPS SAM

**Reference** (Ruff, 1993):

Ruff, R. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the Corps Surface-to-Air Missile (Corps Sam). Picatinny Arsenal, NJ: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

CORPS SAM will be a combat support weapon system, by definition as a part of the Army air defense artillery. The total system is envisioned to be a replacement to the HAWK III medium air defense system. It will have an enhanced capability to counter world-wide current and future threat air-to-surface and surface-to-surface capabilities through the next century, which include counter tactical missile and unmanned aerial vehicle. In addition, it will be highly mobile, strategically deployable, tactically flexible, and highly survivable. Improved capabilities are to include counter tactical missile and unmanned aerial vehicle, high mobility and strategic deployability, tactical flexibility, and improved survivability over the current family of medium air defense artillery. Many of the enhanced capabilities will be realized in meeting the user's requirement for a netted and distributed battle management, command, control and communication (BMC3I) architecture designed to permit standalone fire unit capability and inter-communication with the full complement of AIRLAND battle BMC3I. Personnel required to man, operate, maintain, train and supply the system must also be reduced to obtain a significant operations and support savings over the system life cycle. Reduced manning with enhanced capability will clearly involve increased automation throughout the CORPS SAM operational hardware and support concept. This will require careful assessment and assignment of the soldiersoftware- hardware interface tasks requirements and training development.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- CROWS XM101

**Reference** (Savick, 2005):

Savick, D. S. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the XM101 Common Remotely Operated Weapons Station (CROWS). Redstone Arsenal, AL,: U.S. Army Research Laboratory, Human Research and Engineering Directorate, Redstone Arsenal, Alabama.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

From DTIC ADB297716 :

Fields and Groups:

190500 - Fire Control and Bombing Systems

190600 - Guns

Descriptors:

(U) \*MACHINE GUNS, \*REMOTE CONTROL, TEST AND EVALUATION, RISK, SURVIVABILITY, PROTOTYPES, ARMY EQUIPMENT, CONFIGURATIONS, MISSIONS, SYSTEMS ANALYSIS, GRENADES

Identifiers:

(U) CROWS(REMOTELY OPERATED WEAPON STATION)

**System Description:**

The XM101 Common Remotely Operated Weapons Station (CROWS) is a light-weight remote weapon station capable of individually mounting and firing several weapons. The CROWS will provide protection and enhanced target acquisition, identification and engagement capabilities to light armored vehicles in units whose mission currently places the unprotected gunner at high risk of engagement from enemy - direct and indirect fire weapon systems. These units include Infantry, Artillery, Armor, Cavalry, Engineer, Chemical and Military Police (MP) units performing missions across the entire operational continuum.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- CTASC-II

**Reference** (Poston, 1995):

Poston, A. (1995). Manpower and Personnel Integration (MANPRINT) Assessment for the Corps/Theater Automated Data Processing (ADP) Service Center - II (CTASC-II). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The Corps/Theater Automated Data Processing (ADP) Service Center - II (CTASC-II) will support force projection and operate in a split mode supporting the logistics community. The CTASC-II system, with associated items of equipment and executive software, provides the basis for Standard Army Management Information System (STAMIS) operation. The system is composed of a centralized host processor (super minicomputer) and a deployable computer (lightweight, portable laptop).

2. The CTASC-II fixed site configuration consists of a centralized processor, peripherals, communications subsystem, and a local area network with workstations. The fixed site component of the CTASC-II will remain at the rear fixed site and perform the majority of STANIS processing. Ten fixed sites are planned.

3. The system also provides a deployable "flyaway" computer for force projection into a theater of operation. This configuration will allow materiel managers to conduct limited processing from a forward deployed position. There will be 14 "flyaway" systems associated with each of the fixed sites which can be employed to meet a variety of deployment scenarios.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- CVCCS HCW

**Reference** (Bruno and Corona, 1980):

Bruno, R. S., & Corona, B. M. (1980). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Proposed Ground Combat Vehicle Crewmember Clothing System (CVCCS), Hot and Cold Weather: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. HEL-TM-16-80. DTIC ADB053081.

**Key Words:**

\*Protective clothing, \*Human factors engineering, Crews, Combat vehicles, Test and evaluation, Hot weather, Cold weather tests, Army equipment, Compatibility

Fields and Groups:

230200 - Human Factors Engineering & Man Machine System

230400 - Protective Equipment

Descriptors:

(U) \*Protective clothing, \*Human factors engineering, Crews, Combat vehicles, Test and evaluation, Hot weather, Cold weather tests, Army equipment, Compatibility

**System Description:**

This report describes a human factors evaluation of the Proposed Ground Combat Vehicle Crewmember Clothing System (CVCCS), Hot and Cold Weather. The developmental effort was initiated in October 1977 by the US Army Training and Doctrine Command (TRADOC) and has culminated through efforts of the entire Army R&D community. The objective of this evaluation was to determine fit, general compatibility in the occupational environment, and the impact on crewmembers' effectiveness.

Recommendations concerning each item are described. (Author)

Unclassified

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation; Aug 80. Other requests for this document must be referred to Director, Army Human Engineering Lab., Aberdeen Proving Ground, MD 21005. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- CWHW

**Reference** (McGinnis et al., 1972):

McGinnis, J. M., Lockhart, J. M., & Bensel, C. K. (1972). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Cold-Wet Handwear (CWHW): U.S. Army Natick Research and Development Center, Clothing, Equipment, and Materials Engineering Laboratory, Natick, MA. USA-NLABS-TR-73-23-PR. DTIC AD0756417.

**Key Words:**

\*human factors engineering, \*gloves, performance(human), protective clothing, underwater, cold working

**System Description:**

Subjects performed a battery of manual performance tasks (Torque Test, Minnesota Two-Hand Turning Test, O'Connor Fine Finger Dexterity Test, Cord Manipulation and Cylinder Stringing Test, Bennett Hand Tool Dexterity Test) under six handwear conditions; bare-handed, standard leather glove, impermeable glove, leather glove with wool inserts, impermeable glove with wool inserts, and impermeable glove with built-in insulation. Each subject performed the tests under each handwear condition for 14 days at 35F ambient temperature and this comprised the Dry Glove Investigation. An additional Wet Glove Investigation involved the same tests and handwear conditions and was of four days' duration. For the remaining tests, the bare hand condition resulted in superior performance and the impermeable gloves

with built-in insulation resulted in inferior performance compared to the other handwear conditions. Performance level on all tasks decreased on the first day of water immersion, but performance on the Minnesota Two-Hand Turning Test only was adversely affected on both water immersion days.  
Unclassified

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- DAGR

**Reference** (Savage-Knepshield, 2004):

Savage-Knepshield, P. (2004). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Assessment; Manpower, Personnel, and Training Assessment; and Soldier Survivability Assessment for the Defense Advanced Global Positioning System Receiver (DAGR): U.S. Army Research Laboratory, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland. ARL Technical Report ARL-RP-158.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Defense Advanced GPS Receiver (DAGR) is a dual frequency GPS receiver that weighs less than one pound and is two-thirds the size of its predecessor, the Precision Lightweight GPS Receiver (PLGR). It provides position, velocity (ground speed), time, and navigation capabilities. The DAGR is primarily a handheld unit with a built-in integral antenna, but can be installed in host platforms (such as, ground facilities, air, sea, and land vehicles) using an external power source and external antenna. It incorporates the Department of Defense's next generation GPS security device known as the Selective Availability Anti-Spoofing Module (SAASM), which ensures greater security of the GPS encrypted signal and provides increased anti-jamming protection. The ability to load cryptokeys provides protection against spoofing. It has a Graphical User Interface (GUI) and includes situational awareness capabilities which display a soldier's position relative to known points (such as, waypoints, routes, hazards).

**Report Availability:**

Distribution is authorized to U.S. Government agencies only; critical technology (January 2007). Other requests for this document shall be referred to the Product Manager for DAGR, ATTN: AMSEL DSA GPSR, Squire Hall, Fort Monmouth, NJ 07703.:

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**System Short Name:** MANPRINT- DCGS-A

**Reference** (Kortenhaus, 2004):

Kortenhaus, C. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Distributed Common Ground System-Army (DCGS-A). Redstone Arsenal, AL,: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Distributed Common Ground System-Army (DCGS-A) is an integrated Intelligence, Surveillance, Reconnaissance (ISR) Fixed and Mobile ground processing system composed of joint common components, operating in a secure, distributed and collaborative environment, enabled by networks. The DCGS-A is the Army element of the Department of Defense (DoD) Distributed Common Ground/Surface System (DCGS). DCGS-A will be the primary ground station (software and hardware) for control for Army

airborne and ground sensor systems defined as Future Force systems. It will provide interoperability with the All-Source Analysis System (ASAS), the Digital Topographic Support System (DTSS), and the Army Battle Command System (ABCS). The DCGS-A Fixed and Mobile sites will be part of a multi-intelligence (INT) facility that will receive, process, execute and disseminate ISR data via the National Security Agency Network (NSANet), Joint Worldwide Intelligence Communications System (JWICS) and Secret Internet Protocol Router Network (SIPRNET). The Fixed DCGS-A in CONUS (Home Station) or Theater (Regional Operations Centers) will facilitate reach and split based operations by providing intelligence analysis and strategic planning in stationary locations. The Mobile DCGS-A will operate integrated and co-located with the Fixed DCGS-A, and will operate deployed forward as part of the Unit of Engagement (UE) or as part of the Unit of Action (UA) in the Brigade Intelligence and Communications Company (BICC).

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- EBIST

**Reference** (Boynton and Crowell, 2006):

Boynton, A. C., & Crowell, H. P., III. (2006). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Exoskeleton Boot Interface Sole Thickness (EBIST). Aberdeen Proving Ground, MD: U.S. Army Research Laboratory, Human Research and Engineering Directorate. Aberdeen Proving Ground, MD. ARL Technical Report ARL-TR-3812. DTIC ADA449952.

**Key Words:**

Fields and Groups:

060300 - Biology

120300 - Statistics and Probability

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*STATISTICAL ANALYSIS, \*BIOMECHANICS, TEST AND EVALUATION, COMPUTER PROGRAMS, STABILITY, SOFTWARE TOOLS, EXTREMITIES, DATA ACQUISITION, FEEDBACK, MOBILITY, ARMY PERSONNEL

**System Description:**

The purpose of this study was to identify potential human factors issues related to the sole thickness of an exoskeleton boot interface. Twelve Soldiers were evaluated in three footwear conditions (no additional sole, 1-inch sole, and 2-inch sole). Lower extremity biomechanics were assessed for walking, running, squatting, and kneeling with the use of a force plate and motion capture system. Mobility performance was assessed with five obstacles on a mobility-portability course. Participants also provided subjective feedback on each footwear condition's comfort, stability, and difficulty during the biomechanics and mobility assessments. Results indicate that an exoskeleton could incorporate a boot interface as thick as 2 inches without substantially impacting the human factors issues evaluated in this study.

**Report Availability:**

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**System Short Name:** MANPRINT- ECWCE

**Reference** (Woodward and Hickey, 1977):

Woodward, A. A., Jr., & Hickey, C. A., Jr. (1977). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of an Experimental Reversible Extreme Cold Weather Clothing

Ensemble: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL  
Technical Memorandum HEL-TN-9-77. DTIC ADA046620.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*protective clothing, mobility, army personnel, performance(engineering), camouflage, cold regions,  
human factors engineering, reversible, weight, clothing, cold weather, acceptability, urine, arctic regions,  
parkas

Fields and Groups:

150500 - Logistics, Military Facilities and Supplies

Descriptors:

(U) \*PROTECTIVE CLOTHING, MOBILITY, ARMY PERSONNEL, PERFORMANCE(ENGINEERING),  
CAMOUFLAGE, COLD REGIONS, HUMAN FACTORS ENGINEERING, REVERSIBLE, WEIGHT,  
CLOTHING, COLD WEATHER, ACCEPTABILITY, URINE, ARCTIC REGIONS, PARKAS

**System Description:**

A human factors evaluation was performed on an experimental two-component reversible extreme cold weather clothing ensemble (parka and trousers). The garments tested had been improved following recommendations of an earlier feasibility test; all of the improvements introduced were judged to be completely acceptable. Troop acceptance of the basic concept of the new ensemble is high. Despite this, the two new clothing items remain unsatisfactory for several reasons. These include: (a) excessive sleeve and leg lengths, (b) lack of front fly opening on trousers, (c) lack of trouser ankle closures, (d) poor construction of parka neck for attachment of hood, (e) very poor method of button hold construction, and (f) noise and static electricity generation by the outer fabric layer of the garments.

**Report Availability:**

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**System Short Name:** MANPRINT- EETF

**Reference** (Heuckeroth, 1988):

Heuckeroth, O. H. (1988). Manpower and Personnel Integration (MANPRINT) Assessment: Evaluation of Selected MANPRINT Issues for the Product Improvement Program of the OQ-290(V)1 Electronic Equipment Test Facility (EETF). Fort Hood, Texas: U.S. Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA. Fort Hood Field Element, Working Paper WP FH 88-15. DTIC ADA396103.

**Key Words:**

Fields and Groups:

140200 - Test Facilities, Equipment and Methods

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*TEST EQUIPMENT, \*TEST FACILITIES, \*USER FRIENDLY, ARMY PERSONNEL, ELECTRONIC EQUIPMENT, ARMY EQUIPMENT, USER NEEDS, DIAGNOSTIC EQUIPMENT

Identifiers:

(U) MANPRINT, OQ-290(V)1, ATE(AUTOMATIC TEST EQUIPMENT)

**System Description:**

In mid-1987 coordination was initiated between the Army Research Institute (ARI) Fort Hood Field Unit and the Communications Electronics Board (CEBD) regarding data collection and analysis on several MANPRINT issues to be addressed in the (recently completed) Product Improvement Program (PIP) Test

for the AN/USM-410(V)2/OQ-290(V)1. Subsequent coordination in late 1987 between ARI and the CEBD led to agreement on specific issues for which ARI would perform data collection and/or analysis activities. Per agreement between the CEBD and ARI, Fort Hood Field Unit, data was collected and analyzed for several Product Improvement Program (PIP) issues. This report is designated a working paper and, for the most part, is still formatted as it was to meet the needs of the CEBD Test Officer. Specifically, each of the issues addressed is stated, followed by method of analysis, and findings.

**Report Availability:**

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**System Short Name:** MANPRINT- ENVG

**Reference** (Swiecicki, 2005):

Swiecicki, C. C. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Enhanced Night Vision Goggle (ENVG). Redstone Arsenal, AL.: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Enhanced Night Vision Goggle (ENVG) program currently comprises two different systems, each using a different technology. The ENVG is the next generation night vision goggle for the u.S. Army. The ENVG combines images from image intensification (12) and infrared (IR) sensors to allow the individual Soldier to perform missions under all light levels and when visibility is reduced due to smoke or dust. Situational awareness is improved because the ENVG's IR sensor provides the Soldier with the capability to rapidly detect and recognize man-sized targets while maintaining the ability to see detail with the 12 sensor. The image intensifier allows the ENVG to be compatible with rifle-mounted aiming lights. The ENVG will be used during combat, special operations, and search and rescue missions.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- EPIAFS

**Reference** (Zubal, 2006):

Zubal, O. (2006). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Enhanced Portable Inductive Artillery Fuze Setter (EPIAFS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The EPIAFS is composed of three portions:

- (1) The Platform Integration Kit (PIK) is integrated as a permanent component into the howitzer's Communication Location Assembly (CLA). It receives and sends the fuzing data to the EPIAFS for setting a fuze.
- (2) The connecting cable links the setter to the PIK on the howitzer
- (3) The setter receives input data either manually or via the connecting cable for setting the fuze.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- EPIAFS

**Reference** (Zubal, 2007):

Zubal, O. (2007). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Enhanced Portable Inductive Artillery Fuze Setter (EPIAFS): U.S. Army Research Laboratory, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland. ARL Technical Report ARL-MR-0678. DTIC ADA473942.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*human factors engineering, \*artillery, \*fuze setters, test and evaluation, portable equipment, fuzes(ordnance), platforms, missions, user needs, inert materials, connectors, howitzers, sunlight, reading, kits, gloves, new jersey, hand held, posture(gen

Fields and Groups:

160300 - Guided Missile Warheads and Fuzes

190100 - Ammunition and Explosives

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*ARTILLERY, \*FUZE SETTERS, TEST AND EVALUATION, PORTABLE EQUIPMENT, FUZES(ORDNANCE), PLATFORMS, MISSIONS, USER NEEDS, INERT MATERIALS, CONNECTORS, HOWITZERS, SUNLIGHT, READING, KITS, GLOVES, NEW JERSEY, HAND HELD, POSTURE(GENERAL), MALES, AMMUNITION, SELF CONTAINED, INTEGRATION, SKILLS, ARMY PERSONNEL

**System Description:**

The enhanced portable inductive artillery fuze setter (EPIAFS) is a product improvement of the portable inductive artillery fuze setter (PIAFS). The EPIAFS was designed to receive data manually and via cable and to inductively set all the fuzes set by the PIAFS and initialize the Excalibur ammunition. The EPIAFS system consists of the platform integration kit (PIK) installed in the howitzer s fire control system, a 15-foot cable to connect the EPIAFS to a PIK receptacle on the howitzer, and the setter which can function in an un-cabled mode, a cabled stand-alone mode, and the cabled mode. EPIAFS is a system that consists of the PIK, cable, and setter. The terms EPIAFS setter and setter are used interchangeably in this report to indicate the portable hand-held portion of the EPIAFS system. Ten male Soldiers, ranging in rank from E1 to E6, arrived at Picatinny Arsenal, New Jersey, to serve as participants in a limited user test to allow for a human factors assessment of the EPIAFS. The testing centered on the ability of the Soldiers to set up the EPIAFS, use the EPIAFS to set inert fuzes, and secure the EPIAFS after use. Soldiers were taken into the outside sunlight and a no-light room to assess their ability to read the un-cabled display of the setter. The Soldiers wore their battle dress uniform (BDU) or modified mission-oriented protective posture (MOPP) equipment, which consisted of their mask and gloves with inserts, for alternating trials. The overall times for the Soldiers to set up the EPIAFS, which consisted of unpacking the EPIAFS and cable and connecting one end of the cable to the howitzer connector and the other end to the EPIAFS, were 0.8 minute in BDUs and 0.9 minute in the modified MOPP equipment. To set the first multi-option fuze, artillery (MOFA) required 5.0 seconds in BDUs and 4.5 seconds in the modified MOPP equipment. To set three more MOFAs required 7.7 seconds in BDUs and 7.9 seconds in the modified MOPP.

**Report Availability:**



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**System Short Name:** MANPRINT- Explosives- Bangalore BTDK

**Reference** (Spine, 2008):

Spine, R. J. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the 2.5 Ft. Bangalore Torpedo Demolition Kit (BTDK): MIA3: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Bangalore Torpedo was first Type Classified in 1943. The current configuration, M1A2 was Type Classified in 1958. The M1A2 Bangalore Torpedo Demolition Kit (BTDK) primarily has been used for countermine and wire obstacle-clearing missions. The countermine mission has been replaced by Antipersonnel Obstacle Breaching System (APOBS), but the wire obstacle-clearing mission remains. The M1A2 BTDK is employed for clearing paths through wire obstacles and heavy undergrowth as described in the Training Manual (TM) 43-0001-38; "The Bangalore torpedo demolition kit is used to clear paths through barbed wire entanglements and minefields. It clears a path 3 to 4 meters (m) wide through barbed wired entanglements." The M1A2 Bangalore Torpedo system consists of ten (10) five (5)-foot (ft) tubes with nine (9) connectors and one (1) nose sleeve. The total operational length is fifty (50) ft. The tube assemblies, or torpedoes, are steel tubes 5 ft long and 2 1/8 inches (in) in diameter weighing 13 pounds each, grooved and capped at each end. The torpedoes have a 4-inch Composition A-3 booster (1/2 pound (lb) each) at the ends of each 5 ft section. The main explosive charge is 10 1.2 pounds (lbs) of Composition B-4. The kit packaged in a 60 3/4-inch by 4 9/16 inch wooden box and weighs 211 lbs. A soldier carrying one 5 ft tube, which weighs 13 pounds, in each hand deploys the system.

The M1A3 will consist of 2.5 ft long segments with identical connecting sleeves and nose sleeves to that of the M1A2 BTDK. The Materiel Change (MC) will make it easier for the soldier to deploy the system by reducing the length of the sections to 2.5 ft. The shorter tube lengths will also make it possible for the soldier to transport the tube segments on the Soldier's rucksack. The energetic material contained in the 2.5 ft Bangalore Torpedo Demolition Kit, M1A3, consists of Composition A-3 for the boosters and Composition B-4 for the main explosive charge as in the M1A2 BTDK. The Net Explosive Weight (NEW) for the box of 2.5 ft Bangalore Torpedo is approximately 45.7 lbs.

The 2.5 ft. Bangalore Torpedo Demolition Kit: M1A3 is a shortened version of the 5 ft. Bangalore Torpedo Demolition Kit: M1A2. The 2.5 ft. Bangalore Torpedo Demolition Kit: M1A3 will be used to clear paths through wire obstacles and heavy undergrowth as per the description in Field Manual FM 3-34.214, Explosives and Demolitions, Jun 07. The new M1A3 will include segments 2.5 ft. in length with connecting sleeves and a nose sleeve currently found in the M1A2 version. Two or more sections are assembled by pressing one end of a nose sleeve onto one end of a 2.5 ft. section and connecting two or more sections together using the connecting sleeves. The Materiel Change will improve the transportability of the system for the dismounted Soldier by facilitating transport on the Soldier's rucksack. The energetic materials inherent to the system include: composition A-3 for the boosters and composition B-4 for the main explosive charge. The Net Explosive Weight of the M1A3 is about 5.7 lbs. The M1A3 is primed and initiated with standard military demolition initiation capabilities using standard military explosive procedures identical to the M1A2 and described in Field Manual (FM) 5-250.

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**System Short Name:** MANPRINT- Explosives- DBK XM303

**Reference** (Whalen, 1998):

Whalen, J. B. (1998). Manpower and Personnel Integration (MANPRINT) Assessment for the Demolition Kit, Blasting (DBK): XM303, Special Operation Forces. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Demolition Kit, Blasting: XM303, Special Operations Forces (SOF Demo Kit) consists of a family of inert metal and plastic housings that, when packed with Composition C4 explosive, are tactical explosive devices. The kit includes a variety of housings for explosively formed projectiles (BFP), conical shaped charges (CSC), and linear shaped charges (LSC). It also contains the ancillary equipment necessary to assemble and load the units, plus a variety of attachment devices. One of the primary requirements for the SOF Demo Kit was to be completely inert. The SOF soldier is freed from the problems associated with storage and protection of explosive devices. More importantly, it gives them the ability to carefully select the right explosive device for the specific mission without having to maintain a large inventory of preloaded munitions. The SOP Demo Kit explosive end items are designed to be higher quality, more effective and easier to construct than the handmade explosive devices currently being employed by SOF soldiers.

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**System Short Name:** MANPRINT- Explosives- FPE

**Reference** (Spine, 1996):

Spine, R. J. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the Fighting Position Excavator (FPE). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The FPE is a binary explosive device which will allow a soldier to shape a two-person fighting or protective position that measures 24 inches in width by 72 inches in length. The basic combat load will consist of one FPE for every two soldiers. The FPE will fit in or on the standard issue rucksack and will weigh approximately ten pounds.

The FPE consists of a carrier bag with instructions. The carrier bag contains: an auger, two explosive container assemblies (both packed inside the auger bucket), the shock tube assembly (XM9 Blasting Cap Holder with 80 feet of shock tube), Shock Tube Initiator (STI), Mk 31 Surface Signal Projector, and an empty sandbag. Each explosive container assembly contains primaline and the binary explosive, consisting of one plastic tube containing powder and one plastic tube containing liquid. When mixed, the liquid and powder suspension becomes an explosive material. Two FPEs are packaged inside a PA103 container.

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**System Short Name:** MANPRINT- Explosives- HE WAM XM93

**Reference** (Gunn, 1999):

Gunn, K. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the Basic Hand Emplaced Wide Area Munition (Basic HE-WAM), XM93, and the Basic HE-WAM Individual (XM98) and Collective XM97) Training Devices. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The HE-WAM, an integral part of the family of Wide Area Munitions, is a first generation, intelligent munition designed to autonomously search, detect, classify and destroy enemy tracked armor vehicles at a stand off distance of up to 100 meters. Stored and delivered in a PA160 Shipping and Storage Container, this one-man portable, cylindrical, 35 pound munition is designed to be set in either the Manual Mode or the Remote Mode. The Control, Remote, Land Munition System: M7I [M7I Remote Control Unit (RCU)] is used to send remote arm and destruct commands to WAMs previously encoded with that M7I. After arming, the HE-WAM is designed to remain in a munitionfield and engage target vehicles through means of an electronic sensor suite that seismically detects a vehicle, acoustically measures the signature of a vehicle up to 240 meters away, classifies the signature up to 180 meters away, and, if the signature is classified as a "go", fires a sublet at the projected closest point of approach. The sublet contains an infrared sensor for top attack using an Explosively Fanned Penetrator (EFP) warhead. Examples of target vehicles include but are not limited to: enemy tanks (T-80 and T-72), lightly armored vehicles (BMP), and enemy breachers (KMT 4, K.MT 5, and IMR).

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**System Short Name:** MANPRINT- Explosives- IMS

**Reference** (Gunn, 2005):

Gunn, K. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Intelligent Munitions System (IMS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Intelligent Munitions System (IMS). IMS is a system of controlled ground munitions — lethal and non-lethal — linked into the networked system of systems and capable of autonomous, unattended employment to detect, classify, identify, track, and engage selected targets in accordance with the commander's intent. IMS consists of a Control Station and a Dispensing Module which contains effects devices, gateways, and sensors to control operation of the IMS system. An operator with a single IMS Control Station can control multiple IMS fields at a range of up to 3 kilometers. Fields can be combined to create a large obstacle. Each DM is capable of covering a minimum diameter lethal area of 35 meters which provides the basic building block for larger IMS fields and obstacles. Increment 1 IMS consists of the following characteristics: Rapid emplacement of a 35-meter diameter (minimum) lethal effects field Fields controlled from a distance of up to 3 kilometers Autonomous Engagement Man-in-the-Loop (MITL) with Arm and Disarm (On-Off-On) Capability Provides for safe friendly force passage Provides for selective engagement Multi-mode effects (AT/AV/AP; NL with Spider) Self-Destruct/Self-Deactivate Easily Recovered for Reuse Enhanced Situational Awareness - Populates COP Adaptable Tactics Unmanned

Sentinel: 30-day Operation Capability in a rural environment, and 7-day Operational Capability in an urban environment.

The Intelligent Munitions System (IMS) is being developed utilizing an incremental approach. Increment 1 IMS will provide the near-term capability to the current force and meet new landmine policy. This HFEA is written only for Increment 1 IMS. Additional capabilities will be added and fielded as spiral-outs to the Future Combat System (FCS). IMS provides unattended ground sensors linked to lethal and non-lethal scalable effects components via integrated and robust command and control systems and is employed by multiple delivery means. IMS supports a multitude of operational and tactical Intelligence, Surveillance, and Reconnaissance (ISR), maneuver and fires missions in offensive and defensive operations.

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**System Short Name:** MANPRINT- Explosives- MDI

**Reference** (Spine, 2002):

Spine, R. J. (2002). Manpower and Personnel Integration (MANPRINT) Assessment for the Modernized Demolition Initiators (MDI) Tactical Components (XM19, XM21, and XM23), and the Inert Training Devices (XM20 and XM22): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The five new components of the Modernized Demolition Initiators (MDI) System (i.e., XM19, XM20, XM21, XM22, and XM23) will provide the Army with a safer, more reliable, and less manpower intensive method of initiating demolition and explosive devices.

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**System Short Name:** MANPRINT- Explosives- MOF

**Reference** (Spine, 1996):

Spine, R. J. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the M734E1 Multi-Option Fuze for Mortars. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The M734E1 Multi-Option Fuze for Mortars is a Materiel Change Program to the M734 Multi-Option Fuze for Mortars. The M734B1 improves upon the safety and the performance of the baseline fuze configuration in the following ways. The M734E1 incorporates an apex sensor to allow the fuze to sense apex before electronically arming. It also incorporates a 120mm proximity fuze setting which allows the M934 High Explosive cartridge to perform optimally and permits the M929 white Phosphorous (WP) smoke cartridge to meet its smoke obscuration performance requirement of twice that of the M328 4.2 inch WP mortar cartridge. The M734E1 provides Electromagnetic Environmental Effects Interference (E<sup>3</sup>I) hardened electronics which protect against electronic countermeasure threats. The M734E1

also provides accurate proximity functions over all terrains. Like its predecessor, the M734, no tools are needed to set the M734EI and the setting can be changed several times without damaging the fuse.

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**System Short Name:** MANPRINT- Explosives- RAMS

**Reference** (Gunn, 2004):

Gunn, K. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the XM85 Training Device and the M17 Receiver of the Remote Activation Munition System (RAMS). APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

XM85 Training Device and the M17 Receiver of the Remote Activation Munition System (RAMS).

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**System Short Name:** MANPRINT- Explosives- RAMS MI

**Reference** (Gunn, 2006):

Gunn, K. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the Magneto Inductive Remote Activation Munition System (MI-RAMS), XM156: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The Magneto Inductive Remote Activation Munition System (MI-RAMS), XM156 (hereafter referred to as the MI-RAMS) provides U.S. Forces (SOF and Combat Engineers) the capability to remotely communicate/control demolition devices via Magneto Inductive (MI) signals rather than via traditional Radio Frequency (RF) signals. The MI-RAMS is small, lightweight, and man-portable fitting inside the pocket of the ACU/DCU/BDD. The MI-RAMS consists of four distinct types of components: transmitter (XM27), auxiliary power source (M6) for the transmitter, and two types of receivers (Type A (XM39) and Type B).
2. Intended Applications For Use: The MI-RAMS program was established to provide a capability to remotely control the detonation of demolition charges or the remote operation of other items of equipment (such as: beacons, laser markers, radio functioning, weapons, ground marking lights, etc.) through difficult terrain, obstacles, inside buildings, caves, subterranean structures and under seawater. The MI-RAMS is compatible with RF-RAMS; i.e. both devices can be "daisy chained" as mission requirements, tactics and terrain dictate.

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**System Short Name:** MANPRINT- Explosives- RAMS MI

**Reference** (Gunn, 2008):

Gunn, K. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the Magneto Inductive Remote Activation Munition System (MI-RAMS), M156: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

a. Special Operations Forces (SOF) and COIYIbat Engineers require a multiple capability Magneto-inductive/Remote Activation Munition System that is safe, reliable, lightweight, and logistically supportable to meet the demands of their respective theater of operations throughout peacetime, conflict, and war. The MI-RAMS was designed to withstand the rigors of airborne, underwater operations, and cross-country movement while in the breast pocket of the Arlny Combat Uniform (ACU), Desert Combat Uniform (DCU), or Battle Dress Uniform (BDU). The MI-RAMS provides U.S. Forces (SOF and Combat Engineers) the capability to remotely communicate/control demolition devices via Magneto Inductive (MI) signals rather than via traditional Radio Frequency (RF) signals. The MI-RAMS is compatible with RF-RAMS; i.e. both devices can be "daisy chained" as mission requirements, tactics and terrain dictate. It is capable of detonating explosive charges through all types of medium, both line-of-sight and non line-of-sight. Moreover, the MI-RAMS should operate in environments ranging from -25 degrees F to 135 degrees Fahrenheit, including jungle, desert, arctic, mountainous, and urban environments.

b. SOF doctrine places special emphasis on interdiction operations. These operations may range from the destruction of a single vehicle to strategic strikes against key military or industrial target sites. The attacking force may range from a single saboteur to a large strike force. The target location can range from a highly developed, densely populated urban area to a remote rural location in an underdeveloped country. The MI-RAMS will not replace any currently fielded demolition item; therefore, there is no predecessor system. The MI-RAMS will not displace current Associated Items of Equipment (ASIOE).

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**System Short Name:** MANPRINT- Explosives- SDK

**Reference** (Everette, 2005):

Everette, J. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Special Operations Forces Demolition Kit (SDK) M303. Redstone Arsenal, AL.; U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The M303 SDK provides the interdicting Special Operations Forces (SOF) soldier with the capability to tailor charges to the target by using a variety of inert components and attachment mechanisms. Current

methods force the SOF soldier to improvise warhead designs from suitable components, attachment mechanisms, and housings available in the interdicting area. The M303 SDK provides the SOF soldier with a common set of demolition charges and attachment devices. The following are the five new components for the M303 SDK:

1. Multifaceted Explosively Formed Penetrator (MEFP) Tantalum Warhead Case Assembly, Medium, P/N 12998375: The medium MEFP consists of the standard MEFP housing and an inert 7-inch diameter x 5.5-inch deep plastic container with a removable back plate. The warhead liner that is assembled to the housing is made of tantalum and is preformed into 19 elements that fragment and fly up to 100 meters in a 10-foot diameter fan to defeat the target. The medium MEFP is packaged in a set with expendable tools and items for loading and priming it and an adjustable tripod for setting it up and aiming it. The medium MEFP is initiated using standard military blasting caps or Modernized Demolition Initiators (MOI).
2. Bar & Cable Cutter (BCC) 32-mm, Assembly, P/N 12998367: The 32-mm BCC is a commercial off-the-shelf item consisting of a plastic cylindrical housing with a copper liner. The soldier hand packs the housing with C4, attaches it to the target, and initiates it to cut steel rod and cable up to 1-inch diameter. Initiation is accomplished using standard military blasting caps or Modernized Demolition Initiators (MOI).
3. Bar & Cable Cutter 50-mm, Assembly, P/N 12991264: The 50-mm BCC is a larger version of the 32-mm BCC that is used to cut steel rods and cables up to 2-inches diameter. Initiation is accomplished using standard military blasting caps or Modernized Demolition Initiators (MOI).
4. Linear Shaped Charge (LSC) Assembly, Medium, P/N 13004413: The medium LSC is a 12-inch long plastic container with a copper liner that the soldier hand packs with C4 and uses to cut armor plate up to 1.5-inches thick. Initiation is accomplished using standard military blasting caps or Modernized Demolition Initiators (MDI).
5. Linear Shaped Charge Assembly, Large, P/N 13004422: The large LSC is a 12-inch long plastic container with a copper liner that the soldier hand packs with C4 and uses to cut armor plate up to 3-inches thick. Initiation is accomplished using standard military blasting caps or Modernized Demolition Initiators (MDI).

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**System Short Name:** MANPRINT- Explosives- SLAM

**Reference** (Whalen, 2008):

Whalen, J. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the M4E1 Selectable Lightweight Attack Munition (SLAM) and the M320E1 SLAM Improved Functional Trainer: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

1. The SLAM M4EI is a lightweight multipurpose, one-shot anti-materiel and/or demolition device. It is compact, lightweight (approximately three pounds), and easily portable, for use in small quantities by U.S. Combat Engineers, Infantry, Rangers, Scouts and Special Forces personnel during combat operations. The SLAM is intended for use against armored personnel carriers, parked aircraft, wheeled or tracked support vehicles, and stationary targets such as electrical transformers, small (under 10,000 gallons) fuel storage and ammunition storage sites. The SLAM has four different operational modes, side attack, bottom attack, timed demolition and command detonation. The SLAM is a target-activated munition when using the magnetic influence fusing in the bottom attack mode and passive infrared in the side attack mode. When used in the bottom attack mode and side attack mode, it has seven operator-selectable self-destruct times. The SLAM can also be initiated by setting one of seven time delay settings or by command detonation using standard demolition methods such as Modernized Demolition Initiator (MDI).
2. The M320EI SLAM Improved Functional Trainer (SIFT) is inert and composed of all the safety features, controls, interfaces and algorithms of a fully functional tactical M4EI SLAM. The M320EI SIFT does not

have warhead explosives and explosive train, the Safe and Arming (S&A) device and the Lithium Reserve battery. The SIFT uses a similar housing and external operator interfaces as the M4EI SLAM. It is as rugged as the M4EI SLAM and is designed for both classroom and field training. The SIFT contains outputs which can be used to power and control a Multiple Integrated Laser Engagement System (MILES) or Simulated Area Weapons Effects (SAWE) module. It incorporates a replaceable 9-volt commercial battery to power itself, and both visual and audible indicators used as feedback when an error in setting the trainer is made, as well as when it is properly set and can simulate the fire signal. These indicators can be turned off during the training session and turned on afterward to report if an error was made during the training session, as well as the type of error. A provision is made to allow re-insertion and re-setting of the Safety Pin, Battery Activation Lever, Sensor Mode Enable Pin (SMEP), the Time Selection Switch Knob and the activation lever shear pin, allowing multiple uses.

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**System Short Name:** MANPRINT- Explosives- SLAM- XM2/XM3/XM299

**Reference** (Whalen, 1994):

Whalen, J. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Xm2 Selectable Lightweight Attack Munition; Xm3 Demolition Attack Munition; and Xm299 Training Kit, Selectable Lightweight Attack Munition. Alexandria, VA: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The XM2 SLAM, the XM3 DAM, and the XM299 Training Kit are being developed for, and funded by, the U.S. Special Operations Command (SOCOM). The XM2 SLAM is a 2.2 pound, 35 cubic inch, one shot, multi-purpose, anti-materiel, demolition device. The SLAM can be operated in four different modes:
  - (1) magnetically activated by a vehicle while in the mine mode;
  - (2) as an electronic tripline in the passive infrared (PIR) side attack mode;
  - (3) as a time delay demolition device; and
  - (4) in a command detonation mode. The warhead is an explosively formed penetrator (EFP) that will defeat lightly armored vehicles at stand-off distances of 5 inches to 25 feet.
2. The XM3 is; a skeletonized, non-electric version of the XM2. It has the same dimensions and ballistic capabilities as the XM2. The XM3 requires a M6 Electric or a M7 Non-Electric Blasting Cap (plus an M1A4 Priming Adapter) be inserted into its blasting cap well in order to be detonated. A variety of initiation devices can be attached to the XM3, such as the Time Delay Firing Device (TDFD), Remote Activation Munition System (RAMS), the M122 Remote Firing Device, standard time fuse, etc.
3. The XM299, Training Kit, Selectable Lightweight Attack Munition, is designed to replicate each step of the operation of the tactical SLAM. The kit is comprised of four Reusable Environmental Protective Packs (REPPs). Each REPP contains one non-electric, inert, exact physical replica of the tactical XM2 SLAM. Six carrying straps, eight leg straps, two screwdrivers, instructional placards, spare parts, and the four REPPs are packaged in a PA19 metal shipping and storage container. Each XM299 has been designed to withstand a minimum of 30 training cycles.

**Report Availability:**

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**System Short Name:** MANPRINT- Explosives- SMB

**Reference** (Reinhart, 1994):

Reinhart, J. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Standoff Minefield Breacher (SMB): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

1. The 5MB will replace the existing M58 A1 to A6 Mine Clearing Line Charge (MICLIC). The M58 MICLIC is a rocket deployed explosive line charge that is trailer mounted and towed behind a host vehicle. The M58 MICLIC is effective only against simple pressure fuzed mines.

2. There are two 5MB concepts: the Army's Improved Dispersed Explosive (IOX) and the Marine Corps' Distributed Explosive Mine Neutralization System (DEMNS). Both systems include explosive munitions deployed by rocket from a standoff distance into the minefield which are then detonated to clear a lane. There are two possible 5MB mounting schemes. The 5MB may mount directly on a host vehicle. The 5MB may mount on a trailer towed behind the host vehicle. Projected host vehicles are: M1 Main Battle Tank (MBT), M60 MBT, M113 Family of Vehicles, M2 Bradley, Breacher, Assault Amphibian Vehicle (AAV), and Light Armor Vehicle (LAV).

a. The IOX system consists of a six inch diameter nylon hose filled with dry explosive in two particle sizes mixed with flaked aluminum. A rocket carries this "line charge" across the mine field. After the line charge lands, the operator detonates explosive cords inside the line distributing the dry explosive into the air. The dry explosive forms a ground layer and a cloud layer as it settles. Milliseconds after dissemination, the explosive cloud detonates, which in turn detonates the explosive ground layer. The resulting high pressure impulse causes sympathetic detonation of the main explosive charges of surface laid mines and triggers the fuzes of buried pressure fuzed mines. The effectiveness of IOX against other types of mines is undetermined.

b. The DEMNS consists of a net made of detonation cord with small shaped charge munitions located at each intersection of the net. Two rockets deploy and expand the net across the minefield. Detonation of the net in turn detonates the shaped charge munitions. Each munition then explosively propels a small jet of metal into the minefield. When a jet of metal strikes a mine, kinetic energy transfers to the mine causing detonation or deflagration of the main explosive charge in the mine. The DEMNS is effective against surface and buried mines regardless of mine fuzing.

3. The 5MB will be a Combat Support item and is in the Engineer and Mine Warfare mission area. Task organized breaching teams composed of infantry, tanks, and combat engineers will use the 5MB for deliberate and in-stride breaching of antitank minefields. The draft 5MB Operational Requirements Document (ORO) states that operators will be in Career Management Field (CMF) 12 (Combat Engineering). CMF 12 consists of MOS 12B (Combat Engineer), MOS 12C (Bridge crewmember), MOS 12F (Engineer Tracked Vehicle Crewman), and MOS 12Z (Combat Engineering Senior Sergeant). The Marine Corps operator will be MOS 1371 (Combat Engineer). Anticipated Army 5MB maintainers are MOS 55B (Ammunition Specialist) and CMF 63 (Mechanical Maintenance). Marine Corps maintainers will be MOS 1316 (Metal Worker) and MOS 1341 (Heavy Equipment Mechanic).

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Explosives- Spider XM7

**Reference** (Spine, 2004):

Spine, R. J. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Non-Self Destruct- Alternative (NSD-A), (Spider), Project No. 69-MP-2641-04: Unpublished Report. U.S. Army

Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The NSD-A (SPIDER) is a compact, lightweight, hand-emplaced antipersonnel munition that is easily portable for use by the Army and Marines, and used to replace the operational functions provided by antipersonnel land mines. It was originally assessed using the name Anti- Personnel Landmine- Alternative (APL-A) (reference 1a) in 1999. The recommendations in reference 1a are still applicable. The SPIDER is intended to be used against dismounted soldiers and will include a disturbance detection capability. Target discrimination is provided through man-in-the-loop (MITL) via a remote control unit that will provide target detection via munitions control unit trip lines within a ten-meter radius. SPIDER will be compatible and allow for command and control (C2) through the remote control unit that is fielded at the time of SPIDER fielding. SPIDER shall be in two versions: a lethal version and a non-lethal version, which can incapacitate but not kill its intended target (only the lethal version is currently under development). SPIDER will have two types of detonations: command (to include initiation after intruder alert) and self-destruct. SPIDER will replace the existing M14 and M16 antipersonnel mine materials used in current doctrine (reference 1b). Approximately 2500 systems will be fielded. Seven to nine soldiers will set-up the SPIDER and one or two soldiers will operate the system.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Explosives- Spider XM7

**Reference (Gunn, 2006):**

Gunn, K. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the Spider XM7, Dispensing Set, Network Command Munition (Ncm): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Spider XM7, Network Command Munition is a manportable, remotely controlled and commandable, man-in-the-loop, force protection and area denial munition system. The Spider consists of a Remote Control Station (RCS), a Repeater and Munition Control Units (MCUs). The RCS is used to direct and control the functioning of the MCUs during hostilities. The RCS consists of a Remote Control Unit (RCU) component and an RCU Transceiver component. The Repeater is a relay device used to extend the control range of the RCS for the munitions in difficult terrain or when necessary to a range of 1500 meters. The MCUs contain munitions strategically placed as required by the mission. The MCU assembly contains six (6) Munition Grenade Launchers (MGLs) that provide the lethality for the Spider. In lieu of the MGLs, the MCU can also control other munitions including the M18 Claymore, the Modular Crowd Control Munition (MCCM) and other future lethal and non-lethal munitions.

1. The lethal mechanism is the Launcher and Grenade, Network Command Munition Grenade Launcher, XM8.
2. The sensor module includes both hardwire triplines and the Launcher and Line, Network Command Munition: extended range tripline launcher, XM9.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

---

**System Short Name:** MANPRINT- Explosives- Spider XM7

**Reference** (Gunn, 2009):

Gunn, K. (2009). Manpower and Personnel Integration (MANPRINT) Assessment for the Spider XM7, Dispensing Set, Network Command Munition (Ncm): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Spider XM7, Network Command Munition is a manportable, remotely controlled and commandable, man-in-the-loop, force protection and area denial munition system. The Spider consists of a Remote Control Station (RCS), a Repeater and Munition Control Units (MCUs). The RCS is used to direct and control the functioning of the MCUs during hostilities. The RCS consists of a Remote Control Unit (RCU) component and an RCU Transceiver component. The Repeater is a relay device used to extend the control range of the RCS for the munitions in difficult terrain or when necessary to a range of 1500 meters. The MCUs contain munitions strategically placed as required by the mission. The MCU assembly contains six (6) Munition Grenade Launchers (MGLs) that provide the lethality for the Spider. In lieu of the MGLs, the MCU can also control other munitions including the M18 Claymore, the Modular Crowd Control Munition (MCCM) and other future lethal and non-lethal munitions.

1. The lethal mechanism is the Launcher and Grenade, Network Command Munition Grenade Launcher, XM8.
2. The sensor module includes both hardwire triplines and the Launcher and Line, Network Command Munition: extended range tripline launcher, XM9.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Explosives- TD-SYDET

**Reference** (Gunn, 2005):

Gunn, K. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Firing Device, Demolition: XM153 Time Delay-Sympathetic Detonator (TD-SYDET) and XM316 Trainer Kit. Redstone Arsenal, AL.; U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Firing Device, Demolition: XM153 Time Delay-Sympathetic Detonator (TD-SYDET) and XM316 Trainer Kit is a one-shot electronic device that is capable of initiating a wide variety of demolitions systems. The TD-SYDET consists of the XM153 and its non-explosive XM316 trainer. The XM153 is capable of initiating a user installed all secondary explosive lead cup by means of an internally situated Low Energy Exploding Foil Initiator (LEEFI) secondary explosive train. The XM316 trainer is a totally inert replica of the XM153 capable of performing all the operations except initiating an explosive lead cup. The

TD-SYDET meets the operational needs for a safe and reliable device by combining the capability of time delay or sympathetic detonation of explosive charges and munitions into one item. Either the Time Delay or Sympathetic mode can be selected in the field. In the Time Delay or Sympathetic mode, either relative or absolute times can be selected to provide a total of five user set modes: Time Delay Relative (TDREL), Time Delay Relative (Quick Start), Time Delay Absolute (TD ABS), Sympathetic Absolute (SY ABS) and Sympathetic Relative Mode (SY REL).

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- FAAD-C2I

**Reference** (Nichols, 1995):

Nichols, D. E. (1995). Manpower and Personnel Integration (MANPRINT) Assessment for the Forward Area Air Defense (FAAD) Command, Control and Intelligence (C2I). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Forward Area Air Defense (FAAD) Command, Control and Intelligence (C2I) (FAAD C2I) System is designed to provide the air battle management command and control interface of the complimentary mix of sensors and weapons to support the FAAD Battalion mission. The FAAD C2I System is intended to be a mobile, survivable system, capable of sustained day and night combat operations in all weather conditions in the battlefield environment. The FAAD C2I, Version 3 (C2I V3) software and hardware, support the air defense needs of a FAAD Battalion (FAAD BN) organic to a U.S. Army Division (Light and Special) while the C2I, Version 4 (C2I V4) software and hardware support the needs of a Heavy Division.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- FAMTG XM24E1

**Reference** (Ho, 1991):

Ho, G. C. (1991). Manpower and Personnel Integration (MANPRINT) Assessment for the Simulator, Flash Artillery Main Tank Gun (Famtg), Xm24e1. Alexandria, VA: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The subject system consists of two major components, an XM24E1 cartridge and a firing mechanism. The XM24E1 cartridge is being developed by the U.S. Army Armament Research Development and Engineering Center. The XH24E1 firing mechanism is being developed by the U.S. Army Belvoir Research, Development and Engineering Center. Accordingly, Safety Assessment Reports (SARs) have been prepared by the proponent organizations and are enclosed. The SAR for the XM24E1 firing mechanism addresses potential hazards of the firing mechanism and the interface with the cartridge. The system is to simulate the flash and smoke created by firing the M1 tank.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- FCS- NLOS-C

**Reference** (Dykhuis, 2009):

Dykhuis, J. (2009). Manpower and Personnel Integration (MANPRINT) Assessment for the FCS Non-Line of Sight Cannon (NLOS Cannon): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Non-Line of Site Cannon (NLOS-C) is a cannon system currently under development which may become part of the FCS (Future Combat Systems) environment and was funded by the U.S. Congress shortly after cancellation of the XM2001 Crusader, M109 replacement. It is an 18 ton class vehicle that may be a replacement for current vehicle systems in the 40-60 ton weight class. If design parameters are indeed reached, then it will provide a level of air transportability that current M-109 systems cannot presently match.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- FDD

**Reference** (Whalen, 1995):

Whalen, J. B. (1995). Manpower and Personnel Integration (MANPRINT) Assessment for the Firing Device, Demolition: Delay Type Electronic M147 and the Timer, Interval, Training Kit: M45. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Firing Device, Demolition: Delay Type Electronic M147 and the Timer, Interval, Training Kit: M45.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- FED

**Reference** (Poston, 1991):

Poston, A. (1991). Manpower and Personnel Integration (MANPRINT) Assessment for the Forward Entry Device (Fed). Picatinny Arsenal, NJ: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

a. The Forward Entry Device (FED) is a hand-held device which will replace the TACFIRE Digital Message Device (DMD). It will be used to compose, edit, display, and transmit digital messages from forward observers, Fire Support Team (FIST) chiefs, and maneuver battalion and brigade Fire Support Officers (FSOs). The FED will be able to interface with other current Field Artillery Tactical Data Systems (FATDS). It will provide for the attack of moving targets and supply the required information about the target and its environment. The message formats will be the same as those used by the FIST DMD and the TACFIRE DMD to allow the operator to interface with other systems.

b. The FED will store all data entered in a composed message without subsequent loss upon reception of an incoming message. The interface between the FED and the operator will be an audible alarm, keyboard, and display screen. In addition, menus, prompts, and table selections will be used to assist the operator in processing messages. The operator will have the capability of storing the current database before system power is turned off. The Version 1 system will be used by light division soldiers. Subsequent versions of the FED will be developed for armor and mechanized division units.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- FFW

**Reference** (LaFiandra et al., 2007):

LaFiandra, M. E., Harper, W. H., Brelsford, M. L., & Jarboe, N. (2007). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Assessment of Future Force Warrior Technologies Evaluated at The "On-the-Move" (OTM) Test Bed at Fort Dix, New Jersey, in 2006: U.S. Army Research Laboratory, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland. ARL Technical Report ARL-TR-4029. DTIC ADB325745.

**Key Words:**

Fields and Groups:

230200 - Human Factors Engineering & Man Machine System

150100 - Military Forces and Organizations

Descriptors:

(U) \*TEST BEDS, \*HUMAN FACTORS ENGINEERING, \*MILITARY EXERCISES, \*TECHNOLOGY ASSESSMENT, MILITARY FORCES(UNITED STATES), COMMUNICATIONS NETWORKS, SENSOR FUSION, MANPORTABLE EQUIPMENT, SPECIAL FORCES, HELMET MOUNTED DISPLAYS, SITUATIONAL AWARENESS

Identifiers:

(U) \*FFW(FUTURE FORCE WARRIOR), OTM(ON-THE-MOVE), COOPERATIVE ENGAGEMENT

**System Description:**

The U.S. Army Research Laboratory's Human Research and Engineering Directorate collected data about the human factors aspects of Future Force Warrior (FFW) technologies at the "On-The-Move" (OTM) test bed at Fort Dix, New Jersey in 2006. Technologies tested include networked communications, sensor fusion, cooperative engagement, and other aspects of the FFW combat ensemble. Eleven retired Special Forces Soldiers served as participants and completed tasks including mission planning and rehearsal, movement to contact, and actions on an objective. Tasks were designed to allow researchers to determine if the participants could perceive differences between network configurations and could accurately conduct a cooperative engagement. Additionally, data were collected to compare participants' performance with sensor fusion and human factors aspects (fit, form, comfort, usability) of the FFW ensemble. Objective data at OTM were collected by researchers; subjective data were collected via

questionnaires and videotaped focus groups. The participants said that the major advantages FFW provided were (a) the improved situational awareness that the system allowed, (b) the improved ability to navigate, and (c) the improved communications ability. Participants also commented that the system was limited by its overall weight, and they had several issues with the helmet-mounted display. Additionally, we discovered that the XM104 provided erroneous firing solutions during this evaluation.

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies and their contractors; Critical Technology; MAR 2007. Other request shall be referred to U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425. This document contains export-controlled technical data.:

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**System Short Name:** MANPRINT- FHMUX

**Reference** (Martin, 1996):

Martin, J. M. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the Frequency Hopping Multiplexer (FHMUX). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Frequency Hopping Multiplexer (FHMUX) is an antenna multicoupler that is to be used with the SINCGARS to reduce mutual interference of radios installed on the same vehicle. It will allow up to four VHF-FM SINCGARS receiver-transmitters (RTs) to transmit and receive through one VHF-FM broad band antenna while operating in a frequency hopping mode, non-hopping (single channel) mode, or a combination of these modes. The antenna will be a broad band vehicular whip antenna capable of sustaining the combined RF power output of up to four SINCGARS RTs. The antenna will be issued with the FHMUX enabling units to operate mobile command posts (CPs).

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- FLASH

**Reference** (Reinhart, 1993):

Reinhart, J. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the Close Combat Cueing System (Flash Simulator). Picatinny Arsenal, NJ: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Close Combat Cueing System (FLASH Simulator).

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- FPS

**Reference** (Corona et al., 1974):

Corona, B. M., Jones, R. D., Randall, R. B., Ellis, P. H., & Bruno, R. S. (1974). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Two Proposed Army Infantry/Marine Fragmentation Protective Systems (FPS): U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-24-74. DTIC ADB000799.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

(\*Body armor, Vests), (\*Helmets, Human factors engineering), Marine Corps personnel, Infantry, Ammunition fragments, Enlisted personnel, Weapons, Sizes(Dimensions), Field tests, Acceptability, Area coverage, Compatibility, Protective masks, Headgear, Ra

Ergonomics, Design, Comfort

Fields and Groups:

190400 - Armor

230200 - Human Factors Engineering & Man Machine System

230400 - Protective Equipment

Descriptors:

(U) (\*Body armor, Vests), (\*Helmets, Human factors engineering), Marine Corps personnel, Infantry, Ammunition fragments, Enlisted personnel, Weapons, Sizes(Dimensions), Field tests, Acceptability, Area coverage, Compatibility, Protective masks, Headgear, Radio equipment

Identifiers:

(U) Ergonomics, Design, Comfort

**System Description:**

The two protective systems were compared with each other and the current standard system. Comparisons made included physical characteristics, sizing system accommodation, compatibility with selected environmental clothing systems, and with selected infantry-employed weapons/equipment under static and dynamic situations. Thirty-three enlisted personnel, MOS 11B (Light Weapons Infantryman), performed an infantry assault scenario on the HEL Army Human Engineering Lab.) Mobility/Portability Course using each test system. Objective performance measures were overall time and discrete obstacle time. Subjective measures were rating scales and user panel discussions. These thirty-three infantrymen and an additional twenty-two infantrymen (MOS 11B) participated in compatibility assessments of a wide range of infantry-employed weapons and equipment. The results yielded many points of contrast between the proposed systems and the current system. Significant differences were found in both the objective and subjective evaluations between the proposed systems and the standard system. The proposed systems can be considered successful solutions, ergonomically, for use by infantrymen. No significant differences were found between the two proposed systems.

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation; Oct 74. Other requests for this document must be referred to Director, Human Engineering Lab., Aberdeen Proving Ground, Md. 21005. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- FRPC

**Reference** (Barker, 1996):

Barker, D. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the XM931 120mm Mortar Full Range Practice Cartridge (FRPC). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**



MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The XM931 120mm Mortar Full Range Practice Cartridge (FRPC) will be ballistically similar to the 120mm M934 HE Cartridge and will also be physically similar to the M934 in shape, size and weight. The XM931 will consist of a simulated M734EI Multi-Option Fuze (XM781 - a hybrid of the current M775 and M7S1 mortar practice fuzes), a low coat shell body, and similar M934 cartridge components such as the Fin Assembly (XM34), Ignition Cartridge (XM1005). Increment protectors, Obturating Band and the Final propellant Charge configuration resulting from the Residue Reduction Program. The XM931 fuze will release a bang, flash and smoke signature, through the body of the cartridge and out of the fin boom, upon ground impact. This signature will provide audio and visual feedback to the gun crew and forward observer. The practice cartridge will be less than or equal to 75% of the average unit production cost of the M934EI.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- GB2 Baseplate

**Reference** (Merkey and Paicopolis, 1987):

Merkey, R. P., & Paicopolis, P. S. (1987). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of a Redesigned Baseplate and Baseplate Wrench for the M687, 155mm, GB2 Binary Projectile: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. HEL-TN-1-87. DTIC ADB111631.

**Key Words:**

\*binary chemical agents, \*bases(structures), \*canisters, army research, chemistry, assembly, time, chambers, facilities, low temperature, test and evaluation, engineering, forward areas, removal, daylight, foam, spacers, high temperature, human factors

Fields and Groups:

190100 - Ammunition and Explosives

150603 - Chemical, Biological and Radiological Warfare

Descriptors:

(U) \*BINARY CHEMICAL AGENTS, \*BASES(STRUCTURES), \*CANISTERS, ARMY RESEARCH, CHEMISTRY, ASSEMBLY, TIME, CHAMBERS, FACILITIES, LOW TEMPERATURE, TEST AND EVALUATION, ENGINEERING, FORWARD AREAS, REMOVAL, DAYLIGHT, FOAM, SPACERS, HIGH TEMPERATURE, HUMAN FACTORS ENGINEERING, MISSIONS, POSTURE(GENERAL), PROTECTION, JAMMING

**System Description:**

The U.S. Army Chemical Research, Development, and Engineering Center redesigned the baseplate for the M687 binary projectile and consequently the baseplate wrench to accommodate it. The Human Engineering Laboratory was asked to repeat the assembly evaluation to ensure that the 2.5 man-minute assembly time could still be met. Because the canister interchange was only evaluated during the daylight ambient conditions in previous evaluations, HEL also evaluated the hot chamber, cold chamber, blackout, and mission-oriented protection posture (MOPP IV) conditions. The assembly time of 2.5 man-minutes was met for all conditions except for the cold chamber portion. The cold chamber portion of the evaluation could not be completed because of problems with the chamber facility. The recommendations are as follows: Stow the forward canister (di fluoro) in the projectile instead of the rear canister (isopropyl alcohol-isopropyl amine). Improve the projectile keyway to prevent jamming of the canister; Improve the suction cup to allow for easier canister removal; Secure the foam spacers in the projectile to prevent them from slipping out of position; and Complete the cold chamber evaluation.

**Report Availability:**

Distribution limited to U.S. Gov't. agencies and their contractors; Test and Evaluation; Mar 87. Other requests must be referred to Director, Human Engineering Lab., Aberdeen Proving Ground, MD 21005-5001. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- GEN II FLIR

**Reference** (Reinhart, 1994):

Reinhart, J. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Second Generation Forward Looking Infrared System (Gen II FLIR): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The Gen II FLIR system, also known as the Improved FLIR or I-FLIR, is one of three Horizontal Technical Inteyration (HTI) programs: Battlefield Digitization, Combat Identification, and second Generation FLIR technology insertion. B-Kit Gen II modules are common to all vehicles. A Kits are host platform specific hardware and the modifications required to incorporate the B-Kits. A-Kits are the responsibility of host platform Program Managers and are currently defined only in broad terms. A-Kit specifications and purchase Descriptions probably will not be written until B-Kit development is under way.

1. The Gan II FLIR program will replace current First Generation FLIR systems. It is currently designated for ground vehicle target acquisition systems. It will extend target acquisition and engagement ranges, increase commonality, reduce logistics and costs through centralized procurement.

2. The platforms and subsystems targeted to receive Gen II FLIR technology are; the M1A2 Abrams (Thermal Imaging sight on the Gunner's primary Sight and the Commander's Independent Thermal Viewer), the M2A3 and M3A3 Bradley Fighting Vehicle Systems for Infantry, Cavalry, and Stinger systems (Improved Bradley Acquisition System and Commander's Independent Viewer), Bradley Fire support Vehicle, the M8 Armored Gun System (AGS) (Thermal Imaging sensor on the Gunner's Primary Sighting System), and the Long Range Advanced Scout Surveillance System (LRAS3) development program.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Generator- MTG-2KW

**Reference** (School, 1998):

School, P. (1998). Manpower and Personnel Integration (MANPRINT) Assessment for the 2kw Military Tactical Generator (MTG). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The 2kW Military Tactical Generator (2kW MTG) set will be a skid mounted, soldier portable generator in two modes - 120 volts AC at 60 Hz and 28 volts DC. The 2kW MTG will provide electrical power for command, communication, control, and intelligence (C3I) systems, weapon systems, command post tactical operations systems, logistics systems, and quality of life enhancement. Non-dedicated (non-MOS specific) general purpose users will operate the sets. At the Direct Support and unit levels, MOS 52D will maintain the sets.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Generator- QRG- Corps/Div

**Reference** (Ainsworth and Smootz, 1987):

Ainsworth, J. S., & Smootz, E. R. (1987). Manpower and Personnel Integration (MANPRINT) Assessment for the Quiet Reliable Generators for Corps and Division Headquarters: A Human Factors and Safety Evaluation. Fort Hood, Texas: U.S. Army Research Institute for the Behavioral and Social Sciences (PERI-OH). 5001 Eisenhower Ave, Alexandria, VA 22333. ARI Research Note 87-36. DTIC ADA183902.

**Key Words:**

Mobile Electric Power (MEP); Generators (military); Human Engineering; Human Factors; Safety; MANPRINT

Fields and Groups:

100200 - Electric Power Production and Distribution

Descriptors:

(U) \*AUXILIARY POWER PLANTS, \*ENGINE GENERATOR SETS, LOW NOISE, COMMERCIAL EQUIPMENT, ACQUISITION, ELECTRIC POWER, GENERATORS, HUMAN FACTORS ENGINEERING, LIMITATIONS, MOBILE, NOISE, OPERATIONAL EFFECTIVENESS, QUIET, RELIABILITY, REQUIREMENTS, SAFETY, STANDARDS, TEST AND EVALUATION

Fields and Groups:

100200 - Electric Power Production and Distribution

Supplementary Note:

Appears as Chapter 6 and 7 of Rept. no. TCATA-OTN-1209, dated Aug 85.

Descriptors:

(U) \*AUXILIARY POWER PLANTS, \*ENGINE GENERATOR SETS, LOW NOISE, COMMERCIAL EQUIPMENT, ACQUISITION, ELECTRIC POWER, GENERATORS, HUMAN FACTORS ENGINEERING, LIMITATIONS, MOBILE, NOISE, OPERATIONAL EFFECTIVENESS, QUIET, RELIABILITY, REQUIREMENTS, SAFETY, STANDARDS, TEST AND EVALUATION

**System Description:**

This research note presents the results of a human factors and safety evaluation of commercial and product-improved military generators designed to meet the Army's mobile electric power needs and noise limit standards. The evaluation was part of an operational test conducted by the TRADOC Combined Arms Test Activity (TCATA), at Fort Hood, Texas. The United States Army Engineer School (USAES), in conjunction with the Army Materiel Command (AMC), Forces Command (FORSCOM), and the Project Manager-Mobile Electric Power (PM-MEP) defined the test requirements and identified several commercial and military generators having the potential for satisfying the Army's needs and standards. Test results will be used to develop specifications for the acquisition of future generators. Keywords: Mobile Electric Power(MEP); Generators(Military); Human Engineering; Human Factors; Safety evaluation.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Generator- TMSS-M

**Reference** (Gross, 2005):

Gross, R. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Trailer Mounted Support System-Medium (TMSS-M): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The TMSS-M is mounted on a COTS HP-2C trailer manufactured by DHS Systems and includes these major pieces of equipment (references 6-9):

(1) A 20 kilo Watt (kW) Generator Set. The COTS generator is housed in an acoustic enclosure and mounted over the trailer's single axle (see Appendix B, Figure 1). It is powered by an Isuzu® Model 4LE1, 54-horsepower, 4-cylinder, water-cooled, diesel engine (®Isuzu is a registered tradename of Isuzu Motors America, Inc., 46401 Commerce Center Dr., Plymouth Township, MI 48170). Fuel for the engine is either supplied from the trailer-mounted tank or an alternate source via fuel supply/return hoses carried on the trailer. A diesel fuel-fired coolant heater is integrated into the generator set to facilitate cold weather starting. Electrical power from the generator is used to power an environmental control unit (ECU) and/or tent/sheltered C2 and related equipment via 25-foot cables.

(2) The ECU. The COTS ECU is model DHS-5HT-005, manufactured for DHS Systems by United Coolair Corp®, mounted on the forward end of the trailer, and housed in a weatherproof enclosure (see Appendix B, Figure 1) (®United Coolair is a registered tradename of United Coolair Corp., 491 East Princess St., York, PA 17403). In the cooling mode, the ECU's total capacity is 60,000 British Thermal Units per hour (BTUH) at a maximum ambient temperature of about 130 of. In the heating mode, the ECU's total electric heat capacity is 61,400 BTUH at a minimum ambient temperature of -50 of. In either mode, the supply air flow rate to the tent/shelter is about 1,800 cubic feet per minute (cfm) of conditioned air. This air flow rate can be reduced to about 800 cfm with the use of a damper. Two 16-inch diameter and 15-foot long insulated air ducts with transport bags are supplied with the trailer. The air ducts connect to air supply and return duct adapter ports on the ECU and the tent/shelter (references 7 and 10).

(3) The Tent/shelter. A COTS medium Deployable Rapid Assembly Shelter (DRASH)® in the MX configuration (436 square feet) is carried in the trailer's rear storage/transport space in three separate transport bags (®DRASH is a registered tradename of DHS Systems; 33 Kings Highway, Orangeburg, NY 10962). The MX tent/shelter has an integral tube frame that opens as a geodesic structure (see Appendix B, Figure 2). Multiple tent/shelters can be linked together to the desired length. Windows, doors, lighting, power distribution, and heating/air-conditioning provisions are designed into the DRASH tent/shelter. The tent/shelter will likely be linked with the Command Post Platform Rigid Wall Shelter (CPP RWS) addressed in reference 11.

(4) Miscellaneous Equipment. The miscellaneous equipment carried on the trailer and used by the TMSS-M include trailer stabilizer jack stands, a grounding rod and wire, hand tools, a five-pound ABC-dry chemical fire extinguisher, tarp, and trailer electrical set.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Generator- TQG 3KW

**Reference** (School, 1999):

School, P. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the 3KW Tactical Quiet Generator (TQG-3KW). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The 3kW TQG is a small, diesel engine driven, 60 Hertz (Hz) or 400 Hz, mobile electric generator set. Each set is either skid or trailer-mounted and will provide electric power for command, control, communications and intelligence (C3I) systems, weapons systems, logistics support complexes and mobile medical support facilities.

**Report Availability:**

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**System Short Name:** MANPRINT- Generator- TQG 100/200 KW

**Reference** (School, 1998):

School, P. (1998). Manpower and Personnel Integration (MANPRINT) Assessment for the 100 Kw and 200 Kw Tactical Quiet Generator (TQG). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The 100, 200 kW Tactical Quiet Generator (100, 200 kW TQG) set will consist of six configurations:

- (1) 100 kW, 50 & 60 hertz (Hz), skid mounted, MEP 807A;
- (2) 200 kW, 50 & 60 Hz, skid mounted, MEP 809A;
- (3) trailer mounted, 100 kW, 50 & 60 Hz, PU-807A;
- (4) trailer mounted with switch box, 200 kW, 50 & 60 Hz, PU-807A;
- (5) trailer mounted, 200 kW, 50 & 60 Hz, PU-809A;
- (6) trailer mounted with switch box, 200 kW, 50 & 60 Hz, PU-809A.

According to the DRAFT Integrated Logistics Support Plan (ILSP) (see Data Source II.B.4, Section II), those configurations will provide mobile tactical electric power to units that cannot access fixed source power. These generators will replace the aging Military Standard 100 and 200 kW generator sets. They will provide power for Command, Control, Communication, Computer and Intelligence (C4I) type systems as well as lighting, soldier support, and soldier quality of life enhancement. These sets will be operated and maintained in daylight and darkness, in hot to basic climates, and when Nuclear, Biological and Chemical (NBC) threat conditions exist. Non-dedicated (non-MOS specific) general purpose users will operate the sets. MOS 52D (Power Generation Equipment Repairer), MOS 44B (Metal Worker), MOS 63B (Light Wheeled Vehicle Mechanic) will maintain the sets at the Unit, Intermediate and Direct Support levels.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Generator- TQG 100/200 KW

**Reference** (Reinhart, 2004):

Reinhart, J. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the 100 Kw and 200 Kw Tactical Quiet Generator (TQG). Redstone Arsenal, AL,,: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The 100 kW and 200 kW Tactical Quiet Generator (TQG) sets are mobile electrical generator sets in four configurations: 100 kW, 50/60 Hz, skid mounted; 200 kW, 50/60 Hz, skid mounted; 100 kW power unit (trailer mounted); and 200 kW power unit (trailer mounted). The 100 kW and 200 kW TQGs will replace the current 100 kW and 200 kW Military Standard (Mil-Std) generator sets and will weigh less, have better reliability, lower aural signature, and lower operational costs than the Mil-Std sets.

**Report Availability:**

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**System Short Name:** MANPRINT- GFEBs

**Reference** (Scribner, 2009):

Scribner, D. R. (2009). Manpower and Personnel Integration (MANPRINT) Assessment for the General Fund Enterprise Business System (Gfebs): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The General Fund Enterprise Business System (GFEBs) is a web-based system being developed to allow the U.S. Army to share financial and accounting data across the Service and thus enable the Army to comply with current statutory and regulatory requirements.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- GoldenEye-50 OCU

**Reference** (Jacobson and Burns, 2005):

Jacobson, C. N., & Burns, C. A. (2005). Manpower and Personnel Integration (MANPRINT) Assessment: An Assessment of the Goldeneye-50 Operator Control Unit (OCU). Aberdeen Proving Ground, MD: U.S. Army Research Laboratory, Human Research and Engineering Directorate. Aberdeen Proving Ground, MD. ARL Technical Report ARL-TN-0247. DTIC ADA438579.

**Key Words:**

hfe, robotic, unmanned

Fields and Groups:

010200 - Military Aircraft Operations

170800 - Miscellaneous Detection and Detectors

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*ROBOTICS, \*HUMAN FACTORS ENGINEERING, CONTROL SYSTEMS, PAYLOAD, UNMANNED, MULTIMODE, OPERATORS(PERSONNEL), RECONNAISSANCE, VERTICAL LANDINGS, CHEMICAL DETECTION, REMOTELY PILOTED VEHICLES, MAN COMPUTER INTERFACE, TAKEOFF, FLIGHT, WEAPON SYSTEMS, INTERFACES

Identifiers:

(U) \*OPERATOR CONTROL UNIT, \*GOLDENEYE 50, OCU(OPERATOR CONTROL UNIT), UAV(UNMANNED AERIAL VEHICLE), ARMY FUTURE COMBAT SYSTEM PROGRAM, HUMAN

MACHINE INTERFACE, HUMAN ROBOTIC INTERACTION, UNMANNED ASSETS, ORGANIC AIR  
VEHICLE 2 PROGRAM, HOVER-AND-STARE MODE

**System Description:**

The GoldenEye-50, developed by Aurora Flight Sciences, was selected by the Defense Advanced Research Projects Agency as one of multiple candidates to provide the basic platform for the Organic Air Vehicle II program for expected integration into the U.S. Army's Future Combat System program. The GoldenEye-50 is a transportable (approximately 18 lb) unmanned aerial vehicle (UAV) with vertical take-off and landing capability. It is designed to carry a payload to support reconnaissance and chemical detection missions and can transform from a hover-and-stare mode to wing-borne flight as needed. In support of the Human-Robot Interaction Army Technology Objective, an assessment of the operator control unit (OCU) was conducted during a technical demonstration of the GoldenEye-50 held at Fort Knox, Kentucky, from 9 to 12 May 2005. The authors' primary objective was to reveal human factors engineering issues associated with the design of the OCU interface and to learn the tasks of a UAV operator, particularly with multi-mode flight capability of vertical and horizontal flight. From the observational data, potential issues and recommendations for the final OCU interface design accepted by the Army are presented.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Grenade- Hand- Non Lethal Bursting NLBHG XM104

**Reference** (Whalen, 2008):

Whalen, J. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the XM 104 Non-Lethal Bursting Hand Grenade (NLBHG): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The XM104 NLBHG is designed to fill an existing gap in Non-Lethal (NL) capabilities, particularly the standoff distance. The grenade output combines a bright flash, loud explosion, and dispersion of up to 100 pilable rubber projectiles (0.32 inch diameter rubber balls) to disorient and confuse targeted personnel. The requirement is that it be effective within a radius of three meters (threshold).

The XM104 NLBHG has a M201A1 fuze and a pyrotechnic output charge inside a soft rubber body. The fuze has a persuasion primer, a spring-loaded striker, a safety lever, a pull ring assembly, a safety pin, a confidence clip, and a 1.5 second delay / separation charge. The overall time from release of the safety lever to fuze function is 2.6 +/- 0.5 seconds.

**Report Availability:**

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**System Short Name:** MANPRINT- Grenade- Hand- Practice Stun RSPHG XM102

**Reference** (Whalen, 1998):

Whalen, J. B. (1998). Manpower and Personnel Integration (MANPRINT) Assessment for the Reloadable, Stun, Practice Hand Grenade (RSPHG), XM102. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Stun Hand Grenade (Diversionary Device) is a non-lethal, low hazard, non-shrapnel producing explosive which will produce intense light and sound. The U.s. Army Military Police Corps is involved in missions that require the use of a stun Hand Grenade to confuse, disorient, or momentarily distract a potential threat. The device will be used to apply the minimum force necessary by tactical and non-tactical forces while performing missions of hostage rescue and capture of criminals, terrorists and other adversaries.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Grenade- Hand- Stun SHG XM84

**Reference** (Whalen, 1998):

Whalen, J. B. (1998). Manpower and Personnel Integration (MANPRINT) Assessment for the Stun Hand Grenade (SHG), XM84. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Stun Hand Grenade (SHG) XM84 is an ACAT III, Soldier Enhancement Program. The SHG is a non-lethal diversionary hand grenade which produces a mean flash intensity of 1.5 million candle power and a mean noise level of 170.1 dB at 1.5 meters. Tactical and non tactical U.S. Forces will use the SHG while performing missions of hostage rescue and capture of criminals, terrorists, and other adversary. The SHG is intended to disorient, distract, and or confuse an adversary long enough for the U.S. Forces to gain control of a situation. The standard M201 Smoke Grenade Fuze has been modified to provide a time delay of 1.5 seconds. The fuze is cemented to the plastic casing which contains the pyrotechnic output charge. After the fuze and the pyrotechnic output charge are joined, this sub-assembly is threaded into a perforated aluminum main body. The SHG is functioned in the same manner as the tactical and smoke hand grenades currently in the Army inventory. The SHG is readily distinguishable from other grenades by its small size and unique shape. It is color coded with a Green band, which is the regulation color used to identify non-lethal munitions.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Grenade Launcher- 40mm- Automatic- ALC XM174

**Reference** (Miles et al., 1968):

Miles, J. L., Jr., Ellis, P. H., & Kramer, R. R. (1968). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the XM-174 Automatic Grenade Launcher: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TN-11-68 LIMITED. DTIC AD0510938.

**Key Words:**

MANPRINT  
MANPRINT Assessment



Human Factors Engineering Assessment

MA

HFEA

(\*automatic weapons, projectors(ordnance)), (\*grenades, launching), firing tests(ordnance), human factors engineering, systems engineering, operation, maintenance, army training, infantry, accuracy, cyclic rate, design, safety, test methods, performance

\*grenade launchers, 40-mm grenade launchers, \*xm-174 grenade launchers(40-mm), m-407 cartridges, m-406 cartridges, \*m-174 grenade launchers

Fields and Groups:

190600 - Guns

Descriptors:

(U) (\*AUTOMATIC WEAPONS, PROJECTORS(ORDNANCE)), (\*GRENADES, LAUNCHING), FIRING TESTS(ORDNANCE), HUMAN FACTORS ENGINEERING, SYSTEMS ENGINEERING, OPERATION, MAINTENANCE, ARMY TRAINING, INFANTRY, ACCURACY, CYCLIC RATE, DESIGN, SAFETY, TEST METHODS, PERFORMANCE(HUMAN), PERFORMANCE(ENGINEERING), EFFECTIVENESS, GUN COMPONENTS(U) SEMIAUTOMATIC WEAPONS, SCATTERING

Identifiers:

(U) \*GRENADE LAUNCHERS, 40-MM GRENADE LAUNCHERS, \*XM-174 GRENADE LAUNCHERS(40-MM), M-407 CARTRIDGES, M-406 CARTRIDGES, \*M-174 GRENADE LAUNCHERS

**System Description:**

The human factors evaluation of the XM-174 automatic grenade launcher includes a design and operation evaluation and a field evaluation employing nine enlisted subjects with Infantry MOSs. The report includes detailed accuracy and rate-of-fire data and recommendations for weapon-design modifications.

**Report Availability:**

Distribution limited to U.S. Gov't. agencies and their Contractors; Specific authority; Other requests must be referred to Commanding Officer, Army Human Engineering Labs., Aberdeen Proving Ground, Md. 21005. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- Grenade Launcher- 40mm- Cartridge- AP-IS M81A1E1

**Reference** (Ellis, 1999):

Ellis, M. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 40mm, Armor Piercing with Impact Signature (AP-IS), M81A1E1. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Cartridge, 40mm,Armor Piercing. M81A1, is currently used by the U.S. Air Force Special Operations Command in an air-to-ground role to engage and defeat armored personnel carriers and light armored vehicles. It is fired from the Bofors L60 cannon mounted on the AC-130H/U Spectre gunship. The Operational Requirements Document, ASOC 002-91, AC-130 Lethality Enhancements, 17 Sep 97, requires the addition of a spotting charge to the existing inventory of M81A1 cartridge to allow tracking of non-direct hits and subsequent adjustment to the gunfire solution. The developmental round, designated the M81A1E1, loads a pyrotechnic charge into a modified wind-screen of the,M81A1 to provide the necessary target signature effects at terminal ballistics. The remainder of the cartridge is unchanged. The pyrotechnic charge is 8.25 grams of incendiary mix #136. This modification has not contributed to any significant change to any of the seven MANPRINT issues beyond those already associated with 40mm airborne artillery ammunition.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Grenade Launcher- 40mm- Cartridge- ASLM

**Reference** (Ortega, 2006):

Ortega, S. V. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the XM320 Area Suppression Lethality Module (ASLM): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The XM320 Area Suppression Lethality Module (ASLM) provides direct and indirect grenade, illumination, smoke, and riot control agent fires out to 400m, as well as non-lethal direct fires at close range. The ASLM system includes the following: a Grenade Launcher, mounting hardware to affix the launcher to a host weapon (M4, M16A2, M16A4, and the OICW Increment I), a day/night sighting device, a range determination device, a secondary sight, a stand-alone kit, and support equipment/publications. The ASLM is an improvement over the current M203 Grenade Launcher in that it can accept a wider variety of ammunition, can be mounted on multiple host weapons, and be configured as a stand-alone weapon. More importantly, the ASLM's day/night sight provides greater hit probabilities during both day and night operations. This improved capability will be fielded to the Army's emerging Units of Action.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Grenade Launcher- 40mm- Cartridge- CDC

**Reference** (DeBellis, 2001):

DeBellis, W. B. (2001). Manpower and Personnel Integration (MANPRINT) Assessment for the 40mm Crowd Dispersal Cartridge, XM1029. 21 March 2001. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The 40mm Crowd Dispersal Cartridge (CDC), XM1029, is an upgrade to the DEFTEC-37/40mm cartridge fired from standard civilian law enforcement tear gas grenade launchers. The upgrades consisted of an improved polyurethane lacquer top seal, 48 balls wrapped with a paper sleeve, lacquer around the primer, a thinner cartridge case which is more compatible with the M203 ejection mechanism, and the replacement of the black powder with smokeless powders as the propellant. The CDC is launched from the M203 grenade launcher attached to the M16 and M4 series weapons. The cartridge contains 48 rubber balls (diameter - 0.48 inch, weight - 0.08 ounce) launched with an effective range of 15-30 meters (threshold) and 10-50 meters (objective).

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies and their contractors; Critical Technology; MAR 2007. Other request shall be referred to U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425. This document contains export-controlled technical data.:

**System Short Name:** MANPRINT- Grenade Launcher- 40mm- Cartridge- CS Munition

**Reference** (Lewis, 1965):

Lewis, J. W. (1965). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the E24 CS Munition: U.S. Army Chemical Research and Development Laboratory, Edgewood Arsenal, MD. CRDL-TM-2-34 Project Number 1C522301A079. DTIC AD0474350.

**Key Words:**

(\*grenades, performance(engineering)), (\*smoke munitions, human factors engineering), rifle grenade launchers, protective clothing, hazards, quality control, cs agents, portable equipment, handling, firing tests(ordnance), circular error probable, termi  
40-mm ordnance items, m-79 grenade launchers.

**System Description:**

A human factors evaluation of the Cartridge, 40 mm, Riot Control, CS, E24 revealed that this device can be fired by the M79 launcher and by hand. However, accuracy of the device in the hands of relatively untrained personnel is low, and is much less when fired by hand than when fired from the M79 launcher. Also, hand-firing has some degree of hazard and should not be resorted to routinely. The design of the bandolier is adequate, but quality control of pocket size is necessary. The sealing tape on the munition is difficult to remove. Training, as differentiated from orientation in the use of the device, including test firings, is needed for all personnel who will be required to use it. (Author)

Unclassified Annotation: Human factors evaluation of the E24 CS munition.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Grenade Launcher- 40mm- Cartridge- Dummy M922A1

**Reference** (Spine, 1993):

Spine, R. J. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the 40mm, M922a1 Dummy Cartridge. Picatinny Arsenal, NJ: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The 40mm, M922A1 Dummy cartridge is a totally inert round of ammunition that is used to check the gun function of the MK19 Mod3 Grenade Machine Gun (GMG). It is also compatible with the M129 Grenade Launcher and the MK19 Mod1 GMG. Other applications for this cartridge in the 40mm system include immediate action drill training and gun crew training. This .cartridge is supported under "Training SUBsystems" in the Pre-Planned Product Improvements (PPPI) Group I of the Required Operational Capability (ROC) for the 40mm GMG, dated 3 Jan 1986. It is designed to replace the M922 'Dummy Cartridge. It has the same overall dimensions as the standard M430 High Explosive Dual Purpose (HEDP) Cartridge. Deficiencies of the current M922 include poor reliability, excess link fatigue, difficulty relinking and rebeltting, and separation of the slug from the cartridge case. The M922A1 is a one-piece design that increases reliability and eliminates debulleting. It also has machined grooves that aid in the positioning of the link and recoupling of the belt.

The 40mm, M922A1 Dummy Cartridge is similar to the standard M922 Dummy cartridge. The M922 Dummy Cartridge is totally inert and simulates a loaded round of 40mm High Explosive (HE) ammunition in size, shape and weight. The M922 round consists of a one-piece solid aluminum projectile body with a copper rotating band. An M169 cartridge case is crimped around the projectile body. There are four holes

drilled through the cartridge case to the high pressure chamber to differentiate it from the high explosive cartridges. The primer hole is filled with RTV sealant. The rotating band and the M16A2 links have been modified. A chamfer has been added to the rear edge of the rotating band Which, in conjunction with a relaxation of the force exerted by the retaining tabs on the M16A2 link, permits repositioning of the link after cycling in the MK19 weapons. The M922A1 Dummy Cartridge is also totally inert.-- It is a one-piece cartridge design in lieu of the current inert projectile/M169 cartridge Case. The base plug and the rotating band have been eliminated. The standard M16A2 link is used. The body has four grooves to enable repositioning of the link by hand and to allow link replacement if necessary. The inert primer pocket has been deepened and chamfered to prevent the MK19 firing pin from impacting the solid aluminum during weapon cycling. The RTV fill is not required. The cartridge case rim is chamfered to allow the bolt fingers to pick up the round more easily and the-help reduce aluminum 'buildup-on the vertical cam. Unlike the M922, the M922E2 will' be entirely gold colored with black,markings.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Grenade Launcher- 40mm- Cartridge- HEDP

**Reference** (Spine, 1994):

Spine, R. J. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the 40mm, M430a1, High Explosive Dual Purpose (Hedp) Cartridge Picatinny Arsenal, NJ: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The 40mm, M430AI, HEDP Cartridge is similar to the standard M430 cartridge except it has the capability to defeat personnel and soft targets and penetrate lightly armored vehicles out to the maximum range of 2200 meters. The ability to penetrate armored vehicles makes this round superior to its ammunition predecessors that were only antipersonnel in usage. This cartridge will enhance the capabilities of the 40mm Weapons System against the anticipated lightly armored future threat. The 40mm, M430AI, HEDP Cartridge has the same internal and external physical characteristics as the standard M430 cartridge except the length of the copper cone fluted liner has been extended by 0.100 inch and the amount of Comp AS explosive has been reduced by approximately 3 grams. This design change, providing increased standoff, will improve penetration performance without degradation in antipersonnel or dispersion capabilities.

**Report Availability:**

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**System Short Name:** MANPRINT- Grenade Launcher- 40mm- Cartridge- NLC XM1006

**Reference** (Whalen, 1998):

Whalen, J. B. (1998). Manpower and Personnel Integration (MANPRINT) Assessment for the 40mm Non Lethal Cartridge, XM1006. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The 40mm Non-lethal Cartridge (40mm NLC) is a Congressionally mandated, ACAT III, Soldier Enhancement Program. It will be used by military forces to apply the minimum force necessary while performing missions of crowd control and site and area security of key facilities throughout the world. The 40mm NLC is intended to be a direct fire, low hazard, and non-shrapnel-producing device, which will produce non-lethal blunt trauma upon impact. This cartridge will provide field commanders and soldiers an effective non-lethal capability that increases their flexibility in the application of force and increases their effectiveness during military operations in both war and Military Operations Other Than War (MOOTW).

The 40mm NLC is similar to the 40mm tactical round in size and shape. It uses standard propellant and has a percussion cap at the base of the plastic cartridge case. The projectile is made up of a plastic cylinder and a rounded closed cell foam bullet tip. These two components are cemented together and pressed into the plastic cartridge case. The foam tip of the projectile is color-coded with Green # 34540 which is the regulation color for Non-Lethal. The weight of the projectile is approximately 1 ounce (29.9 grams) and travels at a velocity of 85 meters per second. The 40mm NLC was designed to be used in the M203 Grenade Launcher. The M203 is mounted under the barrel of the M16 family of rifles and the M4 family of carbines. The ORO states the required operational engagement range is 15 to 30 meters and the desired operational range is 10 to 50 meters. The M203 Grenade Launcher leaf sight provides ballistic similitude for the 40mm NLC's maximum range of 50 meters. At ranges between 10 and 45 meters the shooter aims twenty-four inches below the target center of mass. The test data indicates the 40mm NLC exceeds its operational engagement range requirements, and will effectively operate at the desired range of 10 to 50 meters.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Grenade Launcher- 40mm- Cartridge- NLM (NLSRM)

**Reference** (Swiecicki, 2006):

Swiecicki, C. C. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the XM1 044 Non-Lethal Munition (NLM) for the MK19 Grenade Machine Gun (NLM / NLSRM): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The MK19 Non-Lethal Ring Airfoil is a 40 mm ring airfoil round fired from an MK19 Grenade Machine Gun. The round consists of: the ring airfoil, large pistol primer, large pistol primer holder, small pistol primer, small pistol primer holder, pusher, projectile retainer nut, link, link mount, forward body, base, forward charge, rear charge.

Use Scenario. The MK19 Non-Lethal Ring Airfoil will operate in diverse weather conditions and environments with a high rate of successful engagements. It is the only nonlethal, rapid fire capability that exists.

The ability to target groups or areas with rapidly delivered, robust non-lethal effects is needed to meet the needs associated with counter-personnel missions. The MK-19 NLM is designed to be a rapid-fire, area coverage non-lethal capability with a minimum range of 10 meters and a maximum range out to threshold distance of 100 meters. The current candidate developmental non-lethal projectile for the MK-19 includes a blunt trauma capability against the targeted personnel.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Grenade Launcher- 40mm- GLM XM320

**Reference** (Ortega, 2008):

Ortega, S. V. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the XM320 / XM320E1 Grenade Launcher Module (GLM): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The XM320/XM320E1 GLM is a 40mm grenade launcher non-developmental item (NDI) produced by Hechler and Koch (H&K), which can be attached to the 5.56mm M4 MWS, 5.56mm M16A2/M16A4 semi-automatic rifles or used as a Stand Alone (SA) system. Figures 1 through 3 depict the various configurations. The weapon's SA configuration and multi-host weapon attachment system will allow increased modularity and will enable units to better configure their weapons based on mission need. When used with the M16 series weapons, the designation XM320 GLM applies and when used with the M4 Modular Weapon System, the designation XM320E1 applies. The 40mm GLM can be employed against point and area targets in defilade positions (for example, bunkers, rooms, and trenches). The XM320/XM320E1 is a single shot, break open weapon. The barrel opens by unlocking and swinging the breach to the left. The GLM has an unrestricted breach design, enabling capability growth by allowing the system to fire longer projectiles than possible with the current M203 system. The trigger of the XM320/XM320E1 is a double action only type and has an ambidextrous manual safety. The GLM is manually operated and is designed to fire all current U.S. standard low-velocity 40 x 46mm lethal and non-lethal munitions. Also, an NDI Day/Night Sight (DNS) is provided as part of the system. An earlier version of the DNS, termed the AN/PQS-18A, is being fielded under the Rapid Fielding Initiative (RFI). An H&K ladder sight for back-up and a commercial off-the shelf (COTS) handheld Laser Range Finder (LRF) are also provided as part of the system.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Grenade Launcher- Automatic- Sight Bracket MK19

**Reference** (Ortega, 1998):

Ortega, S. (1998). Manpower and Personnel Integration (MANPRINT) Assessment for the Three Adjustable Sight Brackets for the Mk 19 Automatic Grenade Launcher. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

For this abbreviated assessment, the Small Arms Systems Branch of ATC provided the MK 19 weapons, standard pintle and adapters, adjustable sight brackets, M2 tripod, and five tactical and armored vehicles. The, MK 19 was mounted on a specific vehicle using a standard adapter and pintle for that particular vehicle. Each prototyp~ adjustable sight bracket had a unique baseplate which was installed on the MK

19 weapon. The prototype adjustable sight bracket was then mounted on the MK 19 using the baseplate. An AN/TVS-S night scope was then mounted on the prototype bracket. This procedure was repeated for the other types of adjustable sight brackets. The five vehicles on which the MK 19 and adjustable sight brackets were installed were the up-armored High Mobility Multipurpose Wheeled Vehicle (HMMWV), the M113A2 Armored Personnel Carrier (APC), the M109 Self Propelled ISSmm Howitzer, the MBS Improved Recovery Vehicle, and the M992 ISSmm Ammunition Resupply Vehicle. The barrel of the weapon was oriented in one position, parallel to the longitudinal axis of the body of the vehicle, at various selected elevations. The distance of the center of the eye piece to the platform on which a soldier would place his feet were determined with the elevation of the adjustable sight bracket set at various ranges. Other human factors observations were conducted as the brackets were installed on and removed from the MK 19 weapon.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- GSE/GSS

**Reference** (Reinhart, 2008):

Reinhart, J. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the Ground Soldier Ensemble (GSE) / Ground Soldier System (GSS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The Ground Soldier Ensemble is an integrated dismounted Soldier situational awareness system for use during combat operations. It provides the ability to graphically display individual Soldier locations on a digital medium against a geo-referenced imagery product as the background and connects the Soldier to the network.

**Report Availability:**

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**System Short Name:** MANPRINT- HC3

**Reference** (Nesteruk and Cream, 2007):

Nesteruk, H., & Cream, W. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the High Capacity Communications Capability (HC3): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The High Capacity Communications Capability (HC3) is a family of transport communications terminals supporting the ground domain or Configuration Items (CIs) that support tactical communications needs and provides reconfigurable, high capacity, multi band, multi-mode, modular terminals capable of utilizing future satellites. The HC3 is a Theater-Level ground-tactical satellite communication terminal. The HC3

Theater-Level terminal will reside in the Integrated Theater Signal Battalion. HC3 will support tactical communications in the following configurations: Communications On-the-Move (COTM), and Communications At-The-Halt (CATH). The COTM and CATH environments accommodate SATCOM reach back that supports access to Ka-band, Ku-band, X-band, C-band, and Q-band satellite services. HC3 is a joint, high bandwidth, high throughput communications system that will utilize X-band, Ka-band (Wideband Gap filler Satellite (WGS)/Transformational Satellite (TSAT), Q-band (via Advanced Extremely High Frequency (AEHF), TSAT and commercial C, X (military Defense Satellite Communications System (DSCS) compatible) and Ku bands via numerous commercial satellites. HC3 will bridge the battlefield "digital divide" by providing unprecedented Warfighter access and full reach back capability as part of the Global Information Grid (GIG) and evolving FORCEnet, LandWarNet, and Command and Control (C2) Constellation architectures. Voice, video, data, and imagery services over HC3 transports will provide the Quality of Service (QoS) necessary to support ground tactical needs. HC3 will support simultaneous, multiple access on various ground tactical platforms. Tactical Network Operations nodes such as the Warfighter Information Network - Tactical (WIN-T), Network Operations Service Center (NOSC) shall be leveraged for network operations.

HC3 will be the TSAT capability that provides the tactical link to Joint Transformational Communications services and the GIG. With its support of high capacity, and diverse satellite services, HC3 can offer a broad range of capabilities and provide range extension with Spacecraft, Defense Information Services Network (DISN), and the GIG. HC3 will facilitate Intelligence, Surveillance and Reconnaissance (ISR) transport for Army forces via SATCOM and through the use of common data link (CDL) (Increment 1 objective) for sensor information provided by Military Intelligence assets via WIN-T, US Marine Corps (USMC) Tactical Data Network (TDN), or FORCEnet points of presence. HC3 will facilitate ISR convergence to Joint communications systems via both SATCOM range extension to other Joint platforms and supported agencies.

HC3 will consist of modular software-programmable and hardware-configurable digital terminal equipment that provides the flexibility and adaptability needed to support varied Joint warfighter communications missions. HC3 will achieve this by extending the hardware and Application Programming Interfaces (APIs) to enhance hardware reusability and software portability. HC3 connects Joint users to the GIG and Enterprise network gateways utilizing military and commercial satellites and other Joint platforms and supported agencies.

HC3 will support all five of the Joint Functional Concepts (JFCs): Battlefield Awareness, Force Application, C2, Protection, and Focused Logistics. The HC3 provides an enabling capability for the Commander of the Joint Force for mission execution to interface with the Intelligence community and other Government enterprises to support JFCs.

**Report Availability:**

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**System Short Name:** MANPRINT- HDSB

**Reference** (Singapore, 2000):

Singapore, M. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the Heavy Dry Support Bridge (HDSB). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Heavy Dry Support Bridge (HDSB) is a mobile, truck mounted, rapidly emplaced, Military Load Class (MLC) 96 capable, modular/sectionalized bridging system, and will fill all 40 meter or less dry gap bridging roles from the brigade rear to the Communication Zone (COMMZ) ports. The bridge will also serve in a limited assault role where gap widths exceed the capability of armored vehicle mounted bridging systems. The bridging system will be packaged on the Palletized Load System (PLS) Flatrack and transported



using the M1977 Common Bridge Transporter (CBT). The launcher will be integrated on a PLS variant with extended tow bar.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Heater- IECU 60k

**Reference** (Branscome, 2008):

Branscome, T. A. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the 60,000-Btu/Hr Improved Environmental Control Unit (60k IECU): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The 60,000 Btu/hr Improved Environmental Control Unit (60K IECU) is the Army's new generation of ECU that will replace the current Army MIL-STD ECU and the Air Force's Field Deployable ECU. This self-contained unit will provide cooling, heating, and dehumidification to equipment, personnel, and facilities in combat service support units. The 60K IECU design allows it to operate in almost any environmental condition from -25 to 125 degrees Fahrenheit, and is fully portable for movement from one location to another in uneven and rough terrain (up to 10 degrees from the horizontal plane) in a typical field environment. The nominal cooling capacity is 60,000 BTU/hr. The nominal heating capacity is 33,780 BTU/hr.

The 60K IECU uses the environmentally-friendly refrigerant R-410A, which will satisfy the requirements of the National Environmental Policy Act, which was amended in 2000 to ban the use of Ozone-Depleting Chemical (ODC). The external requirements are a power source of 208-volt AC, 3-phase, 50/60 hertz (Hz), a suitable level site, and an entry to a suitable wastewater drain up to 15 feet away. The design of the 60K IECU, when attached to a room or enclosure via flexible ducting, allows it to continuously maintain temperature and circulate and filter the air. The temperature is selected on the remote box assembly. The 60kBtu/h IECU features a variable frequency compressor motor drive to limit in-rush current. The 60kBtu/h facilitates self-contained operation in nuclear, biological, and chemical (NBC) warfare environments.

Individually, this air conditioning unit is not a primary threat target.

**Report Availability:**

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**System Short Name:** MANPRINT- Helmet- ACVC

**Reference** (Oblak et al., 1995):

Oblak, T., Ortega, S. V., Jr., Nagel, J. R., Hammock, C., & Harper, W. H. (1995). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering and Compatibility Assessment of the Advanced Combat Vehicle Crewman (ACVC) Helmet: U.S. Army Research Laboratory, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland. ARL Technical Report ARL-TR-904 LIMITED DIST.. DTIC ADB207785.

**Key Words:**

MANPRINT

MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*human factors engineering, \*crews, \*combat vehicles, \*marine corps personnel, \*protective clothing, \*helmets, test and evaluation, army research, humans, compatibility, prototypes, base lines, user needs, naval warfare, multipurpose, acceptability, gun acvc(advanced combat vehicle crewman) helmet, mcmh( marine corps multipurpose helmet), cvc( combat vehicle crewman's) helmet dh 132b, pe62716a

**System Description:**

In support of the U.S. Army Natick Research Development and Engineering Center (NRDEC), the Human Research and Engineering Directorate (HRED) of the U.S. Army Research Laboratory (ARL) conducted a human factors and compatibility evaluation of a prototype advanced combat vehicle crewman (ACVC) helmet from August to November 1993. The U.S. Naval Warfare Center requested that a similar evaluation be conducted by ARL of a Marine Corps multipurpose helmet (MCMH) in conjunction with the ACVC evaluation. The current combat vehicle crewman's helmet, the CVC DH 132B, was used as the baseline helmet for comparing the ACVC and the MCMH helmets. Seventy-one soldiers and marines participated as subjects. This study involved determining the helmets' user acceptance, compatibility, acceptance of maxilla facial protection (face shield) for the ACVC, comfort and fit, compatibility with selected items of personal equipment and protective clothing, durability and ruggedness, field of view evaluation, and donning and doffing evaluations using various gloved hand conditions. After 2 hours of wearing each test item while driving an armored vehicle, the subjects preferred the ACVC and the MCMH helmets for comfort and fit. However, the face shield of the ACVC became a hindrance with some gunners during simulated tank engagements. The use of the trigger finger mittens significantly reduced donning and doffing times, regardless of the helmet type used. As a result of this study, ARL made recommendations to improve the design of the prototype helmets.

**Report Availability:**

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**System Short Name:** MANPRINT- Helmet- CVC

**Reference** (Dickinson et al., 1975):

Dickinson, N. F., Houff, C. W., & Woodward, C. L. (1975). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Compatibility Assessment of the DH-132 Helmet, Combat Vehicle Crewman (CVC): U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-27-75. DTIC ADA020150.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*helmets, interfaces, comparison, communication equipment, compatibility, human factors engineering, linings, crews, combat vehicles, night vision devices, goggles, periscopes, tank crews, protective masks, anthropometry, binoculars, face(anatomy)

\*DH-132 helmets, T-56 helmets, Comfort, Brow pads

Fields and Groups:

230200 - Human Factors Engineering & Man Machine System

230400 - Protective Equipment

Descriptors:

(U) \*HELMETS, INTERFACES, COMPARISON, COMMUNICATION EQUIPMENT, COMPATIBILITY, HUMAN FACTORS ENGINEERING, LININGS, CREWS, COMBAT VEHICLES, NIGHT VISION

DEVICES, GOGGLES, PERISCOPES, TANK CREWS, PROTECTIVE MASKS, ANTHROPOMETRY,  
BINOCULARS, FACE(ANATOMY)

Identifiers:

(U) \*DH-132 helmets, T-56 helmets, Comfort, Browpads

**System Description:**

The assessment of the DH-132 Helmet, conducted in November 1972, investigated the compatibility and interface of the DH-132 Helmet System with associated equipment, as a component of a protective system and as an individual helmet. This report explains in general terms and pictorially demonstrates those areas of concern that have not been sufficiently addressed in the design of an individual helmet system or its interfacing with its associated equipment.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- HENLM-TAPM

**Reference** (Boynton, 2005):

Boynton, A. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Hand Emplaced Non-Lethal Munition-Taser Anti-Personnel Munition (HENLM-Tapm). Redstone Arsenal, AL, : Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Hand Emplaced Non-lethal Munition-Taser Anti-Personnel Munition (HENLM-TAPM) is a hand-emplaced device that can be employed singly or in groups to provide a standoff, non-lethal incapacitation capability to forces for a variety of tactical area denial applications. The stun effect of the unit provides an important option that is currently missing from the non-lethal arsenal and will allow commanders to engage targets with minimal unintended consequences while reducing fratricide. The unit will operate with limited oversight in diverse weather conditions and environments while achieving a high percentage of successful engagements. With these attributes, the TAPM has the potential to enhance mission performance and task accomplishment as a component of a combined non-lethal/lethal force.

**Report Availability:**

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**System Short Name:** MANPRINT- HNVS

**Reference** (Lazo and Breitmaier, 1980):

Lazo, J., & Breitmaier, W. A. (1980). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Support in the Helicopter Night Vision System (HNVS) Simulation Test Program: U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. Contract to Essex Corporation, Alexandria, VA. NADC-80172-60. DTIC ADB053865.

**Key Words:**

\*night vision devices, integrated systems, flight crews, human factors engineering, helicopters, navigation, marine corps aviation, infrared detectors, flight maneuvers, night flight, terrain avoidance, alphanumeric displays, night landings

hnvs(helicopter night vision system), h-53 aircraft, pe64213n, wuyd801, lpn-a533- 5333/001-d/9w0901-000

Fields and Groups:

170501 - Infrared Detection and Detectors

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*NIGHT VISION DEVICES, INTEGRATED SYSTEMS, FLIGHT CREWS, HUMAN FACTORS ENGINEERING, HELICOPTERS, NAVIGATION, MARINE CORPS AVIATION, INFRARED DETECTORS, FLIGHT MANEUVERS, NIGHT FLIGHT, TERRAIN AVOIDANCE, ALPHANUMERIC DISPLAYS, NIGHT LANDINGS

Identifiers:

(U) HNVS(HELICOPTER NIGHT VISION SYSTEM), H-53 AIRCRAFT

**System Description:**

This report documents the results of the Human Factors Engineering support provided to the Helicopter Night Vision System (HNVS) Simulation Test Program of the HNVS Project.

Unclassified

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation; 12 Jan 1981. Other requests for this document must be referred to Commander, Naval Air Development Center, Warminster, PA. 18974. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Howitzer- LW155 UFH- XM777

**Reference** (Kogler and Tauson, 1997):

Kogler, T. M., & Tauson, R. A. (1997). Manpower and Personnel Integration (MANPRINT) Assessment: Baseline Human Factors Engineering Evaluation for the 155mm, Ultralightweight Field Howitzer (Howitzer- LW155 UFH) (XM777). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The UFH is a 155mm lightweight towed cannon artillery system designed and developed by Vickers Shipbuilding & Engineering Limited (VSEL) in partnership with Textron Marine & Land Systems. The UFH has been tested and evaluated by numerous United States and United Kingdom defense agencies between 1989 and 1996. In March 1997, the UFH was announced as the winner of the competitive shoot-off sponsored by the JPMO LW155. The UFH weighs less than 9,000 pounds and was designed to meet or exceed the requirements identified in the Joint Operational Requirements Document and the technical and operational characteristics of the 16,000 pound M198 towed howitzer. Fundamental design principles include an optimized geometric design that ensures stability and performance at almost half the weight of conventional howitzers. This was achieved by lowering the trunnion height to 0.65 meters and mounting the ordnance well forward in the cradle, providing a forward center of gravity to counteract the movement of recoiling components.

The mission of the LW155 is to provide close and deep fire support, counterfire, and interdiction fire to support operations in both the U.S. Army and U.S. Marine Corps. It will provide the range, accuracy, and lethality of 155mm fire support during light forces and rapid deployment forces operations. It will be capable of firing all standard 155mm munitions. The LW155 will be towed by vehicle, airlifted by helicopter, and transported by landing craft and amphibious ship. The LW155 is an Acquisition Category II (ACAT II) developmental program currently in the EMD phase of the acquisition cycle. It has been given the designation of 155mm, light, towed, howitzer, XM777.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- HSTAMIDS

**Reference** (Reinhart, 1995):

Reinhart, J. (1995). Manpower and Personnel Integration (MANPRINT) Assessment for the Handheld Standoff Mine Detection System (HSTAMIDS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Combat engineers will use the Handheld Standoff Mine Detection System (HSTAMIDS) to detect metallic and nonmetallic antipersonnel and antitank mines. HSTAMIDS is currently an Advanced Technology Demonstration (ATD) program. It will be a handheld, self contained mine detection system consisting of passive and active sensors, a data processor, and visual and audio displays.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- HSTAMIDS

**Reference** (Reinhart, 2000):

Reinhart, J. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the Handheld Standoff Mine Detection System (HSTAMIDS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The HSTAMIDS is a hand held, manually operated mine detection device using metal detector and ground penetrating radar (GPR) technologies. It will be used to locate metallic and non-metallic anti-tank and anti-personnel mines. The HSTAMIDS uses metal detection and ground penetrating radar (GPR) technologies to detect buried targets.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- HSTAMIDS

**Reference** (Davison, 2003):

Davison, A. D. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the AN/PSS-14 Handheld Mine Detector (Handheld Standoff Mine Detector System (HSTAMIDS)): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The AN/PSS-14 is a handheld mine detector that enables a well trained operator to detect on-and off-road metallic and low-metallic mines. Dismounted soldiers will use it to detect both Anti-Tank (AT) and Anti-Personnel (AP) mines. It will present the user with audible signals when a potential mine detection occurs. It incorporates two sensor technologies, Ground Penetrating Radar (GPR) and Metal Detection (MD), each having distinctly different audible signals. The GPR and MD sensors are encased together in a search head positioned at the end of a variable length wand so that the operator can sweep the ground from an upright, kneeling, or prone position. The signal-processor for sensor inputs are contained in a small box, which can be mounted on the upper end of the wand or attached to the soldier's belt. The power-supply is enclosed in a small container and typically is connected to the soldier's belt. The AN/PSS-14 will offer an improved capability to detect low metallic AT and AP mines, an improved capability to detect mines in soils with high electrical conductivity, and a capability to reduce false alarms based on information from the two sensors. The AN/PSS-14 will replace the Portable Metallic-Mine Detection Set, AN/PSS-12, in Engineer Units.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- HTI-SGF

**Reference (Reinhart, 1999):**

Reinhart, J. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the Horizontal Technology Insertion (HTI) Second Generation Forward Looking Infrared (SGF). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Horizontal Technology Insertion Second Generation Forward Looking Infrared (FLIR) (HTI SGF).

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- HTI-SGF

**Reference (Reinhart, 2000):**

Reinhart, J. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the Horizontal Technology Insertion (HTI) Second Generation Forward Looking Infrared (SGF). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Horizontal Technology Insertion (HTI) Second Generation Forward Looking Infrared (SGF).

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- ICAP

**Reference** (Strother et al., 1973):

Strother, D. D., Hairfield, H. W., Rornbough, L. O., & Nethers, R. C. (1973). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Final Report on the Improved Cobra Armament Program (ICAP): U.S. Army Troop Support and Aviation Materiel Readiness Command, Attn: DRCPM-CO-T(2). St. Louis, MO 63120, contract to Bell Helicopter Textron, Fort Worth, TX. BHT-209-099-381. DTIC ADB040947.

**Key Words:**

\*attack helicopters, \*fire control systems, \*human factors engineering, man machine systems, cockpits, trade off analysis, control panels, air to surface missiles, instrument panels, control sticks, pilots, aerial gunners, systems engineering

H-1 aircraft, AH-1G aircraft, Tow missiles

Fields and Groups:

010301 - Helicopters

190500 - Fire Control and Bombing Systems

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*ATTACK HELICOPTERS, \*FIRE CONTROL SYSTEMS, \*HUMAN FACTORS ENGINEERING, MAN MACHINE SYSTEMS, COCKPITS, TRADE OFF ANALYSIS, CONTROL PANELS, AIR TO SURFACE MISSILES, INSTRUMENT PANELS, CONTROL STICKS, PILOTS, AERIAL GUNNERS, SYSTEMS ENGINEERING

Identifiers:

(U) H-1 aircraft, AH-1G aircraft, Tow missiles

**System Description:**

This report discusses human factors engineering (HFE) decisions and trade-offs which influenced the cockpit design of the TOW Cobra. The TOW Cobra is a modification of the Bell Helicopter Company (BHC) Model AH-1G reconfigured for the Improved Cobra Armament Program (ICAP). Remaining HFE problems are discussed and recommendations for remedial action are provided. This documentation in conjunction with those data presented in the HFE progress reports, may also serve as a baseline for application to follow-on system improvements for the AH-1G.

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Proprietary Info.; 5 Oct 79. Other requests for this document must be referred to Commander, Army Troop Support and Aviation Materiel Readiness Command, Attn: DRCPM-CO-T(2). St. Louis, MO 63120. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- ICH

**Reference** (Malkin, 1997):

Malkin, F. J. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Improved Cargo Helicopter ( ICH). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

(a) The ICB will be a product-improved CH-47D helicopter which is the fourth model series of a basic design type that served the U.S. Army with distinction during the Vietnam war. The CH-47D is a twin turbine-engine, tandem-rotor helicopter that was designed for combat and combat support, heavy-lift cargo missions. The basic airframe, in many cases, is over 35 years old and the electronics will be beyond their service life expectancy and are unable to meet the needs of the digital battlefield. Fleet sustainability has become a serious issue for the Army, as has mission compatibility with other Army aircraft that will communicate digitally on future battlefields. Mission equipment, to include communication and navigation suites are seriously outdated. ICH product improvements include airframe modifications to decrease vibration levels and stress loads, and the replacement of obsolescing avionics with systems that are supportable and able to operate on future digitized battlefields.

(b) The CH-47D's two, aft pylon-mounted engines simultaneously drive two tandem, three-bladed, counter-rotating rotors through engine transmissions, a combining transmission, drive shafting, and forward and aft transmissions. Drive shafting from the combining transmission to the forward transmission is housed in a tunnel along the top of the fuselage. The forward transmission is isolated in a pylon above the forward cabin section where sensitive electronic components are located. These many dynamic components of the helicopter's basic design generate considerable one-per-revolution, three-per-revolution, and six per-revolution vibrations during operations. The damage caused by these vibrations over time reduces system availability and drives up Operational and Sustainment (O&S) costs. The aft transmission, combining transmission, and drive shafting from the two engines all meet in the aft pylon, so vibration levels in the rear of the aircraft are the greatest and most complex. When the rotors are stationary, a gas-turbine auxiliary power unit drives a generator and hydraulic pump to furnish hydraulic and electrical power for ground operations. These dynamic components are also in the aft pylon contributing to cumulative structural stresses. However, these vibration-induced stresses pose less of an impact on maintainability and O&S costs than do those in the front of the aircraft because of the sensitivity of avionics located in the front.

(c) "Fuselage tuning" will be employed by the ICH design to reduce rotor-induced vibration levels. This reduced vibration will increase electronic and mechanical component service life expectancies, possibly allow elimination of some vibration absorbers, and reduce O&S costs.

(d) The ICH cockpit will feature a limited integrated avionics suite. Integrated cockpit displays and compatibility with data transfer systems (DTS) and the AMPS should reduce crew workload and facilitate interoperability with future U.S. digital systems. Space, weight and power provisions will allow future integration of digital components. The specifics of cockpit displays and integration will be determined by the contractor and the user community in a combined team approach using "virtual" avionics simulation software and a mock-up of the ICH cockpit in the contractor's System Integration Lab (SIL). The final configuration will be determined through a functional and cost trade-off analysis during the Engineering Manufacturing Development (EMD) phase.

(e) In a separate program proceeding (and supporting ICH) T55-GA-714A engines (qualified through a separate, fleet-wide engineering change proposal 'ECP') will ensure retention of the current CH-47D's lift capability. These same engines will have been previously qualified on the basic CH-47D and the MH-47E by the time ICH production representative aircraft are available for testing. The engines include Full Authority Digitized Electronic Control (FADEC) fuel controls, Improved Magnetostrictive Torque Meters (IMTs), tailpipes that are canted away from the fuselage to eliminate exhaust plume impingement on the aft fuselage, and an engine barrier filter that will permit extended operations in desert environments.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- IEWTPT

**Reference (Armstrong, 1994):**

Armstrong, R. N. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Intelligence Electronic Warfare Tactical Proficiency Trainer (Iewtpt): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.



**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

1. The Combat Electronic Warfare Intelligence (CEWI) units are currently unable to provide effective threat-oriented technical training for their Military Occupational Specialties (MOSs) (96D, 96H, 96R, 96U, 97E, 98e, 98G, 98H, 98J, 350B, 352C and 350/53). These units urgently need a means of supplying a simulated radio frequency environment containing threat communications and non-communications signals to organic tactical electronic warfare (EW) equipment. The IEWTPT will give the unit a realistic training environment in which they can train their personnel to properly apply threat-oriented technical skills, sustain operator proficiency, and enhance unit readiness.
2. The IEWTPT is a training device that will provide the Military Intelligence (MI) Commander a tool for individual, collective, and staff training. The primary objective of the IEWTPT is to sustain and improve the threat-oriented technical and linguistic skills of the CEWI unit personnel. A secondary goal of the IEWTPT is to provide a collective multidiscipline tactical training system. The IEWTPT will be used for Army test and evaluation programs and for training at individual, team, platoon and company level for tactical intelligence systems. The IEWTPT will be maintained by MOS 33T (electronic warfare-intercept tactical systems repairer), limited to remove and replace, at the unit level and by contractor logistic support at the depot repair level.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- IMF

**Reference** (Smootz, 1984):

Smootz, E. R. (1984). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors and Safety Evaluation of the Improved Message Facility (IMF): U.S. Army Research Institute for the Behavioral and Social Sciences (PERI-OH). 5001 Eisenhower Ave, Alexandria, VA 22333. ARI Research Note 84-109. ADA143840.

**Key Words:**

Human Factors; Human Engineering; C3(Command Control and Communication); Safety  
Fields and Groups:

230200 - Human Factors Engineering & Man Machine System

250300 - Non-radio Communications

Descriptors:

(U) \*MESSAGE PROCESSING, \*COMMUNICATIONS CENTRALS, PRODUCTION, FACILITIES, OPERATIONAL EFFECTIVENESS, HUMAN FACTORS ENGINEERING, SAFETY, QUESTIONNAIRES, TEXAS, CHARACTER RECOGNITION

Identifiers:

(U) IMF(Improved Message Facility),

**System Description:**

This report presents the results of a human factors and safety evaluation of the Improved Message Facility. The evaluation was part of Operational Test II conducted by the U.S. Army Communications-Electronics Board at Fort Hood, Texas in the summer of 1983. Numerous human factors problems and several safety problems were identified. The results were used at the In-Process Review to help reach a decision regarding full-scale production of the system.

The Improved Message Facility (IMF) is a semi-automatic, secure telegraph terminal facility which can send, receive and relay record communications traffic. It was developed by the Center for Communication Systems at Fort Monmouth, New Jersey, as an interim facility until a fully automated message switch can be fielded after 1990.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- IVCS

**Reference** (Corona et al., 1977):

Corona, B. M., Kaminski, W. J., Jones, R. D., Randall, R. B., & Woodward, A. A. (1977). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Assessment of the Infiltrator Vest Combat System 7 (IVCS): U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-3-77. DTIC ADB020344.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*vests, load distribution, mobility, military requirements, army personnel, performance(human), infantry, comparison, airborne, field tests, compatibility, human factors engineering, army equipment, ammunition, air drop operations, attachment, manportab

\*infiltrator vest combat system, ivcs(infiltrator vest combat system), alice(all purpose lightweight individual carrying equipment), all purpose lightweight individual carrying equipment, military uniforms

Fields and Groups:

150500 - Logistics, Military Facilities and Supplies

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*VESTS, LOAD DISTRIBUTION, MOBILITY, MILITARY REQUIREMENTS, ARMY PERSONNEL, PERFORMANCE(HUMAN), INFANTRY, COMPARISON, AIRBORNE, FIELD TESTS, COMPATIBILITY, HUMAN FACTORS ENGINEERING, ARMY EQUIPMENT, AMMUNITION, AIR DROP OPERATIONS, ATTACHMENT, MANPORTABLE EQUIPMENT, RIFLES, ACCEPTABILITY, GRENADES, FIELD ARMY, SQUAD LEVEL ORGANIZATIONS, ANTHROPOMETRY

Identifiers:

(U) \*INFILTRATOR VEST COMBAT SYSTEM, IVCS(INFILTRATOR VEST COMBAT SYSTEM), ALICE(ALL PURPOSE LIGHTWEIGHT INDIVIDUAL CARRYING EQUIPMENT), ALL PURPOSE LIGHTWEIGHT INDIVIDUAL CARRYING EQUIPMENT, MILITARY UNIFORMS

**System Description:**

This report describes an HFE assessment of the Belson Associates Infiltrator Vest Combat System VII (IVCS). The Army Lightweight Individual Carrying Equipment (ALICE) was used as the control. During this HFE assessment, both the IVCS and ALICE systems were subjected by infantrymen to a variety of infantry-related situations. These situations placed each system in a structured operational scenario. Based on the objective data measured, subjective data collected and observations, the IVCS as a concept for fighting load portage has some desirable characteristics. However, as currently designed, the IVCS is not acceptable as a one-for-one replacement for ALICE.

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Proprietary Info.; Mar 1977. Other requests for this document must be referred to Director, Human Engineering Lab., Aberdeen Proving Ground, Md. 21005., Availability: Document partially illegible. 03 - U.S. GOVT. ONLY; DOD CONTROLLED.:

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**System Short Name:** MANPRINT- JLCCTC

**Reference** (Korenthaus, 2006):

Korenthaus, C. M. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the Joint Land Component Constructive Training Capability (JLCCTC) Formerly the Army Constructive Training Federation (Actf): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Joint Land Component Constructive Training Capability (JLCCTC) mission, as stated within the Capability Production Document (CPD) dated 5 July 2005 is to fulfill the Army's requirements for training its forces in all aspects of command and control. It supports the Army's Training Transformation Master Plan, which prescribes improving the command and control of Army units by training their leaders and their command posts in a simulation environment. This training need is vital to the Battlefield Functional Mission Area (BFMA) concepts for command and control. This need falls under DOD's and the Army's modeling and simulation initiatives for joint training.

The JLCCTC is a computer based simulation system designed to support the training of unit commanders and their battle staffs from Battalion through Theater-level echelons in the field and in educational institutions. It provides a training environment capable of representing multiple threats across the operational spectrum to include conventional and unconventional warfare, terrorist operations, and operations other than war. The JLCCTC enhances the effectiveness of commander and staff training, exercises, and mission rehearsals by dramatically increasing the realism and the scope of the available training environment in accordance with Field Manual Operations (FMO) 3.0 to meet the requirements annotated in appropriate Universal Joint Task List, Army Universal Task List, Joint Operations Concept, and Force Operating Concepts. The Objective JLCCTC system includes a federation of Army training simulations that includes a core of modern behaviors modeled in Warfighters Simulation (WARFIM) with linkage to One Semi-Automated Forces (OneSAF) and a Logistics Federate (LogFed). The JLCCTC process provides the user with capability in the near term and evolving capability in the future as simulation systems improve.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- JLCCTC

**Reference** (Kortenhaus, 2007):

Kortenhaus, C. M. (2007). Manpower and Personnel Integration (MANPRINT) Assessment: Manpower, Personnel, and Training (MPT), Human Factors Engineering Assessment (HFEA), and Soldier Survivability Assessment (SSA) for the Joint Land Component Constructive Training Capability (JLCCTC): U.S. Army Research Laboratory, Aberdeen Proving Ground, MD, Human Research and Engineering Directorate, . ARL Reprint Report ARL-RP-0198. DTIC ADB334047.

**Key Words:**

Fields and Groups:

050900 - Personnel Management and Labor Relations

120900 - Cybernetics

150600 - Military Operations, Strategy and Tactics

Descriptors:

(U) \*COMPUTERIZED SIMULATION, \*HUMAN FACTORS ENGINEERING, \*BATTLE MANAGEMENT, \*BATTLE GROUP LEVEL ORGANIZATIONS, THREATS, MEASURES OF EFFECTIVENESS, SOFTWARE TOOLS, COMBAT SIMULATION, OPERATIONS OTHER THAN WAR, LEADERSHIP TRAINING, POSTWAR OPERATIONS, ARMY TRAINING

Identifiers:

(U) HFEA(HUMAN FACTORS ENGINEERING ASSESSMENT), JLCCTC(JOINT LAND COMPONENT CONSTRUCTIVE TRAINING CAPABILITY), BATTLE STAFFS, UNIT COMMANDERS, ARMY'S MANPRINT(MANPOWER AND PERSONNEL) PROGRAM

**System Description:**

The Joint Land Component Constructive Training Capability (JLCCTC) is a computer based simulation system designed to support the training of unit commanders and their battle staffs from Battalion through Theater-level echelons in the field and in educational institutions. It provides a training environment capable of representing multiple threats across the operational spectrum to include conventional and unconventional warfare, terrorist operations, and operations other than war. The JLCCTC enhances the effectiveness of commander and staff training, exercises, and mission rehearsals by dramatically increasing the realism and the scope of the available training environment in accordance with Field Manual Operations (FMO) 3.0 to meet the requirements annotated in appropriate Universal Joint Task List, Army Universal Task List, Joint Operations Concept, and Force Operating Concepts. The Objective JLCCTC system includes a federation of Army training simulations that includes a core of modern behaviors modeled in Warfighters Simulation (WARSIM) with linkage to One Semi-Automated Forces (OneSAF) and a Logistics Federate (LogFed). The JLCCTC process provides the user with capability in the near term and evolving capability in the future as simulation systems improve.

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies only; Critical Technology; OCT 2007. Other requests shall be referred to Director, U.S. Army Research Lab., Attn: AMSRD-ARL-HR-MT, Bldg. 459, Aberdeen Proving Ground, MD 21005-5425. (A reprint from the Department of the Army, G1, MANPRINT Office.). Distribution- 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- JLENS

**Reference** (Cook, 2005):

Cook, T. C. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS). Redstone Arsenal, AL.; U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

January 1996 the Office of the Secretary of Defense directing a Joint Service Program with Army as lead service initiated the JLENS program and the Army chartered the Aerostat Joint Project Office, (renamed the JLENS Project Office). The JLENS is an accelerated, Cruise Missile Defense (CMD) support Program. The Spiral 2 system is the Increment 1 system that meets the JLENS ORD Block I requirements. The Spiral 2 system is a part of the Program Executive, Office Missile and Space, System of Systems, Air Space and Missile Defense (ASMD SoS) employing advanced sensors and networking technologies to provide wide-area surveillance and precision tracking capabilities with a specific focus on Land Attack Cruise Missile Defense (LACMD). The dual aerostat system provides two individual radars, one for surveillance and one for precision tracking and illumination each hosted on a separate 74 meter aerostat. The aerostat will be unmanned, tethered and filled with helium and air.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- JLENS

**Reference** (Mares, 2005):

Mares, A. L. (2005). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Assessment for the Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS) Milestone B Decision Review: U.S. Army Research Laboratory, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland. ARL Technical Report ARL-TR-3701. DTIC ADB313948.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*defense systems, \*human factors engineering, \*cruise missiles, payload, detectors, performance(human), precision, communication and radio systems, ground support, army procurement, search radar, surveillance, helium, ground vehicles, air space, army eq  
pe62716a

Fields and Groups:

150300 - Defense Systems

160401 - Air- and Space-launched Guided Missiles

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*DEFENSE SYSTEMS, \*HUMAN FACTORS ENGINEERING, \*CRUISE MISSILES, PAYLOAD, DETECTORS, PERFORMANCE(HUMAN), PRECISION, COMMUNICATION AND RADIO SYSTEMS, GROUND SUPPORT, ARMY PROCUREMENT, SEARCH RADAR, SURVEILLANCE, HELIUM, GROUND VEHICLES, AIR SPACE, ARMY EQUIPMENT, RADAR TRACKING, ARMY PERSONNEL, ACQUISITION

**System Description:**

In January 1996, the Office of the Secretary of Defense, directing a joint service program with the U.S. Army as lead service, initiated the JLENS program and the Army chartered the Aerostat Joint Project Office (renamed the JLENS Project Office). JLENS is an accelerated, Cruise Missile Defense support program. The Spiral 2 system is the Increment 1 system that meets the JLENS operational requirements document block 1 requirements. The Spiral 2 system is a part of the Program Executive, Office Missile and Space, System of Systems, Air Space and Missile Defense, employing advanced sensors and networking technologies to provide wide area surveillance and precision tracking capabilities with a specific focus on Land Attack Cruise Missile Defense. The dual aerostat system provides two individual radars, one for surveillance and one for precision tracking and illumination, each hosted on a separate 74-meter aerostat. The aerostat will be unmanned, tethered, and filled with helium and air.

**Report Availability:**

Distribution: Further dissemination only as directed by Army Research Lab., JLENS Product Ofc., ATTN: SFAE-MSLE-CMDS-JLN, PO Box 1500, Huntsville, AL 35807-3801, DEC 2005, or higher DoD authority. This document contains export-controlled technical data. 05 - CONTROLLED; DOD CONTROLLED 57 - EXPORT CONTROL:

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**System Short Name:** MANPRINT- JNMS

**Reference** (Martin, 2005):

Martin, J. M. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Joint Network Management System (JNMS). Redstone Arsenal, AL,: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Joint Network Management System (JNMS) is a Combatant Commander (COCOM), Joint Task Forces (CJTF), joint communications planning and management system. It is an automated software system that will provide communications planners with a common set of tools to conduct high level planning, detailed planning and engineering, monitoring, control and reconfiguration, spectrum planning and management, and security of the system.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- JNN-N

**Reference (Waters, 2007):**

Waters, P. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the Joint Network Node-Network (Jnn-N) Program: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Joint Network Node-Network (JNN-N) Program.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- JRISS

**Reference (Coleman, 1997):**

Coleman, M. T. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Joint Recruiting. Information Support System (JRISS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Joint Recruiting. Information Support System (JRISS).

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- JSTDS-SS

**Reference (Garrett, 2008):**

Garrett, L. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the Joint Service. Transportable Decontamination System-Small Scale (JSTDS-SS): Unpublished Report. U.S. Army

Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The mission of the JSTDS-SS is to conduct operational decontamination and support thorough decontamination operations. The JSTDS-SS consists of an applicator module, accessory kit, 3,000 gallon blivet, and provides a five (5) jet personnel shower capability. The JSTDS-SS will be transportable by a non-dedicated platform [Le., High Mobility Multi-purpose Wheeled Vehicle (HMMWV)/Trailer, Family of Medium Tactical Vehicles (FMTV)/Trailer] off-road over any terrain. The applicator module is a diesel-motor powered high-pressure cleaning and decontamination system that produces warm water (50°C/122°F) and hot water (80°C/176°F). Decontamination is carried out with hot soapy water.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- JSTDS-SS

**Reference** (Garrett, 2009):

Garrett, L. (2009). Manpower and Personnel Integration (MANPRINT) Assessment for the Joint Service. Transportable Decontamination System-Small Scale (JSTDS-SS)- Addendum for Increment I: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The mission of the JSTDS-SS is to conduct operational decontamination and support thorough decontamination operations. The JSTDS-SS consists of an applicator module, accessory kit, 3,000 gallon blivet, and provides a five (5) jet personnel shower capability. The JSTDS-SS will be transportable by a non-dedicated platform [Le., High Mobility Multi-purpose Wheeled Vehicle (HMMWV)/Trailer, Family of Medium Tactical Vehicles (FMTV)/Trailer] off-road over any terrain. The applicator module is a diesel-motor powered high-pressure cleaning and decontamination system that produces warm water (50°C/122°F) and hot water (80°C/176°F). Decontamination is carried out with hot soapy water.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- JTAGS

**Reference** (Ruff, 1995):

Ruff, R. M. (1995). Manpower and Personnel Integration (MANPRINT) Assessment for the Joint Tactical Ground Station (JTAGS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Joint Tactical Ground Station (JTAGS) is a joint effort by the U.S. Army and the U.S. Navy to develop a tactical ground station to provide the Theater with a direct downlink from Department of Defense (DoD) space based sensors for near-real time early warning, alerting and cueing information on tactical ballistic missiles, slow walkers and other tactical events. Communications processors and radio frequency output organic to JTAGS will provide Predicted Ground Impact Point and Time, alerting and cueing information appropriately formatted for insertion into all possible theater networks, broadcasts, and key point-to-point communication systems to include voice warning. In addition, JTAGS supports the attack operations elements of Theater Missile Defense (TMD) by providing Estimated Launch Point and Time information on ballistic missile launches. JTAGS will be tactical, small, ruggedized, and readily deployable. It will be deployed to the Theater in pairs for redundancy and will be located at the theater level with connectivity to users. In wartime, JTAGS will be under the operational control of the theater Commanders-in-Chief.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- JTIDS

**Reference** (Avery and Pieper, 1988):

Avery, L. W., & Pieper, W. J. (1988). Manpower and Personnel Integration (MANPRINT) Assessment: MANPRINT Findings from the Investigative Operational Assessment of the Joint Tactical Information Distribution System (JTIDS). Fort Hood, Texas: U.S. Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA. Fort Hood Field Element, Working Paper WP FH 8807. DTIC ADA396042.

**Key Words:**

Fields and Groups:

050200 - Information Science

150600 - Military Operations, Strategy and Tactics

Descriptors:

(U) \*INFORMATION SYSTEMS, \*JOINT MILITARY ACTIVITIES, AIR DEFENSE, GUIDED MISSILES, POSITION(LOCATION), BATTALION LEVEL ORGANIZATIONS, SECURITY, TRANSPARENCY, TARGETS, TRANSMITTANCE, USER NEEDS, RADIO LINKS, SURFACE TO AIR MISSILES, ARMY OPERATIONS, ADA PROGRAMMING LANGUAGE, VOICE COMMUNICATIONS, TERMINALS

Identifiers:

(U) PATRIOT MISSILES, F-15 AIRCRAFT

**System Description:**

The Joint Tactical Information Display System (JTIDS) is a multiservice acquisition program being led by the US Air Force. JTIDS is designed to provide secure transmission of position, target track, and voice data between host terminals in a manner that is transparent to the user. The user or host terminal is any system which originates or receives digitized tactical information transmitted over the JTIDS secure radio links. The system was originally designed to provide communication between F-15 and Advance Warning and Control System (AWACS) aircraft and Combat Reporting Centers (CRC). The US Army recognized the potential for improved communication between Air Force and Army Air Defense Artillery (ADA) units, and within ADA units, and became part of the program well into the development process. The Army host terminals were to be TSQ-73s at the brigade and battalion levels for the HAWK fire units, the Platoon Command P9st (PCP) at the batteries, and the PATRIOT missile system.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- JTIDS

**Reference** (Martin, 1994):

Martin, J. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Joint Tactical Information Distribution System (JTIDS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The Joint Tactical Information Display System (JTIDS) is a multiservice acquisition program being led by the US Air Force. JTIDS is designed to provide secure transmission of position, target track, and voice data between host terminals in a manner that is transparent to the user. The user or host terminal is any system which originates or receives digitized tactical information transmitted over the JTIDS secure radio links. The system was originally designed to provide communication between F-15 and Advance Warning and Control System (AWACS) aircraft and Combat Reporting Centers (CRC). The US Army recognized the potential for improved communication between Air Force and Army Air Defense Artillery (ADA) units, and within ADA units, and became part of the program well into the development process. The Army host terminals were to be TSQ-73s at the brigade and battalion levels for the HAWK fire units, the Platoon Command P9st (PCP) at the batteries, and the PATRIOT missile system.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- JTIDS

**Reference** (Martin, 1995):

Martin, J. M. (1995). Manpower and Personnel Integration (MANPRINT) Assessment for the Army Class 2M Joint Tactical Information Distribution System (JTIDS) Program. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Joint Tactical Information Display System (JTIDS) is a multiservice acquisition program being led by the US Air Force. JTIDS is designed to provide secure transmission of position, target track, and voice data between host terminals in a manner that is transparent to the user. The user or host terminal is any system which originates or receives digitized tactical information transmitted over the JTIDS secure radio links. The system was originally designed to provide communication between F-15 and Advance Warning and Control System (AWACS) aircraft and Combat Reporting Centers (CRC). The US Army recognized the potential for improved communication between Air Force and Army Air Defense Artillery (ADA) units, and within ADA units, and became part of the program well into the development process. The Army host terminals were to be TSQ-73s at the brigade and battalion levels for the HAWK fire units, the Platoon Command P9st (PCP) at the batteries, and the PATRIOT missile system.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Land Combat Models

**Reference** (Hoffman, 1989):

Hoffman, J. C. (1989). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Implications for High Resolution Land Combat Models. Alexandria, Virginia: Military Operations Research Society (MORS), Alexandria, VA. DTIC ADA227842.

**Key Words:**

OPERATIONS RESEARCH MILITARY OPERATIONS, STRATEGY AND TACTICS PSYCHOLOGY  
\*COMBAT EFFECTIVENESS, \*MILITARY OPERATIONS, \*OPERATIONS RESEARCH,  
\*MATHEMATICAL MODELS,  
\*PERFORMANCE(HUMAN), ARMY PERSONNEL, BEHAVIOR, DATA BASES, DATA PROCESSING,  
DETERRENCE, FATIGUE, FLIGHT  
TRAINING, HUMAN FACTORS ENGINEERING, HUMANS, OPERATIONAL EFFECTIVENESS, PILOTS,  
PROFICIENCY, SMALL ARMS,  
TACTICAL WARFARE, WARFARE.

**System Description:**

Table Of Partial Contents: Fatigue of Soldiers in Battle; The Effects of Flying Training on Pilot Proficiency; Tactical Deterrent Effects Model; A human Performance Data Base for Target Engagements; The Fundamental Information Base for Modeling Human Behavior in Combat; Assessment of Combat Performance with Small Arms; Combat Operational Data Analysis: An Examination of World War II Suppression Data; On the Distribution of Combat Heroes; Factors in Combat Models; Inserting the Human Factors Into Combat Models; Human Factors- Implications for High Resolution Land Combat Models.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Laser- FS3

**Reference** (Reinhart, 2003):

Reinhart, J. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the Fire Support Sensor System (FS-3): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The FS3 will be an LRAS3 with the Laser Designator Module (LDM) from the Lightweight Laser Designator Rangefinder (LLDR) system attached to the top of the LRAS3. The LRAS3 is a long range reconnaissance and surveillance device used by armor and infantry scouts. The FS3 will be used by Knight and Stryker Fire Support Teams for target location and laser designation. Incorporating the LDM into the LRAS3 will permit fire support units to observe and laser designate targets at ranges much greater than possible with the predecessor GroundVehicle Laser Locator Designator (G-VLDD) and the smaller LLDR.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Laser- LLDR

**Reference** (Reinhart, 2001):

Reinhart, J. (2001). Manpower and Personnel Integration (MANPRINT) Assessment for the Lightweight Laser Designator Rangefinder (LLDR). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Lightweight Laser Designator Rangefinder (LLDR) is a lightweight, two-soldier portable target observation and location determining system with laser designation capability. The LLDR will provide forward observation personnel with the capability to accurately locate, identify, and range targets as well as laser designate targets for precision guided munitions.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Laser- MELIOS

**Reference** (Reinhart, 1993):

Reinhart, J. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the Mini Eyesafe Laser Infrared Observation Set (MELIOS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Mini Eyesafe Laser Infrared Observation Set (MELIOS).

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Laser- MILES

**Reference** (Actkinson, 1980):

Actkinson, T. R. (1980). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Multiple Integrated Laser Engagement System in an Operational Environment (MILES): U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. ARI-RR-1322 Project Number 2Q163743A792. DTIC ADA129730.

**Key Words:**

\*training devices, \*lasers, \*human factors engineering, hazards, army training, interfaces, safety, man machine systems, acceptability

MILES(Multiple Integrated Laser Engagement System), PE63743A, AS792

Fields and Groups:

050600 - Humanities and History

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*TRAINING DEVICES, \*LASERS, \*HUMAN FACTORS ENGINEERING, HAZARDS, ARMY TRAINING, INTERFACES, SAFETY, MAN MACHINE SYSTEMS, ACCEPTABILITY

Identifiers:

(U) MILES(Multiple Integrated Laser Engagement System),

**System Description:**

This report documents results of the human factors evaluation of the Multiple Integrated Laser Engagement System (MILES) during OT II. The research was designed to assess the man-machine interface and user acceptance of MILES.

Unclassified

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- LCS

**Reference** (Brainerd and Bruno, 1985):

Brainerd, S. T., & Bruno, R. S. (1985). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of a Prototype Load-Carrying System: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-15-85 LIMITED. DTIC ADB099022.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*portable equipment, \*army personnel, \*attitudes(psychology), \*human factors engineering, \*backpacks, test and evaluation, stability, mobility, removal, capacity(quantity), performance(human), infantry, prototypes, costs, wear, ammunition, rifles, magaz

lcs(load carrying system), load carrying system, alice(army lightweight individual load-carrying equipment), army lightweight individual load-carrying equipment, obstacle course, export control

Fields and Groups:

050800 - Psychology

150500 - Logistics, Military Facilities and Supplies

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*PORTABLE EQUIPMENT, \*ARMY PERSONNEL, \*ATTITUDES(PSYCHOLOGY), \*HUMAN FACTORS ENGINEERING, \*BACKPACKS, TEST AND EVALUATION, STABILITY, MOBILITY, REMOVAL, CAPACITY(QUANTITY), PERFORMANCE(HUMAN), INFANTRY, PROTOTYPES, COSTS, WEAR, AMMUNITION, RIFLES, MAGAZINES(ORDNANCE), SQUAD LEVEL ORGANIZATIONS, VESTS, AUTOMATIC WEAPONS, WEAPONS CARRIERS

Identifiers:

(U) LCS(LOAD CARRYING SYSTEM), LOAD CARRYING SYSTEM, ALICE(ARMY LIGHTWEIGHT INDIVIDUAL LOAD-CARRYING EQUIPMENT), ARMY LIGHTWEIGHT INDIVIDUAL LOAD-CARRYING EQUIPMENT, OBSTACLE COURSE, EXPORT CONTROL

**System Description:**

This study compared the performance and attitudes of test participants (TPs) while using the prototype load-carrying system (LCS) and the Army Lightweight Individual Load-Carrying Equipment (ALICE). The performance data collected included the TPs' times to march a cross-country course and to complete certain obstacles on the Human Engineering Laboratory (HEL) Mobility and Portability Course. Wear data were collected on the prototype LCS so its durability could be evaluated. The TPs recorded their attitudes on questionnaires. The experimenters noted any human factors problems during the test. The

compatibility of the prototype LCS with the equipment carried by the soldier was assessed. Two subtests were conducted in addition to the main test and will be discussed in separate sections of this report: M-16 rifle magazine removal and replacement, prototype LCS and ALICE, and Squad Automatic Weapon (SAW) magazine removal and replacement, prototype LCS and ALICE. The prototype load-carrying vest allowed more ammunition to be carried at little cost in course times. Removing rifle ammunition from the vest is easier than from the ALICE. The vest must be made more durable, though. The prototype pack is durable and has a large capacity, but the patrol pack needs a quicker and more stable method of attachment to the vest. Keywords: Backpacks; Obstacle course; Infantry.

**Report Availability:**

Distribution limited to U.S. Gov't agencies and their contractors; Critical Technology; Oct 1985. Other requests must be referred to Director, U.S. Army Human Engineering Lab., Aberdeen Proving Ground, MD 21005-5001., This document contains export-controlled technical data. 02 - U.S. GOVT. AND THEIR CONTRACTORS 57 - EXPORT CONTROL:

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**System Short Name:** MANPRINT- LGH

**Reference** (Reinhart, 1995):

Reinhart, J. (1995). Manpower and Personnel Integration (MANPRINT) Assessment for the Launched Grapnel Hook (LGH). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Launched Grapnel Hook (LGH) is a small, propelled grapnel used by individual soldiers to clear a footpath across trip wire initiated minefields. The LGH consists of a grapnel and a bullet trap device. The soldier launches the LGH from his service weapon by firing a round into the bullet trap. The soldier then pulls the grapnel back across the minefield with a cord attached to the grapnel. Tines on the grapnel snag trip wires and cause mine detonation.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- LKMD

**Reference** (Caplinger, 2009):

Caplinger, E. A. (2009). Manpower and Personnel Integration (MANPRINT) Assessment for the Lighting Kit, Motion Detector (LKMD): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

LKMD is a rapidly emplaceable local area intrusion detection sensor capable of providing early warning of an intrusion into an area of 90 degrees out from the center of the sensor to a distance of 80 feet. The LKMD can provide various responses to an intrusion, automatically resets itself for multiple detections, and is used to extend the surveillance capabilities of team-size and larger military units and operating areas. LKMD is extremely versatile in the tactical environment.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- LOGMARS

**Reference** (Kilduff et al., 1985):

Kilduff, P. W., Camden, R. S., Harnden, P. G., Kupets, G. A., Sr, & Shearin, J. D. (1985). Manpower and Personnel Integration (MANPRINT) Assessment: Logistics Application of Automated Marking and Reading Symbols (LOGMARS) Field Ammunition Supply Point Test and Human Factors Evaluation: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TN-6-85 LIMITED. DTIC ADB100832.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

Fields and Groups:

120500 - Computer Programming and Software

Descriptors:

(U) \*AMMUNITION, \*BAR CODES, \*INVENTORY CONTROL, ARMY PERSONNEL, AUTOMATION, CONTAINERS, EXTERNAL, HUMAN FACTORS ENGINEERING, INVENTORY CONTROL, LASERS, LOGISTICS, MACHINE CODING, MARKERS, OPTICAL SCANNING, RETAIL, SPECIALISTS, SUPPLY DEPOTS, SYMBOLS

Identifiers:

(U) \*LOGMARS code, SAAS 4 computer program

**System Description:**

LOGMARS is a Department of Defense (DoD) system of machine-readable symbology (bar codes) which will be affixed by Defense contractors and DoD activities on unit packs, outer containers, and selected documentation. With the introduction of the Tactical Army Combat Service Support Computer System (TACCS), the application of LOGMARS technology to retail ammunition is anticipated. The objective of this study was to determine the best way to implement LOGMARS for the retail inventory management of ammunition to achieve maximum effectiveness. Execution of this objective required developing and validating procedures for the integration of LOGMARS and automated Standard Army Ammunition System-Level 4 (SAAS-4), and evaluating the interaction between the soldier, equipment (wand and laser scanners), and the operating environment which impacts the operation of an Ammunition Supply Point (ASP). Twenty-two male military personnel with MOS 55B (Ammunition Specialist) were test participants. Principal findings show that LOGMARS equipment and proposed SAAS-4 software can be successfully used in the retail inventory management of ammunition, but not without specific performance and human factors problems.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- LRAS3

**Reference** (Reinhart, 1999):

Reinhart, J. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the Long Range Advanced Scout Surveillance System (LRAS3). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The LRAS3 is a long range reconnaissance and surveillance device. It will be used by armor and infantry scouts enabling them to conduct reconnaissance and surveillance missions while remaining outside of threat acquisition and engagement ranges. The LRAS3 sensor unit mounts to the turret ring of the M1114 or M1025A2 High Mobility Multipurpose Wheeled Vehicle (HMMWV) and can be dismounted, carried to a remote observation point, and used on a tripod.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- LRAS3

**Reference** (Reinhart, 2000):

Reinhart, J. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the Long Range Advanced Scout Surveillance System (LRAS3). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Long Range Advanced Scout Surveillance System (LRAS3) is a long range reconnaissance and surveillance device. It will be used by armor and infantry scouts enabling them to conduct reconnaissance and surveillance missions while remaining outside of threat acquisition and engagement ranges. The LRAS3 sensor unit mounts to the turret ring of the M1114 or M1025A2 High Mobility Multipurpose Wheeled Vehicle (HMMWV) and can be dismounted, carried to a remote observation point, and used on a tripod.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- LTV

**Reference** (Singapore, 1997):

Singapore, M. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Light Tactical Vehicle (LTV). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The LTV is a light tactical wheeled vehicle for conducting command and control, transporting light cargo and shelter carrier, and prime mover for towed weapons throughout all areas of the battlefield. The LTV shall have an up-armored variant with built-in ballistic protection. It will replace the current fleet of High Mobility Multipurpose Wheeled Vehicles (HMMWV)

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- LVOSS

**Reference** (Katznelson, 1996):

Katznelson, J. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the Light Vehicle Obscuration Smoke System (LVOSS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Light Vehicle Obscuration Smoke System (LVOSS) is a self-defense smoke obscurant device which can be externally mounted onto a light vehicle, such as the High Mobility Multi-purpose Wheeled Vehicle (HMMWV). Once activated by the vehicle crew, the LVOSS will be capable of providing obscuration in the visual and infrared portion of the electromagnetic spectrum in a matter of seconds. Ignition of the smoke grenades will be used to obscure the vehicle from enemy fire and provide an opportunity to reposition the vehicle. The LVOSS has the following components: grenade discharger, discharger mounting bracket, wiring harness, arming/firing unit, and grenades. The discharger and mounting bracket are mounted directly to the vehicle. The wiring harness connects the discharger and the arming/firing unit to the vehicle's electrical system. To operate the system, grenades are placed in the discharger, the arming/firing unit is armed, the button is pushed, and the grenade canisters are discharged. One arming/firing unit and discharger will be developed for all users. Different mounting brackets and wiring harnesses will be developed for each light vehicle variant.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- LW

**Reference** (Redden, 1994):

Redden, E. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Land Warrior System (Lw): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The Land Warrior is a first generation, integrated fighting system for dismounted combat soldiers. The subsystems and components that comprise the Land Warrior are both government furnished equipment (GFE) and items that will be developed by the contractor as part of the Land Warrior contract. Land Warrior is a soldier system, and thus MANPRINT is probably the most critical area in the development of the system. Without a successful MANPRINT integration effort, the Land Warrior will be nothing more than a melange of items given to the soldier to wear and carry.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:



**System Short Name:** MANPRINT- LW

**Reference** (Krausman et al., 2004):

Krausman, A. S., Boynton, A. C., Harper, W. H., Ortega, S. V., Jr., & Wilson, R. M. (2004). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Land Warrior, Version 1.0. Aberdeen Proving Ground, MD: U.S. Army Research Laboratory, Human Research and Engineering Directorate, Aberdeen Proving Ground, MD. Technical Report ARL-TR-3205. DTIC ADA425220.

**Key Words:**

land warrior

Fields and Groups:

120500 - Computer Programming and Software

150600 - Military Operations, Strategy and Tactics

Descriptors:

(U) \*COMPUTER PROGRAMS, \*LAND WARFARE, \*WEAPON SYSTEMS, COMPATIBILITY, HUMAN FACTORS ENGINEERING, MAN COMPUTER INTERFACE

**System Description:**

The Human Research and Engineering Directorate of the U.S. Army Research Laboratory conducted a human factors evaluation (HFE) of the Land Warrior system as part of the Land Warrior Safety Test conducted by Aberdeen Test Center at Aberdeen Proving Ground, Maryland, in March 2002. The primary objective was to identify human factors issues associated with the Land Warrior system. Five assessments were conducted as part of the HFE: glove compatibility, shooting performance, weapons compatibility, mobility and portability, and range of motion. Several issues were identified, and recommendations to alleviate the potential problems and increase overall system effectiveness are discussed.

The Land Warrior (LW) is the Army's "high tech" integrated Soldier-system designed to equip the dismounted Soldier for the future battlefield. The LW system will enable a Soldier to fight better at night and in all types of weather, communicate instantly with fellow squad members, and send real-time intelligence data such as photos and enemy position coordinates or concentrations of friendly forces (Garamone, 1998).

The idea of an integrated Soldier-system was first conceived in 1991 by an Army study group. In response, the Army initiated the Soldier integrated protective ensemble program (SIPE), whose goal was to integrate the Soldier with technology, thereby increasing lethality and survivability. Demonstrations of the SIPE program helped identify technologies that could be transitioned to the ensuing LW system (Spencer, 2000). The LW system consists of five subsystems:

1. The integrated helmet assembly (IHAS) features a helmet-mounted monocular display with flip-up design, thermal weapon sight (TWS), and video camera. The audio headset includes a chinstrap-mounted microphone and speakers mounted into the helmet suspension system.
2. A modular weapons system with the primary user weapons being the M16A4 rifle, M4 carbine, M240B machine gun, and M249 squad automatic weapon (SAW). Each weapon is fitted with a rail system to hold the following components: TWS, reflex or close combat optic (CCO), multi-function laser, video camera, and infrared aiming light.
3. Protective clothing and individual equipment, which consists of a soft armor ballistic protective vest with optional ballistic plates and load-carrying equipment. The modular packs consist of an approach pack, sustainment pack, and butt pack.
4. A wearable computer and radio, which features a global positioning system receiver, capture and transmission of video imagery, a squad radio with type 1 encryption, and a Soldier radio with type 3 encryption.
5. Computer software, which provides digitized map displays, overlays, signal operating instructions, and controlled messaging. The software allows images from the TWS and video camera to be transmitted to the IHAS and throughout the chain of command.

An LW-equipped Soldier is shown in figure 1. Several prototype LW systems underwent operational testing in 1996. Following the test, Soldiers commented that the system enhanced situational awareness, was user friendly and easy to learn, reduced Soldier workload, and improved squad communications.

However, they recommended that the system be made lighter, have a more powerful battery, have better controls, and be made more rugged (Spencer, 2000).

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- LW

**Reference** (Reinhart, 2007):

Reinhart, J. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the Land Warrior (Lw). Redstone Arsenal, AL.; U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Land Warrior (LW). LW is an integrated combat fighting system. It enhances the lethality, battle-command compatibility, survivability, mobility, and sustainability of dismounted combat leaders, enabling them to engage and defeat enemy targets while minimizing friendly casualties. LW facilitates command, control, and sharing of battlefield information and integrates combat Soldiers down to the team leader level into the digitized battlefield. The LW system includes a laser rangefinder, visual displays, integrated load carrying equipment with ballistic protection, protective clothing, helmet, speaker, microphone, computer, navigation, radio, and controls with a consistent and intuitive interface for use under battlefield conditions. These components are integrated together into a system to support the mission of the combat Soldier. The LW system is modular to permit tailoring for mission requirements, and has the flexibility for expanded capabilities. LW will interface with the M4 carbine, the M203, and the M249 weapon systems. Currently, LW is planned to be fielded down to the team leader level.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- LWGM XM192

**Reference** (Whalen, 2004):

Whalen, J. B. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Lightweight Ground Mount (LWGM) XM192. APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Lightweight Ground Mount (LWGM) is intended to be a lightweight replacement for the current M122A1 Medium Machinegun Tripod. The LWGM has an integrated Traverse and Elevation (T&E) mechanism with elevation and azimuth position indicators and weapon pointing capability with 1 mil fine adjustment. The T&E mechanism will allow rapid and bold adjustment and display weapon elevation and azimuth information during bold adjustments. The legs and T&E mechanism of the LWGM are capable of being folded and repositioned to reduce the size, without disassembly, into a compact package for storage and transporting. Overall mount length is less than the M122A1 when folded/collapsed for transport and has a geometry that takes advantage of the full range and versatility of the M240B and

M249 weapons while allowing the weapon to maintain consistent elevation/depression throughout the full range of weapon traverse.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- LWP

**Reference** (Reinhart, 1996):

Reinhart, J. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the Lightweight Water Purifier (LWP). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Lightweight Water Purifier (LWP) will be a small, mobile, reverse osmosis water purification system. The LWP must produce at least 125 gallons per hour (GPH) of potable water from fresh water and 75 GPR from sea water. Small military units and detachments, Special Operations Forces (SOF), and temporary medical facilities will use the LWP.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- LWP

**Reference** (Reinhart, 1997):

Reinhart, J. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Lightweight Water Purifier (LWP). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Lightweight Water Purifier (LWP) will be a small, mobile, reverse osmosis water purification system. The LWP must produce at least 125 gallons per hour (GPH) of potable water from fresh water and 75 GPH from sea water. Small military units and detachments, Special Operations Forces (SOF), and temporary medical facilities will use the LWP.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Mask- Cold Weather- Face- CWFM

**Reference** (Bensel et al., 1972):

Bensel, C. K., Johnson, R. F. Q., & Nichols, T. L. (1972). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Cold Weather Face Masks (CWFM): U.S. Army

Natick Research and Development Center, Clothing, Equipment, and Materials Engineering Laboratory,  
Natick, MA. USA-NLABS-TR-72-73-PR. DTIC AD0745087.

**Key Words:**

\*human factors engineering, \*protective masks, acoustics, speech, vision, acceptability, hearing, cold weather tests

Fields and Groups:

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*PROTECTIVE MASKS, ACOUSTICS, SPEECH, VISION, ACCEPTABILITY, HEARING, COLD WEATHER TESTS

**System Description:**

A human factors evaluation of three types of cold weather face mask (the Army Standard and two experimental masks) was made in a series of investigations: A visual field investigation, a psychoacoustic investigation, a personal/equipment compatibility test and an arctic chamber test. Results indicated that (a) all three masks were virtually equivalent with respect to the size of the field of vision and person/equipment compatibility, (b) acceptability of the masks varied from a psychoacoustic point of view as a function of the particular variable being measured, and (c) under simulated arctic conditions, the experimental masks offered far better protection of the wearer's skin than did the standard mask.

**Report Availability:**

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**System Short Name:** MANPRINT- Mask- Cold Weather- Headgear- CWHG

**Reference** (Lockhart and Bensel, 1975):

Lockhart, J. M., & Bensel, C. K. (1975). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Cold Weather Headgear (CWHG): U.S. Army Natick Research and Development Center, Clothing, Equipment, and Materials Engineering Laboratory, Natick, MA. CEMEL-150 NDC-TR75-104-CEMEL Project Number. DTIC ADA018237.

**Key Words:**

\*headgear, \*cold weather, \*human factors engineering, protective clothing, environmental protection, cold regions, moisture, protective clothing, compatibility, army research, goggles, humidity, thermal stresses, protective masks, hoods, collars

Comfort

Fields and Groups:

150500 - Logistics, Military Facilities and Supplies

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*HEADGEAR, \*COLD WEATHER, \*HUMAN FACTORS ENGINEERING, PROTECTIVE CLOTHING, ENVIRONMENTAL PROTECTION, COLD REGIONS, MOISTURE, PROTECTIVE CLOTHING, COMPATIBILITY, ARMY RESEARCH, GOGGLES, HUMIDITY, THERMAL STRESSES, PROTECTIVE MASKS, HOODS, COLLARS

Identifiers:

(U) Comfort

**System Description:**

A human factors evaluation of the standard and experimental insulating caps and of the standard cold weather headgear system (cap plus arctic hood and fur ruff with and without the cold weather face mask) and the experimental cold weather headgear system (cap, face piece, and integrating collar) was made in a series of investigations: a visual field investigation, a personal and equipment compatibility test, and cold-wet and cold-dry chamber tests. Results indicated (a) superiority of the experimental system over the standard system only with respect to the size of the field of vision and rotation head movements and (b)

standard system superiority over the experimental system for donning speed, ventral-dorsal head movements and thermal protection, comfort, and preference during cold-dry exposure. (Author)  
Unclassified

**Report Availability:**

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**System Short Name:** MANPRINT- Mask- Protective- CVC- SPFM

**Reference** (Bruno, 1982):

Bruno, R. S. (1982). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Combat Vehicle Crewmember (CVC) Spall Protective Face Masks (SPFM): U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TN-2-82. DTIC ADA112226.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*Human factors engineering, \*Combat vehicles, \*Protective masks, Crews, Prototypes, Test and evaluation, Ratings

Fields and Groups:

190300 - Combat Vehicles  
230200 - Human Factors Engineering & Man Machine System  
230400 - Protective Equipment

Descriptors:

(U) \*Human factors engineering, \*Combat vehicles, \*Protective masks, Crews, Prototypes, Test and evaluation, Ratings

**System Description:**

This report is a human factors evaluation of the Combat Vehicle Crewmember Spall Protective Face Masks. The US Army Human Engineering Laboratory was tasked by the US Army Natick Research and Development Laboratories to conduct an evaluation of two prototype concept face masks. A third concept face mask was configured during the evaluation. Recommendations are described in detail.

**Report Availability:**

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**System Short Name:** MANPRINT- MBCOTM

**Reference** (Martin, 2007):

Martin, J. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the Mounted Battle Command on the Move (Mbcotm) Program: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Mounted Battle Command on the Move (MBCOTM) Program.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- MCF

**Reference** (Reinhart, 1993):

Reinhart, J. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the Modular Causeway Ferry (MCF): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Modular Causeway Ferry will provide a lighter interface between roll-on, roll-off and container vessels anchored offshore for transfer of cargo to the beach in Logistics-Over-The-Shore (LOTS) operations.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- MDARS

**Reference** (Burcham, 1996):

Burcham, P. M. (1996). Manpower and Personnel Integration (MANPRINT) Assessment: System MANPRINT Management Plan (SMMP) Review Comments and Suggestions for the Mobile Detection, Assessment, and Response System (MDARS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

1. Reference revised SMMP for the Mobile Detection, Assessment, and Response System (MOARS); U.S. Army Military Police School; February 1996.
2. The Human Research and Engineering Directorate (HRED) was tasked to review the most current SMMP. The following documents were referenced:
  - a. Operational Requirements Document (ORO), 6 September 1995
  - b. AR 611-201, 1 July 1979
  - c. MOARS SMMP, 18 July 1990
  - d. Safety Assessment Report (SAR) for MDARS-I, 15 March 1996
  - e. Preliminary Hazard Analysis (PHA) for MOARS-E, 10 December 1994
  - f. Operational & Organizational (O&O) Plan, 8 January 1992
  - g. MOARS-I Concept of Operation, 6 October 1993
  - h. Test and Evaluation Master Plan (TEMP) for MDARS-I, August 1994

**Report Availability:**

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Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- MDARS

**Reference** (Spine, 2002):

Spine, R. J. (2002). Manpower and Personnel Integration (MANPRINT) Assessment for the Mobile Detection Assessment and Response System-Interior (MDARS-I): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Mobile Detection Assessment and Response System-Interior (MDARS-I) is a joint Army-Navy effort to field interior autonomous robotic platforms for security and product assessment (inventory) functions at Department of Defense (DoD) warehouse and storage sites under supervised-autonomous control. MDARS-I consists of an MDARS-I Control Station (MCS); RPVs, each equipped with a mission payload suite (MPS); a product database station; data access station(s); dedicated recharging stations; radio frequency identification tags and tag launching station(s); and communication links between the MCS and the RPVs. The MDARS-I is designed as a modular system and can accept a variety of system, subsystem, and component improvements and configuration changes without major redesign. The mission of the MDARS-I is to supplement security and inventory personnel with a semiautonomous platform that can conduct routine surveillance, product assessment, and intruder detection functions. The MDARS-I will also be used to respond to alarms to assess the area in question. Additionally, other sensors may be placed on the RPV for further information (smoke, for example).

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies only; Test and Evaluation. Other requests shall be referred to Director, U.S. Army Research Lab., Attn: AMSRL-HR-MB, Aberdeen Proving Ground, MD 21005-5425. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- MDARS-E

**Reference** (DeBellis, 2001):

DeBellis, W. B. (2001). Manpower and Personnel Integration (MANPRINT) Assessment for the Mobile Detection Assessment Response System- Exterior (MDARS-E). 11 March 2001. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Mobile Detection Assessment Response System (MDARS) is an effort to field interior and exterior autonomous platforms for security and inventory functions at Department of Defense warehouses and storage sites. The MDARS-E is the exterior version of this system. The overall MDARS effort consists of multiple interior and exterior mobile platforms controlled from a single control console, using the Government developed and owned Multiple Resource Host Architecture (MRHA) software. The MDARS-E is designed as a modular system that can accept a variety of system, subsystem, and component improvements and configuration changes throughout its life cycle without major redesign. The primary operational mode is fully autonomous with the capability to be remotely controlled from the operator console. It can be manually controlled when it is off-line through the use of a pendant that is connected to the robot through a short electrical cable. The pendant has a joy stick and a basic set of function switches.

The current design for the robot is a diesel powered four-wheeled vehicle that will be designed to allow for continuous operation of a minimum of 8 hours before refueling is required. The normal mode of operation is fully autonomous using differential global positioning, gyroscopic, and landmark navigation. Obstacle avoidance is obtained through a combination of laser scanning, ultrasonic sensors, and a non-operator involved stereo vision system. The current mission payload consists of intrusion detection, inventory tag reading, and barrier assessment subsystems.

The MDARS-E will provide commanders at Army, Air Force, Navy, and Defense Logistics Agency facilities with the capability to conduct autonomous, random patrols and surveillance activities, including barrier assessment and theft detection functions. MDARS-E can be used in a variety of applications such as: general storage facilities; depots; armament, ammunition, and explosives storage areas; airfields; railroad yards; and port facilities. The MDARS-E will autonomously conduct surveillance activities checking for intruders, conducting lock interrogations, and assessing the status of facility barriers, such as doors of storage bunkers.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- MDARS-I

**Reference** (DeBellis, 1997):

DeBellis, W. B. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Mobile Detection Assessment Response System Interior (MDARS-L). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The MDARS consists of multiple robotic security platforms operating under a high level remote host, with direct supervision of a human operator. The supervised robotic system is geared towards a single guard controlling up to eight robotic platforms whereby the system basically runs itself until an exceptional condition is encountered that requires human intervention.

A globally-shared world. model provides a real-time collision avoidance capability complementing the Cybermotion virtual path navigation scheme. An interactive Radio Frequency (RF) tag reading system onboard each patrolling robotic platform incorporates a centralized database of high-value inventory which is routinely, compared with observed inventory as monitored. Each platform is furnished with a suite of microwave, ultrasonic, passive infrared, and video motion detection sensors which provide a full 36Q-degree coverage. An intelligent security assessment algorithm is employed to maximize the probability of detection while filtering out nuisance alarms.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- MDARS-I

**Reference** (School, 1998):

School, P. (1998). Manpower and Personnel Integration (MANPRINT) Assessment for the Mobile Detection Assessment and Response System-Interior (MDARS-I). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.



**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Mobile Detection Assessment and Response System-Interior (MDARS-I).

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- MDARS-I

**Reference (DeBellis, 2003):**

DeBellis, W. B. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the Mobile Detection Assessment and Response System - Interior (MDARS-I): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Mobile Detection Assessment and Response System (MDARS) is a joint Army-Navy development effort to provide an automated intrusion detection and inventory assessment capability for use in DoD warehouses and storage sites. The program is managed by the Office of Program Manager - Physical Security Equipment at Ft. Belvoir, VA. Overall technical direction for the program is provided by the Space and Naval Warfare Systems Center, San Diego (SSC San Diego).

The MDARS goal is to provide multiple mobile platforms that perform random patrols within assigned areas of warehouses and storage sites. The patrolling platforms: detect anomalous conditions such as flooding or fires, detect intruders, and determine the status of inventoried items through the use of specialized RF transponder tags.

The MDARS-Exterior Program extends the robotic security and inventory control concepts of the Interior program into the realm of semi-structured outdoor environments (i.e., improved roads, defined fence lines, and standardized storage layouts) such as storage yards, dock facilities, and airfields. Inventory control will consist of verifying the contents of closed structures (i.e., warehouses, bunkers, igloos) without the need for opening, as well as inventory of items that are stored outside of structures (i.e. planes, HMMWVs, etc).

The Exterior Program, initiated in 1993, awarded a BAA contract for the development of the outdoor mobility platforms to Robotic Systems Technology (RST, now GDRS), Westminster, MD. The mobility base is a rugged four-wheel hydrostatic-drive diesel-powered vehicle equipped with active-laser, ultrasonic-sonar, millimeter-wave-radar, and stereo-vision sensors for collision avoidance. A formal demonstration of autonomous navigation along straight-line path segments under differential GPS control was conducted at the contractor's facilities in October 1996. Automatic collision avoidance and limited intruder sensing (using image-stabilized video motion detection) was demonstrated in September 1997 at the DoD Force Protection Equipment Demonstration held at the Marine Corps Air Station in Quantico, VA. Additional efforts will focus on autonomous transit of non-linear path segments and fully integrated intrusion detection employing both video and Doppler radar. Two BAA prototypes underwent a successful Technical Feasibility Testing in May 2000. A System Development and Demonstration contract was awarded to GDRS in January 2002. An Initial Operational Test and Evaluation (IOT&E) is scheduled to be conducted at Anniston Army Depot, AL in FY06 that combines both the MDARS-I and MDARS-E systems.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- MDI

**Reference** (Gunn, 1999):

Gunn, K. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the XM151/XM152 Det Cord Components of the Modernized Demolition Initiators (MDI) System. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

XM151/XM152 Det Cord Components of the Modernized Demolition Initiators (MDI) System.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Medical- BMIS-T

**Reference** (Headley, 2004):

Headley, D. B. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Battlefield Medical Information System -- Telemedicine (BMIS-T) AN/Tyq-105. Redstone Arsenal, AL.: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Battlefield Medical Information System -- Telemedicine (BMIS-T) AN/TYQ-105 is a COMPAQ iPAQ handheld Personal Digital Assistant which has a customized software package called Battlefield Management Information System – Telemedicine (BMIS-T). “BMIS-T is a point-of-care medical digital assistant and support architecture which helps to improve military health care by improving medical decision making, reducing errors beginning at the first responder level and providing more accurate information to higher echelons of medical care” (BMIS-T User Manual). The AN/TYQ-105 in turn is the designated mobile data recording device for Medical Communications for Combat Casualty Care, a system of systems.

BMIS-T employs open source software, which enables providers to quickly access readiness information and construct a complete electronic field medical record. It can act as a stand alone system or can transmit medical data to servers in a net-centric environment providing data for readiness, medical history, consultation, evacuation and other medical planning and force health surveillance.” (from BMIS-T User Manual)

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Medical- BMIS-T

**Reference** (Headley, 2006):

Headley, D. B. (2006). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Assessment of the Speech Recognition Enhancement to the AN/Tyq-105, Battlefield Medical Information

System - Tactical (BMIS-T): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The AN/TYQ-I 05 is a iPAQ handheld Personal Digital Assistant which has a customized software package called Battlefield Management Information System - Tactical (BMIS-T). "BMIS-T is a point-of-care medical digital assistant and support architecture which helps to improve military health care by improving medical decision making, reducing errors beginning at the first responder level and providing more accurate information to higher echelons of medical care" (BMIS-T User Manual). The AN/TYQ-I 05 is the designated mobile data recording device for Medical Communications for Combat Casualty Care, a system of systems.

As a means to enable easier data input, a speech recognition device was created by Planning Systems Inc. to eliminate the need for tapping the screen, a two-hand requirement. With verbalization capability, ostensibly one hand would be then freed to perform medic functions. The device, called a HAB [Hybrid Adaptive Beamformer] microphone array, "is a beamforming system built to conform to the iPAQ handheld form-factor. The HAB Microphone consists of an array of four miniature microphones aligned in a diamond formation and a digital signal processing chip all housed in the standard PCMCIA form-factor." [Speech-input Capable Personal Digital Assistant (SCPDA) Voice-Enabled BMIST Tutorial, Planning Systems Inc., Revision # 53]. This assessment addressed the initial HAB version (RO) and included key assessments for product improvement (i.e., versions R1 and R2) developed during this time. All versions are described in paragraph 1 of Appendix A. At issue is the accuracy of speech recognition and any human factors problems inherent in the use of the devices.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Medical- TAMMIS

**Reference** (Smith and Tiffany, 1989):

Smith, N. D., & Tiffany, J. R. (1989). Manpower and Personnel Integration (MANPRINT) Assessment: Theater Army Medical Management Information System (TAMMIS): A MANPRINT Evaluation: U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. ARI-RR-1529. DTIC ADA212283.

**Key Words:**

Fields and Groups:

080300 - Physical and Dynamic Oceanography

Descriptors:

(U) \*BATTLEFIELDS, \*MEDICAL SERVICES, \*BIOMEDICAL INFORMATION SYSTEMS, TEST AND EVALUATION, COMPUTER PROGRAMS, FUNCTIONS, WARFARE, PEACETIME, ARMY TRAINING, OPERATIONAL EFFECTIVENESS, HUMAN FACTORS ENGINEERING, MEDICINE, DIVISION LEVEL ORGANIZATIONS, MICROCOMPUTERS, MILITARY COMMANDERS, MEDICAL PERSONNEL, COMBAT INFORMATION CENTERS, MEDICAL SUPPLIES

Identifiers:

(U) MANPRINT, TAMMIS

**System Description:**

In late 1979, the Office of the Surgeon General (OTSG) recommended development of the Theater Army Medical Management Information System (TAMMIS) to meet and anticipate information requirements of field medical units. A Mission Element Need Statement (MENS) was approved in January 1981. In February 1983, a contract was awarded to develop TAMMIS to serve the Division Medical Supply Office (DMSO)

and higher echelon medical units up to the Medical Group at Theater level. In October 1985, the contract was modified to extend TAMMIS to serve the DMSO and lower echelon units down to the medical platoons within combat and combat support battalions. The Division level and below variant of TAMMIS was named TAMHIS-D.

The TAMMIS/TAMHIS-D systems were developed to meet the needs of medical commanders by providing timely, accurate, and relevant information on the status of patients, medical units, and medical supplies on the battlefield. TAMMIS is defined as an automated, on-line, interactive, microcomputer system that manages combat medical information. The system is designed for wartime operations, but includes the automation of peacetime functions that can be easily suppressed in transition to war. Within TAMMIS-D are the subsystems HEDLOG-D and HEDPAR-D. TAMMIS has similar functions for HEDLOG and HEDPAR, and has the additional subsystems MEDBLOOD and HEDREG.

This report presents the MANPRINT portion of the Initial Operational Test and Evaluation (IOT&E) of the Theater Army Medical Management Information System (TAMMIS) and the division level version of the system, TAMMIS-D. TAMMIS/ TAMMIS-D are automated, on-line, interactive, microcomputer systems designed to manage combat medical information but capable of performing peacetime functions as well. The systems were developed to meet the needs of medical commanders by providing timely, accurate, and relevant information on the status of patients, medical units, and medical supplies on the battlefield. The IOT&E was conducted at Fort Lewis, WA in tents erected between two-story barracks building in January and February, 1988. Soldier operators and data collectors were provided by 9th ID and I Corps. Two test periods of 10 days each, 12 hours per day, were required-one for TAMMIS-D and one for TAMMIS. The TAMMIS-D test organization represented a battalion aid station, brigade surgeon. Six operators and four data collectors participated in the test of the two TAMMIS-D software subsystems. The TAMMIS test organization represented the combat support hospital, medical group, and the division surgeon. Twelve operators and nine data collectors participated in the test of the five TAMMIS software subsystems.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- MFCE

**Reference** (Bruno, 1979):

Bruno, R. S. (1979). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Male Field Clothing Ensembles (MFCE) Worn by Female Soldiers (Hot-Dry, Hot-Wet and Cold-Wet Environments): U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. HEL-TN-5-79. DTIC ADB041463.

**Key Words:**

\*human factors engineering, \*clothing, \*protective clothing, test and evaluation, sizes(dimensions), army personnel, comparison, compatibility, environmental tests, females, gloves, boots

Fields and Groups:

150603 - Chemical, Biological and Radiological Warfare

230200 - Human Factors Engineering & Man Machine System

230400 - Protective Equipment

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*CLOTHING, \*PROTECTIVE CLOTHING, TEST AND EVALUATION, SIZES(DIMENSIONS), ARMY PERSONNEL, COMPARISON, COMPATIBILITY, ENVIRONMENTAL TESTS, FEMALES, GLOVES, BOOTS

**System Description:**

This report describes a human factors evaluation of male clothing ensembles worn by 15 female soldiers. An increasing number of female soldiers are being assigned to combat support roles. The US Army Natick Research and Development Command (NARADCOM) tasked the US Army Human Engineering Laboratory (HEL) to explore the feasibility of issuing the same field clothing items to both male and female soldiers. This evaluation also considered the standard sizing system as well as expanded size

tariff items. The overall objective of this assessment was to determine fit and general compatibility of field clothing with Standard A Load Carrying System (ALICE) when used by female soldiers. Chemical-biological protective clothing and equipment compatibility and fit was evaluated. Recommendations concerning each item are described.

Unclassified

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies and their contractors; Specific Authority; Aug 1979. Other requests must be referred to Director, Army Human Engineering Lab., Aberdeen Proving Ground, MD 21005., Availability: Document partially illegible. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- MFCS-D

**Reference** (Lewis, 2009):

Lewis, J. T. (2009). Manpower and Personnel Integration (MANPRINT) Assessment for the Mortar Fire Control System – Dismounted (MFCS-D), M150/M151: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

(1) The MFCS-D is an add-on system that provides automated fire control for the smoothbore, muzzle-loaded M120 120 millimeter (mm) Towed Mortar System. The MFCS-D allows mortar crews to rapidly send and receive digital calls for fire messages, determine the pointing and positioning of the weapon, and calculate ballistic solutions. The MFCS-D permits shoot and scoot tactics that reduce the probability of detection and counter-battery fire. It provides the means for control, coordination, and synchronization of mortar fire support.

(2) The MFCS-D system will include portable rugged computer systems that will provide automated technical fire control. Each mortar computer will be able to compute its own ballistics and communicate digitally with the Fire Direction Center (FDC). The MFCS-D includes an FDC system (M151) and a Gun system (M150). The Gun system is equipped with a Fire Control Computer (FCC), an Advanced Single Channel Ground to Air Radio System Improvement Program (ASIP), a Portable Universal Batteries Supply, Enhanced Power Distribution Assembly (EPDA), a Pointing Device (PD), a Defense Advanced Global Positioning System (GPS) Receiver [DAGR], and a Gunner's Display (GD). The FDC system is equipped with a FCC and ASIP radios. The MFCS-D provides capabilities to calculate ballistic solutions for full- and sub-caliber training ammunition and all current U.S. Army mortar cartridges and fuze combinations.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- ABM- GMD TXBR

**Reference** (Mares, 2004):

Mares, A. L. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Ground Based Mid-Course (GMD) Test X-Band Radar (TXBR). APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The GBI acts in a defensive mode to intercept incoming ballistic missile warheads outside the Earth's atmosphere and destroy them by force of impact. During flight, the GBI receives information from the In-Flight Interceptor Communication System Data Terminal (IDT), enabling the GBI onboard sensor system to continually discriminate and track the target. The GBI missile consists of a three-stage solid propellant booster and an Exoatmospheric Kill Vehicle (EKV). Each GBI would contain approximately 20,500 kilograms (45,000 pounds) of hydroxyl-terminated polybutadiene solid propellant. Each EKV would contain approximately 7.5 liters (2 gallons) each of liquid fuel and liquid oxidizer.

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**System Short Name:** MANPRINT- Missile- ABM- GMDS

**Reference (Cook, 2005):**

Cook, T. C. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Ground Based Mid-Course Defense (GMDS) System. Redstone Arsenal, AL.; U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. Ground Based Interceptor (GBI): The GBI Component consists of two main components, the Interceptor and the GBI Support System (GSS). The Interceptor further consists of the Payload and the Boost Vehicle (BV). The payload is the Exoatmospheric Kill Vehicle (EKV). To support the GMD Element tests, the GBI component utilizes ground tests in the GMD Development and Integration Laboratory (GDIL), IIF, the Integration Assembly Test and Checkout (IAT&C) and Missile Assembly Building (MAB). The GBI Component will consist of a non-nuclear EKV mated to a three-stage booster, and associated GBI Support System equipment required for interceptor support and launch. It will use pre-commit and in-flight target update data provided by BMD sensors through the GMD Fire Control and Communications (GFC/C) Component to acquire the threat cluster. In the end game, the EKV seeker will select the target from other associated objects. After selecting an aim point and performing final maneuvers, the EKV will hit its target, destroying it by kinematics.

2. GMD Fire Control/Communications (GFC/C): The GFC/C Component provides the computing equipment, user interfaces, mission software, and communications needed for planning, controlling, and directing operations to accomplish the GMD Element mission. GFC/C collects and processes data from space-based and ground-based sensors performing surveillance, missile detection, tracking, target discrimination, and kill assessment functions. Using this information, GFC/C provides threat characterization, situation awareness, and decision support to the Human-in-Control (HIC) through interactive graphical displays, pre-approved rules of engagement, and engagement plans. The GFC/C Component consists of the following five major subComponents:

- GFC: provides the HIC interface to support decision-making and execution of commands. GFC maintains the current state information of the GMD System Components. It correlates (i.e., associates) and selects the best sensor data, and when required, fuses track, discrimination/classification, and kill assessment data. GFC also generates and updates engagement planning for weapon, sensor and GFC/C assets;

- GMD Communication Network (GCN): provides secure, survivable communications and network management services between all Components of the GMD Element. The GCN includes the Long Haul Communication (LHC) network, the LHC System Manager (LSM), the Communication Node Equipment (CNE), the Network System Manager (NSM) (for the CNE and associated workstations), and the GMD Voice Network (GVN);

- In-Flight Interceptor Communications System (IFICS) Data Terminal (IDT): provides communication services between the GFC nodes and the EKV. These communication services consist of In-Flight Target Update (IFTU) sent from IDTs to the interceptors, and In-Flight Status Reports (IFSR) sent from the interceptor to the IDTs.

3. X-Band Radar: The Test X-Band Radar (TXBR) is task-able, X-band, phased array radar that performs surveillance, acquisition, and tracking. The TXBR will search for threat objects, either autonomously or in response to cueing information. The TXBR employs electronic beam steering, coupled with a mechanically slewed antenna mount. The radar incorporates multiple wide-band waveforms for improved range resolution, target identification, and discrimination. The TXBR design is based upon a land based XBR design that completed its Final Design Review (FDR) in April 2002. The TXBR is a derivative of the XBR that meets the cost and schedule constraints of the GMD Test bed Capability. The original land based XBR design was a Multifunction Phased Array Radar (MPAR) evolved from the Ground Based Radar (GBR) and Theater High Altitude Air Defense (THAAD) family of radars. The radar offers limited field of view electronic beam steering with a mechanically slew-able antenna mount to provide an extremely flexible multi-target tracking capability. It also incorporates wide band waveforms for improved range resolution, target identification, and discrimination. The TXBR will utilize a 65%- populated version of the original XBR MPAR. The TXBR design will be a modified version of the land based XBR design suitable for basing on the semi-submersible SBX platform.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- ABM- NMD

**Reference** (Reynolds, 1997):

Reynolds, K. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the National Missile Defense (NMD) System. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The National Missile Defense (NMD) system is a strategic defense system that will provide protection to the United States against accidental and unauthorized launches and limited attacks by ballistic missiles. The NMD system subsystems elements now under development or modification are : a Ground Based Interceptor (GBI), a Ground Based Radar (GBR), Upgraded Early Warning Radars: Forward Based X-Band Radars (FBXBs), the existing early warning satellite system (DSP) and its planned follow-on, Spaced Based Infrared System (SBIRS) High, the Space and Missile Tracking System (SMMTS) know as SBIRS-Low, and a Battle Management/Command, Control and Communication (BM/C3) system The NMD BM/C3 architecture will be designed to promote interoperability. The NMD system will not be mobile. Major ground components will be housed in fixed facilities. The Army's portion of the system are the GBI, GBR and BM/C3.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- ABM- NMD

**Reference** (Cook, 1998):

Cook, T. C. (1998). Manpower and Personnel Integration (MANPRINT) Assessment for the National Missile Defense (NMD) System. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

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**System Short Name:** MANPRINT- Missile- ABM- NMD

**Reference (Ruff, 2000):**

Ruff, R. M. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the National Missile Defense (NMD). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The National Missile Defense (NMD) system is a strategic defense system that will provide protection to the United States against accidental and unauthorized launches and limited attacks by ballistic missiles. The NMD system subsystems elements now under development or modification are : a Ground Based Interceptor (GBI), a Ground Based Radar (GBR), Upgraded Early Warning Radars: Forward Based X-Band Radars (FBXBs), the existing early warning satellite system (DSP) and its planned follow-on, Spaced Based Infrared System (SBIRS) High, the Space and Missile Tracking System (SMMTS) know as SBIRS-Low, and a Battle Management/Command, Control and Communication (BM/C3) system The NMD BM/C3 architecture will be designed to promote interoperability. The NMD system will not be mobile. Major ground components will be housed in fixed facilities. The Army's portion of the system are the GBI, GBR and BM/C3.

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**System Short Name:** MANPRINT- Missile- ABM- THAAD

**Reference (Reynolds, 1996):**



Reynolds, K. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the Theater High Altitude Area Defense (THAAD) System. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Theater High Altitude Area Defense (THAAD) System will be a combat support weapon system. The THAAD Air Defense Weapon System is designed to provide protection against long range airborne threat missiles by intercepting and destroying them in flight in both endo and exo atmospheres. The THAAD System consists of multiple subsystem elements, composed of Missiles, Transporter and Launchers, Battle Management Command, Control, Communications, and Intelligence (BM/C3I) units, Radar Surveillance and Tracking Sensors and associated support equipment. The THAAD System will be fielded in Air Defense Artillery (ADA) Batteries as a part of an ADA THAAD Battalion. The THAAD system is intended to be a mobile, survivable system, capable of sustained day or night combat operations in all weather conditions in the battlefield environment. The THAAD supports the air defense needs of a THAAD Battalion.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- ABM- THAAD

**Reference (Ruff, 2000):**

Ruff, R. M. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the Theater High Altitude Air Defense (THAAD) System. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Theater High Altitude Air Defense (THAAD) System is an acquisition category ID combat support weapon system. It is designed to provide theater level defense against long range airborne threat missiles by intercepting and destroying them in flight in both the endo- and exo-atmosphere. The THAAD System consists of multiple subsystem elements, including Missiles, Transporter/Launchers, Battle Management/Command, Control, Communications, and Intelligence (BM/C3I) units, Radar Surveillance/Tracking Sensors and associated support equipment. The THAAD system will be fielded in air defense artillery (ADA) batteries as a part of an ADA THAAD battalion (Bn). It is intended to be mobile, survivable, and capable of sustained day/night combat operations in all weather conditions.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Air Defense- Hawk BCC

**Reference (Kurtz, 1971):**

Kurtz, G. L. (1971). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Field Test of the Improved Hawk Battery Control Central: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. HEL-TM-15-71. DTIC AD0518357.

**Key Words:**

\*man machine systems, \*guided missile personnel, \*antiaircraft defense systems, surface to air missiles, human factors engineering, performance(human), simulators, guided missile targets, guided missile tracking systems, training, mathematical models

Fields and Groups:

050600 - Humanities and History  
150302 - Antiaircraft Defense Systems  
160402 - Surface-launched Guided Missiles  
170403 - Radar Countermeasures  
170900 - Active & Passive Radar Detection & Equipment  
190500 - Fire Control and Bombing Systems  
230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*MAN MACHINE SYSTEMS, \*GUIDED MISSILE PERSONNEL, \*ANTIAIRCRAFT DEFENSE SYSTEMS, SURFACE TO AIR MISSILES, HUMAN FACTORS ENGINEERING, PERFORMANCE(HUMAN), SIMULATORS, GUIDED MISSILE TARGETS, GUIDED MISSILE TRACKING SYSTEMS, TRAINING, MATHEMATICAL MODELS, TACTICAL WEAPONS, TRAINING DEVICES, EFFICIENCY, EARPHONES, NOISE

**System Description:**

This report presents the methodology and results of a human engineering field test of the Improved HAWK Battery Control Central (BCC). The test was conducted to investigate the ability of a trained BCC crew to effectively operate the Improved HAWK System under a variety of simulated tactical engagement situations. Reaction times, errors and their causes are presented, along with suggestions for crew training.

Unclassified Regrade Code: C

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation; 13 Dec 71. Other requests for this document must be referred to Commanding Officer, Army Human Engineering Labs., Aberdeen Proving Ground, Md. 21005. 03 - U.S. GOVT. ONLY; DOD CONTROLLED. CONFIDENTIAL:

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**System Short Name:** MANPRINT- Missile- Air Defense- IAMD

**Reference** (Stewart, 2007):

Stewart, G. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the Integrated Air and Missile Defense (IAMD) System: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

IAMD will be a tailored, modular force with improved deployability and increased lethality. IAMD will provide fully integrated air and missile defense through a System of Systems (SoS) architecture for attack operations, active defense, passive defense and a common Battle Management, Command, Control, Communications, Computers and Intelligence (BMC4I) architecture. IAMD SoS construct calls for a single BMC4I architecture that enables any joint AMD Sensor and any joint IAMD Shooter to interact to defeat IAMD threats across the full spectrum of operations. IAMO SoS will also provide for third dimensional situation awareness/understanding, airspace management, and high-level operational protection throughout the friendly force battle space.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

**System Short Name:** MANPRINT- Missile- Air Defense- IAMD

**Reference** (Mares, 2009):

Mares, A. L. (2009). Manpower and Personnel Integration (MANPRINT) Assessment for the Integrated Air and Missile Defense (IAMD) System: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

IAMD will be a tailored, modular force with improved deployability and increased lethality. IAMD will provide fully integrated air and missile defense through a System of Systems (SoS) architecture for attack operations, active defense, passive defense and a common Battle Management, Command, Control, Communications, Computers and Intelligence (BMC4I) architecture. IAMD SoS construct calls for a single BMC4I architecture that enables any joint AMD Sensor and any joint IAMD Shooter to interact to defeat IAMD threats across the full spectrum of operations. IAMO SoS will also provide for third dimensional situation awareness/understanding, airspace management, and high-level operational protection throughout the friendly force battle space.

1. Army Integrated Air and Missile Defense (AIAMD). AIAMD is the integration of Army Air and Missile Defense (AMD) capabilities and the Army's contribution to Integrated Air and Missile Defense (IAMD) to defend the Homeland and U.S. national interests, protect designated forces and critical assets, and enable freedom of action by negating an adversary's ability to achieve effects from its air and missile capabilities. The core of IAMD is the Command and Control system, network and the multi-functional role capability provided to the Soldier. The IAMD program is structured to enable the development of an overarching system-of-systems capability with all participating AMD components functioning interdependently to provide total operational capabilities not achievable by the individual element systems. The program establishes the incremental IAMD architecture and will develop the IAMD Battle Command System (IBCS) that will provide the common IAMD Command and Control capability, the Integrated Fire Control (IFC) Network capability for fire control connectivity and enabling distributed operations, and the Common Plug and Fight (P&F) Modification Kits that will network-enable multiple sensor and weapon components.

The AIAMD SoS IAMD Battle Command System (IBCS) capability is a network-enabled, common battle command and control (CBCC) "Plug and Fight" architecture to integrate Patriot and Surface-Launched Advanced Medium-Range Air-to-Air Missile (SLAMRAAM) weapon system components (launchers and radars), and Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS) to be incorporated into data distribution schema: to provide operational integration with the Terminal High-Altitude Area Defense (THAAD) system; and to interoperate with other Air Defense Artillery (ADA) command and control elements, to include those of the Army, joint services, and multinational forces.

2. Intended Applications for Use: The IAMD system intends to improve the Soldier's Air Defense and Air Space Management role to protect friendly forces Army Integrated Air and Missile Defense (AIAMD). AIAMD is the integration of Army Air and Missile Defense (AMD) capabilities and the Army's contribution to Integrated Air and Missile Defense (IAMD) to defend the Homeland and U.S. national interests, protect designated forces and critical assets, and enable freedom of action by negating an adversary's ability to achieve effects from its air and missile capabilities. The AIAMD System of Systems (SoS) Increment 2 (INC 2) equipped deployed forces will support theater, operational and strategic operations in support of the Joint Force Commander (JFC).

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Air Defense- IM-99B

**Reference** (Bishop, 1961):

Bishop, C. C. (1961). Manpower and Personnel Integration (MANPRINT) Assessment: Human Engineering Evaluation of the IM-99B Weapon System: U.S. Air Force, Air Proving Ground Center, Eglin Air Force Base, Florida. USAFPG Technical Note TN 61-45. DTIC AD0269334.

**Key Words:**

\*antiaircraft defense systems, \*guided missiles, \*human factors engineering, ground support equipment, guided missile personnel, hazards, maintenance, maintenance personnel, operation, safety, surface to air bomarc

Descriptors:

(U) \*ANTIAIRCRAFT DEFENSE SYSTEMS, \*GUIDED MISSILES, \*HUMAN FACTORS ENGINEERING, GROUND SUPPORT EQUIPMENT, GUIDED MISSILE PERSONNEL, HAZARDS, MAINTENANCE, MAINTENANCE PERSONNEL, OPERATION, SAFETY, SURFACE TO AIR

Identifiers:

(U) BOMARC

Fields and Groups:

160400 - Guided Missiles

Descriptors:

(U) \*GUIDED MISSILES, \*ANTIAIRCRAFT DEFENSE SYSTEMS, \*HUMAN FACTORS ENGINEERING, GUIDED MISSILE PERSONNEL, OPERATION, GROUND SUPPORT EQUIPMENT, SURFACE TO AIR, MAINTENANCE PERSONNEL, HAZARDS, MAINTENANCE, SAFETY

Identifiers:

(U) BOMARC

**System Description:**

An evaluation was made, from a human engineering standpoint, of the design of equipment in the IM-99B complex. The purpose was to assess the adequacy of the weapon system, both fixed and mobile, and the presentation system insofar as they are affected by man in his maintenance, repair, and operation of the IM-99B weapon system. Human engineering deficiencies were noted and appropriate recommendations are made to correct or improve the performance of both man and/or the machine. Hydrazine hazards exist because of inadequately trained personnel and technical publications which do not provide detailed step-by-step purging procedures together with appropriate cautions and warnings.

The IM-99B weapon system consists of an interceptor missile together with the equipment, facilities, and personnel required to assemble, test, service, and install the missile in an individual launcher shelter so that it can be launched against a hostile aircraft at any time. The functions of assembling, testing, servicing, and maintaining the IM-99B weapon system are accomplished by personnel in an IM-99B squadron. The launching of a missile is controlled from a SAGE Direction Center, the launching operations being sequenced and executed automatically. Controlling the direction of the missile in flight is accomplished by use of data from the SAGE radar network.

On command from the SAGE Direction Center, an interceptor is erected in its shelter and automatically launched vertically in 30 sec. The midcourse guidance commands are computed and relayed to the interceptor by a ground-to-air transmitter. The interceptor homing radar is activated and automatically searches for and acquires the target during terminal dive. After lock-on, the homing radar guides the interceptor on a collision course with the target, and an electronic influence fuze detonates the warhead at proper ranges for optimum target destruction.

The primary function of a tactical IM-99B missile squadron under this operation concept is to provide ready missiles to the SAGE Direction Center for their deployment. In performing this function, the missiles must be implemented and needed maintenance accomplished as outlined below.

The packaged subsystems of a new missile are transported to the A&M shop (assembly and maintenance shop) where they are assembled on the missile shop cradles. After assembly, the missile is loaded onto the transporter-loader with an overhead hoist. The missile is transported to and installed in the shelter. After installation in the shelter, the implementation procedures are carried out. This consists of installing ramjet engines; performing leak tests on engines; servicing flight control system; pressurizing all bottles; performing gas system test; servicing accessory power unit, boost rocket system, and coordinate converter; fueling missile; installing warhead; servicing nose pressurization compartment; performing shelter maintenance; and conducting MIU test.

After implementation of a missile, a regular series of minor and major periodic inspections are scheduled to provide confidence in the system and to provide needed maintenance. Unscheduled maintenance is accomplished as needed.

The main difference between this procedure and that performed on the IM-99A is that practically all maintenance functions after initial implementation are conducted in the shelter. This is made possible by converting the great majority of test and maintenance equipment from fixed locations in the A&M shop into mobile equipment.

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies and their contractors; Administrative/Operational Use; NOV 1961. Other requests shall be referred to Air Proving Ground Center, Eglin AFB, FL. :

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**System Short Name:** MANPRINT- Missile- Air Defense- Nike Zeus

**Reference (USA-HEL, 1962):**

USA-HEL. (1962). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Evaluation of the Nike Zeus Missile System: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-19-62 LIMITED. DTIC AD0488236.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*antimissile defense systems, human factors engineering, guided missile personnel, surface to air missiles, display systems, guided missile tracking systems, target acquisition, target discrimination, radar receivers, radar transmitters, guided missile  
nike-zeus

**System Description:**

x

**Report Availability:**

Distribution: Controlled: all requests to Commanding General, Army Missile Command, Redstone Arsenal, Ala. 35809. Attn: Nike-X Project Office, AMCPM-ZE. 05 - CONTROLLED; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Missile- Air Defense- PATRIOT

**Reference (Carter and Lockhart, 1982):**

Carter, R. J., & Lockhart, J. M. (1982). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Patriot Air Defense Missile System During Operational Test II: U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. ARI-RR-1335 Project Number 2Q162722A791. DTIC ADA138837.

**Key Words:**

\*Man machine systems, \*Guided missile personnel, \*Surface to air missiles, Human factors engineering, Field Army, Questionnaires, Interviewing, Army training, Instruction manuals, Proficiency, Maintenance, Ground support equipment, Enlisted personnel, O  
Patriot missiles, Interoperability, PE62722A, AS791

Fields and Groups:

160100 - Guided Missile Launching and Basing Support  
160402 - Surface-launched Guided Missiles  
230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*Man machine systems, \*Guided missile personnel, \*Surface to air missiles, Human factors engineering, Field Army, Questionnaires, Interviewing, Army training, Instruction manuals, Proficiency, Maintenance, Ground support equipment, Enlisted personnel, Officer personnel, Air defense, Antiaircraft missiles

Identifiers:

(U) Patriot missiles, Interoperability

**System Description:**

The objective of the research was to evaluate the PATRIOT air defense missile system during operational test II for human factors considerations. Three questionnaires addressing specific test issues were completed by eight-five male service members. Thirteen checklists (covering missile reload, march order, and emplacement procedures) were completed by eight data collectors. Two interviews were held with selected test participants. The objectives of the interviews were to determine whether problems existed with the troop proficiency trainer programs and to identify human factors concerns with maintenance operations and procedures. Each subsystem/component had human factors problems. The primary concern however, dealt with software, troop proficiency trainer programs, draft equipment publications, missile reload, the environment within the engagement control station and the information and coordination central, and maintenance. The results of the evaluation were used by the Army Systems Acquisition Review Council and the Defense Systems Acquisition Review Council as part of the information on which the decision for the PATRIOT system to enter production was based.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Missile- Air Defense- PATRIOT

**Reference** (Hawley, 2007):

Hawley, J. K. (2007). Manpower and Personnel Integration (MANPRINT) Assessment: Looking Back at 20 Years of MANPRINT on Patriot: Observations and Lessons: U.S. Army Research Laboratory, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland. ARL Technical Report ARL-SR-0158. DTIC ADA472740.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

Fields and Groups:

150600 - Military Operations, Strategy and Tactics

Descriptors:

(U) \*MILITARY OPERATIONS, DEFENSE SYSTEMS, SURFACE TO AIR MISSILES, FRATRICIDE

**System Description:**

During the combat operations phase of Operation Iraqi Freedom (OIF), Patriot air and missile defense units were involved in two fratricide incidents. Patriot's unacceptable fratricide rate during OIF (18% of engagements) prompted the commanding general of the Army Air and Missile Defense Center to request a human-performance-oriented assessment of the fratricide incidents to complement the official Army board of inquiry investigation. This report summarizes the results and recommendations from that assessment. Recommendations for a solution to the fratricide problem involved both command and control and training modifications. The paper's primary focus is MANPRINT observations and lessons from the Army's 25-year developmental effort with Patriot. Specific observations on the Patriot MANPRINT program gleaned from a review of assessments and test reports going back 20 years are presented and discussed. This material is followed by a discussion of broader lessons from the Patriot MANPRINT program. These broader lessons include: (1) going-in concepts really matter, (2) training

issues really matter, (3) testing must be more comprehensive and rigorous, and (4) lessons must be learned. Implications of the specific observations and broader lessons for the MANPRINT program going forward also are presented and discussed. The observations and lessons discussed in the report are presented in the spirit of action research, defined as research that any community of practice can do to improve its methods. In this sense, the spirit of the report is institutional learning and practice improvement rather than after-the-fact criticism.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Missile- Air Defense- PATRIOT ECS ICC

**Reference (USA-ATEC., 1981):**

USA-ATEC. (1981). Manpower and Personnel Integration (MANPRINT) Assessment: Supplemental PQT-G Report: Human Factors Engineering Study of Patriot Engagement Control Station (ECS) and Information Coordination Central (Icc) Operability: U.S. Army Materiel Test and Evaluation Directorate, White Sands Missile Range, NM. DTIC ADC026312.

**Key Words:**

\*Antiaircraft fire control systems, \*Guided missile personnel, \*Man machine systems, Air defense, Surface to air missiles, Operators(Personnel), Human factors engineering, Weapon system effectiveness, Control centers, Display systems, Information proces

Patriot missiles, FCO(Fire Control Operators), ECS(Engagement Control Stations), AN/MSQ-104, Hooking targets, Workload, Overload, LPN-USATECOM-3-MI-000-PAT-002

Fields and Groups:

160402 - Surface-launched Guided Missiles

190500 - Fire Control and Bombing Systems

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*Antiaircraft fire control systems, \*Guided missile personnel, \*Man machine systems, Air defense, Surface to air missiles, Operators(Personnel), Human factors engineering, Weapon system effectiveness, Control centers, Display systems, Information processing, Reaction time, Antiaircraft missiles

Declassification:

OADR

Identifiers:

(U) Patriot missiles, FCO(Fire Control Operators), ECS(Engagement Control Stations), AN/MSQ-104, Hooking targets, Workload, Overload,

**System Description:**

This report concerns the ability of Patriot fire control operators to conduct an air battle using the display and control system when a multiple target scenario is presented. In general, the FCOs were not using the data available to them on the displays in the fullest and most effective manner nor were they utilizing the fastest hooking method very much. Three deficiencies were noted. Unclassified Regrade Code: C

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation; Aug 81. Other requests for this document must be referred to Commander, Army Materiel Development and Readiness Command, Attn: DRCPM-MD-T. Redstone Arsenal, AL 35898. 03 - U.S. GOVT. ONLY; DOD CONTROLLED.  
CONFIDENTIAL:

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**System Short Name:** MANPRINT- Missile- Air Defense- PATRIOT EPP

**Reference (Reinhart, 1996):**

Reinhart, J. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the Patriot Electric Power Plant (EPP) III. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Patriot Electric Power Plant (EPP) III will provide electrical power for the Patriot Advanced Capability (PAC) - 3 missile system. The EPP III consists of two 150 kW, 400 Hz diesel engine driven electrical generator sets mounted on an extended bed Heavy Expanded Mobility Tactical Truck (HEMTT). The EPP III replaces the turbine engine driven EPP II.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Air Defense- PATRIOT MEADS

**Reference** (Ruff, 1999):

Ruff, R. M. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the Medium Extended Air Defense System (MEADS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Medium Extended Air Defense System (MEADS) will consist of sensors, weapons, battle management and command, control, communications, computer, and intelligence (BM/C4I) subsystems coordinated and configured to meet requirements described in the MEADS Operational Requirements Document (ORD) and as restated, in principle, in the International Common Operational Requirements (ICOR) for MEADS. The MEADS battery will detect, acquire, identify, engage, and destroy hostile airborne targets (theater ballistic missiles (TBMs) and manned and unmanned non-TBM targets) in defense of maneuver forces and military/civilian assets. The MEADS battalion level elements, through BM/C4I subsystems and sensors, coordinate the fires, administration, and logistics of subordinate batteries.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Air Defense- PATRIOT MEADS

**Reference** (Cook, 2004):

Cook, T. C. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Patriot-MEADS Combined Aggregate Program (CAP). APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**



At the direction of the Under Secretary of Defense (Acquisition, Technology and Logistics) an Acquisition Decision Memorandum (ADM) dated 30 Apr 03 approved an Army plan to pursue a combined management, development and fielding of the Patriot and Medium Extended Air Defense System (MEADS) programs. This decision initiated a combined Patriot/MEADS program called the Combined Aggregate Program (CAP) within a broader system-of-systems architecture for integrated air defense. The objective MEADS will be achieved through incrementally replacing Patriot Major End Items (MEIs) with MEADS MEIs capabilities as they are developed. MEADS MEIs include a PAC-3 Missile Segment Enhancement (MSE), a BMC4I, a Surveillance Radar (SR) and a Multifunction Fire Control Radar (MFCR), and a launcher/reloader.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Air Defense- PATRIOT MEADS (Revised)

**Reference** (Cook, 2004):

Cook, T. C. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Patriot-MEADS Combined Aggregate Program (CAP) (Revised). APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

At the direction of the Under Secretary of Defense (Acquisition, Technology and Logistics) an Acquisition Decision Memorandum (ADM) dated 30 Apr 03 approved an Army plan to pursue a combined management, development and fielding of the Patriot and Medium Extended Air Defense System (MEADS) programs. This decision initiated a combined Patriot/MEADS program called the Combined Aggregate Program (CAP) within a broader system-of-systems architecture for integrated air defense. The objective MEADS will be achieved through incrementally replacing Patriot Major End Items (MEIs) with MEADS MEIs capabilities as they are developed. MEADS MEIs include a PAC-3 Missile Segment Enhancement (MSE), a BMC4I, a Surveillance Radar (SR) and a Multifunction Fire Control Radar (MFCR), and a launcher/reloader.

**Report Availability:**

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**System Short Name:** MANPRINT- Missile- Air Defense- PATRIOT MMM

**Reference** (Nichols, 1993):

Nichols, D. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the Patriot Multimode Missile (Mmm): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The PATRIOT surface-to-air missile system is a long range, medium and high altitude, mobile defense system, which uses guided missiles to simultaneously engage and destroy multiple targets at varying

ranges. It was designed to meet the air defense threat of the 1990's and beyond. The Multimode Missile (MMM) is a key component of the overall improvements to PATRIOT that collectively constitute PATRIOT Advanced Capability - 3 (PAC-3) which consists of guidance, lethality and propulsion enhancements. The major changes brought about by the MMM program are to add an autonomous target tracking capability to the missile, provide extended range capabilities, and employ an advanced warhead.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Air Defense- PATRIOT PAC3

**Reference** (Nichols, 1997):

Nichols, D. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Patriot Advanced Capability Phase III (PAC-3) System. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The PATRIOT system is an air defense missile system that provides air defense support of ground forces and high value assets against air and missile threats. PAC-3 is a major system upgrade improvement program composed of current PAC-2 capabilities plus the Quick Response Program (QRP) and will be fielded as configurations. QRP includes an automatic emplacement enhancement system, remote launch capability and radar receiver enhancements to meet current and evolving air breathing threat (ABT) and Tactical Ballistic Missile (TBM) threats.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Air Defense- PATRIOT PAC3

**Reference** (Nichols, 1998):

Nichols, D. (1998). Manpower and Personnel Integration (MANPRINT) Assessment for the Patriot Advanced Capability Phase III (PAC-3) System. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The PATRIOT system is an air defense missile system that provides air defense support of ground forces and high value assets against air and missile threats. PAC-3 is a major system upgrade improvement program composed of current PAC-2 capabilities plus the Quick Response Program (QRP) and will be fielded as configurations. QRP includes an automatic emplacement enhancement system, remote launch capability and radar receiver enhancements to meet current and evolving air breathing threat (ABT) and Tactical Ballistic Missile (TBM) threats.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Air Defense- PATRIOT PAC3

**Reference** (Cook, 2002):

Cook, T. C. (2002). Manpower and Personnel Integration (MANPRINT) Assessment for the Patriot PAC-3 Block 2002 Missile: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The PATRIOT system is a software driven, air defense, guided missile system designed to counter the air breathing and Tactical Ballistic Missile (TBM) threats of 2000 and beyond. PATRIOT's mission is to protect the force and critical assets within the lower tier theater missile defense (TMD) by countering, defeating, destroying short-range ballistic missiles (SRBM), aerodynamic missiles, including cruise missiles and anti-radiation missiles (ARM), fixed and rotary-wing manned aircraft, and unmanned aerial vehicles (UAV). The Configuration 2 Plus, including Post Deployment Build (PDB)-5 software, is the baseline system for currently fielded PATRIOT. PATRIOT Advanced Capability-3 (PAC-3) is a major upgrade to the PATRIOT system consisting of integrated, complementary improvements that have been implemented by a series of phased, incrementally fielded materiel changes in hardware and software that modernizes the PATRIOT system. PAC-3 will increase battlespace and lethality by enhancing current detection and engagement capability. The PAC-3 Configuration-3 program is an acquisition category (ACAT) 1D program with Office of the Secretary of Defense (OSD) oversight.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Air Defense- Stinger

**Reference** (Chaikin, 1976):

Chaikin, G. (1976). Manpower and Personnel Integration (MANPRINT) Assessment: Stinger Human Factors Engineering: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-25-76 LIMITED. DTIC ADB014866.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*human factors engineering, \*stinger missiles, \*surface to air missiles, antiaircraft weapons, performance(human), acceptance tests, manportable equipment, training equipment, test and evaluation, gunnery training, surface launching

**Fields and Groups:**

160402 - Surface-launched Guided Missiles  
230200 - Human Factors Engineering & Man Machine System

**Descriptors:**

(U) \*HUMAN FACTORS ENGINEERING, \*STINGER MISSILES, \*SURFACE TO AIR MISSILES, ANTI-AIRCRAFT WEAPONS, PERFORMANCE(HUMAN), ACCEPTANCE TESTS, MANPORTABLE

EQUIPMENT, TRAINING EQUIPMENT, TEST AND EVALUATION, GUNNERY TRAINING, SURFACE  
LAUNCHING

**System Description:**

This report summarizes design-influencing human factors engineering requirements, decisions and trade-offs applied to the development of the STINGER weapon system, generally following the form and objectives prescribed by Department of Defense Authorized Data Item DI-H-1315. General descriptions of the system, its employment, and operating procedures are provided as background for the reported human factors engineering program planning, analysis, design and test aspects of the program. An extensive list of references is furnished.

**Report Availability:**

Distribution limited to U.S. Gov't. agencies and their contractors; Specific authority; Jul 76. Other requests for this document must be referred to Director, Human Engineering Lab., Aberdeen Proving Ground, Md. 21005. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- Missile- Air-to-Air- SLAMRAAM

**Reference (Cook, 2003):**

Cook, T. C. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the Surface Launched Advanced Medium Range Air-to-Air Missile (SLAMRAAM) System: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The SLAMRAAM is envisioned to be the initial kinetic energy component of an objective Enhanced Area Air Defense System (EAADS) that integrates sensors, command and control, and fire-direction and fire distribution elements linked to the SLAMRAAM Fire Units (FU). The FU is a highly mobile and transportable system consisting of a basic load of four (4) to six (6) AIM-120 Missiles and a slewable launcher with integrated electronics supporting 3600 engagement in day/night and adverse weather conditions. SLAMRAAM is an Objective Force capability that will incrementally replace Stinger-based systems by providing an order of magnitude increase in the battle space against Cruise Missiles, Unmanned Aerial Vehicles (UAVs), Unmanned Combat Aerial Vehicles (UCAVs), Fixed Wing, and Rotary Wing aircraft. The SLAMRAAM program is an acquisition category (ACAT) II program with Office of the Secretary of Defense (OSD) oversight.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Air-to-Air- SLAMRAAM

**Reference (Mares, 2009):**

Mares, A. L. (2009). Manpower and Personnel Integration (MANPRINT) Assessment for the Surface Launched Advanced Medium Range Air-to-Air Missile (SLAMRAAM) System: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The SLAMRAAM is envisioned to be the initial kinetic energy component of an objective Enhanced Area Air Defense System (EAADS) that integrates sensors, command and control, and fire-direction and fire distribution elements linked to the SLAMRAAM Fire Units (FU). The FU is a highly mobile and transportable system consisting of a basic load of four (4) to six (6) AIM-120 Missiles and a slewable launcher with integrated electronics supporting 360° engagement in day/night and adverse weather conditions. SLAMRAAM is an Objective Force capability that will incrementally replace Stinger-based systems by providing an order of magnitude increase in the battle space against Cruise Missiles, Unmanned Aerial Vehicles (UAVs), Unmanned Combat Aerial Vehicles (UCAVs), Fixed Wing, and Rotary Wing aircraft. The SLAMRAAM program is an acquisition category (ACAT) II program with Office of the Secretary of Defense (OSD) oversight.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Air-to-Ground- JCM

**Reference** (Minninger, 2003):

Minninger, J. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the Joint Common Missile System (JCMS): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Joint Common Missile, an air-to-ground weapon, will be employed from rotary and fixed-wing aviation platforms (and potentially Army Objective Force ground platforms) with enhanced targeting capabilities, increased lethality, and extended range, in both fire-and-forget and precision point targeting modes, against advanced threat armored vehicles and non-traditional (or other than armored vehicle) target sets in adverse weather, obscured battlefield conditions, and against current and projected threat countermeasures using advanced seeker technologies. Joint Common Missile will provide improved performance over the systems it replaces by using a tri-mode seeker—incorporating imaging infrared (IIR), millimeter wave radar (MMW), and semi-active laser (SAL) sensors. This combination of sensors will provide the targeting sensors needed for the longer ranges, improved lethality over legacy guided missiles, and an improved precision point attack capability. The combination of sensors will allow for enhanced performance in adverse weather and provide significant hardening against countermeasures. The use of the tri-mode seeker to meet requirements of the U.S. Army, U.S. Navy, U.S. Marine Corps, and United Kingdom aviation will allow a high degree of commonality across a large number of platforms to minimize system life cycle costs for the combined services.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Air-to-Ground- JCM

**Reference** (Cook, 2004):

Cook, T. C. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Joint Common Missile System (JCM). APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Joint Common Missile, an air-to-ground weapon, will be employed from rotary and fixed-wing aviation platforms (and potentially Army Objective Force ground platforms) with enhanced targeting capabilities, increased lethality, and extended range, in both fire-and-forget and precision point targeting modes, against advanced threat armored vehicles and non-traditional (or other than armored vehicle) target sets in adverse weather, obscured battlefield conditions, and against current and projected threat countermeasures using advanced seeker technologies. Joint Common Missile will provide improved performance over the systems it replaces by using a tri-mode seeker—incorporating imaging infrared (IIR), millimeter wave radar (MMW), and semi-active laser (SAL) sensors. This combination of sensors will provide the targeting sensors needed for the longer ranges, improved lethality over legacy guided missiles, and an improved precision point attack capability. The combination of sensors will allow for enhanced performance in adverse weather and provide significant hardening against countermeasures. The use of the tri-mode seeker to meet requirements of the U.S. Army, U.S. Navy, U.S. Marine Corps, and United Kingdom aviation will allow a high degree of commonality across a large number of platforms to minimize system life cycle costs for the combined services.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Antitank- 84mm- AT4-CS-RS

**Reference** (Everette, 2009):

Everette, J. (2009). Manpower and Personnel Integration (MANPRINT) Assessment for the AT4-Confined Space (CS) - Reduced Sensitivity (RS) 84mm Light Anti-Tank Weapon for Confined Space: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The AT4-CS-RS is the Army's primary light anti-tank weapon. The AT4 CS-RS is a recoilless rifle used primarily to defeat light armor targets. The recoilless rifle design permits accurate delivery of an 84mm High Explosive Anti-Armor (HEAT) warhead to 250 meters, with negligible recoil. The AT4-CS-RS is a lightweight, self-contained, anti-armor weapon consisting of a free-flight, fin-stabilized, rocket-type cartridge packed in an disposable, one-piece, fiberglass-wrapped tube. The AT4-CS-RS is man-portable and is fired from the right shoulder only. The AT4 CS-RS consists of a barrel assembly, HEAT projectile, container with counter mass with a total system weight of 15 pounds. The launcher has dust seals on the ends, but is not watertight. Unlike the M72-series LAW, the AT4-CS-RS launcher need not be extended before firing. Though the AT4-CS-RS can be employed in limited visibility, the firer must be able to see and identify the target and estimate the range to it. A re-usable night sight bracket was developed and fielded which permits utilization of standard night vision equipment. The main parts of the projectile are the warhead, fuze system and the fin assembly.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Antitank- 84mm- ATW

**Reference** (Spine, 2004):

Spine, R. J. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the AT4-CS (Confined Space)-RS (Reduced Sensitivity) 84mm Light Anti-Tank Weapon for Confined Space. Redstone Arsenal, AL.; U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

AT4-CS (Confined Space)-RS (Reduced Sensitivity) 84mm Light Anti-Tank Weapon for Confined Space.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Antitank- AAWS-M

**Reference** (Hanlon et al., 1990):

Hanlon, W. E., Hickey, C. A., & Ortega, S. V., Jr. (1990). Manpower and Personnel Integration (MANPRINT) Assessment: Human Engineering Laboratory Mobility-Portability and Human Factors Evaluation of the Advanced Antitank Weapon Systems-Medium (AAWS-M) Candidates: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. HEL-TM-4-90 Project Number 1L162716AH70. DTIC ADB142540.

**Key Words:**

\*antitank weapons, \*human factors engineering, aircraft, antiarmor ammunition, army personnel, base lines, combat vehicles, compatibility, test and evaluation, configurations, demonstrations, exits, fires, firing tests(ordnance), gunners, infantry, mari  
PE62716A, ASH70, \*AAWS-Medium, \*AAWS(Advanced Antitank Weapon System).

Fields and Groups:

160100 - Guided Missile Launching and Basing Support  
230200 - Human Factors Engineering & Man Machine System  
150600 - Military Operations, Strategy and Tactics

Descriptors:

(U) \*ANTITANK WEAPONS, \*HUMAN FACTORS ENGINEERING, AIRCRAFT, ANTIARMOR AMMUNITION, ARMY PERSONNEL, BASE LINES, COMBAT VEHICLES, COMPATIBILITY, TEST AND EVALUATION, CONFIGURATIONS, DEMONSTRATIONS, EXITS, FIRES, FIRING TESTS(ORDNANCE), GUNNERS, INFANTRY, MARINE CORPS PERSONNEL, MODELS, PREPARATION, PROTECTIVE CLOTHING, ROCKET LAUNCHERS, SIMULATION, WEAPON SYSTEMS, WEAPONS

Identifiers:

(U) PE62716A, ASH70, \*AAWS-Medium, \*AAWS(Advanced Antitank Weapon System).

**System Description:**

The Human Engineering Laboratory (HEL) conducted a portability and human factors evaluation of three advanced antitank weapon systems-medium (AAWS-M) candidate weapon systems. Mockups of the candidate weapon systems were provided by Hughes Aircraft, Ford Aerospace, and Texas Instruments and were used during the entire evaluation. The Dragon antitank weapon system was used as the baseline weapon system to which the AAWS-M candidates were compared. Ten marines and seven soldiers were used as test participants (TPs). The TPs carried varying configurations of the Dragon and the AAWS-M candidates on the obstacle and course-country courses. They also performed preparations to fire and returned the weapon systems to a carrying configuration. Several selected infantry fighting vehicles were used for entry and exit demonstrations. A compatibility assessment using selected TPs was also conducted by having the TPs wear protective clothing and equipment ensembles and having them do simulated firings and other infantry-related tasks with the AAWS-M candidates. Keywords: Advanced

antitank weapon systems-medium(AAWS-M); Command Launch Unit(CLU); Mockups; Rocket launchers;  
Gunner; Assistant gunner; Cross country course; Obstacle course; Portability; Mobility; Antiarmor  
weapons; Soldier loads; Infantry. (KT)  
Unclassified

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies only; Contractor Performance Evaluation; Mar 90. Other requests shall be referred to Director, U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005-5001. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Missile- Antitank- ATGM SS-11

**Reference** (McIntyre, 1960):

McIntyre, F. M. (1960). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Evaluation of the SS-11 Antitank Guided Missile; U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-16-60 LIMITED. DTIC AD0478010.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*surface to surface missiles, \*human factors engineering, wire guidance, rockets, ground support equipment, antitank ammunition, launching, control panels, remote control, circuits, handling, safety, illumination, checkout equipment, guided missile laun  
agm-22 missiles, antitank guided missiles, entac, h-1 aircraft, m-113 vehicles, m-59 vehicles.

**System Description:**

Report of specific human factors deficiencies in the SS-11 Antitank Guided Missile System (ATGM) ground equipment, M38A1 1/4-Ton, M-59, M-113 APC, and HU-1 helicopter launchers. Report written as a result of ordnance evaluation of SS-11 system. Includes comparison of SS-11 ATGM ground equipment with ENTAC ATGM ground equipment. Unclassified Annotation: Human factors engineering evaluation of the SS-11 Antitank Guided Missile.

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation; 19 Aug 71. Other requests for this document must be referred to Commanding General, Army Missile Command, Attn: ORDXR-REB. Redstone Arsenal, Ala. 35809.  
03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Missile- Antitank- FOG-M

**Reference** (Rogers et al., 1986):

Rogers, J. G., Hill, R., Serda, D., & Nichols, D. (1986). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation: FOG-M (Fiber Optic Guided Missile) Embedded Training Demonstration Model FOG-M-4-30-Rg-511; U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. Contract to Alabama University, Huntsville, AL, Institutional and Research Support Services. DTIC ADB102765.

**Key Words:**

\*training devices, \*target recognition, \*simulators, man machine systems, computerized simulation, target detection, communication and radio systems, computer programs, computers, test and evaluation, detection, embedding, training, human factors engine  
\*Man in the loop simulators, Embedded training, FOG-M missiles



Fields and Groups:

050600 - Humanities and History

190500 - Fire Control and Bombing Systems

Descriptors:

(U) \*TRAINING DEVICES, \*TARGET RECOGNITION, \*SIMULATORS, MAN MACHINE SYSTEMS, COMPUTERIZED SIMULATION, TARGET DETECTION, COMMUNICATION AND RADIO SYSTEMS, COMPUTER PROGRAMS, COMPUTERS, TEST AND EVALUATION, DETECTION, EMBEDDING, TRAINING, HUMAN FACTORS ENGINEERING, INFORMATION EXCHANGE, INTELLIGIBILITY, INSTRUCTIONAL MATERIALS, CONTINUITY, FIBER OPTICS, GUIDED MISSILES, TARGET ACQUISITION

Identifiers:

(U) \*Man in the loop simulators, Embedded training, FOG-M missiles

IAC Subject Terms:

G--(U)FOG-M MISSILES, EVALUATION, FIBER OPTICS, TARGET DETECTION, COMPUTER PROGRAMS, TARGET ACQUISITION, GUIDED MISSILES, TEST AND EVALUATION, DETECTION, COMMUNICATION SYSTEMS, SIMULATION, TRAINING, MAN MACHINE SYSTEMS, HUMAN FACTORS.,;

**System Description:**

Two types of human engineering evaluations were performed to facilitate communications of program developments from the Fiber Optic Guided Missile System (FOG-M) program office to those involved in embedded training courseware development. The knowledge continuity evaluation examined the sequence and form of presentation of training material to assure a smooth understandable information flow. The computer hardware/software evaluation examined the computer 'hardware/software' to detect problems that would impede progress or procedural changes that would improve progress through the embedded training program. A series of recommendations were derived from each evaluation. Keywords: Hardare-In-The-Loop Simulator (HITLS) Man-In-The-Loop Simulator (MITLS), Target acquisition and Detection.

Unclassified

**Report Availability:**

Distribution limited to U.S. Gov't. agencies and their contractors; Specific authority; 31 Jan 89. Other requests must be referred to Commander, U.S. Army Missile Command, Attn: AMSMI-RD-GC-T. Redstone Arsenal, AL 35898-5000. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- Missile- Antitank- JAVELIN

**Reference** (Ortega et al., 1993):

Ortega, S. V., Jr., Hanlon, W. E., Hickey, C. A., Jr., Peterson, L. L., & Oblak, T. H. (1993). Manpower and Personnel Integration (MANPRINT) Assessment: Mobility, Portability, and Human Factors Evaluation of the JAVELIN Antitank Weapon System: U.S. Army Research Laboratory, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland. ARL Technical Report ARL-TR-238 LIMITED. DTIC ADB176666.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*antitank weapons, ammunition, army, army personnel, army research, army research laboratories, clothing, compatibility, configurations, coolants, demonstrations, exits, gunners, human factors engineering, infantry, laboratories, launchers, mobility, ni  
PE62716A, ASH70, JAVELIN Weapon system.

Fields and Groups:

150600 - Military Operations, Strategy and Tactics

Descriptors:

(U) \*ANTITANK WEAPONS, AMMUNITION, ARMY, ARMY PERSONNEL, ARMY RESEARCH, ARMY RESEARCH LABORATORIES, CLOTHING, COMPATIBILITY, CONFIGURATIONS, COOLANTS, DEMONSTRATIONS, EXITS, GUNNERS, HUMAN FACTORS ENGINEERING, INFANTRY, LABORATORIES, LAUNCHERS, MOBILITY, NIGHT, PROTECTIVE CLOTHING, STANDARDS, TIME, VEHICLES, VELOCITY, WEAPON SYSTEMS

Identifiers:

(U) PE62716A, ASH70, JAVELIN Weapon system.

**System Description:**

The Human Research and Engineering Directorate (HRED) of the U.S. Army Research Laboratory conducted a portability and human factors evaluation of the JAVELIN antitank weapon system. The Dragon II antitank weapon system was used as the baseline system for both the gunner and ammunition-bearer loads to which the JAVELIN was compared. Eleven marines and 10 soldiers were used as subjects. The subjects carried various configurations of the JAVELIN and Dragon II on the HRED mobility and portability courses and conducted two 10-kilometer marches. Subjects also prepared the systems for firing and returned them to a carrying configuration. Several selected infantry-carrying vehicles were used for entry and exit demonstrations. A compatibility evaluation using selected subjects was conducted. These subjects wore items of U.S. Army standard issue personal equipment and protective clothing while assembling and simulating the firing of JAVELIN. Data regarding the durability and ruggedness of the JAVELIN were also collected. The subjects' objective data (i.e., speed of portage, time to complete a task, etc.) as well as subjective data were recorded. The results indicate that there are no significant differences in the portability times between the JAVELIN and Dragon II gunner loads. The JAVELIN ammunition-bearer loads are significantly faster than the Dragon II ammunition-bearer loads. Some of the vehicles are faster and easier to enter and exit with the JAVELIN than others. JAVELIN, Ammo bearer, Command Launch Unit (CLU), Launcher, Mock-up, Mobility, Battery Coolant Unit (BCU), Obstacle course, Round, Portability, Cross-country course.

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies and their contractors; Administrative/Operational Use; Aug 93. Other requests shall be referred to Director, U.S. Army Research Lab., Attn: AMSRL-HR, Aberdeen Proving Ground, MD 21005-5005. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- Missile- Antitank- JAVELIN

**Reference** (Chipser, 1994):

Chipser, J. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the JAVELIN Advanced Antitank Weapon System: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The JAVELIN tactical system is a medium range, manportable, antiarmor assault weapon capable of defeating current and projected enemy armor. It is also capable of defeating fortified bunkers, concrete gun emplacements, and low slow flying enemy aircraft. The JAVELIN has been designed for use during the day, at night, or during degraded visibility conditions, including electronic and electro-optical countermeasures and can be fired from buildings and covered foxhole fighting positions. The JAVELIN is a shoulder fired, fire-and-forget missile system capable of lofted trajectory and direct attack modes. The JAVELIN is being developed as the replacement for the current DRAGON weapon system.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Antitank- JAVELIN

**Reference (Ruff, 1997):**

Ruff, R. M. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Advanced Anti-Tank Weapon System - Medium (JAVELIN) System. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The JAVELIN Advanced Anti-Tank Weapon System - Medium tactical system is a medium range, man portable, anti-armor assault weapon capable of defeating current and projected enemy armor. It is also capable of defeating fortified bunkers, concrete gun emplacements, and low slow flying enemy aircraft. The JAVELIN has been designed for use during the day, at night, or during degraded visibility conditions, including electronic and electro-optical countermeasures and can be fired from within buildings and covered foxhole fighting positions. The JAVELIN is a shoulder fired, fire-and-forget missile system capable of lofted trajectory and direct attack modes. The JAVELIN is being developed as the replacement for the current DRAGON weapon system.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Antitank- LOSAT

**Reference (Swiecicki, 2000):**

Swiecicki, C. C. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the Line of Sight Antitank (LOSAT). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The LOSAT Weapon System will be integrated into a HMMWV (M113) and operated by a three-man crew. This Fire Unit (FU) will carry four ready-to-fire kinetic energy missiles and use components of the Improved Bradley Acquisition System (IBAS) for its target acquisition system. The LOSAT Target Acquisition System/Fire Control System (TASIFCS) incorporates a laser range finder, a day video camera, a second generation forward looking infrared (FLIR) sensor, and target trackers. A second HMMWV and missile trailer will be operated by a two-man crew as a resupply vehicle for the primary FU. The LOSAT Weapon System will provide a heavy antitank kinetic energy missile capability to light Infantry, early entry, and contingency forces. The LOSAT will be primarily employed against tanks and armored vehicles at extended ranges. It will have a secondary mission to defeat field fortifications, helicopters, and other materiel targets. The LOSAT missile will be designed as a "wooden round". As such, it is defined as a round of ammunition with no required checks and maintenance other than ammunition lot surveillance procedures and a built in test (BIT). The crew's pre-operational check of the LOSAT missile will be a GO/NO-GO visual inspection of the missile launch tube's exterior and a crew-initiated BIT test.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

**System Short Name:** MANPRINT- Missile- Antitank- LOSAT

**Reference** (Swiecicki, 2004):

Swiecicki, C. C. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Line of Sight Antitank (LOSAT). APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The LOSAT Weapon System will be integrated into a HMMWV (M1113) and operated by a three-man crew for the Fire Unit (FU). This FU will carry four ready-to-fire kinetic energy missiles and use components of the Improved Bradley Acquisition System (IBAS) for its target acquisition system. The LOSAT Target Acquisition System/Fire Control System (TASIFCS) incorporates a laser range finder, a day video camera, a second generation forward looking infrared (FUR) sensor, and target trackers. A second HMMWV and missile trailer will be operated by a two-man crew as a resupply vehicle (RSV) for the primary FU. The total crew size for the LOSAT system is therefore five personnel, three on the FU and two on the RSV. The LOSAT Weapon System will provide a heavy antitank kinetic energy missile capability to light Infantry, early entry, and contingency forces. The LOSAT will be primarily employed against tanks and armored vehicles at extended ranges. It will have a secondary mission to defeat field fortifications, helicopters, and other materiel targets. The LOSAT missile will be designed as a "wooden round". As such, it is defined as a round of ammunition with no required checks and maintenance other than ammunition lot surveillance procedures and a built in test (BIT). The crew's pre-operational check of the LOSAT missile will be a GO/NO-GO visual inspection of the missile launch tube's exterior and a crew-initiated BIT test.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Antitank- MILAN 2

**Reference** (Hanlon et al., 1987):

Hanlon, W. E., Bruno, R. S., & Ortega, S. V., Jr. (1987). Manpower and Personnel Integration (MANPRINT) Assessment: Human Engineering Laboratory Portability and Human Factors Evaluation of the Milan 2 Antiarmor System: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-26-87 Project Number 1D463612D308 LIMITED. DTIC ADB118978.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*surface to surface missiles, human factors engineering, army, army personnel, base lines, field tests, gunners, human factors engineering, infantry personnel, military forces(united states), test and evaluation, tracking

Milan-2 weapon system, AS308, PE63612A.

Fields and Groups:

160402 - Surface-launched Guided Missiles

Descriptors:

(U) \*SURFACE TO SURFACE MISSILES, HUMAN FACTORS ENGINEERING, ARMY, ARMY PERSONNEL, BASE LINES, FIELD TESTS, GUNNERS, HUMAN FACTORS ENGINEERING, INFANTRY PERSONNEL, MILITARY FORCES(UNITED STATES), TEST AND EVALUATION, TRACKING

Identifiers:

(U) Milan-2 weapon system,

**System Description:**

MILAN 2 Antiarmor System.

**Report Availability:**

Distribution: Further dissemination only as directed by Commander, U.S. Army Missile Command, Procurement and Production Directorate, Attn: AMSMI-IWD, Redstone Arsenal, AL 35898; 17 Dec 87 or higher DoD authority. 05 - CONTROLLED; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Missile- Antitank- TOW 2B AERO GEN 2

**Reference** (Nicholson et al., 2004):

Nicholson, F., Baker, C., & Champion, J. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the TOW 2B Aero Gen 2 Missile. APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The TOW 28 AERO Gen 2 is a product improvement (PI) to the TOW 28 missile.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Antitank- TOW 2B AERO GEN 2

**Reference** (Cook, 2005):

Cook, T. C. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the TOW 2B AERO and TOW 2B AERO GEN 2 Missiles. Redstone Arsenal, AL,: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. TOW 2B AERO - The TOW 2B AERO missile program is a product improvement (PI) to the TOW 2B missile. The PI consists of the addition of an aerodynamic nose and an additional 750 meters of wire wound on the standard TOW 2B bobbin. The PI can be accomplished by retrofitting current TOW 2B missiles or by new production. In either case, all components except the aerodynamic nose and additional wire will be consistent with the TOW 2B configuration.
2. TOW 2B AERO GEN2 - The TOW 2B AERO GEN 2 missile program is a product improvement (PI) to the TOW 2B missile. The PI consists of the addition of an aerodynamic nose, an additional 750 meters of wire wound on the standard TOW 2B bobbin, and a GEN 2 Counter Active Protection System (CAPS) module. The PI was accomplished by retrofitting current TOW 2B missiles or by new production. In either case, all components except for the aerodynamic nose, additional wire and GEN 2 CAPS module will be consistent with TOW 2B configuration.

**Report Availability:**

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**System Short Name:** MANPRINT- Missile- Antitank- TOW BB

**Reference** (Cook, 2002):

Cook, T. C. (2002). Manpower and Personnel Integration (MANPRINT) Assessment for the TOW Bunker Buster Missile Program: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The TOW BB missile system incorporates a newly developed high explosive, bulk charge warhead onto the existing, reliable TOW 2A missile airframe. The TOW BB missile must provide for a minimum through-hole of 24 inches in diameter in an 8-inch thick, double reinforced concrete wall and provide structural overmatch for the Soviet Engineered earth and timber bunker. The missile will use existing TOW 2A flight algorithms and can be fired from existing launch platforms capable of launching TOW missiles. The Modified Improved Target Acquisition Systems (MITAA) will be used to fire the TOW BB missiles from the Anti-Tank Guided Missile (ATGM) variant of the Interim Armored Vehicle, augmenting the capabilities of the ATGM company.

**Report Availability:**

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**System Short Name:** MANPRINT- Missile- Antitank- TOW BB

**Reference** (Cook, 2005):

Cook, T. C. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the TOW Bunker Buster Missile (TOW Bb)with Fragmentation Mitigation Disk. Redstone Arsenal, AL,: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The TOW Bunker Buster (BB) missile system provides the Stryker Brigade Combat Team (SBCT)with an urban warfare weapon for contingency forces. The missile incorporates a newly developed high explosive, bulk charge warhead onto the existing reliable TOW 2A missile airframe. The missile will use existing TOW 2A flight algorithms and can be fired from existing launch platforms capable of launching TOW missiles. The TOW BB missile must provide for a minimum throughhole of24 inches in diameter through an 8-inch thick, double reinforced concrete wall and provide structural overmatch for the Soviet Engineered earth and timber bunker. The missile will use existing TOW 2A flight algorithms and can be fired from existing launch platforms capable of launching TOW missiles.

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**System Short Name:** MANPRINT- Missile- Antitank- TOW FF

**Reference** (Ruff, 2000):

Ruff, R. M. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the TOW Fire and Forget (TOW FF) System. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The TOW Fire and Forget Missile (TOW F&F) System will replace the TOW missile and will be fired from all existing TOW platforms. The TOW F&F missile will provide a heavy anti-armor capability with greater range than the current family of TOW missiles. The TOW F&F missile will be a fire and forget missile with an alternate mode that will allow the operator to guide the missile to the target. In its primary role, the TOW F&F missile will be used to destroy armored vehicles before the firepower and shock action of threat armor can be brought to bear on friendly forces. In its secondary role, the TOW F&F missile will be employed against vehicles, helicopters, and field fortifications of all types. The TOW F&F will use the existing HMMWV TOW platforms using Improved Target Acquisition System (ITAS). The TOW F&F will also be fired from a ground mount. The TOW F&F missile interface on all platforms will be provided through the use of applique kits. These kits will retain the capability of the platform to fire the current family of TOW missiles. The TOW F&F missile will be fielded while TOW missiles are still in the Army's inventory and will replace them as their shelf life expires.

**Report Availability:**

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**System Short Name:** MANPRINT- Missile- Antitank- TOW FOTT

**Reference** (Bragg, 1997):

Bragg, J. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Follow-on-to-TOW (FOTT) System. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1.1.1 The Follow On To TOW (FOTT) will serve as a replacement for TOW missiles and will be fired from all existing and future TOW missile platforms, to include the Improved Target Acquisition System (ITAS) and Improved Bradley Acquisition System (IBAS). It is not an additional tank killing system.

1.1.2 The FOTT will be employed either mounted or dismounted with the TOW launcher. It will provide a heavy antitank capability for all TOW equipped units and be employed against fortifications, helicopters, and other materiel targets.

**Report Availability:**

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**System Short Name:** MANPRINT- Missile- Antitank- TOW FOTT

**Reference (Ruff, 1998):**

Ruff, R. M. (1998). Manpower and Personnel Integration (MANPRINT) Assessment for the Follow-on-to TOW (FOTT) Missile. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Follow-On-To TOW (FOTT) missile will replace the TOW missile and will be fired from all existing TOW platforms. The FOTT missile will provide a heavy anti-armor capability with greater range than the current family of TOW missiles. The FOTT missile will be a fire and forget missile with an alternate mode which will allow the operator to guide the missile to the target. In its primary role, the FOTT missile will be used to destroy armored vehicles before the firepower and shock action of threat armor can be brought to bear on friendly forces. In its secondary role, the FOTT missile will be employed against vehicles, helicopters, and field fortifications of all types. The FOTT will use the 6000 existing TOW platforms to include the HMMWV and Bradley Fighting Vehicle using Improved Target Acquisition System (ITAS) and Improved Bradley Acquisition System (IBAS). The FOTT will also be fired from a ground mount. The FOTT missile interface on all platforms will be provided through the use of applique kits. These kits will retain the capability of the platform to fire the current family of TOW missiles. The FOTT missile will be fielded while TOW missiles are still in the Army's inventory and will replace them as their shelf life expires.

**Report Availability:**

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**System Short Name:** MANPRINT- Missile- Antitank- TOW ITAS

**Reference (Parks, 1996):**

Parks, D. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the Improved Target Acquisition System (ITAS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The TOW ITAS consists of four main subsystems: the Target Acquisition Subsystem (TAS), Fire Control Subsystem (FCS), the Battery Power Source (BPS), and the modified TOW 2 Traversing Unit (TU). The TOW 2 weapon system tripod and launch tube is used unmodified. The TAS includes day and night sights, a laser range finder, day and night mode target viewing, and wide and narrow fields of view. The FCS provides target tracking, missile guidance to target, and built-in-test (BIT) capabilities. The BPS is the power source for the ITAS. The TU is an electro-mechanical assembly which is used to attach the TAS and the launch tube, lock the encased missile into place, and provide the electrical connections between the TAS, TU, FCS, BPS, and the missile.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- Antitank- TOW ITAS

**Reference (Ruff, 1997):**



Ruff, R. M. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Improved Target Acquisition System (ITAS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The TOW ITAS consists of four main subsystems: the Target Acquisition Subsystem (TAS), Fire Control Subsystem (FCS), the Battery Power Source (BPS), and the modified TOW 2 Traversing Unit (TV). The TOW 2 weapon system tripod and Launch tube is used unmodified. The TAS includes day and night sights, a laser range finder, day and night mode target viewing, and wide and narrow fields of view. The FCS provides target tracking, missile guidance to target, and built-in-test (BIT) capabilities. The BPS is the power source for the ITAS. The TU is an electro-mechanical assembly which is used to attach TAS and the launch tube, lock the encased missile into place, and provide the electrical connections between the TAS, TV, FCS, BPS, and the missile.

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**System Short Name:** MANPRINT- Missile- TBM- ATACMS

**Reference (Cook, 1997):**

Cook, T. C. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Army Tactical Missile System (TACMS) Block 1a. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The ATACMS is a quick response, ground launched, surface-to-surface, long-range, precision strike, all weather, day/night weapon system. The ATACMS Block IA can only be fired from a modified M270 multiple launch rocket system (MLRS) launcher, referred to as the improved positioning determination system (IPDS) interim launcher. The ATACMS Block IA will be fired, maintained, repaired, trained for, and supported in a manner similar to the Block I missile and under all battlefield conditions. The Block IA missile will have fewer M74 Anti-Personnel Anti-Materiel (APAM) grenades than ATACMS Block I, and the new Inertial Measurement Unit (IMU) will be aided by the Global Positioning System (GPS) to improve accuracy. The ATACMS Block IA carries and dispenses 310 grenades. The outside surface of the grenades is configured with flutes which cause the grenades to spin as they fall to the target area. The grenade is armed by this spinning action before a rate of 3201 revolutions per minute (rpms) is achieved but not before 2400 rpms is achieved. Detonation occurs on impact with the ground or target surface.

**Report Availability:**

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**System Short Name:** MANPRINT- Missile- TBM- ATACMS

**Reference (Ruff, 1999):**

Ruff, R. M. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the Army Tactical Missile System (ATACMS) Block II. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The ATACMS Block II/BAT system is a long range weapon that operates in near all-weather, day or night, and is capable of effectively engaging high value armored targets at ranges beyond the capability of cannons and rockets. The ATACMS Block II missile with BAT submunitions will be fired from a modified M270 MLRS launcher and will be deployed within the ammunition loads of Corps MLRS battalions and Division Artillery MLRS batteries. The mission of the ATACMS Block II missile with BAT submunitions is to delay, disrupt, neutralize, or destroy high-payoff second echelon moving armored targets.

There are several ATACMS missile variants (Block I - Block IIA). The ATACMS Block II variant, depicted in Figure 2, is a semi-ballistic missile designed to effectively attack and defeat targets at ranges greater than 100 kilometers. The ATACMS Block II will use a Global Positioning System (GPS) to increase accuracy over previous ATACMS missile variants.

The primary ATACMS equipment is a guided missile and launching assembly, consisting of a missile mounted in an Enclosure Assembly. The ATACMS Block II missile consists of the missile airframe, tactical dispenser configuration for the 13 BAT submunitions, guidance section containing an inertial measurement unit, propulsion section, and a control section.

The ATACMS Block II missile is stored, transported, and launched from an EALP, visually similar to the MLRS R/PC, and a modified M270 MLRS launcher using existing targeting, management, and command and control systems. The ATACMS Block II missile carries and dispenses 13 BAT submunitions. The BAT submunition, depicted in Figure 3, is a brilliant, self-guided, anti-armor submunition used to autonomously seek, identify, attack, and destroy second-echelon armored and motorized combat-maneuver forces.

Once the BAT submunitions have been dispensed from the ATACMS Block II missile, each submunition, using acoustic and infrared sensors, glides toward the target area and autonomously locates and destroys a different armored vehicle by top attack using a tandem shaped charge warhead.

**Report Availability:**

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**System Short Name:** MANPRINT- Missile- TBM- ATACMS

**Reference (Cook, 2002):**

Cook, T. C. (2002). Manpower and Personnel Integration (MANPRINT) Assessment for the Army Tactical Missile System (Army TACMS) "Quick Reaction" Unitary Missile Program: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Army TACMS Unitary Missile is a highly accurate conventional surface-to-surface artillery weapon capable of striking targets beyond the range of existing Army cannons and rockets. The missile contains the guidance, payload, propulsion, and aerodynamic control sections and will approximate the range of the existing Block IA missile. The high accuracy necessary for the weapon is obtainable with the missile guidance set (MGS), aided with in-flight navigation updates from a link-up with the GPS. The missile is a certified round which is housed in, and fired from, the Enclosure Assembly Launch Pod (EALP).

**Report Availability:**

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**System Short Name:** MANPRINT- Missile- TBM- ATACMS

**Reference** (Cook, 2007):

Cook, T. C. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the Army Tactical Missile System (ATACMS) 2000 (I2k) Unitary Missile: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Army TACMS Unitary Missile is a highly accurate conventional surface-to-surface artillery weapon capable of striking targets beyond the range of existing Army cannons and rockets. The missile contains the guidance, payload, propulsion, and aerodynamic control sections and will approximate the range of the existing Block IA missile. The high accuracy necessary for the weapon is obtainable with the MGS (M48), aided with in-flight navigation updates from a link-up with the GPS. The M48 Unitary missile contains the Navy's WAU-23/B Stand-off Land Attack Missile (SLAM) Harpoon Warhead and the Missile Guidance Set (MGS), which is aided by the Global Positioning System (GPS) to improve accuracy. Modifications were made to the WAU-23/B warhead, which resulted in the same configuration as the WDU-18B Harpoon Warhead. The M57 Unitary missile contains this same warhead; however, improvements were incorporated in the missile's guidance and control sections, as a part of the TACMS 2000 (T2K) upgrades. The M57 has an improved navigation system, which consists of the Missile Guidance Computer (MGC) and Embedded GPS Navigator (EGN). The EGN houses the inertial and GPS electronics. The missile is a certified round which is housed in, and fired from, the Enclosure Assembly Launch Pod (EALP).

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**System Short Name:** MANPRINT- Missile- TBM- ATACMS BAT

**Reference** (Cook, 2001):

Cook, T. C. (2001). Manpower and Personnel Integration (MANPRINT) Assessment for the Army Tactical Missile System (Army TACMS) Block II Brilliant Anti-Armor (BAT) Submunition Missile Program. 6 February 2001. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Army TACMS is a quick response, ground launched, surface-to-surface, long range, precision strike, all weather, day/night weapon system. The Army TACMS Block II is a semi-ballistic missile designed to effectively attack and defeat targets at ranges greater than 100 kilometers. The Army TACMS Block II missile carries and dispenses thirteen BAT submunitions. Each BAT submunition is a brilliant, self-guided, anti-armor submunition used to autonomously seek, identify, attack, and destroy second-echelon armored and motorized combat maneuver forces. The Army TACMS Block II missile is stored, transported and launched from an enclosure assembly/launch pod, visually similar to the Multiple Launch Rocket System (MLRS) rocket pod container, and a modified M270 MLRS launcher using existing targeting, management and command and control systems. The Army TACMS Block II missile consists of the missile airframe, dispenser configuration for the BAT submunitions, guidance section containing an inertial measurement unit, propulsion section and a control section.

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**System Short Name:** MANPRINT- Missile- TBM- ATACMS P3I APAM

**Reference** (Ruff, 1993):

Ruff, R. M. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the Army Tactical Missile System (Army TACMS) (Atamcs) Pre-Planned Product Improvement (P3I) Anti-Personnel/Anti-Materiel (Apam) Program: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The Army TACMS P3I/APAM Program is a pre-planned improvement to Army TACMS Block I missile. The Improved Army TACMS missile will be fired from the Multiple Launch Rocket System (MLRS) M270 launcher. It will have approximately twice the range of the existing Block I missile. This is accomplished by decreasing the number of "baseball" size M74 grenades and modifying the Inertial Measurement Unit to be capable of receiving in-flight navigation updates from Global Positioning System (GPS) satellites. The propulsion and control section of the Improved missile is the same as for the Block I missile.

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**System Short Name:** MANPRINT- Missile- TBM- ATACMS T2K

**Reference** (Cook, 2008):

Cook, T. C. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the Army Tactical Missile System (ATACMS) 2000 (T2k) Unitary Missile: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The purpose of the Army TACMS Unitary missile is to provide Corps and Joint Task Force Commanders the capability to attack high-payoff, time sensitive targets when and where collateral damage, unexploded ordnance, or pilot/aircraft risk may be of concern. It will be employed, even during inclement weather and restricted operations, to attack a variety of infrastructure and tactical/operational targets. These targets include fixed-installation, infrastructure-types, both single and multi-story buildings, radio and television communications centers, telephone-relay sites and those targets located in urban/complex terrain or foliage/canopy-restricted terrain where anti-personnel/anti-material (APAM) munitions would not be effective or desirable.

**Report Availability:**

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**System Short Name:** MANPRINT- Missile- TBM- ATACMS Unitary

**Reference** (Cook, 2006):

Cook, T. C. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the Army Tactical Missile System- (ATACMS) Unitary Missile: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Army Tactical Missile System (ATACMS) is a theater, short range, ballistic-missile weapon system, which can be launched from the M270 Multiple Launch Rocket System (MLRS), the M270AI and the High Mobility Artillery Rocket System (HIMARS) Field Artillery systems. The ATACMS provides attack capability beyond the range of current, conventional howitzer and rocket systems. The ATACMS is especially suited to attack high-payoff, time-sensitive targets.

The ATACMS Unitary missile will be deployed as a derivative of the ATACMS Block IA, ATACMS Quick Reaction Unitary (QRU) and TACMS 2000 (T2K) missiles to give the land component commander the sustained abilities to engage, with increased lethality and accuracy, critical targets while minimizing collateral damage. The QRU warhead (Standoff Land Attack Missile (SLAM)) will no longer be available starting in FY 09, which necessitated the need for the ATACMS Unitary to meet future production needs of the system. The ATACMS Unitary retains the same maximum range of the Block IA, but replaces the M74 sub-munitions of the Block IA with a 450 pound warhead in the Block IA Unitary. This 450 pound warhead reduces the likelihood of collateral damage while realizing the abilities to attack hardened target out to 300 kilometers.

**Report Availability:**

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**System Short Name:** MANPRINT- Missile- TBM- ATACMS-BAT

**Reference** (Ruff, 1994):

Ruff, R. M. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Army Tactical Missile System (Army TACMS) and Brilliant Anti-Armor Submunition (BAT) Block II: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The ATACMS is a quick response, ground launched, surface-to surface, long-range, precision strike, all weather, day/night weapon system. The ATACMS is fired from a modified M270 multiple-launch rocket system (MLRS) launcher. The ATACMS uses the same structure as the MLRS for targeting, engagement, and command and control. The ATACMS Block II is a semi-ballistic missile designed to effectively attack and defeat targets at ranges greater than 100 kilometers. The ATACMS Block II carries and dispenses thirteen (13) BAT submunitions. Each BAT submunition is a brilliant, self-guided, anti-armor submunition used to autonomously seek, identify, attack, and destroy second-echelon armored and motorized combat maneuver forces. The ATACMS Block II missile is stored, transported, and launched from an enclosure assembly/launch pod (EALP), visually similar to the MLRS rocket/pod container (R/PC), and a modified

M270 MLRS launcher using existing targeting, management, and command and control systems. The ATACMS Block II missile consists of the missile airframe, dispenser configuration for the 13 BAT submunitions, guidance section containing an inertial measurement unit, propulsion section, and a control section. Once the BAT submunitions have been dispensed from the ATACMS Block II missile, each submunition, using acoustic and infrared sensors, glides toward the target area and autonomously locates and destroys a different armored vehicle by top attack using a tandem shaped charge warhead.

**Report Availability:**

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**System Short Name:** MANPRINT- Missile- TBM- ATACMS-BAT

**Reference (Ruff, 1995):**

Ruff, R. M. (1995). Manpower and Personnel Integration (MANPRINT) Assessment for the Army Tactical Missile System (Army TACMS) and Brilliant Anti-Armor Submunition (BAT) Block II Program. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The ATACMS Block II/BAT system is a long range weapon that operates in near all-weather, day or night, and is capable of effectively engaging high value armored targets at ranges beyond the capability of cannons and rockets. The ATACMS Block II missile with BAT submunitions will be fired from a modified M270 MLRS launcher and will be deployed within the ammunition loads of Corps MLRS battalions and Division Artillery MLRS batteries. The mission of the ATACMS Block II missile with BAT submunitions is to delay, disrupt, neutralize, or destroy high-payoff second echelon moving armored targets.

There are several ATACMS missile variants (Block I - Block IIA). The ATACMS Block II variant, depicted in Figure 2, is a semi-ballistic missile designed to effectively attack and defeat targets at ranges greater than 100 kilometers. The ATACMS Block II will use a Global Positioning System (GPS) to increase accuracy over previous ATACMS missile variants.

The primary ATACMS equipment is a guided missile and launching assembly, consisting of a missile mounted in an Enclosure Assembly. The ATACMS Block II missile consists of the missile airframe, tactical dispenser configuration for the 13 BAT submunitions, guidance section containing an inertial measurement unit, propulsion section, and a control section.

The ATACMS Block II missile is stored, transported, and launched from an EALP, visually similar to the MLRS R/PC, and a modified M270 MLRS launcher using existing targeting, management, and command and control systems. The ATACMS Block II missile carries and dispenses 13 BAT submunitions. The BAT submunition, depicted in Figure 3, is a brilliant, self-guided, anti-armor submunition used to autonomously seek, identify, attack, and destroy second-echelon armored and motorized combat-maneuver forces.

Once the BAT submunitions have been dispensed from the ATACMS Block II missile, each submunition, using acoustic and infrared sensors, glides toward the target area and autonomously locates and destroys a different armored vehicle by top attack using a tandem shaped charge warhead.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Missile- TBM- Lacrosse

**Reference (Pomeroy, 1960):**

Pomeroy, T. B. (1960). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Evaluation of the Lacrosse Missile System: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-13-60 LIMITED. DTIC AD0476639.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*human factors engineering, surface to surface missiles, control systems, guided missile personnel, handling, test equipment, ground support equipment, control knobs, control panels, operators(personnel), illumination, clothing, gloves, safety equipment  
lacrosse missiles

**System Description:**

This report presents the results of a five-year continuous evaluation of the LACROSSE Missile System from the human factors engineering standpoint, and a compilation of recommendations made by the Systems Research Laboratory of the U. S. Army Ordnance Human Engineering Laboratories, Aberdeen Proving Ground, Maryland. The purpose of this evaluation was to recommend human engineering modifications in the design of the equipment and improved methods of handling and operating the equipment. Methods used were: (1) discussions with equipment designers, (2) observation of user tests, (3) discussions with the using troops, and (4) conducting formal tests.

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation; 19 Aug 71. Other requests for this document must be referred to Commanding General, Army Missile Command, Redstone Arsenal, Ala. 35809. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Missile- TBM- Lance SU

**Reference** (Kinney and De Togni, 1979):

Kinney, T. E., Jr., & De Togni, G. R. (1979). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Lance Sight Unit: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. HEL-TN-4-79. DTIC ADB041652.

**Key Words:**

\*Gun sights, Guided missile launchers, Human factors engineering, Guided missile personnel, Surface to surface missiles, Night, Day, Gloves, Protective masks

Lance missiles

Fields and Groups:

160402 - Surface-launched Guided Missiles

190500 - Fire Control and Bombing Systems

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*Gun sights, Guided missile launchers, Human factors engineering, Guided missile personnel, Surface to surface missiles, Night, Day, Gloves, Protective masks

Identifiers:

(U) Lance missiles

**System Description:**

The HEL Field Artillery Liaison Representative was requested to coordinate and conduct a 'quick look' evaluation of the improved Lance Missile Sight for both day and night operations. Recommendations for improving the sight are given.

Unclassified

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation; May 79. Other requests for this document must be referred to Director, Army Human Engineering Lab., Aberdeen Proving Ground, MD 21005. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Missile- TBM- Pershing COM Pack

**Reference** (Weiss, 1961):

Weiss, R. (1961). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Evaluation of the Pershing Weapon System: Communications Pack (AN/Trc-80): U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-7-61 LIMITED. DTIC AD0822427.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*human factors engineering, \*communication and radio systems, ground support equipment, surface to surface missiles, control panels, control knobs, configurations, failure  
an/trc-80, pershing

**System Description:**

This report presents the results of the Human Factors Engineering Evaluation of the PERSHING Communications Pack (AN/TRC-80) conducted during the period 10 June 1960 to 14 January 1961. The unit studied contained many deficiencies and shortcomings. The Communications Pack is presently undergoing redesign.

**Report Availability:**

Distribution: DoD only: others to Army Missile Command, Attn: AMCPM-PE-M. Redstone Arsenal, Ala. 35809. 04 - DOD ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Missile- TBM- Pershing PPP

**Reference** (Donley, 1961):

Donley, R. (1961). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Pershing Missile System. Primary Power Pack - near Field Noise: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TN-1-61 LIMITED. DTIC ADB966266.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*surface to surface missiles, \*noise, human factors engineering, near field  
U/A Reports, \*Pershing Missiles, Power Packs.

**System Description:**

PERSHING Missile System. Primary Power Pack - Near Field Noise. In August 1959, representatives of the U. S. Army Ordnance Human Engineering Laboratories met with engineers of the Martin Company in Baltimore to discuss a noise attenuation program to be used in the development of the Pershing Missile System Primary Power Pack (PPP). Recommended design goals were discussed at this meeting and these recommendations were published in the monthly progress report for August 1959. This information



was also submitted to the Corps of Engineers. A second conference among representatives from the Corps of Engineers, the Martin Company, and the Human Engineering Laboratories took place at Ft Belvoir, Virginia on 9 November 1960. The purpose of this conference was to review a noise reduction program to be performed by the Martin Company. This noise reduction program was initiated after comparing data (Martin-Orlando Intra-company Memorandum dated 6 September 1960) taken at the Martin-Orlando, Florida Division with the Army Ballistic Missile Agency (ABMA) specification ABMA-XPD-797 dealing with acceptable noise levels. The ABMA specification is based on Air Force Regulation 160-3 which specifies hazardous exposure for long term and short term periods. The Martin Company personnel stated that this specification is inadequate for defining acceptable noise levels in and around the PPP and requested that the Human Engineering Laboratories provide guidance in determining design goals. The results of a test by the Human Engineering Laboratories scheduled for November 1960 were to be combined with the Martin Company data to assist in developing the proposed noise reduction program. The proposed program was outlined in a report ("Noise Attenuation - Power Station, Engineering Model 001"; 8 November 1960) presented during the conference. The PPP was delivered to the Human Engineering laboratories on 9 January 1961 for examination of the near field noise levels. This Technical Note presents the results of the near-field noise test performed by the Human Engineering Laboratories on 10 January 1961.

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies and their contractors; Critical Technology; Feb 61. Other requests shall be referred to Director, Human Engineering Lab., Aberdeen Proving Ground, MD 21005-5001. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- Missile- TBM- Pershing SNE

**Reference (USA-HEL, 1962):**

USA-HEL. (1962). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Pershing Weapon System: System Noise Evaluation: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-12-62 LIMITED. DTIC AD0902674.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*guided missile personnel, \*hearing, noise, surface to surface missiles, hazards, launching sites, transporter erectors, drivers(personnel), voice communications, interference, human factors engineering, measurement, frequency  
m-474 vehicles, pershing

**System Description:**

Noise measurements of the near-field noise of the Power Station and Power Station Equivalent, the interior noise levels of the Programmer Test Station, Communications Hut, Components Test Station, and System Test Station, the noise at the driver's position of the XM474 Missile Carrier, and the noise spectra in the extreme far-field of the Power Station noise are presented. Each component is discussed in reference to the effects of noise on communication and hearing. No serious damage to hearing is to be expected from these items.

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation; 1 Sep 72. Other requests for this document must be referred to Director, Human Engineering Labs., Aberdeen Proving Ground, Md. 21005. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Missile- TBM- Pershing TEL

**Reference** (Sova et al., 1961):

Sova, B. L., Jr., Pomeroy, T. B., & Coyne, J. F. (1961). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Evaluation of the Pershing Weapon System: Evaluation and Procedure Analysis of the FY-59, Serial Number 005, Transporter- Erector-Launcher and Ground Handling Equipment: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-6-61 LIMITED DIST. DTIC ADB966259.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*transporter erectors, \*guided missile launchers, \*surface to surface missiles, \*man machine systems, human factors engineering, test and evaluation  
U/A Reports, Pershing Missiles.

**System Description:**

PERSHING Weapon System: Evaluation and Procedure Analysis of the FY-59, Serial Number 005, Transporter- Erector-Launcher and Ground Handling Equipment. The PERSHING Weapon System has a number of operator-performed functions which could seriously affect the countdown schedule if not performed properly. The operator activities on the Transporter-Erector-Launcher (TEL) during the countdown require more interaction and coordination than on any other isolated piece of equipment within the system. Further, these operations must be performed tactically under various environmental conditions and terrain features, without seriously affecting the countdown schedule. Therefore, in order to insure that the TEL will be effective in its tactical use, this evaluation was conducted.

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies and their contractors; Critical Technology; Sep 61. Other requests shall be referred to Director, Human Engineering Lab., Aberdeen Proving Ground, MD 21005-5001. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- ModCS

**Reference** (Headley, 1999):

Headley, D. B. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the Modular Causeway System (Modcs). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Modular Causeway System (ModCS) will consist of interlocking floating modules that when assembled will provide a Warming Tug (WT), RollOnJRoll- Off Discharge Facility (RRDF), Causeway Ferries (CF) and Floating Causeways (FC). The system is to be assembled from components that are compatible with International Standards Organization (ISO) transport. The system will be capable of being offloaded, assembled, disassembled and backloaded in sea conditions from sea state 0 (threshold) to sea state 2 (objective). System can be operated through Sea State (SS) 2 (threshold) or SS3 (objective). These sub-systems will be made up of the same floating modular sections arranged in different configurations.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

**System Short Name:** MANPRINT- MOLLE

**Reference** (Sampson, 2001):

Sampson, J. B. (2001). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Modular Lightweight Load-Carrying Equipment (MOLLE) System: U.S. Army Natick Soldier and Biological Chemical Command, Natick, MA. NATICK/TR-01/014. DTIC ADA393792.

**Key Words:**

\*load distribution, \*human factors engineering, \*backpacks, lessons learned, modular construction, surveys, lightweight

load carrying systems, load bearing, molle(modular lightweight load carrying equipment), front end analysis, product improvement tests, user testing, system development

**Fields and Groups:**

150500 - Logistics, Military Facilities and Supplies

201100 - Mechanics

230200 - Human Factors Engineering & Man Machine System

**Descriptors:**

(U) \*LOAD DISTRIBUTION, \*HUMAN FACTORS ENGINEERING, \*BACKPACKS, LESSONS LEARNED, MODULAR CONSTRUCTION, SURVEYS, LIGHTWEIGHT

**Identifiers:**

(U) LOAD CARRYING SYSTEMS, LOAD BEARING, MOLLE(MODULAR LIGHTWEIGHT LOAD CARRYING EQUIPMENT), FRONT END ANALYSIS, PRODUCT IMPROVEMENT TESTS, USER TESTING, SYSTEM DEVELOPMENT

**System Description:**

In March 1994, the Training and Doctrine Command System Manager for the Soldier, the Program Manager Soldier, and the U.S. Marine Corps Systems Command issued a joint call for a front end analysis (FEA) to determine the best design for a load-bearing system for soldiers and marines. The FEA was used in drafting a new user requirements document and initiating the development of a modular load-carrying system which ultimately became known as the Modular Lightweight Load-carrying Equipment (MOLLE). This report presents a summary of the FEA survey and the results from a series of human factors evaluation tests conducted during early MOLLE development. Test methodology and results are presented along with evaluation of the design features of load-bearing equipment important to infantrymen and their missions. This is followed by a discussion of lessons learned in the development of the system.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Mortar- 4.2 In- T201

**Reference** (USA-HEL, 1961):

USA-HEL. (1961). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Evaluation of the 4.2 Inch Mortar, T201: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-4-61 LIMITED. DTIC AD0810756.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

(\*mortars, human factors engineering), operation, standards, army training, army personnel, performance(human), fatigue(physiology), time, portable equipment, firing tests(ordnance), feasibility studies  
m-30 mortars(4.2-in.), t-201 mortars(4.2-in.)

**System Description:**

A comparative study using the T201 and the M30 mortars was conducted to evaluate man-machine relationships under simulated firing missions and to provide a basis for future mortar studies. Two mortar crews were trained in the operation of both weapons and then run through a series of tests simulating firing missions. The findings of this study show the operational times of both weapons to be similar; the T201 to be less fatiguing to carry; and that cross-leveling is the principal factor in the time required for sighting.

**Report Availability:**

Distribution: No Foreign without approval of Watervliet Arsenal, Attn: SWEWV-RDT. Watervliet, N. Y. 12189. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- Mortar- 60mm- Cartridge- Full Range

**Reference** (Gunn, 2001):

Gunn, K. (2001). Manpower and Personnel Integration (MANPRINT) Assessment for the Insensitive Cartridge, 60mm Mortar HE (XM768), with the XM783 Point Detonating (PD) Fuze. 22 June 2001. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Insensitive Cartridge, 60mm Mortar HE (XM768), with the XM783 Point Detonating (PD) Fuze.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Mortar- 60mm- Cartridge- HE M720A1 & M768

**Reference** (Kluchinsky, 2002):

Kluchinsky, T. A. (2002). Manpower and Personnel Integration (MANPRINT) Assessment: Health Hazard Assessment Report (RCS MED 388) on the 60mm, HE M720A1 and HE M768 Mortar Cartridges 69-37-6972-03 December 2002 Redstone Arsenal, AL,; U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

a. The 60mm, HE M720A1 and HE M768 Mortar Cartridges are fired from the M224, 60mm mortar. The M224 mortar is manportable, equipped with a trigger to permit selective fire, and has a small baseplate for use in the hand-held mode. Infantry type companies capable of providing supporting fires to maneuver units will use the M720A1 and M768.

b. The mortar rounds are capable of firing within the battle area at ranges up to 1,000 meters. These fires typically consist of firing for one minute at a rate of 30 rounds per minute, firing for ten minutes at a rate of 15 rounds per minute, and then firing for one minute at a rate of 30 rounds per minute. This

representative mission profile consumes 12 minutes and involves the firing of 210 rounds (at minimum charge to obtain 1,000 meter range). Four soldiers support one mortar.

c. The HE M720A1 and HE M768 Mortar Cartridges will replace the current 60mm M720 and M888 HE Mortar Cartridges. The difference between the new cartridges and the currently used cartridges is a change in propelling charge from the M204 (with M10 Flake Propellant) to the M235 (with M38 Ball propellant).

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Mortar- 60mm- Cartridge- HE M720E1

**Reference** (Gunn, 2001):

Gunn, K. (2001). Manpower and Personnel Integration (MANPRINT) Assessment for the Insensitive Cartridge, 60mm Mortar HE (M720E1), with the M734A1 Multi-Option Fuze. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Insensitive Cartridge, 60mm Mortar HE (M720E1), with the M734A1 Multi-option Fuze.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Mortar- 60mm- Cartridge- MAPAM XM1061

**Reference** (Gross, 2005):

Gross, R. (2005). Manpower and Personnel Integration (MANPRINT) Assessment: Health Hazard Assessment Report (RCS MED-388) No. 69-MP-04JF-06, XM1061/XM1046 60mm Mortar, Anti-Personnel, Anti-Materiel Mortar Cartridges, November 2005: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

60mm Mortar Anti-Personnel Anti-Materiel (MAPAM) XM1061/XM1046. FY00 Defense Appropriations Bill states that there may be a more effective round than the current 60mm M720 HE cartridge. This round is manufactured by the Swiss company, SM. The Mortar Anti-Personnel Anti-Materiel (MAPAM) Evaluation Program serves to assess the relative performance of the Swiss Designed and Produced 60mm munition, as it compares to the U.S. M720 60mm Cartridge. The MAPAM utilizes a markedly different warhead mechanism consisting of a ball matrix for the body of the warhead. This technology offers a more predictable level of lethality through it's inherent increase of optimally sized fragmentation.

**Report Availability:**

Distribution authorized to DOD Components only; test and evaluation; November 2005. Other requests shall be referred to Office of the Product Manager-Mortar Systems, ATTN: SFAEAMO-CAS-MS, Picatinny Arsenal, NJ 07806-5000:

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**System Short Name:** MANPRINT- Mortar- 60mm- Cartridge- MAPAM XM1061

**Reference** (Gunn, 2006):

Gunn, K. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the 60mm Mortar Anti-Personnel Anti-Materiel (Mapam) XM1061/XM1046: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The 60mm Mortar System is comprised of the standard U.S. Army M224 mortar system and the Mortar Anti-Personnel Anti-Materiel (MAPAM) Cartridge. The hardware components of the 60mm M224 Lightweight Company Mortar System (LWCMS) include: M225 Cannon Assembly, M170 Bipod Mount, M7 or M8 Base Plate, M64 Sight Unit. The MAPAM consists of a ball bearing and epoxy matrix warhead body. The MAPAM Cartridge is a modular design shell body, with the US M734AI Multi-option (XMI061) or the M783 point detonating (XMI046) Fuzes. The Propellant System includes the M27 Fin with the M702 Ignition Cartridge and four XM236 propelling charges. The XM236 is essentially the M235 propelling charge with 150 grains of M38 propellant, for a maximum range of 3,500 meters. The MAPAM Cartridges' increased weight required this design change.

2. Intended Applications For Use: The XM1061 and XMI046 will eventually supplement and/or replace the M720AI and M768 already in inventory. The XMI061 and XMI046 will be tactically employed against personnel and materiel targets during close combat.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Mortar- 60mm- Cartridge- PDF XM768

**Reference** (Gunn, 2001):

Gunn, K. (2001). Manpower and Personnel Integration (MANPRINT) Assessment for the Insensitive Cartridge, 60mm Mortar HE (XM768), with the XM783 Point Detonating (PD) Fuze. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Insensitive Cartridge, 60mm Mortar HE (XM768), with the XM783 Point Detonating (PD) Fuze.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Mortar- 60mm- Cartridge- WP M722E1

**Reference** (Gunn, 2001):

Gunn, K. (2001). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 60mm Mortar WP Smoke (M722E1, with the XM783 Point Detonating (PD) Fuze. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Insensitive Cartridge, 60mm Mortar HE (M720E1), with the M734A1 Multi-option Fuze.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Mortar- 81mm- Cartridge- HEMC

**Reference** (Barker and Spine, 1996):

Barker, D., & Spine, R. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the M821a1/M889a1 High Explosive (HE) 81mm Mortar Cartridges (HEMC). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The M821A1/M889A1 High Explosive (HE) 81mm Mortar Cartridges are U.S. designed versions of the M821/M889 mortar cartridges manufactured by the Royal Ordnance in the United Kingdom (UK). The new design reduces production costs while maintaining the safety, performance, and reliability characteristics of the UK produced cartridges. The U.S. versions contain the same HE filler (Composition B) as the U.K.-produced cartridges, but use a high fragmentation steel (HF-I) cartridges body instead of cast iron. The new design also includes the same M24 fin assembly, M299 ignition cartridge, and M220 propelling charge which are used on the M879 fullrange training cartridge. Except for the fuzes, the M821AI and M889AI cartridges are identical. The M821AI is fuzed with the M734 multioption (MO) fuze, whereas the MSS9AI uses the M935 point-detonating (PD) fuze. The cartridge has a unit weight of approximately 9.1 lbs and has a maximum range of 5935 meters.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Mortar- 81mm- Cartridge- HEMC

**Reference** (Zubal, 2008):

Zubal, O. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the M821A2 and M889A2 High Explosive 81mm Mortar Cartridges: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The 81mm HE M821A2 is a mortar cartridge similar to the currently fielded 81mm HE M21A1. Both mortar cartridges utilize identical components, with the sole difference being the fuze used to activate the M821A2. The M821A2 supports combat missions, and will replace the M821A1 as the primary tactical 81mm cartridge.

The 81mm HE M889A2mm is a mortar cartridge similar to the 81mm M821A2 which was Type Classified (TC-STD) on 4Q1996. Both cartridges utilize identical components with the sole difference being the fuze used to primarily support live fire training.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Mortar- 81mm- Cartridge- HEMC M889A1E1

**Reference** (Swiecicki, 2006):

Swiecicki, C. C. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the M889A1E1 81-mm Mortar High Explosive Cartridge (HEMC): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The M889A1E1 81mm High Explosive (HE) mortar cartridges will provide the user the ability to fulfill performance and operational requirements, but minimize the probability of inadvertent initiation and severity of subsequent collateral damage to the weapon system (including personnel) when subjected to unplanned external stimuli. The M889A1E1 will be Type Classified/Materiel Released with the M783 fuze in order to meet near term 81mm HE warfighter needs, offering improved training and increased reliability over the M889A1 which utilizes the older M935 mechanical fuze.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Mortar- 81mm- Cartridge- IRILL XM816

**Reference** (Gunn, 2001):

Gunn, K. (2001). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 81mm Mortar, Infrared Illuminating, XM816. 1 May 2001. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Cartridge, 81mm Mortar, Infrared Illuminating, XM816 was developed as a materiel change to the M853A1 81mm Illumination program. The XM816 cartridge is the same as the M853A1 81mm Illuminating cartridge with the exception of the candle which burns in the infrared spectrum. Both the M853A1 and the XM816 have a cylindrical body configuration and use the M772 Mechanical Time Super



Quick (MTSQ) fuze. An Infrared energy-producing candle is attached to a parachute. The candle and parachute are expelled from the cartridge by a burster charge. The fin assembly and the obturator provide the aeroballistic characteristics of the cartridge. The fin assembly contains an ignition cartridge and base plug. Four felted fiber increments are installed on the boom assembly of the fin. An obturator band is fitted at the widest part of the body to seal in the gases and increase the acceleration of the cartridge. The use of this cartridge with night vision devices makes it easier for forward observer to locate and identify a target. Because this cartridge will be used with no light or very limited light, a tag with a serrated edge on the fuze pull pin and an orange band with the letters will be used to distinguish the XM816 from the M853A1 Illuminating Cartridge and the M819 RP Smoke Cartridge in limited visibility. The M853A1 is the current 81mm Mortar illuminating cartridge that provides illumination in the visible light spectrum. Currently there is no infrared illumination cartridge for the XM816 to replace. The XM816 cartridge supplement the M853A1 in covert operations but will not replace the M853A1 Illumination cartridge. This cartridge will illuminate a battlefield with infrared light that will only be visible to personnel wearing night vision devices. It will be used to support covert operations in areas where it is necessary to identify enemy positions and equipment without their knowledge or revealing friendly positions. The XM816 will provide sufficient infrared light to allow forward observers to direct fire on all targets that can be fired on with HE cartridges fired from the M252 81mm mortar without having to fire the cartridge below charge 2. The Target Audience for the XM816 cartridge is the same as the M853A1 Illuminating cartridge, which is currently fielded with both the US Army and the USMC for use in the M252 81mm Mortar.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Mortar- 81mm- Cartridge- M821A2 / M889A2 HE

**Reference** (Zubal, 2009):

Zubal, O. (2009). Manpower and Personnel Integration (MANPRINT) Assessment for the M821A2 and M889A2 High Explosive 81mm Mortar Cartridges: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The M821A2 and the M889A2 81mm are the two cartridges involved in this effort. The only difference is the fuze used to activate the cartridges. The M812A2 is similar to the M821A1 currently fielded and supports live fire combat missions. The M889A2 is intended to replace the currently fielded M889A1 used in live fire training.

**Report Availability:**

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**System Short Name:** MANPRINT- Mortar- 81mm- Cartridge- WP

**Reference** (Curths and Carter, 1982):

Curths, D. W., & Carter, F. L. (1982). Manpower and Personnel Integration (MANPRINT) Assessment: Field Trial Performance and Human Factors Engineering for the Screening Smoke Cartridge, 81mm, White Phosphorus Wicks, Xm834: U.S. Army Dugway Proving Ground, UT. DPG-FR-81-324. DTIC ADB066814.

**Key Words:**

\*Smoke munitions, White phosphorus, Performance(Engineering), Test and evaluation, Human factors engineering, Wind velocity, Tables(Data)

XM-834 projectiles, LPN-USATECOM-2-MU-010-819-004

Fields and Groups:

190101 - Pyrotechnics

Descriptors:

(U) \*Smoke munitions, White phosphorus, Performance(Engineering), Test and evaluation, Human factors engineering, Wind velocity, Tables(Data)

Identifiers:

(U) XM-834 projectiles

**System Description:**

Field trials of the XM834, white phosphorus, 81 MM smoke cartridge were conducted at US Army Dugway Proving Ground, UT. The relative effectiveness of the XM834 projectile in forming obscuring smoke was compared to that of the M375A2 projectile. This report contains data and results for 35 trails conducted from January through March 1981. The performance of the XM834 projectile (in producing effective smoke screens) equals the performance of the M375A2 projectile, in most cases. Based on the observer survey scores, the XM834 projectiles formed fewer obscurations than the M375A2 projectile for the paired trials conducted in this test series. (Author)

Unclassified

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation; Sep 81. Other requests for this document must be referred to Commander/Director, Chemical Systems Lab., USAARADCOM, Attn: DRDAR-CLN-SM, Aberdeen Proving Ground, MD 21010. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Mortar- 120mm- Cartridge- BMS XM930

**Reference** (Zubal, 1998):

Zubal, O. (1998). Manpower and Personnel Integration (MANPRINT) Assessment for the 120mm Battalion Mortar System XM930 Visible Illuminating and XM983 Infrared Illuminating Cartridges.

Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The 120mm XM930 visible light illumination mortar cartridge consists of a two-part shell body and uses the M776 Mechanical Fuze. Cartridge illumination produces visible light when a pyrotechnic candle assembly is deployed by parachute. Like the 120mm High Explosive (HE) cartridges, the XM930 uses the M31 aluminum tail fin assembly and plastic split ring obturator. The propelling charge is identical to the HE cartridge.

The 120mm XM983 infrared illumination mortar cartridge is physically matched to the XM930 cartridge. The XM983 candle illuminate was changed to illuminate in the near infrared wavelengths.

Both cartridges are 27.6 inches long. The XM930 weighs 30.6 pounds and the XM983 weighs 30.8 pounds.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Mortar- 120mm- Cartridge- FCS BLOS- MRM

**Reference** (Zubal, 2007):

Zubal, O. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the Mid Range Munition (MRM): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The MRM is a 120mm cartridge that is intended to provide Beyond-Line-of-Sight (BLOS) target engagement capability for the Mounted Combat System (MCS). The MRM will employ three modes of operation: autonomous, designate, and designate only. Each of the three modes can be employed against moving or stationary targets while the MCS platform is stationary or moving.

**Report Availability:**

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**System Short Name:** MANPRINT- Mortar- 120mm- Cartridge- M313 STI

**Reference** (Ehmann, 2004):

Ehmann, R. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Xm313 81mm Subcaliber Training Insert (Sti): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The system consists of an 81mm insert tube and a 120mm mock tube. The 81mm tube has an integral Blast Attenuation Device (BAD) and a removable firing pin. The mock 120mm tube provides access to the removable firing pin and an interface with the 120mm mortar's bipod. The height of the 81mm BAD will be the same height as the 120mm mortar BAD. The XM313 insert will be used to train 120mm mortar crews only

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Mortar- 120mm- Cartridge- M313 STI

**Reference** (Gunn, 2005):

Gunn, K. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the M313, 120mm Mortar Subcaliber Training Lnsert (81mm Lnsert Program): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

M313, 120mm Mortar Subcaliber Training Insert (81mm Insert Program). The M313 (currently referred to as the M253) 120mm Subcaliber Training Insert is a smooth bore weapon, consisting of a modified 81mm M253 barrel (tube), a removable breech cap, a 120mm mock tube, an integral Blast Attenuation Device (BAD), and a removable firing pin. The new 81mm insert is being designed with all the safety and performance requirements of the current M253 barrel. The M313 fires both M300- and M800-series 81mm ammunition while maintaining current performance characteristics and system integration compatibilities. It also features improved firing pin removal procedures over those of the M303 Insert to ensure Soldier safety. The mock tube, provided for use during training, consists of a filler extension, a collar, and three windows (which serves as an access port for removing and installing the firing pin). After removing the standard 120mm tube, the mock tube is then screwed into the base cap. The modified M253 barrel is then slid down the mock tube. The rear of the tube is threaded and has a seat that functions as a gas seal and centers the base cap. The modified M253 barrel is finned to provide extra surface area for the dissipation of heat. The incorporation of an integral BAD allows for noise attenuation.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Mortar- 120mm- Cartridge- M313 STI

**Reference** (Gunn, 2006):

Gunn, K. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 120mm, M313, Mortar Subcaliber Training Insert (81mm Insert Program): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The M313, 120mm Mortar Subcaliber Training Insert (81mm Insert Program) will replace the M303, 81mm Training Insert. Due to strength considerations, the M303 cannot be used with the newer M800-series ammunition in training. As stocks of older M300 series ammunition are depleted, it will be necessary to use M800-series ammunition in training. The M313 will replace the M303 81mm Training Insert to enable the use of 81mm ammunition in the 120 Battalion Mortar System (BMS) Training Exercises.

**Report Availability:**

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**System Short Name:** MANPRINT- Mortar- 120mm- Cartridge- M933E1

**Reference** (Gunn, 2007):

Gunn, K. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 120mm Mortar: High Explosive, M933E1: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Cartridge, 120mm Mortar: High Explosive, M933E1 is a materiel change program (MCP) to modify the Cartridge, 120mm Mortar: HE, M933. The change includes use of an improved fuze and propulsion system. The M933E1 uses the M783 Point Detonating/Delay fuze, whereas, the M933 uses the M745 fuze which is no longer producible. The M933E1 also uses the improved propulsion system that includes the M1020 Ignition Cartridge and M234 Propelling Charges which are used on the M934A1 and other 120mm mortar cartridges. This change mirrors a previous Materiel Change Program which generated the M934A1. The only difference between the M933E1 and the currently fielded M934A1 is that the M933E1 utilizes the M783 Point Detonating/Delay Fuze which does not include the proximity fuze function of the M734A1 fuze used on the M934A1. Upon Type Classification (TC), the M933E1 will become the M933A1. The M933E1 is assembled with the M783 PD/DLY fuze which is essentially a non-electronic version of the M734A1 which functions on impact only using a mechanical detonator. The projectile consists of a 1090 steel body, a plastic split ring obturator, and an aluminum tail fin assembly. It consists of a waterproof ignition cartridge and primer and four horseshoe shaped removable propellant increments. The HE fill is Composition B.

1. The Cartridge, 120mm Mortar: High Explosive (HE), M933E1 (hereafter also referred to simply as the M933E1) is a materiel change program (MCP) to modify the Cartridge, 120mm Mortar: HE, M933. This change mirrors a previous MCP which generated the M934A1. The only difference between the M933E1 and the currently fielded M934A1 is that the M933E1 utilizes the M783 Point Detonating/Delay Fuze which does not include the proximity fuze function of the M734A1 fuze used on the M934A1. The type of fuze is the only difference between the M933E1 and the M934A1. The bare M933E1 (with the fuze attached, but without propellant increments) weighs 30.2 pounds and is 28 inches in length.

2. Intended Applications for Use: The M933E1 is designed for use with standard 120mm Mortar weapon, fire control system, and packaging.

**Report Availability:**

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**System Short Name:** MANPRINT- Mortar- 120mm- Cartridge- M934A1E1

**Reference** (Gunn, 2006):

Gunn, K. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 120mm: High Explosive (HE) M934A1E1, with Fuze Multi-Option, M734A1 for Mortars and Pa174 Monopack: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Cartridge, 120mm: High Explosive (HE) M934A1E1, with Fuze Multi-Option, M734A1 for Mortars and PA174 Monopack. The M934 is assembled with the M734 multi-option fuze. The M734 has four function modes that may be selected. These function modes are: proximity (PRX), near surface burst (NSB), impact (IMP), and delay (DLY). The projectile consists of a 1090 steel body, a plastic split ring obturator, and an aluminum tail fin assembly. It consists of a waterproof ignition cartridge and primer and four horseshoe shaped removable propellant increments. The HE fill is Composition B.

**Report Availability:**

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**System Short Name:** MANPRINT- Mortar- 120mm- Cartridge- M934A2

**Reference** (Ehmann, 2005):

Ehmann, R. (2005). Manpower and Personnel Integration (MANPRINT) Assessment: Health Hazard Assessment Report (Hhar) on the Cartridge, 120mm, High Explosive (HE), M934a2 Mortar Cartridge: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

- a. The M934A2 HE, 120mm mortar cartridge is part of the current family of ammunition for the 120mm Battalion Mortar System (BMS). The 120mm BMS ammunition have the same external shape, nearly the same weight, and are intended to be ballistically similar to each other. The cartridges are designed to achieve a range of over 7,000 meters (reference 7).
- b. The projectile consists of a steel body and HBU88B explosive fill which has improved insensitive munitions characteristics, a plastic split ring obturator, and an improved aluminum tail fin assembly. The propelling charge system consists of a waterproof MI020 ignition cartridge and primer and four M234 horseshoe-shaped propellant increments. The M932A2 cartridge will replace the current 120mm M934 and M934A1 cartridges.
- c. The BMS is available in two versions: the MI20 towed and MI21 carrier-mounted (reference 8).
  - (1) The MI20 BMS is transported in a towed configuration and is fired from the ground using a baseplate (ground mount). An MI20 mortar crew consists of five members: squad leader, gunner, assistant gunner, ammunition handler, and driver/ammunition handler.
  - (2) The MI21 BMS includes the MI064 mortar carrier, a derivative of the M113 armored personnel carrier. The mortar is mounted on a turntable in the carrier and is fired from the carrier (carrier mount). A MI21 mortar crew consists of four members: squad leader, . gunner, assistant gunner, and driver/ammunition handler.

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**System Short Name:** MANPRINT- Mortar- 120mm/107mm/81mm/60mm- Computer- IMBC

**Reference** (Barker, 1996):

Barker, D. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the XM30 Improved Mortar Ballistic Computer (IMBC). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Improved Mortar Ballistic Computer (IMBC) is a materiel change to the existing M23 Mortar Ballistic Computer. It is a lightweight, portable, battery powered data entry terminal and computer used for automated computation and display of mortar related information, and for communication with the AN/PSG-7 Forward Entry Device (FED) through standard Army communication radios and field wire. It will calculate all fire control information necessary to lay and fire the U.S. Army's 60mm, 81mm, 107mm, and 120mm mortar systems. It will accommodate all ammunition types and fuze combinations currently in use for these mortars and communicate via digital burst transmissions assuring the efficient transfer of mission data without relying on voice communication. The IMBC hardware, commonly referred to as the Hand Held Terminal Unit (HTU) is a portable, battery operated computer with a built-in display, an internal modern, one interface port, a Disk Operating System, and communications software. Initially, the Product Manager Mortar Systems will use preproduction hardware being provided by Litton Industries. The PM

plans to change to the Common Hardware Software-2 (CHS-2) HTU when it is available from CECOM. Both HTUs are being produced by the same contractor, Litton Industries. The IMBC's functional software is being developed by the Armament Research, Development, and Engineering Center (ARDEC), Life Cycle Software Engineering Center (LCSEC).

**Report Availability:**

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**System Short Name:** MANPRINT- Mortar- 120mm/107mm/81mm/60mm- Computer- LHMBC XM32

**Reference** (Gunn, 2005):

Gunn, K. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Lightweight Handheld Mortar Ballistic Computer (LHMBC) XM32. Redstone Arsenal, AL,: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The Lightweight Handheld Mortar Ballistic Computer (LHMBC) XM32 is based upon a modified non-development item (NDI) Ruggedized Personal Digital Assistant (R-PDA). The LHMBC, XM32 hardware is produced by Talla Tech Corporation and provided through the prime contractor, General Dynamics to the Project Manger Common Hardware Software (PM CHS). The overall dimension ofthe LHMBC is 3.5 by 6.2 by 2.35 inches. The approximate weight ofthe LHMBC is 23.5 ounces.
2. The LHMBC, XM32 will provide ballistic computation capabilities for all current **60mm, 81mm, and 120mm** mortar weapons and ammunitions at the Fire Direction Center, including digital communications, in a dismounted mode to replace the M23 Mortar Ballistic Computer (MBC). The LHMBC, XM32 system provides improved capabilities to calculate ballistic solutions for full and sub-caliber training ammunition and all current US Army mortar cartridges and fuze combinations.
3. The LHMBC, XM32 utilizes software C++ version ofthe same Ballistic Kernel used by the Mortar Fire Control System (MFCS). The LHMBC, XM32 will enhance speed and accuracy for targeting and coordination ofsupporting indirect mortar fires. Additionally, the system will provide the essential functions ofmortar fire control computation ofballistic solutions, registration, and Traversing Fire Suppression.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Mortar- 120mm/107mm/81mm/60mm- Computer- MFCS

**Reference** (Gunn, 2003):

Gunn, K. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the XM95/XM96 Mortar Fire Control System (MFCS): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. To win on future battlefields, maneuver unit Commanders require a more accurate, digitally integrated, responsive, and organic indirect frre system capable of rapid maneuver and displacement. The XM95/XM96 Mortar Fire Control System - Heavy (MFCS-H) provides improvements in command and

control of mortar fires and the speed of employment, accuracy, and survivability of mortars. Technological advances in Fire Control Systems automation will allow each mortar carrier to have precise position-navigation and situational awareness information. The MFCS-H provides both the Fire Direction Center (FDC) and individual mortars an enhanced computer system to automate both command and control functions and technical fire control.

2. The MFCS-H is an automated fire control system designed to resolve current mortar deficiencies as established in the Mission Need Statement (MNS). The MFCS-H will be installed at the Fire Direction Center (FOC) (M577) and at the 120-mm mortar carrier (MIO64A3). The FDC will have the hardware and software to function as a tactical management center while providing backup technical fire-control capability for the gun crews when required. It will have the computer capability to tactically and technically manage guns under its control and the mortars of an adjacent battalion, if required. All FDC configurations will use the same hardware configuration and will have the same hardware as the guns except for the on-board Pointing Device, the Gunner's Display, Driver's Display, Position Lightweight Global Reference Receiver, and Vehicle Motion Sensor.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Mortar- 120mm/107mm/81mm/60mm- Computer- MFCS D120

**Reference** (Urbiola, 2008):

Urbiola, S. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the Mortar Fire Control System - Dismounted 120mm (MFCS - D120): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The Mortar Fire Control System – Dismounted 120mm (MFCS – D120) was designed to provide a complete, fully integrated digital fire control system installed on an M326 equipped trailer, mounted in a HMMWV, or operated on the ground. The MFCS - D120 was designed to be capable of sending and receiving digital commands across the battlefield. Navigation instructions can be calculated and sent to the Fire Control Computer (FCC) through inputs from the Pointing Device (PD) and Defense Advanced GPS Receiver (DAGR).

2. The MFCS - D120 consists of a power supply, portable rugged computer, gunners display, and weapon pointing device. It provides improved capabilities to calculate ballistic solutions for training ammunition and all current US Army mortar cartridges and fuze combinations. The system components perform the task of the mortar Fire Direction Center (FDC), squad leader display, gunner's display, and gun laying/orientation.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Mortar- 120mm/107mm/81mm/60mm- Computer- MFCS-H

**Reference** (Gunn, 2003):

Gunn, K. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the Mortar Fire Control System- Heavy, XM95/XM96 (MFCS-H): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.



**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. To win on future battlefields, maneuver unit Commanders require a more accurate, digitally integrated, responsive, and organic indirect fire system capable of rapid maneuver and displacement. The XM95/XM96 Mortar Fire Control System – Heavy (MFCS-H) provides improvements in command and control of mortar fires and the speed of employment, accuracy, and survivability of mortars. Technological advances in Fire Control Systems automation will allow each mortar carrier to have precise position-navigation and situational awareness information. The MFCS-H provides both the Fire Direction Center (FDC) and individual mortars an enhanced computer system to automate both command and control functions and technical fire control.

2. The MFCS-H is an automated fire control system designed to resolve current mortar deficiencies as established in the Mission Need Statement (MNS). The MFCS-H will be installed at the Fire Direction Center (FDC) (M577) and at the 120-mm mortar carrier (M1064A3). The FDC will have the hardware and software to function as a tactical management center while providing backup technical fire-control capability for the gun crews when required. It will have the computer capability to tactically and technically manage guns under its control and the mortars of an adjacent battalion, if required. All FDC configurations will use the same hardware configuration and will have the same hardware as the guns except for the on-board Pointing Device, the Gunner's Display, Driver's Display, Position Lightweight Global Reference Receiver, and Vehicle Motion Sensor.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- MOUT

**Reference** (Gunn, 1999):

Gunn, K. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the Military Operations on Urbanized Terrain (MOUT) Fuze (Fuze, Point Detonating/Delay, Mk399 MOD1 for Artillery MOUT Applications). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Military Operations on Urbanized Terrain (MOUT) Fuze (Fuze, Point Detonating/Delay, Mk399 MOD1 for Artillery MOUT Applications).

**Report Availability:**

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**System Short Name:** MANPRINT- MPCV

**Reference** (Reinhart, 2001):

Reinhart, J. (2001). Manpower and Personnel Integration (MANPRINT) Assessment for the Mine Protected Clearance Vehicle (MPCV). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Mine Protected Clearance Vehicle (MPCV) is a non-developmental off-the-shelf (NDI-OTS) wheeled, armored vehicle designed to operate and survive in mined environments. Personnel will use a remotely controlled arm mounted on the front passenger side corner to expose or dig up buried mines. The MPCV will serve as the control vehicle for the Ground Standoff Mine Detection System (GSTAMIDS) and Interim Vehicle Mounted Mine Detector (IVMMD) teleoperation crews.

**Report Availability:**

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**System Short Name:** MANPRINT- MSS

**Reference** (Reinhart, 2007):

Reinhart, J. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the Mounted Soldier System (MSS). Redstone Arsenal, AL,: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Mounted Soldier System (MSS).

**Report Availability:**

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**System Short Name:** MANPRINT- MSU

**Reference** (Spine, 1996):

Spine, R. J. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the M67 Mortar Sight Unit (MSU). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The M67 Mortar Sight Unit (MSU) is for use on the 120mm mortar to lay the mortar in elevation and deflection. It replaces the M53 and M64AI Mortar Sight units. The M67 Sight Unit consists of an elbow telescope and telescope mount. The M67 is more rugged, for the 120mm Mortar System, than the M64A1. The M67 employs tritium lamps for night use as opposed to the older battery lighted M53 sight unit. The sight has a 4X telescope vs. the 1.2X M64A1 telescope. The weight of the M67 Sight Unit is 2 3/4 pounds versus the 6.5 pounds of the M53.

**Report Availability:**

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**System Short Name:** MANPRINT- MTS

**Reference** (Headley, 2000):

Headley, D. B. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the Movement Tracking System (MTS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

A. The Army requires a worldwide capability to track the location of vehicles, communicate with vehicle operators, and redirect movements based on battlefield requirements. The MTS is part of a suite of digitized additions planned for tactical wheeled vehicles (TWV) that will influence future distribution operations on the battlefield. Recent campaigns demonstrated unacceptable capabilities for maneuver and logistics commanders to track, communicate with, and reroute TWVs. This inability resulted in the inefficient use of limited assets, high risks to personnel and equipment, and supplies being delivered to the wrong locations. The MTS is to prevent a repeat of these problems.

B. The MTS is a non-developmental item. It incorporates a global positioning system, automatic identification technology, non line-of-sight communications, and mapping technologies. The MTS will be consistent with the Joint Vision 2010 and its database, and the Army will integrate MTS data into the Global Command and Control System.

C. The MTS will follow a two tiered evolutionary strategy of incremental developments that will eventually meet all operational, environmental, and performance goals. Block I will deliver a core capability of two-way messaging, mapping, and position location that will be the baseline for follow-on enhancements. Block II will deliver enhanced information flow, evolving capabilities, additional functionality, and improved electronic interfaces.

**Report Availability:**

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**System Short Name:** MANPRINT- MTS

**Reference** (Headley, 2001):

Headley, D. B. (2001). Manpower and Personnel Integration (MANPRINT) Assessment for the Movement Tracking System (MTS). 17 November 2001. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

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way messaging, mapping, and position location that will be the baseline for follow-on enhancements. Block II will deliver enhanced information flow, evolving capabilities, additional functionality, and improved electronic interfaces.

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**System Short Name:** MANPRINT- MVS

**Reference** (Jee, 1996):

Jee, L. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the Muzzle Velocity System (MVS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Muzzle Velocity System (MVS).

**Report Availability:**

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**System Short Name:** MANPRINT- NBC- Decon- JSTDS-SS

**Reference** (Garrett, 2006):

Garrett, L. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the Joint Service Transportable Decontamination System-Small Scale (JSTDS-SS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The JSTDS-SS Increment I program is a non-developmental integration effort intended to take existing commercial technologies and provide maneuver commanders the ability to decontaminate non-sensitive equipment such as facilities and terrain that have been exposed to Chemical Biological, Radiological, and Nuclear (CBRN) contamination and Toxic Industrial Material (TIM). The JSTDS-SS Increment I will replace the existing M17 Senator and expand on the capabilities of the existing system.

**Report Availability:**

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**System Short Name:** MANPRINT- NBC- Decon- MDS

**Reference** (Harrah, 1993):

Harrah, D. M. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the Modular Decontamination System (MDS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Chemical Companies will use the MDS to perform the primary wash, decontaminant application and rinse steps of detailed equipment decontamination (DED) as described in Field Manual (FM) 3-5, NBC Decontamination. Each MDS will consist of one XM21, Decontaminant Pumper (DP) module and two XM22, High Pressure Washer (HPW) modules. The basis of issue will be one MDS per chemical decontamination squad and a total of 1047 XM22 HPW modules and 546 XM21 DP modules will be purchased.

The XM22 HPW modules will replace the M17 Lightweight Decontamination System and M12AI Power-driven Decontamination Apparatus (PDDA) which are currently used by the light and heavy division chemical decon or smoke/decon squads at the pre-wash and rinse steps of the DED process, respectively. Each HPW will consist of a pump unit which is capable of providing a water flow rate of 5 gpm at pressures adjustable from 500 to 3000 psi, a heater unit capable of heating the water to at least 70 degrees C, and two 75 foot hoses with spray wands attached to the ends which allow the operator to control the flow of water. The HPW reduces the size, weight, transportation requirements and water usage rates of the equipment used at these steps of the DED.

The XM21 DP modules will replace the current, labor intensive, decontaminant application methods of using mops and brooms or using the Decontaminating Apparatus, M13 at the decontaminant application step of the DED. Each DP module will consist of a chemical pump unit to draw the Army's standard decontaminant solution (DS2) from containers to the DP, two 75 foot hoses with spray wands attached to the ends which allow the operator to apply the DS2, and two electrically powered scrub brushes which allow the operator to mix the DS2 with the chemical or biological agent on the vehicle surface. The 14 pound powered scrub brushes will be manually held in position and guided over the vehicle surface by the operator. Operator lift and control of the scrub brush is maintained through the use of handles and a shoulder strap which is designed to spread the weight of the brush unit over the upper body muscle groups. The scrubbing action will be automated by the electrically powered rotating brush.

The intent of the MDS is to increase decon efficiency, reduce operator workload, improve transportability, reduce water usage rates and to meet DED vehicle throughput objectives. Figure 1 is the MDS Concept of Use Schematic showing the system transport configuration as well as the DED station uses of the individual MDS modules.

The MDS powered equipment will be operated by chemical squad members (MOS 54B, Chemical Specialists) or soldiers from the supported unit being decontaminated (MOS immaterial) who are supervised by the 54B soldiers. The unit level maintainer for the XM21 and XM22 will be MOS 63J, Quartermaster/Chemical Equipment Repairer. The prime mover vehicle (HMMWV) and trailer will be maintained by 63B, Light Wheel Vehicle Repairer soldiers.

**Report Availability:**

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**System Short Name:** MANPRINT- NBC- Decon- Sorbent

**Reference (Harrop, 2000):**

Harrop, W. J. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the Sorbent Decontamination System (SDS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Sorbent Decontamination system (SDS) is a ready-to-use chemical decontamination system for liquid chemicals, including Chemical Warfare Agents. It consists of two kits packed in a hard plastic container, which is 36.8 cm long by 14.0 cm wide by 9.5 cm high. Each kit, packaged in moisture protecting soft plastic pack, consists of two sections, which can be separated at a perforated tear strip. The smaller section of the kit (packet 1) contains one application mitt. The mitt is vacuum packed to reduce the packet size. When the packet is opened, the mitt expands to normal shape and size. The mitt is used to apply the sorbent powder (contained in packet 2) to the contaminated surface. Packet 2 contains the sorbent powder, which weighs 0.35 kg and consists of powdered aluminum oxide doped with 10% sodium silicate, and 5% carbon. As the sorbent powder is applied to the contaminated surface, the powder absorbs the contaminant. The sorbent powder and the contaminants can then be removed from the surface.

**Report Availability:**

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**System Short Name:** MANPRINT- NBC- Detector- BIDS

**Reference** (Poston, 1994):

Poston, A. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Biological Integrated Detection System (BIDS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

a. The Non-Developmental Item (NOI) BIDS consists of a standard military shelter vehicle (M1097 Heavy High Mobility Multipurpose Wheeled Vehicle (HMMWV)) outfitted with a S-788 Lightweight Multipurpose Shelter which provides a collectively protected and environmentally controlled work environment. Three collector stacks draw atmospheric samples at a rate of 1000 liters per minute in order to provide samples for the Aerodynamic Particle Sizer, other diagnostic tests, and for evacuation to laboratory facilities for definitive identification purposes. The BIDS is also outfitted with equipment which provides for communications, navigational aids, and meteorological sensors. Electrical power for the entire system is provided by a trailer-mounted standard Army 15 kW generator. The system can also operate on commercial electrical power, if available.

b. The biological detection suite consists of:

(1) Biological Sampler. This sampler is an XM2 biological sampler. It is a high volume aerosol sampling and collection device. On demand, it samples the ambient air through a two-stage virtual impactor, which concentrates aerosol particles in the two to 10 micrometer diameter size range. The concentrated particle stream is directed through a wet collector containing a buffer solution (40 ml). Particles are transferred from the air stream into the collection buffer. At the end of the sampling period (45 minutes), the wet collector is removed from the XM2 and transported to a laboratory for confirmatory analysis of biological agents.

(2) Liquid Sampler. The Liquid Sampler is a modified XM2 in which the wet collector is replaced with a continuous flow liquid scrubber. The device also includes a sample delivery system that transfers the concentrated liquid to sample tubes arranged in a carousel. On demand, the delivery system dispenses 0.5 ml into a separate tube each minute. These samples are then analyzed by the BIDS crew using the various detection components.

(3) Aerodynamic Particle Sizer (APS). The APS continuously samples the ambient air and directs it through an orifice to accelerate the velocity of aerosol particles. To measure particle velocity, a laser beam is split into two beams, and the beams are focused onto two spots downstream of the orifice. The light scattered by a particle passing through these beams is collected and focussed on a photomultiplier tube. The time required for a particle to cross the distance between the two beams is used to calculate its aerodynamic diameter. The APS provides a measure of background aerosol contamination and particle

size distribution. Changes in this background can indicate the presence of a man-made aerosol associated with a biological warfare attack. When pre-set threshold values are exceeded, the operator is automatically alerted to collect samples, using the Aerosol Particle Sampler, for analysis by other BIDS detection components.

(4) Bioluminometer. The bioluminometer is an instrument designed to measure the light produced by the reaction of firefly luciferase with adenosine triphosphate (ATP). There is a relatively constant amount of ATP present in the cells of all living organisms; therefore, this reaction differentiates bacteria and other types of cells from non-biological airborne material. A sample from the Aerosol Particle Sampler is added to a ticket containing the luciferase and other reagents, and the ticket is inserted into the analyzer. The light emitted by the reaction is monitored with a photomultiplier tube and is converted into a relative bacterial concentration. The use of different detergents to release the ATP from within the cells can provide some level of discrimination between spores, other microorganisms, and higher plant or animal cells. If a positive ATP reading is obtained, the operator triggers the XM2 Sampler to collect a sample for laboratory analysis.

(5) Flow Cytometer (FCM). The FCM is a particle counting and sizing device similar in concept to the APS, except that it uses a liquid sample in which aerosol particles have dissociated into their subcomponents. The sample to be analyzed is injected into the center of a fast moving fluid stream which is then forced through an orifice. Upon exiting the orifice, the stream passes through a measurement station where particulates, such as bacterial cells, are illuminated by a light source. Scattered light is measured at different angles and wavelengths using a series of optical filters and photomultiplier tubes to provide information concerning the cell's size, shape, density, and surface morphology. Typically, a dye is added to the sample to enhance contrast and to provide additional discrimination. Using pattern recognition techniques, bacterial cells can be differentiated from natural background and can be placed into different classes. This device is used to provide generic detection information subsequent to positive indications from both the APS and the Bioluminometer.

(6) Threshold Device. The Threshold Device is an instrument used to monitor the results of specific antigen-antibody reactions. A liquid sample is mixed with antibodies against specific biological agents and then filtered through a specially coated ticket. If the specific agents are present, they remain bound to the surface of the ticket. Additional reagents are subsequently filtered through the ticket to label any bound agent with an enzyme. The ticket is then placed into a reader station where a substrate is added. A solid-state microsensor measures small changes in pH produced by the enzyme-substrate reaction, which are directly proportional to the amount of agent present. The Threshold Device can provide simultaneous detection of up to eight different agents within 10 to 12 minutes, if antibodies are available. This device is used to provide specific detection information subsequent to positive indications from both the APS and the Bioluminometer.

(7) Detection Tickets. The Detection or Sensitive Membrane Antigen Rapid Test (SMART) Ticket also uses antibody-based reagents to detect specific biological agents. A liquid sample is mixed with antibodies against specific biological agents that have been conjugated to colloidal gold particles. The resulting mixture is added to the ticket. If the agent is present, a bright red spot will form on the ticket within 20 minutes. Each ticket is capable of detecting a single agent. Detection Tickets are included in the BIDS as a backup for the Threshold Device.

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**System Short Name:** MANPRINT- NBC- Detector- BIDS

**Reference** (Murray, 1995):

Murray, R. (1995). Manpower and Personnel Integration (MANPRINT) Assessment for the Biological Integrated Detection System (BIDS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

### **System Description:**

a. The Non-Developmental Item (NDI) Biological Integrated Detection System (BIDS) is an integrated biological detection and sampling suite in a S-788 Lightweight Multipurpose Shelter mounted on an M1097 High Mobility Multipurpose Wheeled Vehicle (HMMWV), Heavy Variant (HHV). In addition to the detection equipment, the shelter includes collective protection, environmental control, meteorological, communications, navigation, and power equipment. A trailer mounted IS-kilowatt generator (PU-801) is used to provide electrical power. The BIDS is not designed to operate on the move, but it has the capability to rapidly relocate to a new position. For this reassessment, multiple BIDS will be employed in an array with some units as far upwind as practical. Information from multiple BIDS will be used to determine if a Biological Warfare (BW) attack has occurred.

b. The biological detection suite consists of five detection components and two sampling components (samplers) :

(1) High Volume Aerodynamic Particle Sizer (HVAPS or APS). The HVAPS consists of a high volume particle concentrator, aerodynamic particle sizer, notebook computer, and monitor unit. The particle concentrator samples air through a 1000 liter per minute collector. The collector concentrates aerosol particles in a one liter per minute sample flow that is supplied to the Aerodynamic Particle Sizer (APS). The APS determines the concentration of aerosol particles as a function of size for particles between .5 and 15 microns (micro-meter). The notebook computer analyzes the output of the APS for changes in particulate size and concentration that would indicate a man-made BW aerosol cloud. When a threshold is exceeded, the monitor unit provides an audible and visual indication to alert the BIDS operators to begin sampling operations. All HVAPS data are automatically recorded on diskettes installed in the notebook computer for later analysis or reconstruction of the alerts. The HVAPS is a NON-SPECIFIC monitoring device since it is unable to discriminate between biological and non-biological particles. However, the capability of the HVAPS to distinguish man-made aerosol clouds provides a limited GENERIC detection capability. The HVAPS operates continuously.

(2) Microluminometer (MLN). The Microluminometer is a portable device that measures the amount of light emitted from certain types of biochemical reactions. It detects a characteristic chemical marker to determine if biological material is present in a sample. The marker, Adenosine Triphosphate or ATP, is a soluble material found only in living cells. Disposable tickets are used which contain reagents that react with ATP to produce light. The intensity of the emitted light is converted into an electrical signal and displayed on a liquid crystal display (LCD) in units of millivolts (mV). The microluminometer measures chemical properties of samples collected by the Liquid Sampler. The instrument is a GENERIC detection device since it cannot distinguish between different types of biological cells. The microluminometer operates on demand

(3) Flow Cytometer (FCM). The FCM system consists of cytometer and power supply units, computer, display unit, and keyboard. The FCM is used to detect the presence of bacterial cells or spores in a liquid sample provided by the Liquid Sampler. The FCM uses light scattering to analyze the size, shape, and nucleic acid ratio of suspended particles between 0.5 and 10  $\mu$ m. The data is transferred to the computer, processed, and presented to the operator in graphical form on the monitor. using pattern recognition techniques, bacterial cells and spores can be differentiated from other types of particles. All FCM data is automatically recorded on disk for later analysis or reconstruction. The FCM is a GENERIC detection device since it cannot distinguish between different types of bacteria. The FCM is operated on demand.

(4) Threshold Device (THS). The THS consists of a threshold workstation, notebook computer, and printer. The THS is used to provide presumptive identification of a sample after POSITIVE results are obtained from other components of the biological detection suite (HVAPS, MLN, and FCM). The THS is the most labor intensive system in the BIDS and requires an operator to mix and transfer several different samples and reagents in a specific order. It detects the presence of specific agents by monitoring the results of individual antigen-antibody reactions. The data are presented to the operator and saved to disk for later analysis or reconstruction. The THS is a SPECIFIC identification device since the antibodies used bind only to specific BW agents. Samples are collected and drawn from the Liquid sampler. The THS is operated on demand.

(5) Sensitive Membrane Antigen Rapid Test (SMART) Tickets. The SMART tickets measure the chemical properties of samples collected with the Liquid Sampler. The tickets detect unique chemical markers using antibody-antigen reactions similar to the THS. Each SMART ticket measures the degree of antibody binding for a single type of antibody. The SMART tickets are SPECIFIC identification devices since the antibodies used bind only to specific BW agents. The SMART tickets are operated on demand, normally if the THS is inoperable.



(6) Carousel Sample Liquid Collector (Liquid Sampler). The Liquid Sampler constantly samples ambient air through a 1000 liter per minute collector which concentrates particles in the two to 10 micron size range. The particles are transferred from air to liquid in a continuous flow liquid scrubber. The resulting liquid sample is normally routed to a waste container. On demand, the sampler diverts the concentrated liquid sample to six test tubes arranged in a carousel. After activation by the operator, one-half milliliter samples are dispensed into a separate tube each minute. Samples from the liquid sampler are analyzed using the GENERIC and SPECIFIC components of the BIDS suite. Although the liquid sampler operates continuously, it only provides samples for analysis on demand.

(7) Single Sample Liquid Collector (Biological sampler). The Biological Sampler collects a concentrated aerosol sample in liquid for confirmatory analysis outside the BIDS. Upon demand, the biological sampler samples ambient air through a 1000 liter per minute collector which concentrates particles in the two to 10 micron size range. The particles are transferred from air to liquid in a wet collector containing 40 ml of collection buffer. The sampling time can be adjusted by the operator, but typically 45 minutes is used. The biological sampler maintains the wet collector temperature between 40 and 45 degrees F to preserve the viability of the sample. After the sample is collected, the wet collector is removed, sealed, and placed in temporary cold storage within the BIDS. The sample and associated documentation are transported to a designated laboratory for confirmatory analysis. The biological sampler is operated on demand, normally at the same time as the liquid sampler, in response to an APS alert condition or external indication of a BW attack.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- NBC- Detector- JCBRAWM

**Reference** (Garrett, 2008):

Garrett, L. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the Joint Chemical, Biological, and Radiological Agent Water Monitor (JCBRAWM) Kit: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The Joint Chemical, Biological, Radiological Agent Water Monitor (JCBRAWM) Increment 1 consists of the XM329 and the XM330. The XM329 is a one-man portable kit for detecting, identifying, and quantifying the presence of radiological and 'biological agents in water. It consists of the RADIAC meter IM263/ PDR-77 and the DT-695/PDR-77 beta probe for detecting alpha/beta radiological contamination and handheld assays for detecting biological agents. The kit also includes several items to aid in sample collection and testing: sample collection containers, pipettes, nitrile gloves, stainless steel planchets, an attenuator, a stand, liquid detergent, and a heater with DC power cable and AC-to-DC converter assemblies. All components are contained in a carrying case for easy portability and storage. This kit supplements the M272 Chemical Agents Water Testing Kit (TM 3-6665-319-10). The XM330 has the same function as the XM329. However, it does not contain the IM-263/PDR-77 RADIAC meter or the DT-695/PDR-77 probe. Otherwise, the handheld assays and the sample collection and testing components are the same as the XM329. The JCBRAWM will have common detection components across the multi-service platforms: It may also share the same operational and support concept. The JCBRAWM Increment 1 mission includes:

- Tactical reconnaissance, testing at water generation sites and fixed sites.
- Water point selection, water purification, water storage, and distribution.
- Reconnaissance, infectious disease, water treatment, water source acceptability, storage and distribution.

**Report Availability:**

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**System Short Name:** MANPRINT- NBC- Gloves- CB Protective

**Reference** (Bensel, 1980):

Bensel, C. K. (1980). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Two Types of Rubber CB Protective Gloves: U.S. Army Natick Research and Development Center, Clothing, Equipment, and Materials Engineering Laboratory, Natick, MA. NATICK/CEMEL-205 NATICK-TR-80/005. DTIC ADA084716.

**Key Words:**

\*rubber gloves, test and evaluation, damage, sizes(dimensions), human factors engineering, biological warfare agents, chemical warfare agents, neoprene, butyl rubber

pe62723a, ash98, wu006

Fields and Groups:

150603 - Chemical, Biological and Radiological Warfare

230200 - Human Factors Engineering & Man Machine System

230400 - Protective Equipment

Descriptors:

(U) \*RUBBER GLOVES, TEST AND EVALUATION, DAMAGE, SIZES(DIMENSIONS), HUMAN FACTORS ENGINEERING, BIOLOGICAL WARFARE AGENTS, CHEMICAL WARFARE AGENTS, NEOPRENE, BUTYL RUBBER

**System Description:**

This study was conducted to determine the effects on manual dexterity capabilities of two types of rubber chemical and biological protective gloves, the standard Army butyl glove and a neoprene glove. Six men and six women performed a battery of six manual tasks during 14 daily sessions under each of the following handwear conditions: bare hands, butyl gloves, butyl gloves under leather gloves, neoprene gloves, and neoprene gloves under leather gloves. Lightweight cotton gloves were worn next to the skin whenever either the butyl or the neoprene gloves were used. One of the tasks performed was a measure of the angular force which could be exerted on a cylindrical handle. Five tasks measures finger or hand dexterity. One of these included the use of wrenches and screwdrivers and another and the disassembly and assembly of an M16A1 rifle. The greatest amount of angular force was exerted when butyl gloves were worn and the least amount of force was exerted with the neoprene and leather glove combination.

(Author)

Unclassified

**Report Availability:**

Distribution: DTIC Users Only. 12 - U.S. GOVT. AND THEIR CONTRACTORS. Report available from U.S. Army Natick Research and Development Center, Clothing, Equipment, and Materials Engineering Laboratory, Natick, MA.:

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**System Short Name:** MANPRINT- NBC- Mask- JSMLT

**Reference** (Garrett, 2005):

Garrett, L. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Joint Service Mask Leakage Tester (JSMLT). Redstone Arsenal, AL,: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Joint Service Mask Leakage Tester (JSMLT) is a one-man setup and two person portable device that is capable of determining serviceability, proper fit, and identifying defective components of current and future Chemical, Biological, Radiological and Nuclear (CBRN) negative pressure protective masks. This system will provide a capability currently not available in the field to quantitatively test the protective mask for defects and fit by measuring the performance of the mask against known performance standards.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- NBC- Mask- Protective- Aircrew- ACPM XM45

**Reference** (Harrah, 1996):

Harrah, D. M. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the XM45 Aircrew Protective Mask (Acpm): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The XM45 Aircrew Protective Mask is being developed as the replacement for the M48, M49, and M24 Masks. The mask provides protection from chemical and biological agents that enter through the respiratory tract or that affect the eyes. The mask will be worn by all Rotary Wing Aviation personnel except for the APACHE helicopter - Warrant Officer Area of Concentration (AOC) 150 A, 151 A, 152 (except 152F), 153, and 154, Officer AOC 15, and Career Management Fields (CMF) 67, 91, and 93 (enlisted assigned aircrew flight duties). The mask will be worn both on the ground and in the helicopter. The mask consists of closefitting eyelenses, front and side voicemitters for face-to-face and phone communication, a microphone pass through for aircraft communication, a drink tube pass through for liquid nutrients, a low profile canister interoperability hose assembly to allow both hose and face mounted configurations, interchangeable nose cups mounted in a rubber facepiece with an in-turned peripheral seal and a second skin hood. The mask will provide the required CB protection without the aid of forced ventilation air while maintaining compatibility with aircraft sighting systems (except the IHADDS ) and night vision devices. Injection molded composite materials will be used for the component parts to reduce weight and cost.

The primary requirements that the mask must meet are:

- Fit the 5th percentile female through 95th percentile male (2nd percentile female through 98th percentile male desired).
- Provide intelligible speech over aircraft radios, handsets, and face-to-face.
- Compatible with vision and sighting devices, displays, life support systems, and cockpit
- Protect aviator from nerve, blister, and blood agents in persistent and non-persistent forms, without the use of forced or ventilated air
- Provide unobstructed and undistorted vision, provide vision correction system, not fog, and protect against lasers
- Fit the 5th percentile female through 95th percentile male (2nd percentile female through 98th percentile male desired).
- Provide NATO threads so that the canister is interchangeable with canisters from allied nations; canister should be quick to change from left to right side and vice versa.
- Provide capability for aviator to drink 0.1 quarts of water per minute
- Allow trained crewmember to wear mask up to 15 hours under moderate workload in hot and basic climates
- Permit rapid entry and egress from cockpits
- Permit aviator to perform Valsalva maneuver
- Include a carrier to hold ancillary items Aviator must be able to don mask from the carrier in nine seconds (six additional seconds for hood)

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- NBC- Mask- Protective- Aircrew- APM

**Reference** (Harrah, 1996):

Harrah, D. M. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the XM45 Aircrew Protective Mask (APM). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The XM45 Aircrew Protective Mask (APM) is being developed as the replacement for the M48, M49, and M24 Masks. The mask provides protection from chemical and biological agents that enter through the respiratory tract or that affect the eyes. The mask will be worn by all Rotary Wing Aviation personnel except for the APACHE helicopter - Warrant Officer Area of Concentration (AOC) 150 A, 151 A, 152 (except 152F), 153, and 154, Officer AOC 15, and Career Management Fields (CMF) 67, 91, and 93 (enlisted assigned aircrew flight duties). The mask will be worn both on the ground and in the helicopter. The mask consists of closefitting eyelenses, front and side voicemitters for face-to-face and phone communication, a microphone pass through for aircraft communication, a drink tube pass through for liquid nutrients, a low profile canister interoperability hose assembly to allow both hose and face mounted configurations, interchangeable nosecups mounted in a rubber facepiece with an in-turned peripheral seal and a second skin hood. The mask will provide the required CB protection without the aid of forced ventilation air while maintaining compatibility with aircraft sighting systems (except the IHADDS ) and night vision devices. Injection molded composite materials will be used for the component parts to reduce weight and cost.

The primary requirements that the mask must meet are:

- Fit the 5th percentile female through 95th percentile male (2nd percentile female through 98th percentile male desired) .
- Provide intelligible speech over aircraft radios, handsets, and face-to-face.
- Compatible with vision and sighting devices, displays, life support systems, and cockpit.
- Protect aviator from nerve, blister, and blood agents in persistent and non-persistent forms, without the use of forced or ventilated air.
- Provide unobstructed and undistorted vision, provide vision correction system, not fog, and protect against lasers.
- Provide NATO threads so that the canister is interchangeable with canisters from allied nations; canister should be quick to change from left to right side and vice versa.
- Provide capability for aviator to drink 0.1 quarts of water per minute.
- Allow trained crewmember to wear mask up to 15 hours under moderate workload in hot and basic climates.
- Permit rapid entry and egress from cockpits.
- Permit aviator to perform Valsalva maneuver.
- Include a carrier to hold ancillary items.

Aviator must be able to don mask from the carrier in nine seconds (six additional seconds for hood).

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- NBC- Mask- Protective- Aircrew- JSAM

**Reference** (Garrett, 2009):

Garrett, L. (2009). Manpower and Personnel Integration (MANPRINT) Assessment for the Joint Service Aircrew Mask (JSAM) Type Ia MPU-6/P: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Joint Service Aircrew Mask (JSAM) will be a multipurpose, lightweight chemical and biological (C/B) protective mask that will provide individual aircrew protection against C/B warfare agents, radiological particles, and toxic industrial materials (TIMS). The JSAM will be able to integrate with numerous multi-service aircraft platforms and aircrew life support equipment configurations.

This combined Human Factors Engineering Assessment (HFEA), Manpower, Personnel, Training Assessment (MPTA), and Soldier Survivability Assessment (SSvA) is for the Type IA (MPU-6/P). The Type IA (MPU-6/P) will be used by AH-64 pilots (only). The Type IA (MPU-6/P) was developed to accommodate the unique helmet and helmet display unit (HDU) that AH-64 pilots wear during missions.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- NBC- Mask- Protective- Hood- CBPH

**Reference** (Bruno and Randall, 1978):

Bruno, R. S., & Randall, R. B. (1978). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Evaluation of a Chemical-Biological Protective Hood (CBPH) for the XM-29 Protective Mask: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. HEL-TN-6-78. DTIC ADB031883.

**Key Words:**

\*protective masks, \*hoods, human factors engineering, chemical warfare, biological warfare, compatibility, materials, operational effectiveness

XM-29 protective mask

Fields and Groups:

150603 - Chemical, Biological and Radiological Warfare

Descriptors:

(U) \*PROTECTIVE MASKS, \*HOODS, HUMAN FACTORS ENGINEERING, CHEMICAL WARFARE, BIOLOGICAL WARFARE, COMPATIBILITY, MATERIALS, OPERATIONAL EFFECTIVENESS

Identifiers:

(U) XM-29 protective mask

**System Description:**

This report describes a human factors engineering evaluation of prototype chemical-biological (CB) protective hoods for the XM-29 CB protective mask. Thirteen candidate hoods were evaluated along with three 'Standard A' control items. The candidate hoods were submitted by the US Army Natick Research and Development Command (NARADCOM) and the US Army Chemical Systems Laboratory (CSL). In this evaluation, the hoods were worn in actual working environments with complete clothing and equipment ensembles. Based on subjective data and professional judgment, one candidate hood (with modifications) was recommended that would meet all suitability criteria and would be compatible with the XM-29 CB protective mask in all modes. (Author)

Unclassified

**Report Availability:**

Distribution limited to U.S. Gov't. agencies and their Contractors; Specific authority; Aug 78. Other requests must be referred to Director, Army Human Engineering Lab., Aberdeen Proving Ground, MD 21005. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- NBC- Mask- Protective- M40

**Reference** (Harrah, 1994):

Harrah, D. M. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the M40 Protective Mask: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

1. To fulfill a joint services operational requirement (JSOR), the U.S. Army Edgewood Research, Development and Engineering Center (ERDEC) developed the M40 Series Protective Mask. The mask provides protection against field concentrations of all chemical and biological agents in vapor and aerosol form and against radioactive fallout particles.
2. The M40 mask is worn by all ground crew personnel in the U.S. Army and U.S. Marine Corps (USMC), and the M42 mask is worn by combat vehicle crewmembers (CVC) in the U.S. Army and U.S. Marine Corps. The M40A1 ground crew and M42A1 CVC masks are in production for use by the U.S. Army only. The product improvement provides a new vision correction system to replace the current metal frame insert; provides laser protective outserts, improves the M7 Voice Amplifier; provides a new, smaller carrier for the mask; and provides an easily removable external microphone for the M42 and M42A1 masks to replace the current fixed internal microphone.
3. The original M40 and M42 masks were type classified in 1987, and the initial Block I product improvements were type classified in September 1992. This HEA only covers the additional Block I improvements of the P3I program as well as improvements to satisfy identified problems from the field.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- NBC- Mask- Protective- XM30

**Reference** (Barnes et al., 1983):

Barnes, J. A., Bruno, R. S., Hanlon, W. E., Harrah, D. M., & Hickey, C. A. (1983). Manpower and Personnel Integration (MANPRINT) Assessment: XM30 Engineering Design Test--Government (Human Factors): U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. HEL-TM-5-83. DTIC ADB074226.

**Key Words:**

\*protective masks, experimental design, test and evaluation, human factors engineering, performance tests, vision, mobility, firing tests(ordnance)

XM-30 mask

Fields and Groups:

150603 - Chemical, Biological and Radiological Warfare

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*PROTECTIVE MASKS, EXPERIMENTAL DESIGN, TEST AND EVALUATION, HUMAN FACTORS ENGINEERING, PERFORMANCE TESTS, VISION, MOBILITY, FIRING TESTS(ORDNANCE)

Identifiers:

(U) XM-30 mask

**System Description:**

This test was designed to investigate the effect of wearing the XM30 series protective masks on soldier performance over a range of generic tasks which included mobility/portability, rifle and machine gun firing, armored vehicle operation, visual performance, night operations, donning/doffing, and drinking in a simulated chemical contaminated environment. (Author)

Unclassified

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation; Mar 83. Other requests for this document must be referred to Director, ARRADCOM, Chemical Systems Labs., Attn: DRDAR-CLE, Aberdeen Proving Ground, MD 21010. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- NBC- MOPP Procedures

**Reference** (Harrah et al., 1990):

Harrah, D. M., Bruno, R. S., & Weaver, B. C. (1990). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Mission-Oriented Protective Posture (MOPP) Exchange Procedures: U.S. Army Dugway Proving Ground, UT, Technical Analysis and Information Office. DPG/TA-90/025. DTIC ADB148421.

**Key Words:**

\*protective clothing, \*chemical warfare agents, chemicals, layers, human factors engineering, internal, missions, chemical agents, chemical warfare, external, transfer, posture(general), contamination, marine corps personnel, clothing, indicators, exchange  
pe65710a, lpn-usatecom-8-co-210-049-101

Fields and Groups:

150603 - Chemical, Biological and Radiological Warfare

Descriptors:

(U) \*PROTECTIVE CLOTHING, \*CHEMICAL WARFARE AGENTS, CHEMICALS, LAYERS, HUMAN FACTORS ENGINEERING, INTERNAL, MISSIONS, CHEMICAL AGENTS, CHEMICAL WARFARE, EXTERNAL, TRANSFER, POSTURE(GENERAL), CONTAMINATION, MARINE CORPS PERSONNEL, CLOTHING, INDICATORS, EXCHANGE, PROTECTIVE MASKS, CHEMICAL AGENT SIMULANTS, FOOTWEAR, BUTYL RUBBER, RUBBER GLOVES

**System Description:**

This evaluation answers a requirement by the U.S. Army Chemical School on the mechanisms of transfer of contamination (chemical agent), the guidance that can be provided during training, and whether changes in the procedures or in clothing design are needed to minimize transfer of contamination. A colored simulant was used as an indicator of contact between the outer layer of the chemical protective ensemble and the next layer, a white paper suit. The location of contact, the time required to perform each task and the marines opinions of the procedures and ensembles were recorded and analyzed. The marines participating in the evaluation were not able to remove the ensemble without contact between the outer and inner layers. Recommendations were made to improve the design of the ensemble and to change the procedures to minimize contamination transfer. Keywords: Chemical warfare (CW), Test and evaluation, CW agent simulant, Overgarment, Overshoes, Protective mask, Human factors engineering, MOPP exchange procedures, Butyl rubber gloves.

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies only; Test and Evaluation; Sep 1990. Other requests shall be referred to Director, U.S. Army Laboratory Command, Human Engineering Lab., Attn: SLCHE-CC-LHD, Aberdeen Proving Ground, Dugway, UT 83022-5000., Availability: Document partially illegible. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- NBC- Suit- CB

**Reference** (Bruno, 1980):

Bruno, R. S. (1980). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation and Fitting Survey of the Chemical Biological (CB) Suit and Associated Equipment in Combination with Field Clothing Ensembles Worn by Male Soldiers: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. HEL-TN-12-80. DTIC ADB052014.

**Key Words:**

\*Protective clothing, \*Human factors engineering, Chemical warfare, Biological warfare, Army personnel, Males, Field conditions, Test and evaluation, Surveys, Compatibility, Gloves

Fields and Groups:

150603 - Chemical, Biological and Radiological Warfare

Descriptors:

(U) \*Protective clothing, \*Human factors engineering, Chemical warfare, Biological warfare, Army personnel, Males, Field conditions, Test and evaluation, Surveys, Compatibility, Gloves

**System Description:**

This report describes a human factors evaluation and fitting survey to determine the adequacy and compatibility of the CB Protective Suit and associated equipment when worn in conjunction with male field clothing ensembles. Clothing ensembles used were the temperature, cold-wet and cold-dry uniforms. The U. S. Army Natick Research and Development Command (NARADCOM) tasked the U. S. Army Human Engineering Laboratory (USAHEL) with the responsibility for conducting sizing, fitting, and compatibility evaluations to insure the universality of application (Project No. Q793035). This is one of a series of reports on CB Suit compatibility Recommendations concerning each item are described. (Author)  
Unclassified

**Report Availability:**

Distribution limited to U.S. Gov't. agencies and their Contractors; Specific authority; Aug 80. Other requests must be referred to Director, Army Human Engineering Lab., Aberdeen Proving Ground, MD 21005. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- NBC- Suit- CVCCS

**Reference** (Bruno, 1980):

Bruno, R. S. (1980). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation and Fitting Survey of the Chemical Biological Suit and Associated Equipment in Combination with the Combat Vehicle Crewmember Clothing System (CVCCS): U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TN-13-80. DTIC ADA092669.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*human factors engineering, \*protective clothing, test and evaluation, surveys, biological warfare, combat vehicles, chemical warfare, crews, compatibility

Fields and Groups:

150603 - Chemical, Biological and Radiological Warfare

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*PROTECTIVE CLOTHING, TEST AND EVALUATION, SURVEYS, BIOLOGICAL WARFARE, COMBAT VEHICLES, CHEMICAL WARFARE, CREWS, COMPATIBILITY

**System Description:**



This report describes a human factors evaluation of the proposed ground Combat Vehicle Crewmember Clothing System (CVCCS). The CVCCS is an integrated clothing system that will protect the crewmember from environmental, occupational, and imposed hazards. The US Army Natick Research and Development Command tasked the US Army Human Engineering Laboratory to evaluate body extraction, fit, sizing, and general compatibility of the CVCCS. There were a few minor problems which were easily corrected. Comments and recommendations concerning each component of the CVCCS are described.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- NBC- Suit- MOPP ACE

**Reference** (Bruno, 1991):

Bruno, R. S. (1991). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the MOPP Exchange Procedure for the Aircrew Ensemble (MOPP ACE): U.S. Army Dugway Proving Ground, UT, Joint Operational Test and Information Directorate. DPG/JOD-92/003. DTIC ADB162111.

**Key Words:**

chemicals, combat vehicles, crews, exchange, flight crews, human factors engineering, infantry personnel, pilots, test and evaluation

LPN-USATECOM-8-CO-210-049-112, PE65710A, AS049, \*Chemical warfare, Decontamination, Protective equipment, Army personnel, Army training, \*Chemical protective ensembles.

Fields and Groups:

150603 - Chemical, Biological and Radiological Warfare

Descriptors:

(U) CHEMICALS, COMBAT VEHICLES, CREWS, EXCHANGE, FLIGHT CREWS, HUMAN FACTORS ENGINEERING, INFANTRY PERSONNEL, PILOTS, TEST AND EVALUATION

Identifiers:

(U) LPN-USATECOM-8-CO-210-049-112, PE65710A, AS049, \*Chemical warfare, Decontamination, Protective equipment, Army personnel, Army training, \*Chemical protective ensembles

**System Description:**

The U.S. Army Chemical School, in an effort to update FM 3-5 to include the latest chemical protective ensembles for the infantry soldier, combat vehicle crew member, and aviator, tasked U.S. Army Dugway Proving Ground to evaluate current procedures. The evaluation of the new procedures and training with simulants showed an increase in the number of clean test participants, when compared to a previous exchange evaluation using the procedures in FM 3-5.

Unclassified

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies only; Test and Evaluation ; Dec 91. Other requests shall be referred to STEDP-JOD, Dugway Proving Ground, UT 84022-5000. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- NEO

**Reference** (English et al., 2006):

English, A., Gimblett, R., & Coombs, H. (2006). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Implications and Issues in Network Enabled Operations (Neo): KMG ASSOCIATES KINGSTON (ONTARIO). DTIC ADA477187.

**Key Words:**

\*networks, \*command and control systems, \*network centric warfare, requirements, integrated systems, theory, canada, military forces(foreign), validation  
foreign reports, human factors

**System Description:**

Network Enabled Operations (NEOps) seems poised to become the driving concept behind CF transformation for a number of reasons, not the least of which is Canada's tendency to follow the American lead in new concepts related to war and other operations. This paper concludes that Canada and the CF should be cautious about using NCW as the foundation for NEOps, because the context and needs that are the basis for NCW may not be congruent with Canadian requirements. The paper noted that NCW is not really a theory of war, as its proponents claim, but a series of largely untested hypotheses or assumptions that require validation before they should be accepted as a basis for transformation. Recent Canadian Forces (CF) operations have shown that a "one size fits all" approach to command and control, as proposed by many NCW advocates, may not be the best approach for networked operations, even in an increasingly integrated joint and combined operating environment. Perhaps most importantly, from a Canadian point of view, using NEOps in the Joint, Interagency, Multinational, and Public (JIMP) or integrated context will require network architects not only to consider the use of information technology as an enabler, but also for them to address the much more complex issue of the creation of effective social networks. In summary, NEOps as a concept has a promising future if it is predicated on Canadian needs and culture. However, there is significant risk in placing too much reliance on concepts like NCW which put the technology before the human requirements. Therefore, future development of the NEOps concept should be firmly rooted in the Canadian context and based on Canadian experience. NEOps concept development should be complemented by the relevant experience of others, but it should avoid slavishly copying other frameworks as DND has sometimes done in the past.

Unclassified

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- NVG AN/PVS-7A

**Reference** (Anton, 1988):

Anton, R. (1988). Manpower and Personnel Integration (MANPRINT) Assessment: Follow-on Evaluation of Night Vision Goggle (NVG) AN/Pvs-7a. Pretest Inventory and Inspection, Safety, Human Factors Engineering, Logistic Supportability, and Electromagnetic Pulse Subtests: U.S. Army Electronic Proving Ground, Fort Huachuca, AZ. USAEPG-FR-1317. DTIC ADB127111.

**Key Words:**

\*night vision devices, \*goggles, test and evaluation, logistics support, test methods, rubber, human factors engineering, safety, assembly, housings, electromagnetic pulses, space perception, peripheral vision, face(anatomy), gas masks

\*an/pvs-7, \*night vision goggles, lpn-usatecom-8-ee-pvs-007-012

**System Description:**

USAEPG conducted testing on the AN/PVS-7A Night Vision Goggle to obtain information on safety, human factors engineering, logistic supportability, and electromagnetic pulse. A pre-test inventory and inspection was performed. The AN/PVS-7A, personnel had trouble defining their depth perception and peripheral vision. These are known problems with night vision devices in general and can be partially compensated for by proper training and user common sense. The human factors problems were: wearer discomfort caused by the eye relief distance adjustment mechanism, lack of a forehead support, cheek pads, rubber eyepie cups, and design of the chin strap; the goggle did not fit over the gas mask and cheek and forehead pads came off the face mask easily. Logistic supportability problems involved bent contacts in the battery holder, broken face mask carriage, and a broken face mask carriage, and a broken housing assembly.

Unclassified

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies and their contractors; Specific Authority; 31 Jul 1989.  
Other requests shall be referred to Project Manager, Night Vision Devices, Attn: AMCPM-NVD-E, Fort  
Belvoir, VA 22060-5000. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- NVG AN/PVS-7B

**Reference** (Anton, 1988):

Anton, R. (1988). Manpower and Personnel Integration (MANPRINT) Assessment: Follow-on Evaluation of Night Vision Goggle (NVG) AN/PVS-7B: Safety, Human Factors Engineering, Logistic Supportability, Pretest Inventory and Inspection, and Electromagnetic Pulse Subtests: U.S. Army Electronic Proving Ground, Fort Huachuca, AZ. USAEPG-FR-1318. DTIC ADB124153.

**Key Words:**

\*goggles, \*night vision devices, configurations, electromagnetic pulses, human factors engineering, image intensifiers(electronics), inventory, lenses, logistics support, peripheral vision, safety, space perception, straps, test and evaluation, training  
an/pvs-7b.

Fields and Groups:

170500 - Optical Detection and Detectors

170800 - Miscellaneous Detection and Detectors

Descriptors:

(U) \*GOGGLES, \*NIGHT VISION DEVICES, CONFIGURATIONS, ELECTROMAGNETIC PULSES, HUMAN FACTORS ENGINEERING, IMAGE INTENSIFIERS(ELECTRONICS), INVENTORY, LENSES, LOGISTICS SUPPORT, PERIPHERAL VISION, SAFETY, SPACE PERCEPTION, STRAPS, TEST AND EVALUATION, TRAINING

**System Description:**

USAEPG conducted testing on the AN/PVS-7B Night Vision Goggle to obtain information on Safety, Human Factors Engineering, Logistic Supportability, and Electromagnetic Pulse. A pretest inventory and inspection was performed. the AN/PVS-7B met the required technical performance except in the areas of safety and human factors. While wearing the AN/PVS-7B personnel had trouble defining their depth perception and peripheral vision. These are known problems with Night Vision Devices in general and can be partially compensated for by proper training and common sense on the part of the user. The Human Factors problems were: Wearer discomfort associated with the weight and strap configuration of the device; an incorrect field of view due to the objective lenses being aimed 10-15 degrees too high; insufficient hands-on training; and difficulties with straps, pockets, and demisting shields. Keywords: Night Vision Goggle, AN/PVS-7B, Image Intensifier (I2), MX-18282, MX-10130. (SDW).

Unclassified

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies only; Test and Evaluation; Jul 88. Other requests shall be referred to PM, Night Vision Devices, ATTN: AMCPM-NVD-E, Fort Belvoir, VA 22060-5000. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- OCU

**Reference** (Burcham, 1998):

Burcham, P. M. (1998). Manpower and Personnel Integration (MANPRINT) Assessment: Human Engineering Evaluation of the Omnitech Operator Control Unit (OCU): U.S. Army Research Laboratory, Aberdeen Proving Ground, MD 21005, Human Research and Engineering Directorate. ARL Technical Note ARL-TN-106. DTIC ADB234759.

**Key Words:**

**HFEA- Human Factors Engineering Assessment**

**Fields and Groups:**

120900 - Cybernetics

130600 - Surface Transportation and Equipment

150600 - Military Operations, Strategy and Tactics

**Descriptors:**

(U) \*MILITARY REQUIREMENTS, \*HUMAN FACTORS ENGINEERING, \*REMOTELY PILOTED VEHICLES, CONTROL SYSTEMS, MILITARY STANDARDS, ENGINEERING, MISSIONS, VEHICLES, OPERATORS(PERSONNEL)

**Identifiers:**

(U) OCU(OPERATOR CONTROL UNIT)

**System Description:**

A human engineering (HE) evaluation was conducted on the Omnitech operator control unit (OCU) whose basic mission is to provide a comprehensive tele-remote conversion capability to a variety of engineering vehicles for mine-breaching applications. The evaluation revealed 13 human-item-related hazards. Recommendations for design modifications to fulfill military standard requirements are discussed.

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies only; Proprietary Information; Mar 98. Other requests shall be referred to U.S. Army Research Laboratory, ATTN: AMSRL-HR-SC. Aberdeen Proving Ground, MD 21005-5425. :

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**System Short Name:** MANPRINT- OCU II

**Reference** (Burcham and Gombash, 1998):

Burcham, P. M., & Gombash, J. (1998). Manpower and Personnel Integration (MANPRINT) Assessment: Human Engineering Evaluation of the Omnitech D7g Mark II Operator Control Unit (OCU II). City: U.S. Army Research Laboratory, Aberdeen Proving Ground, MD 21005, Human Research and Engineering Directorate. ARL Technical Note ARL-TN-130. DTIC ADB241188.

**Key Words:**

HFEA- Human Factors Engineering Assessment

**Fields and Groups:**

120500 - Computer Programming and Software

230200 - Human Factors Engineering & Man Machine System

190300 - Combat Vehicles

**Descriptors:**

(U) \*HUMAN FACTORS ENGINEERING, \*MAN COMPUTER INTERFACE, \*REMOTE CONTROL, MILITARY REQUIREMENTS, CONTROL SYSTEMS, MILITARY STANDARDS, ENGINEERING, MISSIONS, GROUND VEHICLES, OPERATORS(PERSONNEL), BULLDOZERS

**Identifiers:**

(U) D-7G BULLDOZERS

**System Description:**

A human engineering evaluation was conducted on the Omnitech D7G Mark II operator control unit whose basic mission is to provide a comprehensive tele-remote conversion capability to a variety of engineering vehicles for various missions. The evaluation revealed 12 human-item-related hazards. Recommendations for design modifications to fulfill military standard requirements are discussed.

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies only; Proprietary Info; Dec 98 Other requests shall be referred to ARL/AMSRL-HR-SC, Aberdeen Proving Ground, MD 21005-5425:

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**System Short Name:** MANPRINT- OICW

**Reference** (Spine, 1999):

Spine, R. J. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the Objective Individual Combat Weapon (OICW). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Objective Individual Combat Weapon (OICW).

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Parachute- ATPS

**Reference** (Spencer, 2009):

Spencer, R. A. (2009). Manpower and Personnel Integration (MANPRINT) Assessment for the T-11 Advanced Tactical Parachute System (ATPS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The ATPS is a troop personnel parachute system consisting of the main parachute, T-11R reserve parachute, and troop harness. Each is described as below.

1. Main Parachute System. The main parachute serves as the primary functional component used to safely deliver the paratrooper to the ground during airborne operations. The main parachute consists of a Universal Static Line (USL), deployment bag, pilot chute, canopy sleeve, suspension lines, risers, slider, and canopy releases for connection to the troop harness. The main parachute is non-gliding, but possesses the capability to perform a riser slip to avoid mid-air collisions during descent.
2. Reserve Parachute System. The T-11R reserve parachute is intended for emergency use during airborne operations in the event of a main parachute malfunction. It also contains a pilot chute, suspension lines, risers, attachment devices for connection to the troop harness, a chest mounted reserve and an activation handle. A deployment device (kicker spring) provides positive deployment of a pilot parachute thereby preventing entanglement of the reserve with the malfunctioning or fully functioning main parachute.
3. Troop Harness. The troop harness is a device that interfaces between the parachutist, the main and reserve parachute canopies, and the jumper's equipment. The harness is worn by the parachutist, and the parachutes and equipment are affixed to the harness. The harness is designed to fit the 5th percentile female through the 95th percentile male soldiers. It will permit soldiers the mobility needed to run. The main canopy is mounted on the back and the reserve is mounted on the front. The harness has shoulder mounted riser attachment points for interfacing with the ATPS main parachute and chest mounted riser attachment points for the reserve parachute. There will be two integral main parachute riser release devices for separation of the main parachute after landing. The harness will also have equipment attachment points capable of integrating with all current equipment and weapons container systems certified for airborne operations. The harness will have the capability of rapid doffing after landing on the ground or in water. The harness must incorporate separate attachment points on either side for an equipment lowering line.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director,

Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-  
HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Parachute- Mask- POM

**Reference** (Spencer, 2009):

Spencer, R. A. (2009). Manpower and Personnel Integration (MANPRINT) Assessment for the Parachutist Oxygen Mask (POM) Redstone Arsenal, AL,: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The POM is intended to be part of the Military Free Fall (MFF) parachutist's oxygen life support system, which includes the American Safety Flight System (ASFS) Twin 53 cubic inch oxygen bailout bottle system and the Twin cubic inch portable oxygen system already certified for use by the U.S. Air Force. The portable oxygen systems are designed to be used at elevations up to 35,000 feet Mean Sea Level (MSL) during the conduct of High Altitude Low Opening (HALO) and High Altitude High Opening (HAHO) airdrop operations. The POM is designed to be capable of delivering diluted and 100% aviator's grade oxygen to the parachutist during MFF operations above 12,999 feet MSL.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- PASGT

**Reference** (Kaminski, 1977):

Kaminski, W. J., Jr. (1977). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Assessment of Personnel Armor System, Ground Troop (PASGT) for Airborne Use: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TN-4-77 LIMITED. DTIC ADB018660.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*body armor, army personnel, infantry, cold weather operations, airborne, nylon, human factors engineering, air drop operations, helmets, cold weather tests, parachute jumping, vests kevlar, ground troops

Fields and Groups:

190400 - Armor

Descriptors:

(U) \*BODY ARMOR, ARMY PERSONNEL, INFANTRY, COLD WEATHER OPERATIONS, AIRBORNE, NYLON, HUMAN FACTORS ENGINEERING, AIR DROP OPERATIONS, HELMETS, COLD WEATHER TESTS, PARACHUTE JUMPING, VESTS

Identifiers:

(U) KEVLAR, GROUND TROOPS

**System Description:**

A human factors engineering assessment of the Personnel Armor System, Ground Troop (PASGT) for use in airborne operations was conducted by the Human Engineering Laboratory. The compatibility of the PASGT (Kevlar helmet and vest) and Standard A (ballistic nylon vest and M1 helmet) systems with extreme cold- weather clothing, parachute assemblies and combat equipment employed during airdrop operations was evaluated using canopy control, emergency landing and ground-drag maneuvers. Difficulties encountered with either vest included restricted forward neck extension when under the canopy and inability to use the cross-arm method for canopy release activation when wearing the arctic cold-dry uniform. The Standard M1 helmet was found to contact the collar of the body armor partially restricting upward vision. The PASGT helmet chinstrap was found incompatible with the arctic cold-weather cap. However, these difficulties were judged minor with both systems considered compatible with the personnel airdrop system and safe for use in airborne operations.

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation; Apr 1977. Other requests for this document must be referred to Director, Human Engineering Lab., Aberdeen Proving Ground, Md. 21005. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- PGMM

**Reference** (Harris, 2003):

Harris, S. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the Precision Guided Mortar Munition, XM395: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

In accordance with the Mission Need Statement for the 120mm Battalion Mortar System (BMS), 23 Oct 85, "an immediate need exists for an organic precision guided mortar munition with the ability to incapacitate troops in earth and timber bunkers, behind masonry structures, and in lightly armored vehicles at extended ranges." The complexity of the 21st century battlefield will require that mortars be able to provide immediate support to the maneuver element in urban and complex terrain while reducing the risk of collateral damage. The Precision Guided Mortar Munition (PGMM) will achieve extended ranges, increased capability to accurately engage targets in urban and complex terrain, and incapacitate enemy personnel in earth and timber bunkers, behind masonry structures, and in lightly armored vehicles. These capabilities will increase the lethality and the survivability of both the maneuver element and the mortar system, and thus extend the close combat zone. This system must be compatible with the 120mm BMS.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- PIAFS

**Reference** (Zubal, 2000):

Zubal, O. (2000). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Evaluation of the XM1155 Portable Inductive Artillery Fuze Setter (PIAFS): U.S. Army Research Laboratory, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland. ARL Technical Report ARL-MR-483. DTIC ADB255580.

**Key Words:**

MANPRINT  
MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*human factors engineering, \*howitzers, \*fuze setters, portable equipment, infantry personnel, military training, error correction codes, induction systems, joint test and evaluation, electric fuzes(ordnance), electromagnetic fuzes

155-mm howitzers, pe61102a

Fields and Groups:

190100 - Ammunition and Explosives

190600 - Guns

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*HOWITZERS, \*FUZE SETTERS, PORTABLE EQUIPMENT, INFANTRY PERSONNEL, MILITARY TRAINING, ERROR CORRECTION CODES, INDUCTION SYSTEMS, JOINT TEST AND EVALUATION, ELECTRIC FUZES(ORDNANCE), ELECTROMAGNETIC FUZES

Identifiers:

(U) 155-MM HOWITZERS

**System Description:**

PIAFS is a small, 4.2- by 3.5- by 2.7-inch device that houses electronics for accepting and transmitting fuze data. On top of the box is a small liquid crystal screen for displaying the main menu and sub-menu choices. Two standard D batteries, housed in an attached cylindrical handle, provide operating power. On the bottom of the box is a conical depression that fits over the nose of an electronic fuze when data are to be transmitted to the fuze. Two PIAFSs were used in this evaluation; they were identical in function, but one had a screen with a yellow background and black pixels the other screen had a light blue background and brown pixels.

The portable inductive artillery fuze setter (PIAFS) was designed to allow crews of presently fielded 155-mm howitzers to set electronic fuzes that are being developed for use in the highly automated future howitzer. A one-day effort was conducted to evaluate whether artillerymen could learn to effectively use the PIAFS. After 30 minutes of training, the participants were ready for the evaluation. As simulated fire commands were issued, a participant had to select fuze type, fuze function mode, and fuze time from appropriate sub-menus and then set one fuze using the PIAFS. After setting the first fuze, the participant set three more fuzes using the same data. Average time to enter data and set one fuze ranged from 5.6 seconds to 15.1 seconds. The variation was a function of the number of digits that needed to be manipulated in the fuze time sub-menu. Setting additional rounds required 2.9 seconds per round and was insensitive to hand condition or type of fuze being set. Errors were minor. Overall, the artillerymen readily accepted the PIAFS but complained that it was inconvenient to correct errors in the fuze time sub-menu. It was concluded that artillerymen could quickly learn to use the PIAFS effectively. A recommendation was made to explore methods to expedite error correction.

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies only; Test and Evaluation; Jun 2000. Other requests shall be referred to Director, U.S. Army Research Lab., Attn: AMSRL-HR-MB, Aberdeen Proving Ground, MD 21005-5425. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Pistol- 9mm- XM10

**Reference** (Sellers et al., 1990):

Sellers, K. J., Ellis, P. H., Ortega, S. V., Jr., Hanlon, W. E., & Merkey, R. P. (1990). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the XM10 Pistol

Candidates: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-3-90 LIMITED. DTIC ADB144841.

**Key Words:**

MANPRINT

MANPRINT Assessment



#### Human Factors Engineering Assessment

MA

HFEA

\*human factors engineering, \*pistols, acceptability, army personnel, assembly, disassembly, females, operators(personnel), performance(human), questionnaires, scenarios, targets, test and evaluation, user needs, weapons

9-MM Guns, XM-10 Guns.

Fields and Groups:

190600 - Guns

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*PISTOLS, ACCEPTABILITY, ARMY PERSONNEL, ASSEMBLY, DISASSEMBLY, FEMALES, OPERATORS(PERSONNEL), PERFORMANCE(HUMAN), QUESTIONNAIRES, SCENARIOS, TARGETS, TEST AND EVALUATION, USER NEEDS, WEAPONS

Identifiers:

(U) 9-MM Guns, XM-10 Guns

#### System Description:

This report addresses the human factors evaluation of three XM10 9mm pistol candidates conducted as part of a follow-on pistol competition to the M9 pistol. The primary objective was to identify any human factors engineering (HFE) issues that might affect a soldier's ability to operate any of the XM10 candidates in combat. The evaluation compared the three candidate pistols in terms of human performance and user acceptability. Performance issues related to the ease of engagement, reloading, and operator level disassembly and assembly of the weapons (i.e., field stripping). Seventeen male and two female military test participants (TPs) fired and field stripped the three pistols. Firing was conducted on a combat-style course of 30 short exposure single and double pop-up silhouette targets at ranges of 10 and 25 meters. Each TP fired each pistol twice against the target scenario. TPs responded to questionnaires about the operating, firing, and field stripping procedures of each pistol. TP responses were scored to determine preferences. HEL subject matter experts supplemented TP observations with HFE critiques of each pistol. There were clear TP preferences regarding candidates. All the XM10 pistol candidates, however, were deemed adequate for operational use from a human factors standpoint.

#### Report Availability:

Distribution authorized to U.S. Gov't. agencies only; Proprietary Info.; Contractor Performance Evaluation; Apr 90. Other requests shall be referred to Director, U.S. Army Human Engineering Lab., Aberdeen Proving Ground, MD 21005-5001. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- PLGR

#### Reference (Zeman, 1994):

Zeman, J. (1994). *Manpower and Personnel Integration (MANPRINT) Assessment for the Precision Lightweight Gps Receiver (Plgr)*: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

#### Key Words:

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

#### System Description:

The PLGR or AN/PSN-11 is a navigational tool that provides the operator with accurate position, velocity, time, target locations, and various ways of navigating to waypoints, in adverse weather and all climates. In order to obtain the highest degree of accuracy, the PLGR needs to have current crypto key. The PLGR can continuously track up to five satellites. The PLGR has an antenna, a limited keypad, backlit display, receiver processor unit, a main power battery and a memory battery. The PLGR can be used with an external power source and external antenna. The PLGR was designed to be operated and held with the same hand (except for initializing). The PLGR weighs 2.75 pounds with all batteries installed. The PLGR will operate hand-held or in various ground, water, and air vehicles.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- PLRS

**Reference** (Smootz, 1984):

Smootz, E. R. (1984). Manpower and Personnel Integration (MANPRINT) Assessment: Position Location Reporting System (PLRS) OT II Human Factors and Training Evaluation: U.S. Army Research Institute for the Behavioral and Social Sciences (PERI-OH). 5001 Eisenhower Ave, Alexandria, VA 22333. ARI Research Note 84-110. ADA143818.

**Key Words:**

Automated Battlefield Systems; Tactical Data Systems; Position Location Systems; Human Factors; Training

Fields and Groups:

050600 - Humanities and History

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*TEST AND EVALUATION, \*TRAINING, \*HUMAN FACTORS ENGINEERING, \*DEFICIENCIES, \*QUESTIONNAIRES, ARMY PERSONNEL, COMPUTERS, VENTILATION, OPERATIONAL EFFECTIVENESS, MAINTENANCE PERSONNEL, SAFETY, SUPERVISORS, AIR CONDITIONING EQUIPMENT, MARINE CORPS PERSONNEL, OPERATORS(PERSONNEL), MANUALS

**System Description:**

A human factors and training evaluation of the Position Location and Reporting System (PLRS) was conducted in conjunction with OTEA Operational Test II of the system at Fort Hood, Texas. Data were collected by administering questionnaires to and interviewing system operators, system maintainers, and unit leaders. Most of the human factors problems which were identified related to operating and maintaining the master station, whereas most of the training problems which were found centered on the user unit training program.

The position location reporting system (PLRS) is a computer-based system designed to provide realtime three dimensional position and navigation information to selected elements within an Army Division, a separate Brigade, or a Marine Amphibious Brigade. Such a system can be expected to enhance a commander's control over his units, allow for more rapid fire support coordination, and provide more accurate position and navigation information information to military units under a wide variety of environmental and tactical conditions.

The system consists of two master stations and 725 user units, although only 370 user units can be active at any given time. The central component of the system is the master station. It provides the network management and automatic data processing that is necessary for the system to function. It receives radio frequency pulses from the individual user units and through multilateration computes the location of each unit. This information, as well as other information such as messages, restricted zone locations, and the locations of other units, is transmitted by the master station to a user unit upon request.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- PLRS-JTIDS

**Reference** (Erickson, 1986):

Erickson, J. R. (1986). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering for PLRS-JTIDS Hybrid (PJH): U.S. Army Research Office, Research Triangle Park, NC 27709-2211 and Battelle Laboratory, Columbus, OH. TCN-86-363 ARO-TCN-86-363. DTIC ADB216056.

**Key Words:**

\*contract administration, \*human factors engineering, \*problem solving, monitoring, shelters, communications networks, military downsizing  
plrs(positive location reporting system), pjh(plrs jtids hybrid)

Fields and Groups:

050100 - Administration and Management

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*CONTRACT ADMINISTRATION, \*HUMAN FACTORS ENGINEERING, \*PROBLEM SOLVING, MONITORING, SHELTERS, COMMUNICATIONS NETWORKS, MILITARY DOWNSIZING

Identifiers:

(U) PLRS(POSITIVE LOCATION REPORTING SYSTEM), PJH(PLRS JTIDS HYBRID)

**System Description:**

PLRS-JTIDS (positive location reporting system) Hybrid (PJH). The Joint Tactical Information Display System (JTIDS) is a multiservice acquisition program being led by the US Air Force. JTIDS is designed to provide secure transmission of position, target track, and voice data between host terminals in a manner that is transparent to the user. The user or host terminal is any system which originates or receives digitized tactical information transmitted over the JTIDS secure radio links. The system was originally designed to provide communication between F-15 and Advance Warning and Control System (AWACS) aircraft and Combat Reporting Centers (CRC). The US Army recognized the potential for improved communication between Air Force and Army Air Defense Artillery (ADA) units, and within ADA units, and became part of the program well into the development process. The Army host terminals were to be TSQ-73s at the brigade and battalion levels for the HAWK fire units, the Platoon Command P9st (PCP) at the batteries, and the PATRIOT missile system.

**Report Availability:**

Distribution: Further dissemination only as directed by U.S. Army Research Office, Research Triangle Park, NC 27709-2211, 20 Nov 96 or higher DoD authority. 05 - CONTROLLED; DOD CONTROLLED:

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**System Short Name:** MANPRINT- PLS

**Reference** (Booher, 1990):

Booher, H. R. (1990). Manpower and Personnel Integration (MANPRINT) Assessment for the Palletized Loading System (PLS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Palletized Loading System (PLS).

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- PQA

**Reference** (School, 1994):

School, P. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Petroleum Quality Analysis (Pqa) System: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

1. The PQA will be a mobile fuel testing and analysis laboratory contained within a shelter. The PQA will mount on a tactical vehicle such as the High Mobility Multipurpose Wheeled Vehicle (HMMWV) or be used as a stand-alone unit. Automated fuel testing equipment will provide quick, on-site testing and analysis of fuels in forward areas. Facsimile and modem equipment will provide results directly to the unit. The PQA will replace slower, more labor intensive fuel testing equipment and methods used now.
2. The level of operator involvement with the PQA is currently unknown. The PQA may be fully automated, if so, an operator need do little more than pour a fuel sample into an analyzer, wait for results, and transmit those results to the unit. PQA operation might involve more complicated procedures. The nature of operator involvement will not be determined until the Demonstration and Validation phase trade-off analyses are complete and PQA equipment is selected.
3. Combat Service Support units will use the PQA throughout the theater of operations. PQA operators will be two MOS 77L (Petroleum Laboratory Technician). One operator is desired. Operators will perform Preventative Maintenance Checks and Services (PMCS) and replacement of modular components. Maintainers have not been identified and the maintenance concept beyond the operator level is not currently defined. Therefore, specific maintenance MOS's cannot be identified.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Profiler-MMS-P

**Reference** (Kortenhaus, 2005):

Kortenhaus, C. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Meteorological Measuring Set-Profiler (MMS-P) AN/Tmq-52. Redstone Arsenal, AL.; U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The MMS-P ANITMQ-52 is a mobile upper air meteorological (MET) data collection, processing and dissemination system that will provide meteorological data to field artillery, target acquisition and air weather service to improve their mission capabilities. The MMS-P will replace to the Meteorological Measuring Set (MMS) AN/TMQ-41 and AN/TMQ-41A, and will exploit existing mature technology from the civilian meteorological field. The MMS-P will include meteorological sensors and software models to produce a representation of the atmospheric state of the battle zone and provide current meteorology in the launch area, along the trajectory and in the target area to support combat fire. The atmospheric profiles will be produced using a numerical Mesoscale Model (MM5) in conjunction with Unified Post Processing System software to receive large-scale atmospheric data from weather communications satellites, in addition to local and area soundings. The MMS-P will process the meteorological data as it is received, convert it into proper message formats, and transmit the final data to artillery firing units and to the Integrated Meteorological System (IMETS). The MMS-P will interface through the Advanced Field Artillery Tactical Data System (AFATDS) to the Army Battle Command System and the Future Force Command and Control System. Information exchange will be through communication satellites, the Air Force Weather Agency, Global Positioning Systems (GPS), and Unmanned Aerial Vehicles.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Profiler-MMS-P (Revised)

**Reference** (Kortenhaus, 2005):

Kortenhaus, C. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Meteorological Measuring Set-Profiler (MMS-P) AN/Tmq-52 Revised Rating. Redstone Arsenal, AL,: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The MMS-P ANITMQ-52 is a mobile upper air meteorological (MET) data collection, processing and dissemination system that will provide meteorological data to field artillery, target acquisition and air weather service to improve their mission capabilities. The MMS-P will replace to the Meteorological Measuring Set (MMS) AN/TMQ-41 and AN/TMQ-41A, and will exploit existing mature technology from the civilian meteorological field. The MMS-P will include meteorological sensors and software models to produce a representation of the atmospheric state of the battle zone and provide current meteorology in the launch area, along the trajectory and in the target area to support combat fire. The atmospheric profiles will be produced using a numerical Mesoscale Model (MM5) in conjunction with Unified Post Processing System software to receive large-scale atmospheric data from weather communications satellites, in addition to local and area soundings. The MMS-P will process the meteorological data as it is received, convert it into proper message formats, and transmit the final data to artillery firing units and to the Integrated Meteorological System (IMETS). The MMS-P will interface through the Advanced Field Artillery Tactical Data System (AFATDS) to the Army Battle Command System and the Future Force Command and Control System. Information exchange will be through communication satellites, the Air Force Weather Agency, Global Positioning Systems (GPS), and Unmanned Aerial Vehicles.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- PVAB

**Reference** (Spine, 1999):

Spine, R. J. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the Portable Vehicle Arresting Barrier (PVAB), XM1. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Portable Vehicle Arresting Barrier (PVAB), XM1 consists of the vehicle capture net assembly, two telescoping erector assemblies, four 16-inch anchor plates, seven bump modules with two end piece adapters, two brake box assemblies, a control system to include a hand held pendant, miscellaneous hardware and a hand operated tire pump. The capture net is constructed from

3-inch commercial grade nylon webbing that is sewn into a zig-zag pattern approximately 22 feet wide and 4 feet high. The capture lines are made of high strength ¾ inch SPECTRA® rope and travel through the net and are attached at the ends of the capture net. This forms a lasso or noose, which the vehicle travels into. The capture net and lines are folded and stored inside a series of hinged plastic bump modules. The other ends of the SPECTRA® ropes are attached to 140 feet of 3-inch commercial nylon webbing that is wound onto a spool inside the two PVAB brake box assemblies. The brake box assemblies are attached to either end of the bump modules. Each of these spools are attached to a 16-inch industrial disk brake. These brake box assemblies are anchored in place by one of five anchoring methods depending on terrain and conditions. Each brake box assembly also provides a platform for one of the two telescoping compressed air powered erectors that lift the capture net on command from the operator. These components are situated on the end of the bump module assembly that is assembled and placed across a road. The bump modules are 3 ft. in length and can be added or subtracted to accommodate a single or double lane road. The sequences of operational events are:

- a. The soldier, Marine or Airman observe a vehicle approaching his or her check point/control point, the vehicle does not slow to an appropriate speed, at a pre determined moment or point the operator activates the PVAB system remotely through a control pendant attached to the system via a 300-ft cable.
- b. Within 2 seconds of activation, the capture net is completely raised. The raised net makes contact and wraps around the front and sides of the vehicle. As the vehicle travels forward the slack in the capture lines is taken up and the lines start to apply the brakes. As the vehicle continues forward the capture lines become entangled in the rear wheels causing them to lock up and stop the vehicle. As the vehicle comes to a stop, the side doors are usually pinned closed from the capture lines that are pulled tight around the vehicle.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- PVAB

**Reference** (Whalen, 2000):

Whalen, J. B. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the Portable Vehicle Arresting Barrier, XM1 (PVAB) Formerly Known as Portable Vehicle Immobilization System (PVIS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The PVAB consists of the vehicle capture net assembly, two telescoping erector assemblies, four 16-inch anchor plates, seven bump modules with two end piece adapters, two brake box assemblies, a control system to include a hand held pendant, miscellaneous hardware and a hand operated tire pump. The capture net is constructed from 3-inch commercial grade nylon webbing that is sewn into a zig-zag pattern approximately 22 feet wide and 4 feet high. The capture lines are made of high strength ¾ inch SPECTRA® rope and travel through the net and are attached at the ends of the capture net. This forms a lasso or noose, which the vehicle travels into. The capture net and lines are folded and stored inside a series of hinged plastic bump modules. The other ends of the SPECTRA® ropes are attached to 140 feet of 3-inch commercial nylon webbing that is wound onto a spool inside the two PVAB brake box assemblies. The brake box assemblies are attached to either end of the bump modules. Each of these spools are attached to a 16-inch industrial disk brake. These brake box assemblies are anchored in place by one of five anchoring methods depending on terrain and conditions. Each brake box assembly also provides a platform for one of the two telescoping compressed air powered erectors that lift the capture net on command from the operator. These components are situated on the end of the bump module assembly that is assembled and placed across a road. The bump modules are 3 ft. in length and can be added or subtracted to accommodate a single or double lane road. The sequences of operational events are:

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- b. Within 2 seconds of activation, the capture net is completely raised. The raised net makes contact and wraps around the front and sides of the vehicle. As the vehicle travels forward the slack in the capture lines is taken up and the lines start to apply the brakes. As the vehicle continues forward the capture lines become entangled in the rear wheels causing them to lock up and stop the vehicle. As the vehicle comes to a stop, the side doors are usually pinned closed from the capture lines that are pulled tight around the vehicle.

**Report Availability:**

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**System Short Name:** MANPRINT- Quick Stow- QSS

**Reference** (Gunn, 2007):

Gunn, K. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the XM326 120mm Stowage Kit (Quick Stow): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The XM326 120mm Stowage Kit (Quick Stow) (hereafter also referred to as the Quick Stow System<sup>TM</sup>, Quick Stow, or QSS) is a powered device that allows the M120A1 120mm Mortar to be carried on the vehicle as a single unit and deployed to the ground at the rear of the prime mover or trailer. This device incorporates a strut that holds the mortar tube, baseplate and bipod solidly as a unit. This unit assembly is then lifted by a stow device onto or lowered off of the vehicle either by a hydraulic hoist or a manually operated winch.

**Report Availability:**

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**System Short Name:** MANPRINT- Quick Stow- QSS

**Reference** (Gunn, 2008):

Gunn, K. H. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the XM326 120mm Stowage Kit (Quick Stow): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The XM326 120mm Stowage Kit (Quick Stow) (hereafter also referred to as the Quick Stow System<sup>TM</sup>, Quick Stow, or QSS) is a powered device that allows the M120A1 120mm Mortar to be carried on the vehicle as a single unit and deployed to the ground at the rear of the prime mover or trailer. This device incorporates a strut that holds the mortar tube, baseplate and bipod solidly as a unit. This unit assembly is then lifted by a stow device onto or lowered off of the vehicle either by a hydraulic hoist or a manually operated winch.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Radio- JTRS

**Reference** (Paulillo, 2002):

Paulillo, C. (2002). Manpower and Personnel Integration (MANPRINT) Assessment for the Joint Tactical Radio System (JTRS): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Joint Tactical Radio System (JTRS) will combine the functionality of ten single function legacy radios into a single radio. The JTRS will operate over a continuous frequency range from 2 megahertz (MHz) to 2 gigahertz (GHz). The JTRS will also include a new wide-band waveform for which there is no predecessor radio. The JTRS will be software-programmable, multi-band, multi-mode capable, and provide simultaneous voice, data, and video communications via user defined networks.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Radio- JTRS

**Reference** (Savage-Knepshield, 2004):

Savage-Knepshield, P. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Joint Tactical Radio System (JTRS) Cluster 5. APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The requirement for the Joint Tactical Radio System (JTRS) is documented in the Operational Requirements Document, (data source II.B.1.b). Defense planning guidance directs consolidation of service programs into an interoperable, joint program for the development and acquisition of affordable, high capacity tactical radios to meet the bandwidth needs of various echelons. The single function hardware design of legacy communications systems can neither take advantage of rapid changes in commercial technology, nor can they provide the functionality and flexibility necessary to achieve information superiority required by today's armed forces. The military requires a software-programmable, hardware-configurable digital radio system that will provide increased interoperability, flexibility, and adaptability to support the varied mission requirements of its warfighters.
2. The JTRS lays the foundation for achieving network connectivity across the radio frequency (RF) spectrum and provides the means for digital information exchanges between joint warfighting elements while enabling connectivity to civil and national authorities. The JTRS will ultimately replace all existing tactical radios and introduce new capabilities to the warfighter. The Army will acquire the JTRS in an evolutionary manner. This approach enables technology insertion that will increase JTRS capabilities and functionality to meet objective and emerging requirements.



3. Each cluster is a separate acquisition program that satisfies a set of requirements across services with similar functional requirements and fielding timeframe. The JTRS Cluster 1 will operate over a continuous frequency range from 2 MHz to 2 GHz. It will provide the functionality of the legacy radio that it replaces and will be interoperable with the legacy radios. Each legacy radio uses a specific waveform for communication. In addition, the JTRS Cluster 1 will incorporate a new wide-band waveform for which there is no legacy radio. The JTRS Cluster 1 will be in forms suitable for vehicular and aircraft platforms including several variations of Army Vehicular and Rotary Wing platforms. The JTRS Cluster 1 will provide the operator with the ability to load and reconfigure its modes and capabilities via software and hardware while in the operational environment. The Army manages the JTRS Cluster 1 and Cluster 5 programs. Other Services manage the JTRS Cluster 2, JTRS Cluster 3, and JTRS Cluster 4 programs. The U.S. Special Operations Command, which will acquire radios for the Army, Navy Marine Corps, and Air Force, manages Cluster 2. The Space and Naval Warfare Systems Command manages Cluster 3 and will acquire radios for maritime platforms (sea only) for the Navy, and fixed site sets for all Services. The Program Management Office at the Air Force Electronic Systems Center, Networks, and Information Integration Directorate will manage Cluster 4. As the lead service for the Airborne JTRS Cluster, the Air Force will acquire, test, and field airborne joint tactical radio sets for all services.
4. JTRS Cluster 1 is in development and the schedule calls for a Limited User Test (LUT) during the First Fiscal Quarter of 2006. The Cluster 1 radio consists of software modules and specific line replaceable units (LRUs), handsets, antennas, RF amplifiers, cables, installation kits, and input-output devices that are needed to operate on a specific platform. The control and display device (CDD) serves as the operator interface. The CDD front panel measures 10.25" wide, 6.50" high, and 5.0" deep with a liquid crystal display (LCD) measuring 3.0" wide and 4.0" high. The LCD supports 21 rows containing 30 characters per row. The JTRS has 15 variable function keys surrounding the display and a keypad containing 36 keys embedded on the front panel. The keys support alpha and numeric characters as well as special symbols.
5. The JTRS Cluster 5 program is comprised of three discrete form factors: Manpack, Handheld, and Small Form Fit (SFF) for embedded applications. A spiral development process will meet technical performance requirements over time. The objective of Spiral 1 is to modify Commercial Off-the-Shelf (COTS) or Non-Developmental Items (NDI) for single channel Handheld and two-channel Manpack radios and field them by the Fourth Fiscal Quarter of 2006 to satisfy critical near-term warfighter needs. The objective of Spiral 2 is to expand Spiral 1 capabilities by designing, testing, and fielding dual channel Handheld and Manpack radios as well as SFF embedded applications.
6. From a functional perspective, the JTRS Cluster 5 will have the same basic capabilities as the Cluster 1 radio except that Cluster 5 radios will be reduced in size and will have fewer channels. Unlike the Cluster 1 radio, the Cluster 5 radio will support a new soldier radio waveform. From a manpower and personnel perspective, the JTRS Cluster 5 radio should not cause an increase in force structure or create new Military Occupational Skills (MOS). Personnel assigned to the applicable platform will operate and maintain the radio. The JTRS Cluster 5 is a general-purpose user (GPU) system operated by the units' organic personnel.
7. The Program Executive Office, Command, Control and Communications-Tactical, plans open competition followed by contract award during the Second Fiscal Quarter of 2004. Design and development of both Spiral 1 and Spiral 2 will commence simultaneously after contract award. Approximately five months after contract award, the PM will conduct a Spiral 1 Design Readiness Review (DRR). Approximately nine months after the DRR, the contractor will deliver production representative Handheld and Manpack radios for developmental testing starting in the Third Fiscal Quarter of 2005 and operational testing during the First Fiscal Quarter of 2006. A System Evaluation Report (SER) will support a Full Rate Production (FRP) In-Process Review (IPR) for Spiral 1 scheduled for the Second Fiscal Quarter 2006.
8. The PM will conduct a DRR for Spiral 2 during the Second Fiscal Quarter 2005. The System Development and Demonstration (SDD) phase for Spiral 2 includes developmental and operational testing. Independent assessments conducted during SDD for Spiral 2 will support a Milestone C Decision Review for Low Rate initial Production scheduled for the First Fiscal Quarter 2007.

**Report Availability:**

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**System Short Name:** MANPRINT- Radio- SINCGARS

**Reference** (Buckalew, 1988):

Buckalew, L. W. (1988). Manpower and Personnel Integration (MANPRINT) Assessment: Single Channel Ground and Airborne Radio System (SINCGARS) AN/ARC-201 (ABN) Manprint Evaluation. Fort Hood, Texas: U.S. Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA. Fort Hood Field Element, Working Paper WP FH 88-13. DTIC ADA395528.

**Key Words:**

Fields and Groups:

250200 - Radio Communications

Descriptors:

(U) \*COMMUNICATION AND RADIO SYSTEMS, \*VOICE COMMUNICATIONS, GROUND LEVEL, AIRBORNE, RADIO EQUIPMENT, AIRCRAFT EQUIPMENT, CHANNELS

**System Description:**

The AN/ARC-201 SINCGARS radio (ABN) is the aircraft counterpart of the ground SINCGARS combat net radio and is available in three (3) configurations. Two of these configurations were tested at Fort Sill, Oklahoma in the SINCGARS ABN Early User Test and Experimentation (EUTE) conducted during April and May of 1988 in conjunction with the SINCGARS Follow On Test and Evaluation (FOTE). The two ABN models--Panel Mounted Radio RT-1476 and Dedicated Remote Radio RT-1477 with Remote Control Unit C-11466--were installed in two UH-1 helicopters such that each aircraft had one copy of each model. A total of four ABN radios (two per helicopter) were installed and made operational. Six aviators were trained in operating the SINCGARS ABN by personnel from the Army Aviation Center, Fort Rucker, Alabama. The Army Research Institute (ARI), Fort Hood Field Unit, which supported MANPRINT efforts associated with the SINCGARS FOTE, was requested to conduct a preliminary MANPRINT evaluation of the SINCGARS ABN with primary concern for pilot workload.

Each UH-1 aircraft housed one RT-1476/ARC-201(V) in the center console to the immediate left of the pilot and one Remote Control Unit, C-11466/ARC-201(V), in the center console to the immediate right of the co-pilot. The RT-1477, to which was cabled the Remote Control Unit, was mounted in the nose of the aircraft. Both radios operate in frequency hopping or single channel modes within the frequency range of 30-88 MHz VHF-FM and a capability of 2320 channels. Both radios accommodate voice and data, and include automatic retransmit, built-in homing, and built-in test. Both radios incorporate electroluminescent light--g (green) and a liquid crystal display. The front panel of the RT-1476 is slightly larger (146mm wide by 104mm high) than that of the RT-1477's Remote Control Unit (127mm wide by 102mm high). The panel color is olive drab, with all knobs and pushbuttons (keypad) medium gray. All labeling is etched and painted white. Both radios allow for six preset channels (single channel operation), with 5 and 10 kHz offset capability, or six preset nets (frequency hopping operation). The digital capability for both models is 16 kbps. The power output for either model is 10 watts nominal, and both models can interface with an AM-7189A/ARC 50 watt power amplifier. The RT-1476 was used only for communications with the tower, range control, and retransmission conditions. The RT-1477 was used for all test (EUTE) communications and conditions.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Radio- SINCGARS ICOM

**Reference** (Palmer, 1987):

Palmer, R. L. (1987). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the SINCGARS ICOM Radio: U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. ARI Working paper ARI-WP-FH-8701. DTIC ADA395353.

**Key Words:**

\*human factors engineering, \*communication and radio systems, \*radio equipment, test and evaluation, operational effectiveness

Fields and Groups:

230200 - Human Factors Engineering & Man Machine System

250200 - Radio Communications

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*COMMUNICATION AND RADIO SYSTEMS, \*RADIO EQUIPMENT, TEST AND EVALUATION, OPERATIONAL EFFECTIVENESS

**System Description:**

SINGGARS ICOM Radio.

**Report Availability:**

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**System Short Name:** MANPRINT- Radio- SINGGARS ICOM

**Reference** (Martin, 1993):

Martin, J. M. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the Single Channel Ground and Airborne Radio System (SINGGARS) Integrated Comsec (ICOM) 2nd Source General Dynamics Model: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Single Channel Ground and Airborne Radio System (SINGGARS) Integrated COMSEC (ICOM) 2nd Source General Dynamics Model.

**Report Availability:**

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**System Short Name:** MANPRINT- Radio- SINGGARS-V

**Reference** (Palmer, 1985):

Palmer, R. L. (1985). Manpower and Personnel Integration (MANPRINT) Assessment: SINGGARS-V Maturity Operational Test: Human Factors Evaluation (Synopsis): U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. ARI-RN-85-1 Project Number 2Q263739A793. DTIC ADA149601.

**Key Words:**

\*test and evaluation, \*human factors engineering, \*transmitter receivers, computer programs, systems engineering, models, operational effectiveness, limitations, simplification, cueing, control panels pe63739a, as793

Fields and Groups:

230200 - Human Factors Engineering & Man Machine System

250300 - Non-radio Communications

Descriptors:

(U) \*TEST AND EVALUATION, \*HUMAN FACTORS ENGINEERING, \*TRANSMITTER RECEIVERS, COMPUTER PROGRAMS, SYSTEMS ENGINEERING, MODELS, OPERATIONAL EFFECTIVENESS, LIMITATIONS, SIMPLIFICATION, CUEING, CONTROL PANELS

**System Description:**

ARI, Ft. Hood, TX, conducted the human factors evaluation of the preproduction Advanced Development Model of the SINCGARS-V receiver/transmitter (RT). The evaluation was part of the Maturity Operational Test of the system conducted by OTEA at Ft. Riley, KS, September - December 1983. The RT was found to have numerous human factors problems. The most notable were in the areas of the complexity of operational procedures, the physical design of the control panel, the inadequacy of the cue function, system documentation, and the excessive training requirement. The report includes suggestions for hardware and software design changes and stresses the necessity for operational simplification.  
Unclassified

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**System Short Name:** MANPRINT- Radio- Troposcatter RS

**Reference** (Krohn and Bowser, 1989):

Krohn, G. S., & Bowser, S. E. (1989). Manpower and Personnel Integration (MANPRINT) Assessment: MANPRINT (Manpower and Personnel Integration) Evaluation: AN/Trc-170 Digital Troposcatter Radio System: U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. ARI-RR-1524. DTIC ADA211799.

**Key Words:**

Fields and Groups:

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*TROPOSPHERIC SCATTER COMMUNICATIONS, ARMY RESEARCH, ASSEMBLY, BEHAVIORAL SCIENCES, DISASSEMBLY, HAZARDS, HEALTH, INTEGRATION, INTERVIEWING, JOBS, MANPOWER, MATERIALS HANDLING, PERFORMANCE(HUMAN), PERSONNEL, SOCIAL SCIENCES, SYSTEM SAFETY

**System Description:**

This document describes the Manpower and Personnel Integration (MANPRINT) Evaluation of the AN/TRC-170 Digital Troposcatter Radio System. The MANPRINT evaluation was conducted in support of the AN/TRC-170 Follow-On Operational Test and Evaluation (FOT&E) by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI). The FOT&E was conducted by the U.S. Army Operational Test and Evaluation Agency (OTEA) at Fort Huachuca, AZ, from September 1986 through January 1987. The purpose of the MANPRINT Evaluation was to identify human factors engineering, system safety, health hazards, training, and manpower factors leading to refinements in the AN/TRC-170 system. The MANPRINT evaluation methodology included structured interviews, on-site observations of operations and maintenance, and measures of task performance times. There were 24 MANPRINT findings involving equipment assembly and disassembly, materials handling procedures, and safety during road marches. Human factors evaluation; MANPRINT evaluation; Troposcatter communications; System safety; Health hazards; Training; Manpower.

**Report Availability:**

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**System Short Name:** MANPRINT- Radio- WIN-T

**Reference** (Waters, 2003):

Waters, P. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the Warfighter Information Network-Tactical (WIN-T) Program: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Warfighter Information Network-Tactical (WIN-T) will be Army's tactical telecommunications system consisting of communication infrastructure and network components. WIN-T will replace Mobile Subscriber Equipment (MSE) and Tri-Services Tactical Communications (Tri-Tac) equipment, to function as the major communications systems to the maneuver battalions, brigade, division, corps, EAC and theater boundaries. WIN-T provides advanced commercial-based networks to enable command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) capabilities that are mobile, secure, survivable, seamless, and multimedia based. The system provides a seamless, secure architecture that increases global connectivity; significantly reduces the footprint and signal force structure; moves soldiers off hilltops; and supports future voice, video and data traffic requirements. The WIN-T system will consist of shelters, ground and airborne communications equipment, antennas, and computer hardware and software.

**Report Availability:**

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**System Short Name:** MANPRINT- Rifle- 5.56mm- Carbine- M4A1

**Reference** (Spine, 1994):

Spine, R. J. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Carbine, 5.56mm, M4E1 (M4a1). Picatinny Arsenal, NJ: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The M4E1 (M4A1) Carbine is the same as the M4 Carbine except for the following: (1) mode of fire for the M4E1 (M4A1) is semi-automatic and full-automatic (M4 fires in semi-automatic and three-round bursts); (2) M4E1 (M4A1) has a removable carrying handle whereas the M4 carrying handle is not removable; and (3) M4E1 (M4A1) has an "optical rail" which is an integral part of the upper receiver. The rail is used with the carrying handle removed for mounting an assortment of ancillary devices. These devices are being developed as separate development programs. The permanent carrying handle on the M4 precludes mounting the ancillary devices that the U.S. Special Operations Command (USSOCOM) needs to use.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rifle- 5.56mm- Carbine- XM8

**Reference** (Faughn, 2004):

An Annotated Bibliography of MANPRINT Related Assessments and Evaluations Conducted by the U.S. Army, 2<sup>nd</sup> Edition: 1953 to 2009. Volume II- MANPRINT Assessments

Faughn, J. A. (2004). Manpower and Personnel Integration (MANPRINT) Assessment: Initial Impressions for the XM8 Carbine. APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Initial Impressions for the XM8 Carbine.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rifle- 5.56mm- Cartridge- LFS

**Reference (Spine, 2009):**

Spine, R. J. (2009). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 5.56 mm, Ball, Lead Free Slug (Lfs), M855lfs: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The M855 LFS projectile utilizes a lead free slug and a steel penetrator encapsulated in a reverse gilding metal jacket. The baseline M855LFS uses SMP842 for its propellant and the No. 41 primer as the ignition system. Both the primer and the propellant are contained in a standard 5.56mm cartridge case. The M855LFS cartridge is identified by a dull black phosphated steel tip. The M855LFS can be fired from the M249 machine gun, the M16-series weapons, as well as the M4-series weapons. The M855LFS is used in both training and combat. In combat, the cartridge is intended for use against personnel and light armored targets.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rifle- 5.56mm- Cartridge- RLEM

**Reference (Whalen, 2002):**

Whalen, J. B. (2002). Manpower and Personnel Integration (MANPRINT) Assessment for the Rifle Launched Entry Munition (RLEM), XM100, and RLEM Trainer, XM101: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Rifle Launched Entry Munition (RLEM) is designed to provide U.S. Forces with the necessary ability to rapidly gain access into sealed buildings during Military Operations in Urban Terrain (MOUT). The RLEM will allow our troops to explosively breach an entry door of a building from 15 to 40 meters away. The munition is lightweight, muzzle launched, equipped with a standoff rod, and is fired from the M16A2 or M4 series weapons with either 5.56mm M855 ball or M856 Tracer service rounds. Detonation occurs

when the standoff rod impacts the target door and initiates the main charge. The over-pressure caused by the explosion will cause the breaching of either wood or metal clad exterior doors.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rifle- 5.56mm- Cartridge- RLNLM XM95

**Reference** (Whalen, 1999):

Whalen, J. B. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the 5.56mm Rifle Launched - Non-Lethal Munition (5.56mm NLM), XM95. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The 5.56MM Rifle Launched Non-Lethal Munition, XM95 (RL-NLM) is an ACAT III Soldier Enhancement Program. The RL-NLM is designed as a crowd control munition that is fired from the M16A2 Rifle, M4 and M4AI Carbines. The system consists of a cylindrical, aluminum canister (2.0 x 7.188 inches) that contains fifteen plastic coated steel balls (.7 inch diameter). The aluminum canister is slid over the muzzle of the weapon and functions as a launcher. An M195 5.56mm blank cartridge is inserted into the breach of the host weapon and fired, producing enough gas to rupture the canister seals and propel the plastic coated steel balls to the target. After the RL-NLM is fired, the expended housing must be removed in order to install the next round. This munition is intended to be used by U.S. Forces involved in Military Operations Other Than War (MOOTW) throughout the globe. Maintaining and establishing law and order, countering civil disturbances and responding to varied levels of threat with varied levels of force have been reoccurring tasks for U.S. Military Forces involved in joint, multinational and interagency operations. The RL-NLM will provide friendly forces the capability to enforce a standoff distance from a crowd of belligerents without using deadly force. It is intended to confuse, disorient and momentarily distract potential threat personnel. This munition will be used to apply the minimum force necessary by military forces while performing missions of crowd control, security and protection of key facilities throughout the world. Within the bounds of the operational situation the RLNLM will not produce any permanent injury.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rifle- 5.56mm- M16/M4A1- MWS

**Reference** (Spine, 1997):

Spine, R. J. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Modular Weapon System (MWS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The U.S. Army has identified a need to improve the versatility of the M4 Carbine and M16A2 Rifle. This will be accomplished by providing multiple mounting surfaces on the M4 and M16A2 that will enable the mounting of various accessories. The Modular Weapon System (MWS) program will replace the

handguards on the M4 and M16A2 and part of the receiver on the M16A2. The component that replaces the handguard is called the Rail Adapter System (RAS). The RAS is the main component of the MWS program. The XM4 RAS is a 4-rail system which replaces the handguards on the M4 Carbine. The XMS is a 4-rail system which replaces the handguards on the M16A2 Rifle. A new barrelled upper receiver with detachable carrying handle and integral rear aperture sight will be used to convert M16A2 Rifles into M16A4 Rifles. Accessories that may be mounted are day optics, night optics, grenade launchers, laser pointers infrared lights, and the Multiple Integrated LASER Engagement System (MILES). These accessories will allow the weapons to be configured as necessary to meet the commander's needs after conducting a mission, enemy, terrain and weather, troop availability and time (METTT) analysis. The Modular Weapon System program is funded by the congressional mandated Soldier Enhancement Program (SEP), whose purpose is to enhance the lethality of the weapons used by the U.S. Army infantry soldier.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rifle- 5.56mm- Machine Gun- SAW M249

**Reference** (Corona et al., 1980):

Corona, B. M., Hickey, C. A., Jr., Woodward, A. A., Jr., & Bruno, R. S. (1980). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Assessment of the Squad Automatic Weapon (SAW) System: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. HEL-TM-18-80. DTIC ADB055135.

**Key Words:**

\*Automatic weapons, \*Rifles, \*Machine guns, \*Human factors engineering, Weapon system effectiveness, Handling, Manual operation, Manportable equipment, Squad level organizations, Mobility, Comparison, Performance(Human), Loading(Ordnance projectors), Ta  
\*XM-106 rifles, \*XM-248 machine guns, \*XM-249 machine guns, \*XM-262 machine guns, M-16A1 rifles, PE63607A, AS640

Fields and Groups:

190600 - Guns

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*Automatic weapons, \*Rifles, \*Machine guns, \*Human factors engineering, Weapon system effectiveness, Handling, Manual operation, Manportable equipment, Squad level organizations, Mobility, Comparison, Performance(Human), Loading(Ordnance projectors), Tactical weapons, Infantry Identifiers:

(U) \*XM-106 rifles, \*XM-248 machine guns, \*XM-249 machine guns, \*XM-262 machine guns, M-16A1 rifles

**System Description:**

A human factors engineering assessment of four Squad Automatic Weapon Systems (SAWS) (XM106, XM248, XM249, and XM262) was conducted by the US Army Human Engineering Laboratory (HEL). The SAW candidates were compared to each other and the M16A1 automatic rifle. Comparisons made included presented area measurements, physical characteristics, relative mobility/portability, and human performance assessments during live firing exercises. Twenty-one US Marine infantrymen, MOS 11B (light weapons) performed infantry-assault scenarios on the HEL Mobility/Portability Course using the candidate SAWS and the M16 automatic rifle. Objective performance measures were overall course time, obstacle time, and inter-obstacle time. In addition, live firing exercises were conducted on the HEL firing range. Results indicated that SAW gunners were not as mobile as the M16A1-equipped infantrymen. However, of the SAW candidates, the XM249, for the most part, was slightly better than the XM262 and superior to the XM106 and XM248 throughout the human factors engineering assessment.

**Report Availability:**



Distribution limited to U.S. Gov't. agencies only; Proprietary Info.; Aug 80. Other requests for this document must be referred to Director, Army Human Engineering Lab., Aberdeen Proving Ground, MD 21005. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Rifle- 7.62mm- Cartridge- APC

**Reference** (Spine, 1995):

Spine, R. J. (1995). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, 7.62mm Armor Piercing (ACP), XM993. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The XM993 Armor Piercing ammunition is currently produced by Bofors Carl Gustaf AB of Sweden. It will be used in the M60 and M240 machine guns and the M24 Sniper Weapon System (SWS). The XM993 will provide enhanced penetration capability and lethality over that afforded by the current M80 ball cartridge, while maintaining a ballistic match to the predecessor cartridge.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rifle- 7.62mm- Cartridge- RLRP

**Reference** (Kramer, 1975):

Kramer, R. R. (1975). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of a Rifle-Launched Rocket Projectile (RLRP): U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-28-75 ONLINE. DTIC ADA022661.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*gun launchers, \*rifles, \*rockets, \*rocket launchers, \*shoulder launched weapons, firing tests(ordnance), human factors engineering, weight, lightweight, aiming, manportable equipment, rocket launching, ignition lag, dust control

Rifle launched rocket projectiles, M-16 rifles, Cant(Inclination), Comfort

Fields and Groups:

190600 - Guns

190700 - Rockets

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*GUN LAUNCHERS, \*RIFLES, \*ROCKETS, \*ROCKET LAUNCHERS, \*SHOULDER LAUNCHED WEAPONS, FIRING TESTS(ORDNANCE), HUMAN FACTORS ENGINEERING, WEIGHT, LIGHTWEIGHT, AIMING, MANPORTABLE EQUIPMENT, ROCKET LAUNCHING, IGNITION LAG, DUST CONTROL

Identifiers:

(U) Rifle launched rocket projectiles, M-16 rifles, Cant(Inclination), Comfort

**System Description:**

An experimental investigation was made of the aiming and cant errors associated with the firing of a rocket round from the muzzle of a rifle. The unusual features of the system were an appreciable weight at the muzzle (5-7 lbs) and an appreciable delay (.3 second) between ignition and launch. If ignition is accomplished by firing a ball round from the rifle, launch errors of 4-7 mils may be expected. If the ignition is recoilless, errors of 2 mils may be expected. Cant errors of about 1.40 deg appear typical.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Rifle- 7.62mm- Cartridge- SRTA

**Reference (Bascone, 1993):**

Bascone, J. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the Rifle-Cartridge- 7.62mm, Short Range Training Ammunition. Picatinny Arsenal, NJ: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Cartridge, 7.62mm, Short Range Training Ammunition (SRTA) XM973 and the Short Range Training Ammunition Tracer (SRTA-T) XM974 consists of a training projectile crimped inside of a standard 7.62mm, brass cartridge case with a standard rifle primer (No. 34 Primer). Currently, there are two projectile designs that are being evaluated, a one-piece and a two-piece design. The one-piece bullet design is made of injection molded brass filled Nylon 11 material. The two piece design consists of an ogive of injection molded Delrin plastic resin, while the base portion is made of case brass. Both of these designs use the WC749 propellant, while the two-piece design's tracer counterpart uses the CMR-IOO propellant. The cartridge is designed for use in the M60 and M240 machine guns and are linked in various configurations simulating the performance of standard 7.62mm M80 ball and 7.62mm M62 tracer combat ammunition up to 100 meters with a maximum range of 600 meters. The dispersion pattern of the SRTA/SRTAT at a range of 100 meters will be no greater than the dispersion of the standard service ammunition at a range of 400 meters. This permits training in geographical areas that would normally be considered unsuitable for firing standard 7.62mm service ammunition. The SRTA round is designed to function in the M60 machine gun without any ancillary devices or modifications to the weapon or belt link.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rifle- 7.62mm- Cartridge- Tracer

**Reference (Spine, 1992):**

Spine, R. J. (1992). Manpower and Personnel Integration (MANPRINT) Assessment for the Rifle-Cartridge- 7.62mm, Dim Tracer, XM276. Picatinny Arsenal, NJ: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Cartridge, 7.62mm, Dim Tracer, XM276 is similar to the standard M62 cartridge with the exception of the tracer column. The standard M62 trace column consists of 1 grain of 1-136 ignitor, 1 grain of R-280.subignitor, and 6.5 grains of R-284 trace mix. The 7.62mm, XM276 trace column is comprised of 1 grain of 1-136 ignitor and 12.5 grains of R-440 trace mix. The R-440 is a lower burning temperature mix which produces light in a spectrum visible only to Night Vision Devices (NVDs) and does not hinder target acquisition. All other design characteristics, materials and dimensions of the two cartridges are the same. The cartridge is designed to be used with NVDs where the use of standard tracer cartridges would cause blooming which renders the NVDs ineffective for a short time.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rifle- 7.62mm- Machine Gun- M73C

**Reference** (Clark and Norlander, 1961):

Clark, L. V., & Norlander, W. D. (1961). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Evaluation of the M73C Tank Machine Gun: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-3-61. DTIC AD0478885.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*human factors engineering, machine guns, antipersonnel weapons, small arms, test methods, firing tests(ordnance), deflection, errors  
m-60 tanks, m-73 guns(7.62-mm), t-65 guns(cal .22)

**System Description:**

An M73C Tank Machine Gun was evaluated to determine any design features in the weapon or its accessory equipment that would inhibit maximum effective usage of the weapon. A 1919A6 Machine Gun was used during parts of the evaluation to provide a standard of evaluation for the M73C. The many deficiencies found in the M73C cause the practicality of adopting this weapon to be questioned without consideration of the suggested recommendations. A re-examination of the T65 Machine Gun, comparing it with the M73C, should be made, before incorporation of the M73C into the Army's family of weapons.

**Report Availability:**

Distribution: USGO: others to Human engineering Labs., Aberdeen Proving Ground, Md. 21005. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Rifle- 7.62mm- Machine Gun- M240E4

**Reference** (Spine, 1996):

Spine, R. J. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the M240E4 Medium Machine Gun and M122E1 Machine Gun Mount (MGM). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The U. S. Army has identified a need to upgrade its current inventory of 7.62mm Medium Machine Guns, in order to provide the dismounted infantryman a more reliable, accurate, and lethal machine gun to suppress and destroy enemy personnel, lightly armored vehicles, and fortified positions. Based on responses to a Sources Sought announcement in the Commerce business Daily, commercially available conversion and modification kits were identified. When applied to existing machine guns in the inventory these conversion and modification kits form the basis for a best value, non-developmental item (NDI) approach to meet the requirement. The kit which is applied to the M240 includes a buttstock, trigger guard and trigger group, a barrel handle, bipod, flash suppressor, handguard, heat shield, and weapon mount. The M240E4 is based on the existing vehicle mounted M240, which has been in service on infantry vehicles and tanks for many years.

**Report Availability:**

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**System Short Name:** MANPRINT- Rifle- 7.62mm- Machine Gun- M240E5

**Reference (Spine, 2004):**

Spine, R. J. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the M240e5 Machine Gun (Aviation Variant) Mounted on the M144 Mounting Arm for the UH-60, and the M24 and M41 Mounts for the Ch-47: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

M240E5 Machine Gun (Aviation Variant) Mounted on the M144 Mounting Arm for the UH-60, and the M24 and M41 Mounts for the CH-47

**Report Availability:**

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**System Short Name:** MANPRINT- Rifle- 7.62mm- Machine Gun- M240E6

**Reference (Whalen, 2007):**

Whalen, J. B. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the M240E6 Lightweight Medium Machine Gun (Lmmg) (M240E6): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The M240E6 is a lightweight version of the current M240B Medium Machine Gun (MG). The M240E6 is an air cooled, 7.62mm caliber, link-belt fed, gas operated weapon. It features fixed headspace which permits rapid changing of the barrels. The M240E6 can be operated using the integral adjustable bipod or be tripod mounted and used with a traverse and elevation mechanism (T&E). The M240E6 was developed to meet a requirement for a lightweight version of the M240B Medium Machine Gun to be used by selected Infantry Divisions and consisting of the following changes:

- (a) Receiver side plates, bottom plate, rear sight bracket, and front block are made of titanium.
- (b) Barrel assembly redesigned, re-contoured outer dimensions, titanium carrying handle and lighter weight gas housing.
- (c) Pistol grip/trigger frame assembly composed of a metal/polymer hybrid.
- (d) Buttstock is collapsible and adjustable to five different positions.
- (e) Redesigned forward folding bipod legs are height adjustable with an integral rail adapter assembly.
- (f) Redesigned charging handle has larger diameter with a rearward rigid extension.
- (g) Collar of gas regulator replaced with wire retainer.

**Report Availability:**

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**System Short Name:** MANPRINT- Rifle- 7.62mm- SASS

**Reference** (Spine, 2006):

Spine, R. J. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the XM110 Semi Automatic Sniper System (SASS) and XM151 Sniper Spotting Scope (SSS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The XM110 Semi Automatic Sniper System is a semi-automatic, shoulder fired, direct line of sight weapon system capable of delivering precision, rapid fire on targets out to an objective range of 1000 meters. Major components consist of a caliber 7.62mm rifle with detachable box magazine, a removable variable power day optical sight, sound suppressor, a hard carrying case for storage and transportation, and a soft case for tactical operations. A backup iron sight is included for use in the event the primary day optic fails. Also included as part of the system are a bipod, detachable sling, extra magazines, cleaning and maintenance equipment, manuals, and a spotting scope with reticule. The XM151 Sniper Spotting Scope (SSS) is included as part of the system and is a direct replacement to the existing M141 Spotting Scope.
2. The XM110 and XM151 will be employed in the same mission and climatic scenarios as the M24 Sniper Weapon System. The XM110 and XM151 will be employed by the U.S. Army and Joint Special Operations Forces (SOF) personnel.

**Report Availability:**

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**System Short Name:** MANPRINT- Rifle- 7.62mm- Stoner G3

**Reference** (Kramer et al., 1964):

Kramer, R. R., Krogh, R. V., Torre, J. P., Jr., & Waldhour, L. G. (1964). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Stoner G3 Assault Rifle: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-7-64 LIMITED. DTIC AD0349898.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*small arms, performance(engineering), probability, failure, human factors engineering, gun barrel attachments, maintainability, terminal ballistics, boresighting

**System Description:**

The human factors,engineering evaluation consisted of: (1) assessing the operability of the assault rifle based on its configuration, considering such aspects as loading, unloading, carrying, assembling, charging, etc; (2) assessing the pointing characteristics of the rifle in its present configuration; (3) modifying its basic configuration to improve its pointing capability; (4) attaching a muzzle-brake compensator to the weapon so that it could be fired automatically in 2-round bursts; and (5) conducting a quick-fire test whereby the effectiveness of the basic weapon would be compared with the modified weapon while varying both type of fire, semi-automatic, automatic, and automatic bursts of 2-rounds, and type of ammunitions, ball and tracer.

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies and their contractors; Administrative/Operational Use; APR 1964. Other requests shall be referred to Human Engineering Laboratory, Aberdeen Proving` Ground, MD. 02 - U.S. GOVT. AND THEIR CONTRACTORS. Downgraded from Confidential to Unclassified on 30 April 1976, DoDD 5200.10:

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**System Short Name:** MANPRINT- Rifle- 50 Cal- LRSR XM107

**Reference (Spine, 2003):**

Spine, R. J. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the XM107, .50 Caliber, Long Range Sniper Rifle: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

- a. The XM107 Long Range Sniper Rifle is a semi-automatic, shoulder fired, direct line of sight weapon system capable of delivering precision, rapid fire on targets out to an objective range of 2000 meters. Major components consist of a caliber .50 rifle with detachable 10 round box magazine, a removable variable power day optical sight, a hard carrying case for storage and transportation, and a soft case for tactical operations. A backup iron sight is included for use in the event the primary day optic fails. Also included as part of the system are a bipod, detachable sling, extra magazines, cleaning and maintenance equipment, and manuals.
- b. The XM107 will be employed in the same mission and climatic scenarios as the M24 Sniper Weapon System. The XM107 will be employed by the U.S. Army and Joint Special Operations Forces (SOF) personnel. Explosive Ordnance Disposal (EOD) units currently employ a comparable weapon to remotely disrupt unexploded ordnance on the battlefield. The XM107 will be issued to EOD units to replace the non-standard weapon in current use.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rifle- 50 Cal- Machine Gun- Cartridge- SLAP

**Reference (Spine, 1993):**

Spine, R. J. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the Cartridge, Caliber .50, Saboted, Light Armor Penetrator (SLAP), Xm903 and Xm962 Tracer. Picatinny Arsenal, NJ: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

a. The XM903 SLAP cartridge utilizes a projectile assembly comprised of a sub caliber tungsten alloy penetrator encased in a lightweight plastic (ULTEM) sabot, inserted into a standard caliber .50 brass cartridge case. An aluminum alloy pusher plate, also known as the Area Multiplier, is imbedded in the sabot directly behind the projectile. As the sabot engages the rifling of the barrel, it imparts spin to the projectile allowing it to attain the spin rate required for in-flight stability.

b. The XM962 tracer cartridge is designed to improve the hit probability and target acquisition capability of the XM903 cartridge when used in the caliber .50 M2 machine gun to engage lightly armored, stationary and moving targets. The tracer cartridge provides a trajectory match to the XM903 out to its maximum effective range (1370 meters). The XM962 utilizes a conventional primer, propellant and cartridge case. It differs from the standard caliber .50 tracer ammunition only in projectile design. The projectile assembly is similar to the XM903 except for the tracer element. The tracer mix is consumed en route to the target.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rifle- 50 Cal- Machine Gun- Cartridge- SLAP

**Reference** (Spine, 1996):

Spine, R. J. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the M903 and M962 Caliber .50 Sabot Light Armor Penetrator (SLAP) Cartridges. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The M903 and M962 ammunition has been developed in response to a U.S. Marine Corps Required operational Capability for an improved anti-armor capability for crew served weapons. The M962 SLAP is the companion tracer cartridge to the M903 cartridge. It is intended to provide an exterior ballistic match to the untraced M903 cartridge. Both cartridges were Type Classified Standard during a Milestone III Decision Review conducted in March 1993. These cartridges are used exclusively in the Browning Machine Gun, Caliber .50 HB, M2.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rocket- 2.75" Smoke Warhead

**Reference** (Cohen, 1993):

Cohen, K. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the Warhead, 2.75 Inch Rocket, Smoke: Screening, Rp, Xm264: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The XM264 incorporates the same warhead case, nose cone assembly, base plug assembly, external profile, MK66 Rocket Motor, and M439 fuze as the Hydra 70 M261 Multipurpose Submunition, and M267 Illumination Rounds. The XM264 expulsion charge and payload are different from the other Hydra 70 rounds. Differences in ballistics of these rounds has been accounted for in the programming of the Rocket Management System. The pilot merely lases the target with his range finder or selects the desired range to target, selects the type of round, and fires.

2. The aircrew can selectively fire rockets by using the Rocket Management System panel in the cockpit. There are established procedures for loading a single type of rocket into a particular zone of the launcher so that the pilot can select a zone (smoke, submunition, illumination) and a number of rounds that he wants to fire.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rocket- Davy Crockett GFS

**Reference (USA-HEL, 1961):**

USA-HEL. (1961). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Evaluation of the Davy Crockett Graphical Firing Scale (FRE 24776): U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-11-61 LIMITED DIST. DTIC ADB965266.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*guided missiles, human factors engineering, hit probabilities  
davy crockett missiles

**System Description:**

Davy Crockett Graphical Firing Scale (FRE 24776).

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies and their contractors; Administrative/Operational Use; JUL 1961. Other requests shall be referred to Human Engineering Laboratory, Aberdeen Proving Ground, MD. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- Rocket- Direct Attack Guided Rocket

**Reference (Cook, 2002):**

Cook, T. C. (2002). Manpower and Personnel Integration (MANPRINT) Assessment for the Direct Attack Guided Rocket: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.



**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Direct Attack Guided Rocket will fill the weapon gap between the current unguided 2.75-inch rocket system and the HELLFIRE anti-armor missile. The transformation of United States (U.S.) forces from reliance on well stocked forward deployed forces reinforced from the U.S., to a continental U.S.-based power projection force demands weapon systems that are lighter, more deployable, and which produce higher ratios of kills per platform. Direct Attack Guided Rocket is a low cost laser guided rocket. This system is an evolution of the current HYDRA 2.75-inch rocket system and will be compatible with all Army attack and reconnaissance helicopters. The Direct Attack Guided Rocket will consist of a laser based guidance and control section, 2.75-inch rocket components (motor, warhead and fuze) and the shipping container.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rocket- GLMRS UR

**Reference (Davis, 2008):**

Davis, T. W. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the Guided Multiple Launch Rocket System (GMLRS) Unitary Rocket: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The GMLRS Unitary Rocket is a product improvement of the GMLRS DPICM Rocket. The , primary improvement will be a unitary warhead that reduces collateral damage and which is effective against critical area and point targets and, against targets that are employed in restricted terrain. Reduced collateral damage is achieved by warhead design optimization and by enhancements that improve the delivery accuracy of the rocket. These enhancements include a Global Positioning System (GPS)-augmented Inertial Measurement Unit (IMU) and anti-jam GPS features. The Unitary Rocket has been designed to accommodate follow-on advanced technology warheads/submunitions and / or guidance and control packages with minimal integration and / or design changes. These improvements have been designed to minimize impact to the rocket, Launch Pod Container (LPC), and system operation. The GMLRS Unitary Rocket warhead contains a single 180 - 200 pound class high explosive with a multiple fuze capability. The multi-mode fuze options are point detonating, delay and proximity, which will allow engagement of targets that cannot be attacked with conventional, dual purpose improved conventional munitions (DPICM) munitions. The GMLRS Unitary Rocket will be designed to allow handling within the current Multiple Launch Rocket System (MLRS) logistics system. The GMLRS Unitary Rocket configuration is composed of three sections: Guidance and Control (G&C), payload, and propulsion sections.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rocket- GMLRS

**Reference (Cook, 1997):**

Cook, T. C. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Guided Multiple Launch Rocket System (GMLRS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The G-MLRS rocket is an improved version of the Extended Range Multiple Launch Rocket System (ER-MLRS) Dual Purpose Improved Conventional Munition (DPICM) rocket. The primary modifications associated with the G-MLRS upgrade involve changes to the guidance and control elements for improved accuracy, and reduced submunition payload and increased length of the rocket motor for increased range. The exterior dimensions of the G-MLRS rocket are the same as the ER-MLRS and Basic MLRS rocket. The G-MLRS will dispense M85 submunitions and is fired from the M270 and M270Allauncher. While the Multiple Launch Rocket System (MLRS) satisfies the need for a non-nuclear, allweather, indirect area fire weapon system to strike counterfire, air defense, armored formations, and other high-payoff targets at all depths of the tactical battlefield, post Operation Desert Storm reports indicated that the basic MLRS M26 rocket was out ranged by enemy artillery systems. The ER-MLRS rocket was designed to correct this problem and counter those threats. The GMLRS rocket is designed to address the need for even greater range and accuracy by extending the range out to 60-70 km. G-MLRS is an ACAT IT program.

In addition to increased range and accuracy the G-MLRS is designed to decrease the hazardousto-friendly dud rate of the M77 submunition to less than one percent with the addition of a selfdestruct fuze thereby enhancing soldier survivability.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rocket- GMLRS

**Reference (Ruff, 1998):**

Ruff, R. M. (1998). Manpower and Personnel Integration (MANPRINT) Assessment for the Guided Multiple Launch Rocket System (GMLRS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Guided Multiple Launch Rocket System (GMLRS) will be fired from the M270 launcher. It is an upgrade to the Extended Range MLRS (ER-MLRS) by adding guidance control, fins, a new launch motor and ATACMS propellant. This assessment will only address the issues created by adding the GMLRS munition to the MLRS Family Of Munitions (MFOM). However, hazards exist for the M270 launcher that if not addressed will affect the GMLRS system effectiveness and could result in operator incapacitation or mission failure.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rocket- GMLRS

**Reference** (Hernandez, 2007):

Hernandez, C. L. (2007). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the XM30 Guided Multiple Launch Rocket System (GMLRS) in the Combined High Mobility Artillery Rocket System (HIMARS)-GMLRS Initial Operational Test: U.S. Army Research Laboratory, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland. ARL Technical Report ARL-TR-4113. DTIC ADA468402.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*human factors engineering, \*artillery rockets, \*multilaunching, \*rocket launchers, test and evaluation, questionnaires

\*gmlrs(guided multiple launch rocket system), \*hme(human factors evaluation), \*himars(high mobility artillery rocket system)

Fields and Groups:

190700 - Rockets

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*ARTILLERY ROCKETS, \*MULTILAUNCHING, \*ROCKET LAUNCHERS, TEST AND EVALUATION, QUESTIONNAIRES

Identifiers:

(U) \*GMLRS(GUIDED MULTIPLE LAUNCH ROCKET SYSTEM), \*HME(HUMAN FACTORS EVALUATION), \*HIMARS(HIGH MOBILITY ARTILLERY ROCKET SYSTEM)

**System Description:**

The GMLRS rocket is an improved version of the ER-MLRS rocket. The primary improvements will be enhanced accuracy by the addition of Guidance and Control (G&C) elements and increased range provided by a newly designed rocket motor, reducing its payload, and additional fly-out capabilities provided by the canards. These improvements will be developed to minimize design impact to the rocket, Launch Pod Container (LPC) and system operation. The potential GMLRS rocket configuration is composed of three sections: G&C, payload, and propulsion sections.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Rocket- GMLRS UR

**Reference** (Cook, 2003):

Cook, T. C. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the Guided Multiple Launch Rocket System (GMLRS) Unitary Rocket (UR): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The GMLRS Unitary Rocket will provide the Tactical Commander with a greatly improved capability to neutralize or destroy enemy targets at tactical depths with the option of selecting a reduced collateral damage munition. GMLRS Unitary Rocket will allow engagement of these targets that cannot be attacked with conventional Dual Purpose Improved Conventional Munitions (DPICM) because the targets were intentionally or unintentionally positioned near facilities or areas that we do not wish to damage or

destroy, or where collateral damage and unexploded ordnance are unacceptable. The Guided Unitary Rocket Program is a product improvement of the current GMLRS Rocket which will provide the capability to precisely attack and defeat critical area and point targets in restricted terrain (under foliage, urban environments, heavy snow, etc.) while minimizing collateral damage and unexploded ordnance. The GMLRS Unitary Rocket will use selected technology of the GMLRS program (i.e., motor, tail section, guidance and control section). The GMLRS Unitary Rocket will include a pre-planned product improvement (P3I) potential to exploit technological opportunities, respond to changing threats, tactics, or adapt to wider roles with regard to force projection and deep attack in early entry operations.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rocket- GMLRS UR

**Reference (Davis, 2008):**

Davis, T. W. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the Guided Multiple Launch Rocket System (GMLRS) Unitary Rocket (UR) Full Rate Production Decision: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The GMLRS Unitary Rocket is a product improvement of the GMLRS DPICM Rocket. The primary improvement will be a unitary warhead that reduces collateral damage and which is effective against critical area and point targets and, against targets that are employed in restricted terrain. Reduced collateral damage is achieved by warhead design optimization and by enhancements that improve the delivery accuracy of the rocket. These enhancements include a Global Positioning System (GPS)-augmented Inertial Measurement Unit (IMU) and anti-jam GPS features. The Unitary Rocket will be designed to accommodate follow-on advanced technology warheads/submunitions and /or guidance and control packages with minimal integration and/or design changes. These improvements have been designed to minimize impact to the rocket, Launch Pod Container (LPC), and system operation. The GMLRS Unitary Rocket warhead contains a single 180 – 200 pound class high explosive with a multiple fuze capability. The multi-mode fuze options are point detonating, delay and proximity, which will allow engagement of targets that cannot be attacked with conventional, dual purpose improved conventional munitions (DPICM) munitions. The GMLRS Unitary Rocket will be designed to allow handling within the current Multiple Launch Rocket System (MLRS) logistics system.

The GMLRS Unitary Rocket configuration is composed of three sections: Guidance and Control (G&C), payload, and propulsion sections.

1. Guidance and Control (G&C) Section. The G&C section occupies the forward portion of the rocket and provides the commands and controls to navigate the rocket to the desired target coordinates where the fuze then detonates the warhead in either the point detonating, delay or proximity function. The G&C components are powered by an on-board thermal battery, which will be initiated during the launch sequence. The G&C section consists of the IMU, G&C computer, GPS antenna and receiver, Control Actuation System, canards, umbilical, and battery. The G&C function is accomplished through inertial guidance with GPS updates. The IMU and GPS with integrated Selective Availability Anti-Spoofing Module and enhanced anti-jam features are tactical grade non-developmental items. Steering of the rocket is performed by four small non-folding canards located in the ogive portion of the rocket. Electromechanical actuators, in response to navigation and control commands from the G&C computer, control the canards. The G&C computer provides the electrical commands to activate the Electronic Safe and Arm Fuze (ESAF), which in turn arms the warhead. At the appropriate point in the rocket flight trajectory, (pre-determined height above the ground, delay, or proximity) the multi-mode fuze initiates the booster, which in turn, detonates the high explosive warhead.

2. Payload Section. The payload section of the GMLRS Unitary Rocket consists of the warhead skins, the multimode fuze system, and the high explosive warhead and the test configuration, a Telemetry System and Flight Termination System. The Unitary warhead consists of the outer metallic fragmenting casing, the explosive fill, and the multi-mode fuze. The metallic casing is designed to fragment upon warhead function in a manner that is optimized to maximize effects against the target set while minimizing collateral damage. The casing also gives the munition a limited ability to penetrate hardened targets/structures. The explosive fill will be compliant with requirements for Insensitive Munitions (IM) while providing blast effects optimized for the target set. The fuze is designed to provide three modes of operation, point detonating, delay and proximity. The desired mode is selected via software prior to launch depending on target and mission parameters and is uploaded to the individual rocket with the mission critical data.

3. Propulsion Section. The propulsion section contains the rocket motor, a spinning tail fin assembly and detent system. The rocket motor and propellant (ARCADENE 361) are the same as that used in the GMLRS DPICM Rocket. The rocket motor nozzle accommodates the slower burn rate, which aids in the increased range of the system. A spinning tail section is incorporated to decouple the control section from the tail to improve rocket control. The tail fins are spring deployed. The new designed detent system holds the rocket in the tube during transportation. Rocket motor improvements required to comply with IM requirements will be added as an upgrade when available.

4. Launch Pod Container (LPC). The LPC is the unit of issue and will serve as a shipping and storage container, as well as a launch pod for the rocket. Each LPC will hold six GMLRS Unitary Rockets. (The minimum storage life of the loaded LPC will be 10 years.) A Signal Distribution Box will distribute the launcher-provided GPS signal to each GMLRS Unitary Rocket. The rear tube covers have been modified during the GMLRS DPICM development to accommodate a change in the detent system. The detent system is used to hold the rocket in the tube during transportation and supports the rocket until it is fired. The W20 cable on the aft end of the LPC provides the capability for communications between the Signal Distribution Box and the M270A1 and High Mobility Artillery Rocket System (HIMARS) launchers. The LPC will have the same height, width, and length characteristics as the GMLRS DPICM LPC. The weight and center of gravity of any GMLRS Unitary LPC (with and without rockets) will be within the limits of the M270A1 launcher hoist mechanism; the Heavy Expanded Mobility Tactical Truck M985 with 5400-pound lift capability crane; the XM142 HIMARS launch hoist mechanism; and the Family of Tactical Vehicle M1084A1 Resupply Vehicle with 5500-pound lift capability crane.

5. Launch Platforms.

a. MLRS M270 Launcher. The MLRS M270 launcher is the standard United States (US) Army platform for firing the MLRS Family of Munitions (MFOM). The M270 launcher is a self-propelled armored rocket and missile firing platform with a crew of three. The launcher is composed of the M993 extended Bradley tracked carrier and the M269 launcher module (LM). The LM contains a built in self-loading system that holds two LPCs. Each launcher has the onboard capability to receive a fire mission, determine launcher location, compute firing data, orient on the target and fire. The M270 carrier cab houses the man-machine interface for the Fire Control System (FCS).

b. MLRS M270A Launcher. The M270A1 launcher is a combined fielding of improved launcher mechanical system (ILMS) and improved fire control system (IFCS). The ILMS drastically reduces fire mission and reload cycle times. It allows the LM to elevate and traverse simultaneously at an increased speed. Incorporating the GPS and decentralizing the weapon system command function enhances operational performance of the launcher. The ILMS and IFCS improvements provide the capability of firing the existing MFOM.

c. High Mobility Artillery Rocket System (HIMARS). The HIMARS is a C-130 transportable, wheeled, indirect fire rocket/missile system capable of firing all rockets and missiles in the current and future MFOM. HIMARS is based on the need for a lighter weight, more rapidly deployable MLRS to provide the maneuver commander lethal, long range fires. HIMARS launcher will consist of a Family of Medium Tactical Vehicle carrier and the same FCS that is in the M270A1 to include the IWIU. The HIMARS launcher will carry one LPC and have the same performance characteristics of the M270A1. HIMARS is an Army Legacy to Objective Force System.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

**System Short Name:** MANPRINT- Rocket- GMLRS XM30

**Reference** (Cook, 2005):

Cook, T. C. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Guided Multiple Launch Rocket System (GMLRS) XM30 Rocket. Redstone Arsenal, AL,: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The rocket, known as the XM30 GMLRS (Guided MLRS for short) is an improved version of the Extended Range Multiple Launch Rocket System (ER-MLRS) Dual Purpose Improved Conventional Munition (DPICM) rocket. The primary improvements are enhanced accuracy by the addition of Guidance and Control (G&C) elements and increased range provided by development of a new rocket motor and additional fly-out capabilities provided by the Control Actuation System. GMLRS rocket improves upon the ER-MLRS DPICM free-flight rocket by providing precision-guided technology. These improvements have been designed to minimize impact to the rocket, Launch Pod/Container (LP/C), and system operation. The design of the G&C elements will facilitate future MLRS munitions. The mission of the GMLRS rocket is to attack, neutralize, suppress, or destroy targets at a greater depth, with greater accuracy while reducing the number of rockets required to defeat targets. The GMLRS rocket will be designed to allow handling within the current Army MLRS logistics system.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rocket- GMLRS-DPICM

**Reference** (Cook, 2003):

Cook, T. C. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the Guided Multiple Launch Rocket System (GMLRS) Dual Purpose Improved Conventional Munitions (DPICM): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The HIMARS is a C-130 transportable, wheeled, indirect fire system that is Joint Technical Architecture-Army (JTA-A) compliant and capable of firing all rockets and missiles in the Multiple Launch Rocket System family of munitions (MFOM). The HIMARS will provide tactical and operational support during both offensive and defensive operations. The HIMARS will be deployable worldwide and will operate in all climatic conditions in which the M270AI operates. The HIMARS units will be functionally and operationally compatible with current MLRS units, and will be assigned to Corps FA Brigades in support of light, airborne and air assault divisions, and in early entry contingency force operations. The HIMARS includes the launcher, ammunition trucks and trailers, MFOM, and the Command and Control (C2) System.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rocket- Grenade- 66mm- LAW XM72

**Reference (USA-HEL, 1961):**

USA-HEL. (1961). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Infantry Assault Weapon, Light (LAW) Rocket Grenade, 66mm, XM-72: A Study of the Effect of Trigger Pull on the Accuracy of the LAW Weapon: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. HEL Technical Note HEL-TN-2-61. DTIC ADB966265. CHICAGO UNIV ILL HUMAN DYNAMICS LAB.

**Key Words:**

\*grenade launchers, \*pull tests, human factors engineering  
U/A Reports, XM-72 Grenades(66-MM).

**System Description:**

Infantry Assault Weapon, Light (LAW) Rocket Grenade, 66mm, XM-72

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies and their contractors; Critical Technology; Mar 61. Other requests shall be referred to Director, Human Engineering Lab., Aberdeen Proving Ground, MD 21005-5001. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- Rocket- LAW AT4

**Reference (Ellis, 1984):**

Ellis, P. H. (1984). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Modified AT-4 Light Antiarmor Weapon: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TN-10-84. DTIC ADA147482.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*antitank weapons, \*recoilless guns, mobility, human factors engineering, lightweight, marine corps equipment, marine corps personnel, ruggedized equipment

Fields and Groups:

190600 - Guns

Descriptors:

(U) \*ANTITANK WEAPONS, \*RECOILLESS GUNS, MOBILITY, HUMAN FACTORS ENGINEERING, LIGHTWEIGHT, MARINE CORPS EQUIPMENT, MARINE CORPS PERSONNEL, RUGGEDIZED EQUIPMENT

**System Description:**

The AT-4 is a man-portable, 84-mm antiarmor weapon designed by the FFV Co. of Sweden who is represented in the United States by Honeywell Corp. This AT-4 evaluation was conducted in two parts. The first part addressed its durability, ruggedness, and compatibility with the marine rifleman's fighting load. This took place on the USAHEL (US Army Human Engineering Laboratory) cross-country and mobility/portability course. The second part examines the time it took marines to prepare the weapon for firing, and the frequency and type of errors they made during the preparation. Recommendations are made to improve the ruggedness, durability, and operational suitability of the AT-4. The AT-4 was found to be a rugged weapon that is fast and easy to prepare for firing. It was enthusiastically endorsed by the Marine test participants even though it is significantly larger and heavier than the lightweight antiarmor weapon (M72A1) with which they were familiar. Originator-supplied keywords include: Antitank weapons, Recoilless rifle, and Infantry weapons.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Rocket- Little John

**Reference** (Pomeroy, 1960):

Pomeroy, T. B. (1960). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Evaluation of the Little John Launchers, XM34 and XM80: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-6-60 LIMITED. DTIC AD0809777.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

(\*guided missile launchers, \*human factors engineering), (\*transporter erectors, human factors engineering), guided missile personnel, operators(personnel), operation, structures, trailers, surface to surface missiles  
little john, m-34 rocket launchers(318-mm), m-80 rocket launchers(318-mm)

**System Description:**

This report presents the results of a human factors survey of the LITTLE JOHN Launchers, XM34 and XM80. This survey consisted of test observations and discussions with using troops. The purpose of this study was to determine what significant human factors problems were being encountered by the users with the LITTLE JOHN Launchers. In addition an attempt was made to gather information about how the operator copes with these problems and to elicit his suggestions for design improvements. Effort was concentrated on the problems encountered in operation of the Spin on Straight Rail XM34 (SOSR) and the Pre-spin Automatic dynamic Alignment XM80 (PADA) launchers and the XM505 trailer. Although no mention has been made of design recommendations for the cold weather shelter, of problems encountered under varying climatic and terrain conditions, or of a formal job analysis study, this should not be construed to mean that no human factors problems exist. The intention of this study is to determine specific problem areas rather than to obtain an overall evaluation of the weapon system. The discussion of the problem areas should not be taken as overall dissatisfaction with the weapon system.

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation of Military Hardware presented; May 1971. Other requests for this document must be referred to Army Weapons Command, Attn: AADWSD. Rock Island, Ill. 61201. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Rocket- MLRS

**Reference** (Earl, 1984):

Earl, W. K. (1984). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Analysis of the Multiple Launch Rocket System (MLRS) in Operational Test III: U.S. Army Research Institute for the Behavioral and Social Sciences Field Unit, Fort Hood, TX. ARI Research Report 1387. DTIC ADA163087.

**Key Words:**

Fields and Groups:  
190700 - Rockets  
230200 - Human Factors Engineering & Man Machine System  
Descriptors:



(U) \*HUMAN FACTORS ENGINEERING, \*ROCKET LAUNCHERS, ORGANIZATIONS, OPERATIONAL EFFECTIVENESS, LOADERS, DEFICIENCIES, AMMUNITION, VEHICLES, LAUNCHERS, ARTILLERY ROCKETS, ROCKETS, REPLENISHMENT, MULTILAUNCHING, SELF PROPELLED

Identifiers:

(U) MLRS(MULTIPLE LAUNCH ROCKET SYSTEM),

**System Description:**

An analysis of the human factors design and related considerations of the Multiple Launch Rocket System (MLRS) was conducted in conjunction with the MLRS Operational Test III. Eighty probable or confirmed human factors, training and organizational deficiencies are identified. Twenty-three of these are considered serious enough to result in significant reductions in operational effectiveness if left uncorrected. The methods used to obtain the human factors data are described, and summarized data and analyses are presented. Results of the evaluation are discussed and their implications are considered. This report provides the Army with data that identify needed design changes in succeeding production models of the MLRS Self Propelled Launcher Loader and Ammunition Resupply Vehicle. The data also provide a basis for the development of design criteria for future similar systems.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Rocket- MLRS FCS

**Reference** (Savick, 2002):

Savick, D. S. (2002). Manpower and Personnel Integration (MANPRINT) Assessment: Personnel and Training Evaluation for the M270A1 Multiple Launch Rocket System (MLRS) Fire Control System (FCS): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland. ARL HRED Technical Report ARL-MR-546. DTIC ADA408167.

**Key Words:**

Fields and Groups:

190500 - Fire Control and Bombing Systems

190700 - Rockets

Descriptors:

(U) \*FIRE CONTROL SYSTEMS, \*MULTILAUNCHING, \*ROCKET LAUNCHERS, TEST AND EVALUATION, ARMY PERSONNEL, ARMY TRAINING

**System Description:**

The M270A1 FCS provides overall control of the M270A1 launcher. This includes executing fire missions for missile and rocket munitions, performing reloading operations, providing secure digital communications with upper echelons, and providing vehicle location information to the FCS and the crew. The FCS is equipped with a global positioning system (GPS), built-in test, and built-in test equipment and is capable of isolating malfunctions in the circuit card assemblies.

During the time of this evaluation, there was a concern within the TSM-RAMS office and with the instructors at the U.S. Army Field Artillery School (USAFAS) that many students who presently enter the 13M crew member course may not have the capabilities and skills to successfully complete the training for operating the new FCS. While the operating system for the M270A1 FCS provides more capabilities for the gunner, it also requires that he or she must learn and remember more procedures. Therefore, specific concerns must be addressed in order to select qualified soldiers and properly train them. In addition, retention of the training is also a concern. Many MOS 13Ms will not apply this training for months, possibly even years after they complete their initial training, based on their assignments after training. Their proficiency in these skills may lessen over time.

In conjunction with the M270A1 FCS, a 13M crew member is also required to operate a portable computer, commonly referred to as the Soldier's Portable On-System Repair Tool (SPORn. SPORT's main functions are to host the Interactive Electronic Technical Manual (IETM) and interface with the FCS to download data files. The operating system used by SPORT is currently Windows 95. This additional

piece of equipment adds concerns in the area of training. Current 13M crew member courses provide instruction to soldiers about how to use printed technical manuals. Instructing a soldier to use an IETM will require familiarity with Windows 95.

The personnel and training evaluation included an examination of three issues. The first issue was to determine whether the Armed Services Vocational Aptitude Battery (ASVAB) aptitude area cut-off score for Operator and Food (OF) handler for entrance into the 13M crew member course needed to be raised to accommodate for a more complex FCS. The aptitude area, OF, is comprised of a set of ASVAB subtests used to measure the soldier's ability to operate the MLRS. The second issue was to determine how long a trained 13M crew member can retain proficiency before there is a need for retraining. The third issue was to determine if there is a need to include Windows training for incoming 13M crew member students for effectiveness on both the FCS and the SPORT.

The Human Research and Engineering Directorate of the U.S. Army Research Laboratory (ARL) performed a personnel and training evaluation of the M270A1 multiple launch rocket system (MLRS) fire control system (FCS) for the Training and Doctrine Command System Manager- Rocket and Missile Systems (TSM-RAMS) at Fort Sill, Oklahoma. The M270A1 FCS is an improved version of the current M270 FCS. It improves the capability and versatility of the FCS by using a "Windows-like" operating system. During the time of this evaluation, the M270A1 was in the engineering and manufacturing development phase of acquisition. Improving the capability and versatility of the operating system does not necessarily improve the usability of the operating system. The complexity of the system can affect personnel and training requirements of the military occupational specialty (MOS) 13M for successful operation of the FCS. Therefore, the evaluation was performed to determine if personnel and training requirements should be changed to provide effective training for the new FCS.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Rocket- MLRS M270A1

**Reference** (Cook, 2002):

Cook, T. C. (2002). Manpower and Personnel Integration (MANPRINT) Assessment for the Multiple Launch Rocket System (MLRS) M270A1 Launcher: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Multiple Launch Rocket System (MLRS) M270A1 Launcher is the end result of the application of the Improved Fire Control System (IFCS) and the Improved Launcher Mechanical System (ILMS) modifications to the M270 launcher. Additionally, all M270 launchers will be evaluated as re-manufacturing candidates with primary emphasis on the engine drive train, reliability components, and bringing all launchers to a common configuration. Initial fielding of the M270A1 launcher will begin during 2QFY02 with an expected life span through the year 2025. The M270A1 launcher will support all fielded and future munitions.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rocket- MLRS RRPR M28A2

**Reference** (Thomas, 2004):

Thomas, C. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Multiple Launch Rocket System M28A2 Reduced Range Practice Rocket. APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Multiple Launch Rocket System M28A2 Reduced Range Practice Rocket (RRPR) will be used for MLRS Field Artillery battery annual service practice firings. The M28A2 RRPR is compatible with all MLRS launchers (M270, M270A1 and High Mobility Artillery Rocket System (HIMARS)) and requires no new software for use. The M28A2 RRPR is installed into the M26 rocket Pod and houses six rockets per pod. The RRPR is the third variant of practice rockets to be developed and fielded to the U.S. Army, U.S. Marine Corp and foreign military sales customers.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rocket- MLRS-IFCS

**Reference (Bass, 1997):**

Bass, D. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Multiple Launch Rocket System (MLRS) Improved Fire Control System (IFCS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Multiple Launch Rocket System (MLRS) Improved Fire Control System (IFCS).

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rocket- MLRS-RRPR

**Reference (Cook, 2005):**

Cook, T. C. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Multiple Launch Rocket System (MLRS) M28A2 Reduced Range Practice Rocket (RRPR). Redstone Arsenal, AL.; U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Multiple Launch Rocket system (MLRS) M28A2 Reduced Range Practice Rocket (RRPR) will be used for MLRS Field Artillery battery annual service practice firings. The M28A2 RRPR is compatible with all MLRS launchers (M270, M270AI and High Mobility Artillery Rocket System (HIMARS)) and requires no

new software for use. The M28A2 RRPR is installed into the M26 rocket Pod and houses six rockets per pod. The RRPR is the third variant of practice rockets to be developed and fielded to the U.S. Army, U.S. Marine Corp and foreign military sales customers.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Rocket- MRL M91

**Reference** (Norlander et al., 1962):

Norlander, W. D., Hunt, J. D., & Young, R. R. (1962). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Evaluation of the M91, 115mm Multiple Rocket Launcher: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-13-62 LIMITED. DTIC AD0809784.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*rocket launchers, \*human factors engineering, operation, operators(personnel), multiple operation m-91 rocket launchers(115-mm)

**System Description:**

The M91 Multiple Rocket Launcher was evaluated against its military characteristics and human factors criteria. The operation of the launcher was successfully handled by a six-man crew, although the work was extremely strenuous. In some areas, design changes should be made in order to make operations safer and faster. The immobility of the ground-mounted launcher seriously impairs its use as a tactical weapon.

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation of Military Hardware presented; May 1971. Other requests for this document must be referred to Army Weapons Command, Attn: AADWSD. Rock Island, Ill. 61201. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Rocket- SMAW

**Reference** (Hickey and Ortega, 1992):

Hickey, C. A., Jr., & Ortega, S. V., Jr. (1992). Manpower and Personnel Integration (MANPRINT) Assessment: Mobility, Portability, and Human Factors Evaluation of the Shoulder-Launched Multipurpose Assault Weapon (SMAW) Mk 153 Mod 1: U.S. Army Research Laboratory, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland. ARL Technical Report ARL-TR-24 LIMITED. DTIC ADB172127.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*assault, \*multipurpose, \*shoulder launched weapons, portable equipment, mobility, compatibility, sights, straps, vehicles, pictures, tubes, army research laboratories, exits, launchers, vision, geometry, human factors engineering, field tests, firing t

smaw(shoulder launched multipurpose assault weapon), mark-153 mod-1 shoulder launchers, pe62716a  
Fields and Groups:

150500 - Logistics, Military Facilities and Supplies

190700 - Rockets

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*ASSAULT, \*MULTIPURPOSE, \*SHOULDER LAUNCHED WEAPONS, PORTABLE EQUIPMENT, MOBILITY, COMPATIBILITY, SIGHTS, STRAPS, VEHICLES, PICTURES, TUBES, ARMY RESEARCH LABORATORIES, EXITS, LAUNCHERS, VISION, GEOMETRY, HUMAN FACTORS ENGINEERING, FIELD TESTS, FIRING TESTS(ORDNANCE)

Identifiers:

(U) SMAW(SHOULDER LAUNCHED MULTIPURPOSE ASSAULT WEAPON), MARK-153 MOD-1 SHOULDER LAUNCHERS

**System Description:**

A mobility, portability, and human factors assessment was conducted by the U.S. Army Research Laboratory (ARL), Human Research and Engineering Directorate (HRED), Aberdeen Proving Ground, Maryland, from 28 October through 15 November 1991. The objectives of this assessment were to evaluate the shoulder-launched multipurpose assault weapon (SMAW) MK 153 MOD 1 regarding portability, simulated firing, vehicle entry and exit, and field stripping and reassembly. Twelve marines participated in this assessment. The results indicated that the SMAW MK 153 MOD 1 was no different than the SMAW MK 153 MOD X for the objective measures evaluated on the mobility and portability course. The differences noted during the mobility and portability assessment were subjective and pertained to the design of the shoulder straps used on each launcher. The most significant result noted during this assessment was that approximately half the marines experienced difficulties securely positioning the SMAW MK 153 MOD 1 launcher on or against their shoulders to obtain and maintain a sight picture. The geometry and location of the shoulder stock, sights, and launch tube should be redesigned so that the users can easily and comfortably shoulder the launcher and use the sights. Compatibility, Shoulder strap, Human factors, Sight picture, Shoulder-launched multipurpose, Assault weapon (SMAW).

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies only; Administrative/Operational Use; NOV 1992. Other requests shall be referred to Executive, Human Research and Eng. Directorate, U.S. Army Research Laboratory, Aberdeen Proving Ground, MD 21005-5425. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- RSCCE

**Reference** (Martin, 1994):

Martin, J. H. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Replacement Satellite Communication Configuration Control Element (RSCCE): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

Model Systems

PSCCE

The PSCCE can command and monitor one satellite while simultaneously monitoring and recording telemetry data from a second satellite. The PSCCE workstation consists of two sets of dual monitors, one set for each satellite, totaling four video monitors. For each satellite, operators typically monitor realtime telemetry data on one video terminal while they perform realtime control or planning tasks using the

second video terminal. There is a fifth video terminal which combines data from both satellites. In addition to the five video terminals, there are five keyboards for data entry. To perform satellite monitoring and control, the operator accesses the appropriate location within the menu structure and performs the necessary control actions. The workstation can accommodate two operators during times of added workload.

#### CSCCE

The CSCCE can command and monitor anyone DSCS III satellite at a time and support the space-craft based improvements of the newer DSCS III satellites. Compared to the PSCCE, the CSCCE has a much improved man-machine interface with more automated functionality. The CSCCE host computer utilizes more modern computer technology and utilizes an X-Windows protocol to allow a windowing ManMachine Interface (MMI). The CSCCE operator workstation consists of dual monitors, a keyboard and a mouse. The operator can move the cursor from one screen to another enabling access to two different locations within the CSCCE menu structure. Operators often keep the main menu which contains alarm indicators displayed on one screen while they work on control or real-time monitoring tasks from the other display.

#### RSCCE

The RSCCE will use CSCCE software modified for use on a new hardware platform. The human-computer interface (HCI) software will be modified to include additional satellite coverage and the reporting capabilities of the PSCCE. The RSCCE operator workstation will have two video terminals and two input devices to accommodate two operators. One operator will perform real-time command or monitor operations using one or two video monitors. If the primary operator is not using the second video monitor, a second operator could perform off-line planning operations, or real-time operations if necessary. To provide the necessary satellite coverage, each facility will receive three RSCCEs. To the operator, the RSCCE HCI will closely resemble that of the CSCCE. However, unlike the CSCCE, the operator can access only one location within the menu structure that corresponds to a particular satellite and have it displayed on one video terminal. The two terminals for each RSCCE will be used independently and they will not be linked as in the CSCCE.

Other major hardware components include the computer and peripheral subsystem (CPS) and the telemetry and command subsystem (TCS). The CPS consists of a rack-mounted computer with a maintenance display and a data storage device to write and read archived data. TCS consists of two racks which contain Government-furnished equipment (GFE). Other peripheral equipment will include a line printer, and a printer/plotter.

#### Report Availability:

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- RWBK

#### Reference (Hoffman, 2004):

Hoffman, T. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Rapid Wall Breaching Kit (RWBK XM322, Force on Force Trainer, XM323, and the Inert Trainer Xm324. APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

#### Key Words:

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

#### System Description:

The Rapid Wall Breaching Kit (RWBK) is a demolition system that provides the dismounted soldier with the capability to rapidly create a man sized hole in double reinforced concrete and triple brick walls, to rapidly cut through steel and other materials to breach obstacles, and to create obstacles to deny or impede enemy mobility. Dismounted soldiers need this capability to be pre-formed, pre-packaged, easily and rapidly deployed, lightweight, and safe while in use and while minimizing their exposure time at the target. The two rows of re-bar reinforcing rods that remain in the wall after the RWBK has been detonated

must be removed to allow the soldiers to pass through the hole. A re-bar cutting device will be added to the kit to allow the elimination of any steel re-bar obstructing the passage of the soldiers through the hole. The system is lightweight and one man-portable. The RWBK system is transported in a dedicated backpack that can be carried by a soldier with his fighting load and can be quickly and securely attached to either the ALICE or the MOLLE Pack for limited distances. The RWBK will also have a classroom Inert Trainer and high fidelity Force on Force Trainer.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- SAFEGUARD

**Reference** (McCommons and Keiser, 1972):

McCommons, R. B., & Keiser, A. H. (1972). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Safeguard Intrasite Communications Subsystem: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-6-72 LIMITED. DTIC AD0893652.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*intercommunication systems, \*antimissile defense systems, \*human factors engineering, surface to air missiles, launching sites, communication and radio systems, voice communications, ground support equipment, command and control systems, data transmiss

\*safeguard antiballistic missile system, sprint

Fields and Groups:

150301 - Antimissile Defense Systems

230200 - Human Factors Engineering & Man Machine System

250500 - Command, Control and Communications Systems

Descriptors:

(U) \*INTERCOMMUNICATION SYSTEMS, \*ANTIMISSILE DEFENSE SYSTEMS, \*HUMAN FACTORS ENGINEERING, SURFACE TO AIR MISSILES, LAUNCHING SITES, COMMUNICATION AND RADIO SYSTEMS, VOICE COMMUNICATIONS, GROUND SUPPORT EQUIPMENT, COMMAND AND CONTROL SYSTEMS, DATA TRANSMISSION SYSTEMS, SECURE COMMUNICATIONS, ELECTRICAL NETWORKS, MAN MACHINE SYSTEMS, INTERFACES, MAINTENANCE, ARMY TRAINING, OPERATORS(PERSONNEL), PERFORMANCE(HUMAN), CONTROL PANELS

Identifiers:

(U) \*SAFEGUARD ANTIBALLISTIC MISSILE SYSTEM, SPRINT

**System Description:**

This report presents the results of a human factors evaluation of the SAFEGUARD Intrasite Communications Subsystem. This evaluation was performed to determine whether existing subsystem design proposals adhered to established human engineering criteria. Also, where entities within the subsystem were as yet undefined, specific design recommendations were made. The areas addressed were (1) the Tactical Communications Officers' consoles, (2) the Technical Control Facilities, (3) the Private Automatic Branch Exchanges, (4) communications control at the Remote Sprint Launch sites, (5) communications subsystem maintenance, and (6) crypto management.

**Report Availability:**

Distribution limited to U.S. Gov't. agencies and their Contractors; Specific authority; 10 Mar 72. Other requests must be referred to Director, Human Engineering Labs, Aberdeen Proving Ground, Md. 21005. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- SASRD

**Reference** (Ganem et al., 1965):

Ganem, G. P., Kramer, R. R., & Torre, J., James P. (1965). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of a Small-Arms Soft-Recoil Device: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TN-2-65 LIMITED. DTIC AD0484208.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

(\*recoil mechanisms, performance(human)), small arms, rifle grenade launchers, recoilless guns, human factors engineering, circular error probable, reliability, firing tests(ordnance), performance(engineering), targets, rifles, kill probabilities, react  
40-mm ordnance items, m-79 grenade launchers(40-mm)

**System Description:**

This experiment attempted to determine how Hydro-Coil -- a soft-recoil,air-pressure device for small arms -- affected aiming error, reluctance to fire, force-time functions, and subjective ratings of recoil force. There were three pairs of weapons(M14, 12-gauge shotgun, and M79 grenade launcher), with Hydro-Coil installed on one member of each pair. The Hydro-Coil device did not affect aiming error or reluctance to fire. However, it reduced peak force and extended the force over a longer time interval. Subjective estimates indicate that the device reduced felt kicks slightly. Unclassified Annotation: Human factors evaluation of a small-arms soft-recoil device.

**Report Availability:**

Distribution: USGO: Others to Human Engineering Labs., Aberdeen Proving Ground, Md. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- SCS-CGCPT

**Reference** (Kass and Smootz, 1984):

Kass, R. A., & Smootz, E. R. (1984). Manpower and Personnel Integration (MANPRINT) Assessment for the Special Communications System (SCS) AN/Gsc-40 Combined Ground Command Post Terminal (CGCPT): Human Factors and Safety Evaluation Fort Hood, Texas: U.S. Army Research Institute for the Behavioral and Social Sciences (PERI-OH). 5001 Eisenhower Ave, Alexandria, VA 22333. ARI Research Note 84-142. DTIC ADA150182.

**Key Words:**

Special communications system; command post terminal; AN/GSC-40 Terminal; satellite communications terminal

Fields and Groups:

230200 - Human Factors Engineering & Man Machine System

250500 - Command, Control and Communications Systems

Descriptors:

(U) \*DEFENSE SYSTEMS, \*HUMAN FACTORS ENGINEERING, \*COMMAND AND CONTROL SYSTEMS, \*COMMUNICATION TERMINALS, TEST AND EVALUATION, ARMY RESEARCH, FIELD TESTS, OPERATIONAL EFFECTIVENESS, SAFETY, SATELLITE COMMUNICATIONS

Identifiers:



(U) Command posts

**System Description:**

The AN/GSC-40 combined ground command post terminal is a satellite communications terminal employed as part of the special communications system used for command and control in Europe and the Pacific. It was designed to act as the command post for the Flaming Arrow Net (FAN) and to be interoperable with AN/MS-64 force terminals located in various units, the airborne command post, the Strategic Air Command, and those communications terminals used by the National Command Authority. The TRADOC Combined Arms Test Activity (TCATA) conducted a field test of the system in January through March of 1983 in order to assess its operational effectiveness and military utility. The test was conducted using AN/GSC-40 terminals at the United States European Command (USEUCOM) headquarters and the United States Air Force in Europe (USAFE) headquarters.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- SDRI

**Reference** (Fried, 1960):

Fried, C. (1960). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Seven Digital Readout Indicators (SDRI): U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-5-60. Project Number TB1 1000. LIMITED. DTIC AD0243030.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*digital systems, \*display systems, errors, human factors engineering, intelligibility, reaction(psychology), reading, reflexes

**System Description:**

Evaluation of Seven Digital Readout Indicators (SDRI): 1) Projection Method Display; 2) Engraved Edge Lighted Display; (3) Columnar display; 4) Simulated Dekatron; 5) Super Nixie; 6) Segment Switching Display; 7) Pixie.

**Report Availability:**

Distribution: DoD only; others to Commander, Army Human Engineering Lab., Aberdeen Proving Ground, Md. 21005. 04 - DOD ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- SFC

**Reference** (Reinhart, 1994):

Reinhart, J. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Soldier Fighting Cover (Sfc): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

1. The Soldier Fighting Cover (SFC) will replace two current fighting position cover methods. One is the Overhead Cover (OBC), which covers only an individual fighting position and does not provide sufficient blast protection. The other method, per Field Manual (FM) 5-103, uses heavy Class IV construction materials in the construction of the fighting position shelter. This method is labor intensive; and Class IV materials are low priority, difficult to obtain, and not easily transported on the battlefield.
2. The SFC will be a rapidly emplaced, lightweight overhead cover for fighting positions. One soldier will carry an SFC up to 300 meters and emplace it over the fighting position. The SFC must cover the central portion of a two-man deliberate fighting position and provide blast and fragmentation protection by supporting a soil cover of approximately 18 inches. SFCs will be dropped off at unit locations within the theater of operations, then carried to the emplacement site.
3. The SFC will be used throughout the Army by combat, combat support, and combat service support units. Primary users will be light infantry, airborne, air assault, special forces, and special contingency forces. There is no designated user military occupational specialty (MOS) for the SFC, but it most likely will be used by combat personnel such as infantrymen (MOS 11B), combat engineers (MOS 12B), and radio operators (MOS 31C). The SFC will be reusable during training but is considered expendable during combat. No maintenance, other than cleaning, will be required. Thus, there are no maintenance MOSs for the SFC.
4. Prototype SFC candidates from both industry and inhouse (Army) efforts will be evaluated against an Operational Requirements Document (ORD). Data from prototype evaluations will be used to produce a generic performance specification which will be type classified at the Milestone I and IIIA IPR. The Milestone IIIB IPR will type classify as standard the hardware purchased against the performance specification.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- SHF-TSST

**Reference** (Anderson, 2005):

Anderson, B. W. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Phoenix Tactical Super High Frequency (SHF) Satellite Terminal (TSST). Redstone Arsenal, AL,: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Phoenix Tactical Super High Frequency (SHF) Satellite Terminal (TSST).

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Shotgun- 12 Gauge- MASS

**Reference** (Spine, 2006):

Spine, R. J. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the XM26 Modular Accessory Shotgun System (MASS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The XM26 Modular Accessory Shotgun System (XM26 MASS) is a manually operated, lightweight, man portable, rapid fire, direct line of sight shotgun system. It is operator mountable to the M16/M4 or can be configured to be a stand-alone system with the addition of an operator installed buttstock assembly. The XM26 MASS allows the Soldier to attack targets at distances up to 40 meters while minimizing his vulnerability to enemy forces. The XM26 MASS has a rate-of-fire equal to or greater than the M500 Mossberg 12 gauge pump shotgun. The XM26 MASS supports the Soldier on the dynamic battlefield of the future with an all-weather, day/night tactical capability that is a compact, mission tailorable, rapid fire, high kinetic energy weapon used against materiel and personnel targets. The XM26 MASS significantly augments Soldier/coalition force mission effectiveness by providing a non-lethal blunt trauma operational capability. This will be part of an improved full spectrum capability that is simple yet functional and sets the stage for future scalable, modular effects that allow the tactical commander to tailor the unit capability to meet the needs of any operation. Two different XM26 MASS variants (mounted or stand-alone) will fill a variety of roles in the Brigade Combat Team, the Unit of Employment, and the US Army. The XM26 MASS is capable of firing the current inventory of NATO-standard 12 gauge ammunition.

2. Intended Applications For Use: The XM26 MASS intends to improve the Soldier's ability to breach, acquire targets, and transition from materiel to personnel, from lethal to non-lethal without separating the Soldier from his lethal capability. The XM26 MASS achieves target effect with kinetic energy (KE) projectiles (A011, A014, A017, and AA54). The XM26 offers an easily transportable weapon system that can be used with standard combat clothing and equipment.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Shotgun- 12 Gauge- MASS

**Reference** (Spine, 2007):

Spine, R. J. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the XM26 Modular Accessory Shotgun System (MASS) (Revised): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

XM26 Modular Accessory Shotgun System (MASS). MASS is a lightweight shotgun that is designed to be attached to the M4 or used as a stand-alone shotgun.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- SICPS

**Reference** (Cook, 2003):

Cook, T. C. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the Standardized Integrated Command Post System (SICPS): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Standardized Integrated Command Post System (SICPS) provides platforms from which to conduct Command Post (CP) Command and Control (C2) activities. SICPS will facilitate CP operations by providing the flexibility, commonality, and operational capabilities needed to enhance unit mobility and integrate Army Battle Command Systems (ABCS) (i.e. Global Combat Service Support-Army (GCSS-A) and associated communication and networking equipment). It supports the integration of command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) capabilities into Command Post Platforms (CPPs) that can serve as a stand alone CP or as an integrated element in a larger digitized CP or Tactical Operations Center (TOC). SICPS allows for the integration of fielded ABCS and supporting systems consistent with the operational needs of interim and objective forces. The SICPS provides a local area network (LAN) infrastructure with connectivity to the Army's tactical communications systems. This infrastructure is comprised of sets of modular, re-configurable and standardized automatic data processing equipment (ADPE), based on common hardware and software (CHS) developed for the ABCS and defense information infrastructure common operating environment (DII-COE). It also provides the Large Scale Display (LSD) - Controller and Command Post Communications System (CPCS) components used in digitized command posts.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- SICPS

**Reference** (Minninger, 2005):

Minninger, J. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the Standardized Integrated Command Post System (SICPS). Redstone Arsenal, AL,: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

As a C2 system, the Standardized Integrated Command Post System (SICPS) is primarily a nondevelopmental effort that consists of the integration of fielded ABCS/GCSS-A and other C4ISR systems (Government-Off-The-Shelf (GOTS) and Commercial Off-The-Shelf (COTS)) technology into platforms supporting the operational needs of the Current (Mechanized and Light) and Stryker Brigade Combat Team Forces, with direct applicability to the Objective Force. Key to the system is the capability to host multiple ABCS Battlefield Operating Systems (BOS) applications and Global Combat Support System - Army (GCSS-A) modules and supporting applications on one Command Post Platform (CPP) which can combine with other platforms to form a larger command post (CP). Individual operator positions are remote-able from the platform into a larger facility. To meet the mobility and workspace needs of each echelon of command and type of force, SICPS consists of different variants of a CPP that are C130 deployable. Some variants consist of a self-contained shelter with an onboard power generation and common grounding capability that is transported on a vehicle(s) organic to the unit (e.g., the Rigid Wall Shelter CPP (RWS CPP), and the Light CPP). These platforms, along with the Track CPP, can serve as a standalone CP in a "core" role on which people and other systems fall in. The Track CPP, transforms a vehicle into a CPP through the addition of an Installation Kit (IK).

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- SICPS

**Reference** (Frederick, 2006):

Frederick, L. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the Standardized Integrated Command Post System (SICPS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

As a Command and Control (C2) system, SICPS is primarily a non-developmental effort that consists of the integration of fielded Army Battle Command Systems (ABCS) I Global Combat Support System - Army (GCSS-A) and other Command, Control, Communications, Computers, and Intelligence (C4ISR) systems (Government-Off-The-Shelf (GaTS) and Commercial Off-The-Shelf (COTS)) technology into platforms supporting the operational needs of the Current (Mechanized and Light) and Stryker Brigade Combat Team Forces, with direct applicability to the Objective Force. Key to the system is the capability to host multiple ABCS Battlefield Operating Systems (BaS) applications and GCSS-A modules and supporting applications on one CPP which can combine with other platforms to form a larger command post (CP). Individual operator positions in the platform are capable of remote operation, usually from a larger more comfortable facility. To meet the mobility and workspace needs of each echelon of command and type of force, SICPS consists of different variants of a CPP that are C-130 deployable. Some variants consist of a self-contained shelter with an onboard power generation and common grounding capability that is transported on a vehicle(s) organic to the unit (e.g., the Rigid Wall Shelter CPP (RWS CPP), and the Light CPP). These platforms, along with the Track CPP, can serve as a standalone CP in a "core" role on which people and other systems fall in. The Track CPP transforms a vehicle into a CPP through the addition of an Installation Kit (IK).

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- SIDPERS

**Reference** (Krausman, 1996):

Krausman, A. S. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the Standard Installation/Division Personnel System - 3 (SIDPERS-3). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Standard Installation/Division Personnel System - 3 (SIDPERS-3)

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- SIIRCM

**Reference** (Durbin, 2001):

Durbin, D. (2001). Manpower and Personnel Integration (MANPRINT) Assessment for the Suite of Integrated Infrared Countermeasures (SIIRCM). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The U.S. Army is currently the lead service for the SIIRCM program. Therefore, SLAD's analyses concentrate on the use of this system in rotorcraft (helicopter) type operation. However, if this system is to be integrated into other aircraft, then SLAD proposes that a similar analysis be conducted on survivability of the host aircraft due to the implementation of the SIIRCM system.

The SIIRCM system consists of the ATIRCM and the Advanced Infrared Countermeasure Munition (AIRCMM). The baseline ATIRCM consists of three subsystems: (1) the Common Missile Warning System, (2) the Advanced Threat Infrared Jammer (ATIRJ), and (3) the Improved Countermeasures Dispenser (ICMD). These three subsystems are fully integrated through the Electronic Control Unit (BCU). The CMWS provides declaration and detection of missiles with emphasis on the short-range, surface-to-air infrared (IR) threat. The ATIRJ counters IR-guided missile systems using information from the CMWS through the ECU to locate and jam with direct laser and lamp energy. The ICMD will be capable of loading and employing three or more types of expendables as directed by the ECU software. The baseline ICMD consists of a sequencer and two dispenser assemblies.

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies and their contractors; Critical Technology. Other request shall be referred to U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Snowshoes- Assault

**Reference** (Hickey et al., 1994):

Hickey, C. A., Jr., Hanlon, W. E., & Oblak, T. H. (1994). Manpower and Personnel Integration (MANPRINT) Assessment: Mobility and Human Factors Evaluation of Three Prototype Assault Snowshoes: U.S. Army Research Laboratory, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland. ARL Technical Report ARL-TR-383. DTIC ADA278151.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*test and evaluation, \*army personnel, \*army research laboratories, \*snowshoes, mobility, humans, test equipment, snow, standards, cold weather tests, boots, army, laboratories, engineering, human factors engineering, assault, marine corps, army research  
pe62716a, ash70.

**Fields and Groups:**

081200 - Snow, Ice and Permafrost  
150500 - Logistics, Military Facilities and Supplies

**Descriptors:**

(U) \*TEST AND EVALUATION, \*ARMY PERSONNEL, \*ARMY RESEARCH LABORATORIES, \*SNOWSHOES, MOBILITY, HUMANS, TEST EQUIPMENT, SNOW, STANDARDS, COLD WEATHER TESTS, BOOTS, ARMY, LABORATORIES, ENGINEERING, HUMAN FACTORS ENGINEERING, ASSAULT, MARINE CORPS, ARMY RESEARCH

**System Description:**

The Human Research and Engineering Directorate (HRED) of the U.S. Army Research Laboratory (ARL) conducted a mobility and human factors evaluation of candidate assault snowshoes for the U.S. Marine Corps Systems Command from 15 through 20 February 1993. This evaluation compared the performance and attitudes of marine subjects using the standard military snowshoe and three candidate assault snowshoes. The performance data consisted of timed trials for negotiating an assault course, getting into and out of the prone firing position, donning, and doffing. Marines subjectively rated the snowshoes at various times throughout the evaluation. The results indicated that marines negotiated the assault course and got into and out of the prone firing position significantly faster and with more ease with the candidate assault snowshoes than when using the standard military snowshoe. The results also showed that marines could don Snowshoe C faster than the other snowshoes and that none of the snowshoes were difficult to remove. Marines subjectively rated the candidate assault snowshoes higher than the standard snowshoe for most characteristics and features. Subjective data also indicated that Snowshoe A was the most preferred candidate snowshoe. None of the candidate snowshoes evaluated are acceptable for military usage without implementing some design changes to correct the shortcomings noted in this report. Assault snowshoes, Mobility, Human factors, Snowshoes.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- SNS

**Reference** (School, 1994):

School, P. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Sniper Night Sight (SNS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

1. The SNS will be a third generation image intensification (I\*\*2 ) device for the M24 Sniper Weapon System which will provide snipers with night vision capability. The SNS could be an I\*\*2 night sight that mounts and adapts to the existing sniper weapon day sight or an integrated day and I\*\*2 night sight which replaces the existing sniper day sight. The SNS system will consist of the sight, mount, carrying case, batteries and ancillary equipment.
2. The SNS will be used by U.S. Army Special Forces (Military Occupational Specialty (MOS) 18B, 18C, 180, and 18E) and Infantry (MOS 11B, 11C, 11H, and 11M). SNS maintainers are tentatively MOS 39E (Special Electronic Devices Repairer). The SNS maintenance concept will not be developed until after contract award in March 1994, therefore, maintenance MOSs are subject to change.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- SPIW- 3 Prototypes

**Reference** (Kramer, 1964):

Kramer, R. R. (1964). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Three Special Purpose Infantry Weapons (SPIW) Prototype Weapons: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. DTIC AD0353228.

**Key Words:**

\*weapons, human factors engineering, performance(engineering), grenades, blast, noise, hazards, small arms, weight, reliability, auditory nerve  
hit probability, spiw

**System Description:**

The aspects of weapon performance considered in the human engineering evaluation are the following: Noise and blast, pointability, pseudotactical, that is, Day Defense performance, particulate Matter hazards, and rapid grenade fire performance (pilot study). (Author)  
Unclassified

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies and their contractors; Administrative/Operational Use; Aug 93. Other requests shall be referred to Director, U.S. Army Research Lab., Attn: AMSRL-HR, Aberdeen Proving Ground, MD 21005-5005. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- SPIW- 3 SP Prototypes

**Reference** (Kramer, 1964):

Kramer, R. R. (1964). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Three Prototype Special Purpose Infantry Weapons (SPIW): U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-8-65 LIMITED. DTIC AD0393443.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

\*rifles, impact, hazards, performance(human), firing tests(ordnance), test methods, targets, grenades, semiautomatic weapons, gun sights, human factors engineering, configurations, small arms, launching, eye, noise

m-14 guns(cal .30), m-16 guns(5.56-mm), special purpose infantry weapons

Fields and Groups:

190600 - Guns

Descriptors:

(U) \*RIFLES, IMPACT, HAZARDS, PERFORMANCE(HUMAN), FIRING TESTS(ORDNANCE), TEST METHODS, TARGETS, GRENADES, SEMIAUTOMATIC WEAPONS, GUN SIGHTS, HUMAN FACTORS ENGINEERING, CONFIGURATIONS, SMALL ARMS, LAUNCHING, EYE, NOISE

Identifiers:

(U) M-14 GUNS(CAL .30), M-16 GUNS(5.56-MM), SPECIAL PURPOSE INFANTRY WEAPONS

**System Description:**

This report summarizes human factors studies of three prototype Special Purpose Infantry Weapons (SPIW) with particular emphasis on pointability and potential injury to the firer from noise and particles produced in firing. Included also are considerations in selecting and matching subjects for such studies and comments on certain aspects of day-defense and extreme-speed firing situations.

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies only; Administrative/Operational Use; AUG 1964. Other requests shall be referred to Army Human Engineering Laboratory, Aberdeen Proving Ground, MD



21005. 03 - U.S. GOVT. ONLY; DOD CONTROLLED. Downgraded to Unclassified from Confidential 31  
Aug 1976, DoDD 5200.10:

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**System Short Name:** MANPRINT- SRAT

**Reference** (Singapore, 2006):

Singapore, M. (2006). Manpower and Personnel Integration (MANPRINT) Assessment for the Armor System Stryker Reactive Annor Tiles (Srat): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Armor System Stryker Reactive Annor Tiles (SRAT).

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Stab Bino XM25

**Reference** (Spine, 1998):

Spine, R. J. (1998). Manpower and Personnel Integration (MANPRINT) Assessment for the XM25 Stabilized Binocular. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

XM25 Stabilized Binocular.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- STANO

**Reference** (Smootz, 1980):

Smootz, E. R. (1980). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Selected Stano Devices Employed in a Mechanized Infantry Platoon. Fort Hood, Texas: U.S. Army Research Institute for the Behavioral and Social Sciences (PERI-OH). 5001 Eisenhower Ave, Alexandria, VA 22333. ARI Research Report 1305. ADA128086.

**Key Words:**

Human Factors Evaluation; Protective Mask; STANO Device; Thermal Imaging Device

Fields and Groups:

170501 - Infrared Detection and Detectors

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*NIGHT VISION DEVICES, \*INFRARED EQUIPMENT, \*INFRARED SURVEILLANCE, HAZARDS, COMBAT SURVEILLANCE, TARGET ACQUISITION, DISPLAY SYSTEMS, INFRARED IMAGES, SAFETY, RATINGS, PLATOON LEVEL ORGANIZATIONS Identifiers:

(U) STANO(SURVEILLANCE TARGET ACQUISITION AND NIGHT OBSERVATION), TOW NIGHT SIGHT, DRAGON NIGHT TRACKER, PLATOON EARLY WARNING SYSTEM, AN/TRS-2,

**System Description:**

Recently the Army has begun to deploy several new types of surveillance, target acquisition, and night observation (STANO) devices. One of these devices, the Platoon Early Warning System (PEWS; AN/TRS-2), is sensitive to vibration and changes in soil conductivity and thus can be used to detect moving vehicles and moving personnel. The system is basically composed of nine detectors which a soldier emplaces at locations where an enemy is likely to cross but which are not directly observable by the soldier from his defensive position, and a receiver which can receive information from the sensors through either a wire link or by electromagnetic transmission. After emplacing the sensors the soldier merely monitors the receiver, either visually or aurally, to determine if there is enemy activity in the areas around which the sensors are emplaced. Current distribution of this system is one per infantry platoon. Additional STANO devices which have recently been introduced include three thermal imaging devices which are sensitive to a narrow range of energy from the infrared (IR) portion of the electromagnetic spectrum. These devices include the night sight (AN/TAS-4) for the TOW weapon system, the night tracker (AN/TAS-S) for the Dragon Weapon System, and the Night Observation Device - Long Range (NODLR; AN/TAS-6), for use by commanders in observing the battlefield. All of these devices enable soldiers to detect objects in environments of reduced visibility, such as where there is no external light at night from either the moon or stars, or where visibility has been reduced by the presence of smoke. They have an advantage over earlier devices which also detected IR energy in that they do not require an active IR source to "illuminate" the object to be detected, but rather they passively detect small differences in the amount of IR energy emitted by an object compared to the amount emitted by its surrounding environment.

Currently, the planned basis of issue of these latter devices is one TOW night sight per TOW weapon system, one Dragon night tracker per Dragon weapon system, and one NODLR per mechanized infantry company.

Since the above devices provide the soldier with a capability which he has not had in the past, particularly in the ability to detect targets while in a smoke environment, the U.S. Army Infantry School (USAIS) requested that the TRADOC Combined Arms Test Activity (TCATA) conduct a test to examine the effects of employing these STANO devices on the capability of a mechanized infantry platoon to conduct offensive and defensive operations during periods of reduced visibility. The information obtained from such a test could be used by USAIS in formulating and refining doctrine for mechanized infantry units which were equipped with such STANO devices.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- TACJAM

**Reference** (Smutz, 1979):

Smutz, E. R. (1979). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of a Tactical Jamming System (AN/MLQ-34, TACJAM) Undergoing Operational Testing: U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. ARI-RES PROBLEM REV-79-6 Project Number 2Q763743A775. DTIC ADA076637.

**Key Words:**

\*human factors engineering, \*jamming, \*man machine systems, hazards, data reduction, systems analysis, operators(personnel), tactical warfare, questionnaires, noise(sound), ear protectors  
\*AN/MLQ-34, Design, PE63743A, AS775

**Fields and Groups:**

170400 - Countermeasures

230200 - Human Factors Engineering & Man Machine System

**Descriptors:**

(U) \*HUMAN FACTORS ENGINEERING, \*JAMMING, \*MAN MACHINE SYSTEMS, HAZARDS, DATA REDUCTION, SYSTEMS ANALYSIS, OPERATORS(PERSONNEL), TACTICAL WARFARE, QUESTIONNAIRES, NOISE(SOUND), EAR PROTECTORS

**System Description:**

This research was conducted as a human factors evaluation of a tactical jamming system (AN/MLQ-34). This report is designed to supplement the TCATA OT 518 Test Report. It identifies man-machine interface problems which pose possible hazards to system operators and/or which reduce system effectiveness. It also suggests changes in hardware design, operating procedures, and training procedures which should alleviate these problems.

Unclassified

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- TASER

**Reference** (Caplinger, 2008):

Caplinger, E. A. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the TASER® X26E: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The TASER® X26E is a conductive energy device that utilizes compressed nitrogen to launch two small probes 21, 25, or 35 feet, depending on the cartridge loaded. These probes are connected to the X26E device by high voltage insulated wire. When the probes make contact with a target and the circuit is complete, the X26E transmits electric pulses for a 5 second cycle into the target through up to two inches of clothing. The cycle can be stopped by operating the ambidextrous safety lever or can be reapplied by pulling the trigger a second time. The X26E sends electrical signals that overpower the normal electrical signals with the body's nerve fibers and cause the target to instantly lose control of their body and fall to the ground.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- TC-AIMS II

**Reference** (Headley, 2000):

Headley, D. B. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the Transportation Coordinators Automated Information for Movements System II (TC-Aims II). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Transportation Coordinators' Automated Information for Movement System II (TC-AIMS II) is an automated information system that will be fielded on commercial off the shelf computers. Its "focus includes daily transportation management, traffic management, commercial carrier interfaces, movement control and mode operations in garrison and at depots, consolidation activities, and transshipment locations" (Mission Need Statement, pg 1). It will be delivered in three main versions. Version 3.01, the Unit Move portion, consists of modules Asset Management, Movement Planning, Movement Coordination, Movement Execution, and Services. Additional functionalities will be built into Versions 3.02 and 3.03. This assessment looked at the Asset Management and Movement Planning modules, Build 53, and User Guide Version April 1999.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- TC-AIMS II

**Reference** (Headley, 2003):

Headley, D. B. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the Transportation Coordinators Automated Information for Movements System II (TC-Aims II): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Transportation Coordinators'- Automated Information for Movements System II (TC-AIMS II) is an automated information system that will be fielded on commercial off the shelf computers. It is a joint system and its "focus includes daily transportation management, traffic management, commercial carrier interfaces, movement control and mode operations in garrison and at depots, consolidation activities, and transshipment locations" (Mission Need Statement, pg 1). Functionality and fielding will be done in blocks. Currently Unit Move functionality consists of the modules Asset Management, Movement Planning, Movement Coordination, and Movement Execution.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- TC-AIMS II

**Reference** (Headley, 2004):

Headley, D. B. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Transportation Coordinators Automated Information for Movements System II (TC-Aims II). APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Transportation Coordinators' Automated Information For Movements System II (TC-AIMS II) is an automated information system that will be fielded on commercial off the shelf computers. It is a joint system and its "focus includes daily transportation management, traffic management, commercial carrier interfaces, movement control and mode operations in garrison and at depots, consolidation activities, and transshipment locations" (Mission Need Statement, pg 1). Functionality and fielding will be done in blocks. Currently Unit Move functionality consists of the modules Asset Management, Movement Planning, Movement Coordination, and Movement Execution.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- TC-AIMS II

**Reference** (Faulkner, 2007):

Faulkner, B. (2007). Manpower and Personnel Integration (MANPRINT) Assessment: Manpower, Personnel Capabilities and Training (MPT) Domain Assessment for Transportation Coordinators' - Automated Information for Movement System II (TC-Aims II) Block 3: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

TC-AIMS II is an Automated Information System (AIS) that will automate the process of planning, organizing, coordinating, and controlling unit-related deployments, sustainment, day-to-day Installation Transportation Officer (ITO) operations, redeployment, and retrograde operations in support of the Defense Transportation System (DTS). It will interface with installation, unit and depot-level supply systems and will be capable of supporting both peacetime and wartime requirements. TC-AIMS II will produce movement documentation and unit move information. It will furnish nearly instantaneous information to major Army commands (MACOM), Transportation Component Commands (TCC), USTRANSCOM, and the Joint Deployment Community. As a DOD source movement information system, TC-AIMS II will be the source of information for in-transit visibility and transportation management over cargo and passenger movement during peace, operations other than war, and war. TC-AIMS II will integrate the functionality of selected, existing transportation legacy systems into a single AIS migration system.

TC-AIMS II underwent Initial Operational Test and Evaluation (IOT&E) in 2001. Operational Testing for subsequent blocks are termed Limited User Tests (LUT). TC-AIMS II Block 3 will incorporate, enhance, and extend the Theater Movement Management functions presently found in the Transportation Information Systems - Theater Operations (TISTO), formerly the Department of the Army Movement Management System - Revised (DAMMSR). TC-AIMS II Block 3 will encompass theater movements, movement control, convoy operations, management and control of organic and common user transportation assets, and will interface to specific external systems unique to Joint Reception, Staging, Onward Movement, and Integration (JRSOI) environment, convoy operations, or to specific theaters. Block 3 will also increase joint interoperability beyond Unit Movement and allow management of common user-land transportation assets. By concentrating on deployment related transportation management functions, Block 3 will extend transportation planning and execution capability forward from the Port of Debarkation to the Tactical Assembly Area (TAA) in theater completing the Unit Movement.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- TC-AIMS II

**Reference** (Headley, 2008):

Headley, D. B. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the Transportation Coordinators'- Automated Information for Movement System II (TC-Aims II) Block 3: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

TC-AIMS II is an automated information system which operates on off-the-shelf hardware and customized software. Using PCs or laptops it is in three configurations: enterprise, or web-based; client-server; and standalone.

"TC-AIMS II Block 3 incorporates, enhances, and extends the Theater Movement Management functions presently found in the Transportation Information Systems—Theater Operations, formerly the Department of the Army Movement Management System—Revised. TC-AIMS II Block 3 encompasses theater movements, movement control, planning and managing convoy operations, management and control of organic and common user transportation assets, and interfaces to specific external systems unique to the JRSOI environment, convoy operations, or to specific theaters. Block 3 also increases joint interoperability beyond unit movement and allows management of CULT assets. Concentrating on deployment-related transportation management functions, Block 3 extends transportation planning and execution capability forward from the POD to the TAA in theater completing the Unit Movement." (from ATEC TC-AIMS II System Evaluation Report, pg 1-7)

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- TCD

**Reference** (Manasco, 1992):

Manasco, C. (1992). Manpower and Personnel Integration (MANPRINT) Assessment for the Threat Cue Devices (Tcd). Alexandria, VA: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

General Concept of the THREAT CUE Pyrotechnics Program.

- (1) XM25 Target Hit Simulator: Indicates that an armored target has been hit. It provides a flash, bang, and shower of sparks.
- (2) XM26 Target Kill Simulator: Indicates an armored target has been killed. It emits a continuous cloud of black smoke for two to three minutes.
- (3) XM27 Anti-Tank Guided Missile Signature Simulator: Simulates enemy infantry Sagger Firing by having a powered flight of 500 - 1,000 meters and producing a two foot flame.
- (4) XM79 Electric Match Igniter: Used to ignite the XM27 and various pyrotechnic devices at CTC ranges.
- (5) The original procurement of the Threat Cue pyrotechnics included commercial, non standard devices. The original sagger simulator (XM27) is a variation of a device in use by the U.S. Navy. All devices have been in use at the National Training Center (NTC) since 1988. The formal type classification program and MANPRINT assessment must be completed to provide for continued acquisition of these devices to support the Combat Training Centers (CTCs).

(6) No scheduled maintenance of the devices beyond periodic surveillance inspection and testing is anticipated. Misfire procedures have been prepared and incorporated into the special stand alone operators manual describing their usage. There are no critical areas of training envisioned at this time.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- TCF- Coltano, Italy

**Reference** (Krueger and Keiser, 1971):

Krueger, G. P., & Keiser, A. H. (1971). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Automated Quality Monitoring and Reporting Subsystem in the Technical Control Facility at Coltano, Italy: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-19-71 LIMITED. DTIC AD0891895.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*communication and radio systems, \*human factors engineering, \*circuit testers, italy, automation, automatic, quality control, monitors, control systems, control panels, global communications, telephone systems, electronic technicians, maintenance perso  
automated quality monitoring and reporting subsystem, automated technical control systems, autovon, keyboards

Fields and Groups:

230200 - Human Factors Engineering & Man Machine System

250400 - Voice Communications

Descriptors:

(U) \*COMMUNICATION AND RADIO SYSTEMS, \*HUMAN FACTORS ENGINEERING, \*CIRCUIT TESTERS, ITALY, AUTOMATION, AUTOMATIC, QUALITY CONTROL, MONITORS, CONTROL SYSTEMS, CONTROL PANELS, GLOBAL COMMUNICATIONS, TELEPHONE SYSTEMS, ELECTRONIC TECHNICIANS, MAINTENANCE PERSONNEL, JOB ANALYSIS, TELETYPE SYSTEMS, VOICE COMMUNICATIONS, PUNCHED TAPE, SPEECH TRANSMISSION, NOISE

Identifiers:

(U) AUTOMATED QUALITY MONITORING AND REPORTING SUBSYSTEM, AUTOMATED TECHNICAL CONTROL SYSTEMS, AUTOVON, KEYBOARDS

**System Description:**

This report summarizes the results of a human factors evaluation of the Automated Quality Monitoring and Reporting Subsystem (AQMRS) in the regional strategic communications Technical Control Facility (TCF) at Coltano, Italy. The objectives of the evaluation were to compare the design of the AQMRS to established human engineering standards and to develop human factors design recommendations for future automated technical control systems. Areas addressed are (1) automatic circuit quality monitoring, (2) automatic status reporting and record keeping, (3) design and positioning of AQMRS and TCF equipment, (4) TCF environmental factors, (5) technical control maintenance, and (6) personnel subsystem considerations.

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation; 29 Oct 71. Other requests for this document must be referred to Director, Human Engineering Labs., Aberdeen Proving Ground, Md. 21005. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- TeamMATE

**Reference** (Clark et al., 2008):

Clark, B. R., Reed, D. E., Chen, J. Y. C., & Marshall, H. A. (2008). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Assessment of the Teammate System for Dismounted Embedded Training and Mission Rehearsal: U.S. Army Research Laboratory, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland. ARL Technical Report ARL-TR-4479. DTIC ADA482393.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

Fields and Groups:

050900 - Personnel Management and Labor Relations

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*TRAINING DEVICES, LOW COSTS, EMBEDDING, INTERFACES, TEAMS(PERSONNEL), MILITARY EXERCISES, TEST AND EVALUATION, GLOBAL POSITIONING SYSTEM, USER NEEDS, HEURISTIC METHODS, ARMY RESEARCH, SOLUTIONS

**System Description:**

TeamMATE was developed in response to the need of a very low cost solution to ET for the individual Soldier. The hardware platform for TeamMATE is a Dell Axim1 51v personal digital assistant (PDA). The Axim is augmented with an external battery (for a longer operational lifetime) and a Global Positioning System receiver for real-time spatial awareness (figure 1). The total cost of the commercial off-the-shelf equipment for TeamMATE tallies to less than \$550 per unit and presents a very reasonable per-unit cost, even when compared to a Multiple Integrated Laser Engagement System (MILES). The Axim also supports an on-board three-dimensional graphics accelerator, which is rarely found on business class PDA systems.

TeamMATE supports four modes: plan, rehearse, execute, and review (figure 3). The planning mode (figure 4) allows a team leader to formulate a plan for distribution to his or her team. The planning mode supports a phase-based system for introducing and explaining a mission. The team leader can share his plan with the squad and can unfold the plan as he explains the individual phases. Objectives, way points, fields of fire, and rally points are all supported within the TeamMATE planning phase.

The Rehearse mode supports the ability to virtually practice a mission designed during the planning phase. Rehearse mode also allows the virtual force-on-force engagement, capabilities to "puckster" (i.e., role play) multiple entities, as well as white boarding for map markup<sup>2</sup>. The Execute mode is provided to actually perform the missions outside (e.g., a military operations on urban terrain exercise). TeamMATE uses a recording method to keep track of player positions and optional MILES hit/miss data. The Review mode allows users to replay exercise data collected in the Rehearse or Execute modes. Video cassette recorder-like software controls and an event graph indicate important exercise events to the user.

Since Windows3 was the operating system (OS) for TeamMATE, it could not be transitioned to programs such as FW or LW, which use Linux4 as their host OS. Therefore, the SET-MR ATO needed a new transition strategy to move the TeamMATE functionality into these FW/LW programs. The new transition strategy derived was to re-implement the TeamMATE functions on the host platform with the use of a plug-in architecture. This concept is called the Soldiers' Training Enhancement Package (STEP) and involves employing the host software such as the command and control mobile intelligent net-centric computer system (C2MINCS) on the FW platform to realize a subset of the TeamMATE functions.

Isolating the appropriate functions and presenting them correctly to the user required HFE evaluations.

The U.S. Army Research Laboratory's Human Research and Engineering Directorate performed a human factors engineering assessment on the TeamMATE (Team Mission Assistant-Tactical/Exercise) system, which was developed by the U.S. Army Research, Development, and Engineering Command's Simulation and Training Technology Center in response to the need of a low cost solution to embedded training for the individual Soldier. A heuristic/expert evaluation for usability was performed on the user interface of



TeamMATE, and this report provides a detailed description of recommendations for improving the usability of the TeamMATE system interface.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Trailblazer

**Reference** (Palmer, 1978):

Palmer, R. L. (1978). Manpower and Personnel Integration (MANPRINT) Assessment: The Trailblazer Special Purpose Detecting System: Human Factors Evaluation: U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. ARI-RR-1307 Project Number 2Q263743A775. DTIC ADC037691.

**Key Words:**

\*direction finding, \*human factors engineering, target detection, radio interception, radio equipment, portable equipment, operation, reliability, safety, operators(personnel), army personnel, questionnaires \*AN/TSQ-114, \*Trailblazer radios, \*Human factors, PE63743A, AS775

**System Description:**

The purpose of this research was to provide an operator-oriented human factors evaluation of the prototype AN/TSQ-114 (Trailerblazer) system--a direction-finding system for intercepting and locating target radio signals. The procedure involved: (a) direct observation of operator training and system operation; (b) in-depth interviews of system operators; (c) examination of training documents; and (d) administration of comprehensive questionnaire to all 23 system operators. The questionnaire requested operator judgements about reliability, safety, frequency, importance, convenience, etc., of various parts, procedures, and characteristics of the system. Additional operator comments were collected and reported. The findings of this research have been classified confidential. In general, a number of reliability, safety, and other performance aspects of the system were considered less than completely satisfactory by system operators. The reader is referred to the report itself for further information. Unclassified Regrade Code: C

**Report Availability:**

Distribution limited to DoD only; Critical Technology; 22 Oct 85. Other requests must be referred to U.S. Army Research Inst. for the Behavioral and Social Sciences (PERI-ZA), 5001 Eisenhower Ave., Alexandria, VA 22333. 04 - DOD ONLY; DOD CONTROLLED. CONFIDENTIAL:

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**System Short Name:** MANPRINT- TSST

**Reference** (Knapp and Anderson, 2004):

Knapp, B., & Anderson, B. W. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Phoenix Tactical Super High Frequency (SHF) Satellite Terminal (TSST). APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Phoenix TSST is a tactical Satellite Communications (SATCOM) terminal operated as an Army Signal Corps asset at echelons corps and above. For Block 1 acquisition, the TSST, designated as the AN/TSC-156, is a transportable terminal that transmits and receives in the super high frequency (SHF) bands (C-, X-, and Ku-bands) over commercial and military satellites. A Block 2 acquisition effort will add Ka-band capabilities. The Phoenix has been integrated onto one primary M1113 Expanded Capacity Vehicle

(ECV) and one Mobile Power Unit (MPU) vehicle containing a palletized Tactical Quiet Generator (TQG). The Phoenix can be configured for operation with either the integral small aperture antenna (SAA) or an external Light Weight High-Gain X-band Antenna (LHGXA). A computerbased Control, Monitor, and Alann (CMA) laptop computer station provides much of the soldier-machine interface for operation and maintenance of the system. The Phoenix equipment is designed for operation and transport with a crew of three signal soldiers (MOS 31 S) and their personal equipment.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- TSV

**Reference** (Pollard, 2004):

Pollard, S. E. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Theater Support Vessel (TSV). APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Theater Support Vessel (TSV).

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Uniform- Clothing of Viet Nam

**Reference** (Chaffin and Youngling, 1963):

Chaffin, J. M., & Youngling, E. W. (1963). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Clothing and Personal Equipment in Thailand and the Republic of Viet Nam: U.S. Army Natick Research and Development Center, Clothing, Equipment, and Materials Engineering Laboratory, Natick, MA. DTIC AD0462467.

**Key Words:**

(\*clothing, army personnel), (\*army personnel, clothing), thailand, vietnam, human factors engineering, military requirements, standardization, helmets, shoes, underwear, socks, bedding, knives, materials south vietnam

**Supplementary Note:**

Report on Program for Individual Clothing and Equipment Development and Human Factors Studies for Indigenous Forces Engaged in or Threatened by Conflict in Southeast Asia.

**Descriptors:**

(U) (\*CLOTHING, ARMY PERSONNEL), (\*ARMY PERSONNEL, CLOTHING), THAILAND, VIETNAM, HUMAN FACTORS ENGINEERING, MILITARY REQUIREMENTS, STANDARDIZATION, HELMETS, SHOES, UNDERWEAR, SOCKS, BEDDING, KNIVES, MATERIALS

**Identifiers:**

(U) SOUTH VIETNAM

**System Description:**

This report summarizes work done in Southeast Asia related to human factors requirements in the design of clothing and personal equipment for the Royal Thai Army and for the Republic of Viet Nam Armed

Forces. The findings reported are based on controlled observations and structured interviews made in the respective countries. Specific recommendations are made concerning human factors considerations for each clothing and equipment item observed. Human factors evaluation of clothing and personal equipment in Thailand and Republic of Viet Nam. Report on Program for Individual Clothing and Equipment Development and Human Factors Studies for Indigenous Forces Engaged in or Threatened by Conflict in Southeast Asia.

**Report Availability:**

Distribution limited to U.S. Gov't agencies and their contractors. Other requests must be referred to Director, U.S. Army Human Engineering Lab., Aberdeen Proving Ground, MD 21005-5001., This document contains export-controlled technical data. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- USNS Corpus Christi Bay

**Reference** (Chaillet and Klett, 1966):

Chaillet, R. F., & Klett, S. L. (1966). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Evaluation of Usns Corpus Christi Bay: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TN-9-66. DTIC AD0640448.

**Key Words:**

MANPRINT  
MANPRINT Assessment  
Human Factors Engineering Assessment  
MA  
HFEA

**System Description:**

The purpose of this report is to present the results of the analytic study and on-site survey conducted by the U.S. Army Human Engineering Laboratories on the Floating Aircraft Maintenance Facility (FAMF) USNS Corpus Christi Bay, which was undertaken at the request of COL John F. Sullivan, Project Manager for Project Flattop.

Casual conversations with personnel from operating organizations in Southeast Asia, who came aboard the FAMF to either have parts repaired or secure replacement parts, attest to the importance of the role played by the FAMF. Unquestionably, the FAMF operation in Southeast Asia represents a significant contribution to the overall U.S. Army efforts in that area. There are side benefits derived from the FAMF that were not anticipated when the development of this depot facility was undertaken; for example, the capacity of the FAMF to supply potable water to essential small vessels operating in the area and the repair of items unrelated to aircraft operations.

The Project Flattop staff has been unusually thorough in identifying problems, actual or potential, and is thus well aware of most of the problems which this survey could hope to locate in the four-month study period. Nevertheless, COL Sullivan felt that, in view of the probability that further ships would be converted for Floating Depot Maintenance Facility (FDMF) purposes in the future, several independent surveys by different disciplines should be made to reduce the possibility that important problems were being overlooked, A discussion of this study team's findings comprise the remainder of this report.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- APC- T113 & T117

**Reference** (Torree and Garinther 1958):

Torree, J. P., Jr, & Garinther, G. R. (1958). Manpower and Personnel Integration (MANPRINT) Assessment: A Dynamic Human Engineering Evaluation of the Armored Personnel Carriers T113 &

T117: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL  
Technical Memorandum TM-7-58. DTIC AD0627819.

**Key Words:**

HFEA- Human Factors Engineering Assessment

Fields and Groups:

190300 - Combat Vehicles

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*PASSENGERS, VEHICLES, HUMAN FACTORS ENGINEERING, HUMAN FACTORS  
ENGINEERING, MILITARY PERSONNEL, NOISE, CONFIGURATIONS

Identifiers:

(U) T-113 VEHICLES, T-117 VEHICLES

**System Description:**

In 1957 a Field Liaison team of the U. S. Army Ordnance Human Engineering Laboratory (HEL), Aberdeen Proving Ground, Maryland, conducted a static evaluation of the T113 and T117 Armored Personnel Carriers at the Food Machinery Corporation, San Jose, California. This evaluation was conducted to uncover human engineering design deficiencies and to note those areas in which the vehicles proved adequate from a human engineering standpoint.

The findings of the study indicated the necessity for more intensive investigation. For example, excessive sound levels within the vehicles were found which might affect audition, communication, and general crew performance. (For additional findings see HEL TM 10-57.) In order to adequately determine the extent and nature of the problems encountered, the Field Liaison team conducted a dynamic evaluation of the vehicles at Fort Knox, Kentucky. The testing was run concurrently with U. S. Army Armor Board user-tests of the vehicles. Data on two M59 vehicles were also obtained for comparative purposes. (No formal comparison was made between test vehicles since **the major difference was that the T113 is aluminum and the T117 is steel.**) Primary efforts were directed in the following areas:

- a. Sound measurement and analysis within all vehicles with a full complement of personnel.
- b. Effects of noise on audition, communication, and performance.
- c. Effects of vehicle configuration and design on crew performance, safety, and comfort.

**Report Availability:**

This information is furnished for information purposes only with the understanding that it will not be released to any other nation without specific approval of the United States of America Department of the Army and that it will not be used for other than military purposes. It is understood that the furnishing of the attached plans, specifications, technical data and other information to the recipient does not in any way constitute a license to make, use, or sell the subject matter of any inventions which may be embodied or described in the information so furnished, and any manufacture, use or sale which the recipient makes of any such inventions disclosed therein is at the risk of the recipient. Copies of this report have not been distributed to ASTIA nor has it been released to the Office of Technical Services, U. S. Department of Commerce, Washington, D.C. for release to the general public. Further requests for this document should be forwarded to the U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Tracked- APC- T113 and T117

**Reference** (Bacon et al., 1957):

Bacon, A. S., Cronk, D. R., & Rose, A. J. (1957). Manpower and Personnel Integration (MANPRINT) Assessment: Human Engineering Problems of the Armored Personnel Carriers T113 and T117. City: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum 10-57. DTIC AD0627818.

**Key Words:**

HFEA- Human Factors Engineering Assessment

Fields and Groups:

190300 - Combat Vehicles

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*PASSENGERS, VEHICLES, HUMAN FACTORS ENGINEERING, HUMAN FACTORS ENGINEERING, MILITARY PERSONNEL

Identifiers:

(U) T-117 VEHICLES, T-113 VEHICLES

**System Description:**

The report consists of recommendations for improvement of the Armored Personnel Carriers T113 and T117.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Artillery- 155mm- Howitzer AFAS/FARV

**Reference** (Jee, 1994):

Jee, L. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Advanced Field Artillery System (AFAS) and Future Armored Resupply Vehicle (FARV). Picatinny Arsenal, NJ: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The AFAS is a combat/combat support "system of systems" consisting of a 155mm self-propelled howitzer and the FARV that will provide close, tactical, and operational fires during both offensive and defensive operations.
2. The AFAS howitzer will have significantly increased survivability, lethality, and mobility capabilities over the current M109 fleet and will be the indirect fire support system providing direct support, reinforcing; general support, reinforcing; and general support fires to the maneuver forces on the future battlefield. The AFAS howitzer will displace the current M109A6 self-propelled howitzers.
3. The AFAS will incorporate new technologies, such as the XM46 Liquid Propellant (LP) and the Regenerative Liquid Propellant Gun (RLPG). Development programs being pursued include: accuracy and fire control enhancement, mobility and development of a new chassis.
4. The FARV will be the companion ammunition resupply vehicle to the AFAS. The FARV is the next generation combat support rearm vehicle and will provide quantum improvements in mobility and survivability over current thin-skinned, wheeled, and tracked resupply vehicles. The FARV will displace the M992 resupply vehicle.'
5. It is envisioned that the FARV will consist of a rearm module and crew module mounted on a chassis with component commonality with the AFAS to the maximum extent practical. Development programs being pursued include: ammunition transfer technology, mobility and chassis development, and training device and simulation technology.
6. The crew duties of the AFAS and FARV may require more responsibilities than those of the current system. AFAS and FARV will trade physical effort for automation. Crew members will control all operations using automation, eliminating many of the manual, physical exertion characteristics of present artillery systems. The use of current state-of-the-art man-machine interface technologies enables soldiers to be assisted by decision aids which will enable them to make more decentralized technical and tactical decisions on the future battlefield. The planned level of system automation, will enable continuous fire control processing and enhanced mission execution. However, the soldier is a key component and will remain in the decision-making loop.
7. The AFAS and FARV will be deployable worldwide and will operate in a wide range of climatic conditions. The AFAS and FARV will be designed with a "Fix Forward" maintenance concept to increase sustainability. The AFAS must be capable of firing to a maximum range of 40 to 50 kilometers at a

maximum rate-of-fire of 10-12 rounds per minute. The FARV must be capable of remotely transferring fuel to the AFAS at a rate of 132 to 190 liters per minute while simultaneously rearming the AFAS with ammunition and liquid propellant.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Artillery- 155mm- Paladin M99A2

**Reference** (Zubal, 2003):

Zubal, O. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the Transfer of Ammunition from the M992A2 Field Artillery Ammunition Support Vehicle into the M109a6 Paladin Self-Propelled Howitzer: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

- a. A new Modular Artillery Charge System (MACS) has been developed and type classified for the 155mm M109 family of howitzers. MACS will replace the existing bag charges; however, the MACS requires shipping and storage canisters that are different from the canisters used for bag propellants. After new canisters were developed for the M231 and the M232 MACS, Project Manager (PM) Paladin/Field Artillery Ammunition Support Vehicle (FAASY) initiated a program to remodel both the M109A6 Paladin self propelled howitzer and the M992A2 FAASV to accommodate the MACS new canisters.
- b. Picatinny Arsenal performed the redesign and physical remodeling of the Paladin interior. A civilian contractor performed the redesign and physical remodeling of the FAASV. In both cases a representative from the Army Research Laboratory's Human Research and Engineering Directorate (HRED) served as the Human Factors (HF) consultant, providing basic guidance as requested for the design of the soldier-materiel interface characteristics of the canister storage systems in the vehicles.
- c. Reconfiguration of the Paladin and the FAASV were completed and both vehicles arrived at the Aberdeen Test Center (ATC) for hardware and durability testing. At the same time the PM requested that HRED provide a HF evaluation of the designs and the ability of guncrews to transfer ammunition. In coordination with ATC, HRED developed a protocol to conduct a brief evaluation of the HF aspects of the vehicles' designs and provide an estimate of the time required to manually transfer ammunition from the FAASV into the Paladin.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Artillery- 155mm- Paladin M109A6

**Reference** (Jee, 1993):

Jee, L. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the M109a6, 155-mm Self Propelled Howitzer: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The PALADIN system consists of a 155mm self-Propelled Howitzer, its integrated logistic support and Command, Control and Communication (C3) interfaces with the artillery fire support system. The PALADIN, designated the M109A6, is an armored, full-tracked howitzer carrying a minimum of 34 complete conventional geometry rounds and two oversized projectiles on board. It is operated by a nominal crew of four including the driver. Type Classification for the Limited Procurement Program Decision Milestone was accomplished in the first quarter of Fiscal Year 1990.
2. The PALADIN main armament consists of a modified version of the M1SS cannon assembly (the M284) and M178 gun mount (the M182E1) currently employed on the M109A2/A3. All current, as well as developmental U.S. conventional 155mm artillery projectiles will be compatible. A new turret structure is provided to enhance integration of the various turret improvements and vulnerability reduction measures to improve overall crew compartment layout and space. The Automated Fire Control System (AFCS) provides accurate position location and azimuth reference, on-board ballistic solutions of fire missions (with Battery Computer System at platoon Fire Direction Center as backup), and computer-controlled gun drive through servos with manual backup. The SPH is capable of firing within 30 seconds when emplaced and when on the move is able to stop and fire within 75 seconds after receipt of a fire mission. Digital and voice communications utilizing current systems and the Single Channel Ground/Air Radio System (SINCGARS) through an on-board communications processor enables conduct of dispersed operations/missions from one firing unit or multiple howitzers. The M109A6 incorporates state-of-the-art materials and technologies to achieve enhanced availability and maintainability through use of Built-in Test Equipment, both diagnostic and prognostic; modularity; redundancy; reduced operating stress levels through use of a Micro-Climate Conditioning system (MCS); and application of vulnerability reduction measures for the crew and critical mission essential equipment.
3. The PALADIN howitzer will be a one-for-one replacement for the existing M109A2/A3 howitzer in all active 155mm self-propelled units and selected National Guard units. The PALADIN battalion organization is similar to that of the current M109A2/A3 3x8 battalion. The battalion is organized into a headquarters battery, a service battery, and three identical firing batteries. Divisional and separate brigade PALADIN battalions and armored cavalry regimental PALADIN batteries are organized, manned, and equipped to perform direct support standard tactical missions. The battalion is also capable of performing the other standard tactical missions of reinforcing, general support reinforcing, and general support plus nonstandard tactical missions. As part of the field artillery system, M109A6 battalions will also be found within Corps Artillery where they will augment the fires of divisional units during surge periods or in the attack of high density targets. The most significant operational difference between PALADIN and the current M109A2/A3 howitzer is through the PALADIN application of the AFCS, FM radios, on-board weapon pointing and navigation system, and its ability to operate semi-autonomously (i.e. shoot-and-scoot) over a widely dispersed area.
4. The PALADIN is operationally deployed to provide direct support fires to committed units within the division sector. A divisional field artillery battalion is habitually placed in direct support of a maneuver brigade. PALADIN units will normally be deployed in firing position areas with support centralized in a battery support area. Platoon position areas will be 1000 to 4000 meters apart. Platoons are further deployed such that either a pair or individual M109A6 howitzers operate within an assigned area as large as 1000 meters in diameter (dependent upon the threat situation). PALADIN batteries and subordinate fire units will be located in depth between 3 and 15 kilometers behind the forward-line-of-troops (FLOT). Specific distances will vary with the tactical situation, the mission of the supported maneuver force, and the terrain. Although capable of operating on many types of terrain, it is expected that 48 percent will be on secondary terrain, 42 percent on cross-country terrain, and 10 percent on primary surface. During a 150-day-per-year training scenario, the PALADIN will travel 1400 kilometers and fire 425 rounds (nominal).
5. The wartime Operational Mode summary/Mission Profile (OMS/MP) and propelling charge mix calls for 254 rounds per day, 22 moves per day, and 17 kilometers per day; with a propelling charge mix of 31 percent green bag (M3), 29 percent white bag (M4), 32 percent M119, and 8 percent M203.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

**System Short Name:** MANPRINT- Vehicle- Tracked- ARV- HERCULES

**Reference** (Singapore, 1996):

Singapore, M. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the Hercules M88a1e1 Armored Recovery Vehicle (ARV). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The HERCULES M88A1E1 Armored Recovery Vehicle (ARV) is a modified version of the M88A1, thus providing increased capability to recover the heavy combat vehicles. The M88AE1 will perform recovery operations in support of the M60A3 and M1 series tanks and future heavy combat vehicles. It will replace the M88A1 in all armor battalions, regimental cavalry squadrons, and supporting intermediate direct support maintenance units. The HERCULES will be able to tow a vehicle weighing as much as 70 tons and provide a main winch capability with 100 meters of usable cable with a 70-ton pull force. A light auxiliary winch enables deployment of the main winch cable by one soldier, in order that it may be pulled to the disabled vehicle. The HERCULES will be fielded to Active, Reserve, and National Guard organizations.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- C2V

**Reference** (McMahon, 1996):

McMahon, R. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the Command and Control Vehicle (C2V). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. The C2V is one of several planned systems intended to provide the Army with the capability to support the command and control mission function during mobile operations. The XM4, C2V is a closed-hatch, armored, tracked, command post (CP) vehicle that will house and transport command, control, communications, computer, and intelligence (C4I) equipment on the battlefield. The C2V program is a United Defense, Limited Partnership (UDLP) modified Multiple Launch Rocket System (MLRS) M993 chassis and a mission module integration effort, performed by Loral. The integration effort involved providing a mission module with the flexibility to accommodate various crew station module configurations of Army Tactical Command and Control System (ATCCS) Common Hardware and Software (CHS). The configuration of the mission module is dependent on the system's operational use. The C2V will have a crew of two in the carrier cab (driver and vehicle commander) and a crew of up to six in the mission module compartment that may consist of officers and enlisted soldiers engaged in maneuver and fire support operations.
2. During armored operations, the C2V is intended to function as a CP (Corps & Division) or a tactical operations center (brigade and battalion) in conjunction with the Abrams Main Battle Tank and Bradley Fighting Vehicle.

**Report Availability:**



Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- CCP XM577 SNE

**Reference** (Garinther and Donley, 1963):

Garinther, G. R., & Donley, R. (1963). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Carrier, Command Post, (CCP) Light, Tracked XM577; Systems Noise Evaluation: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum TM-14-63. DTIC AD0424397.

**Key Words:**

HFEA- Human Factors Engineering Assessment

Descriptors:

(U) (\*HUMAN FACTORS ENGINEERING, TRACKED VEHICLES), (\*NOISE, HUMAN FACTORS ENGINEERING), SOUND, COMBAT INFORMATION CENTERS, NOISE ANALYZERS, HEARING, AUXILIARY POWER PLANTS, RECORDING SYSTEMS, VOICE COMMUNICATIONS, INTELLIGIBILITY, AUDIO FREQUENCY

**System Description:**

The XM577 Command Post Vehicle is a modified version of the M113 Armored Personnel Carrier (APC). It is intended to provide a tracked, lightly armored mobile command post for field use, in which the crew compartment is heightened to allow troops to stand. The functions of the command post (gathering field information, coordinating supply and transportation of men and equipment, and combining these factors to provide direction to unit commanders) may be performed in this vehicle or by combinations of several vehicles to meet the requirements of higher echelon headquarters. The chassis suspension and transmission are identical with the M113 APC. The interior of the vehicle contains space for radio and teletypewriter communications equipment, a drafting area for mapping, and a small computer. Power for operating this equipment is obtained from an auxiliary generator mounted on the front of the cab, over the engine. The generator, which provides 30-volt, 300-ampere power, may be removed from the vehicle by a hoist attachment on the XM577 and used on the ground at a distance up to 50 feet. These vehicles, when combined with one or more similar vehicles for use as a higher headquarters, are connected by a canvas shelter. In this application one or more generators may be combined to provide greater power. The mission of the command post demands care in designing the proper acoustical environment. Direct communication among the staff of the command post and electrical communication between the command post and the information reception and dissemination points must be quick, reliable, and accurate. Decisions must be made correctly, which requires minimizing avoidable interference from noise. An acoustical environment must not produce temporary or permanent hearing losses, or other auditory disturbances, if it is to be an acceptable working situation over long periods of time. In addition, relative freedom from detection by hostile groups is required for continuous successful operation of the command post. With these considerations in mind, acoustical measurements of the XM577 Command Post Vehicle were made at Aberdeen Proving Ground, Md., 30 May 1962 to 1 June 1962 and on 11 June 1962 using Pre- Production Vehicle No. 12M603 (Pilot No.1). This report summarizes the results of these tests and offers comments on the acoustical characteristics of the vehicle and how they affect the acoustical environment.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Tracked- DIVAD

**Reference** (Sarli and Carter, 1981):

Sarli, G. G., & Carter, R. J. (1981). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Division Air Defense (DIVAD) Gun Systems: U.S. Army Research Institute for the Behavioral and Social Sciences, Field Unit at Fort Bliss, Texas. Proceedings of the Annual Conference of the Military Testing Association (23rd) held at Arlington, Virginia on 25-30 October, 1981. Volume 2, AD-A130 703, p1031-1037. DTIC ADP001371.

**Key Words:**

\*Human factors engineering, \*Weapon systems, \*Air defense, \*Operational effectiveness, Man machine systems, Maneuverability, Survivability, Reliability, Maintainability, Personnel selection, Job training, Manpower utilization, Optimization, Questionnaire  
Component reports, Operational tests

**Descriptors:**

(U) \*Human factors engineering, \*Weapon systems, \*Air defense, \*Operational effectiveness, Man machine systems, Maneuverability, Survivability, Reliability, Maintainability, Personnel selection, Job training, Manpower utilization, Optimization, Questionnaires, Army research, Attitudes(Psychology), Skills  
Identifiers:

(U) Component reports, Operational tests

**System Description:**

A human factors evaluation was conducted upon DIVAD Gun prototypes during Operational Test II. It was physically impossible to observe the crew-members during operations; therefore, data were gathered from each of 32 enlisted crew-members by means of five questionnaires drawn from a master set of 506 items. Despite some difficulties experienced by crew-members in responding to the questionnaires, the required data were obtained and the results were submitted to the U.S. Army Operational Test and Evaluation Agency and the DIVAD Gun Source Selection Board.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Tracked- DIVAD

**Reference** (Carter and Sarli, 1984):

Carter, R. J., & Sarli, G. G. (1984). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Two Division Air Defense (DIVAD) Gun Systems During Operational Test II: U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. ARI-RN-84-8 Project Number 2Q162722A791. DTIC ADB082588.

**Key Words:**

\*Antiaircraft guns, \*Human factors engineering, Prototypes, Gun components, Firepower, Antiaircraft fire control systems, Night warfare, Enlisted personnel, Army personnel, Gunners, Air defense, Division level organizations, Acceptability, Questionnaire  
DIVAD(Division Air Defense), M-246 guns, M-247 guns, PE62722A, AS791

**System Description:**

The objective of the research was to evaluate two prototype division air defense gun systems, XM246 and XM247 for human factors considerations. Each of 32 male service members completed five questionnaires which were constructed from a master set of 506 items addressing twenty-two areas of concern. Both systems received an overall rating of good. They only differed in three areas: detection, night operations, and NBC. Each system did have human factors problems with specific components/subsystems. The results of the evaluation were used in the determination of the prime contractor for the gun system and to support the production decision.  
Unclassified

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Contractor Performance Evaluation; 18 May 84. Other requests must be referred to the Project Manager, Division Air Defense Gun System, Attn: DRCPM-ADG-T. Dover, NJ 07801. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Vehicle- Tracked- DIVAD Sgt York

**Reference** (Babbitt, 1988):

Babbitt, B. A. (1988). Manpower and Personnel Integration (MANPRINT) Assessment: Manprint Analysis of the DIVAD System: Volume I. Human Factors Data from Sgt York Follow-on Evaluation I: U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. Contract to Essex Corporation, Fort Hood, TX. DTIC ADA396092.

**Key Words:**

\*human factors engineering, \*gun air defense systems, test and evaluation, training, weapon systems, operational effectiveness, visibility, army, workload, system safety, antiaircraft guns, forward area air defense systems, gun crews

manprint, divad(division air defense), sgt york

Fields and Groups:

230200 - Human Factors Engineering & Man Machine System

150302 - Antiaircraft Defense Systems

190600 - Guns

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*GUN AIR DEFENSE SYSTEMS, TEST AND EVALUATION, TRAINING, WEAPON SYSTEMS, OPERATIONAL EFFECTIVENESS, VISIBILITY, ARMY, WORKLOAD, SYSTEM SAFETY, ANTI-AIRCRAFT GUNS, FORWARD AREA AIR DEFENSE SYSTEMS, GUN CREWS

Identifiers:

(U) MANPRINT, DIVAD(DIVISION AIR DEFENSE), SGT YORK

**System Description:**

This report is the first of two volumes presenting a MANPRINT analysis of the Division Air Defense (DIVAD) Gun System, also known as Sgt York. The first volume is a consolidation and analysis of the human factors data obtained from the Sgt York Follow-On Evaluation I tests. The second volume is a discussion of the lessons learned from that experience.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Tracked- DIVAD Sgt York FOE

**Reference** (Muckler et al., 1989):

Muckler, F. A., Babbitt, B. A., & Seven, S. A. (1989). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Design Criteria for Future Systems. Faads Design Criteria Evolving from the Sgt. York Follow-on Evaluation I: U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. Contract to Essex Corporation, Fort Hood, TX. ARI RP-89-11 DTIC ADA210356.

**Key Words:**

\*human factors engineering, \*gun air defense systems, test and evaluation, training, weapon systems, operational effectiveness, visibility, army, workload, system safety, antiaircraft guns, forward area air defense systems, gun crews

manprint, divad(division air defense), sgt york

INDUSTRIAL/COMMERCIAL

150302 - Antiaircraft Defense Systems

230200 - Human Factors Engineering & Man Machine System

(U) \*HUMAN FACTORS ENGINEERING, ZHUMAN FACTORS ENGINEERINGZ, \*ANTIAIRCRAFT DEFENSE SYSTEMS, ZANTIAIRCRAFT DEFENSE SYSTEMSZ, \*FORWARD AREA AIR DEFENSE SYSTEMS, ZFORWARD AREA AIR DEFENSE SYSTEMSZ, TEST AND EVALUATION, ZTEST AND EVALUATIONZ, LEADERSHIP, ZLEADERSHIPZ, ARMY PERSONNEL, ZARMY PERSONNELZ, COMPARTMENTS, ZCOMPARTMENTSZ, CREWS, ZCREWSZ, MAN MACHINE SYSTEMS, ZMAN MACHINE SYSTEMSZ, GUNNERS, ZGUNNERSZ, SQUAD LEVEL ORGANIZATIONS, ZSQUAD LEVEL ORGANIZATIONSZ  
(U) FAADS(FORWARD AREA AIR DEFENSE SYSTEM),

**System Description:**

Fifty-one human factors design problems reported from the Sgt. York Follow-On Evaluation (FOE) I are examined with respect to the driver's station (20 problems) and the crew compartment housing the squad leader and gunner (31 problems). Each design problem is compared with human factors criteria from MIL-STD-1472C and MIL-HDBK-759A to determine the adequacy of currently available design criteria. Where existing design criteria were inadequate or nonexistent, proposed changes and additions are presented. The purpose of this work is to provide human factors design criteria for future Forward Area Air Defense System (FAADS) with respect to improved soldier-machine interfaces. Keywords: Antiaircraft defense systems.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Engineer- R028 Scraper

**Reference (Beran, 1984):**

Beran, G. (1984). Manpower and Personnel Integration (MANPRINT) Assessment: Technical Feasibility Test of Human Factors and Safety Evaluation of R028 Scraper: U.S. Army Combat Systems Test Activity (Prov), Aberdeen Proving Ground, MD. USACSTA-6077. DTIC ADB086060.

**Key Words:**

\*Scrapers, \*Road building equipment, \*Visibility, \*Human factors engineering, Army equipment, Acoustic measurement, Noise(Sound), Safety, Test and evaluation, Feasibility studies, Military vehicles, Ground level, Operators(Personnel), Standards, Militar

\*R028 scraper, Ground surface visibility, LPN-USATECOM-8-EG-785-000-001

Fields and Groups:

130300 - Construction Equipment, Materials & Supplies

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*Scrapers, \*Road building equipment, \*Visibility, \*Human factors engineering, Army equipment, Acoustic measurement, Noise(Sound), Safety, Test and evaluation, Feasibility studies, Military vehicles, Ground level, Operators(Personnel), Standards, Military requirements

Identifiers:

(U) \*R028 scraper, Ground surface visibility

**System Description:**

US Army Combat Systems Test Activity (Prov), Aberdeen Proving Ground, MD, tested the R028 scraper to determine accessibility of the operator's compartment to 5th through 95th percentile personnel, noise levels (and acoustical protection requirements) within the cab, and any obstructions affecting the operator's ground surface visibility around the vehicle. Results are compared to criteria in MIL-STD-1472C, SAE-J898, SAE-J88, and SAE-J919c. (Author)

Unclassified

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation; Sep 84. Other requests must be referred to Commander, TACOM, Attn: DRCPM-CE-T. Warren, MI 48090. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Engineer- R038 Grader

**Reference** (Beran, 1984):

Beran, G. (1984). Manpower and Personnel Integration (MANPRINT) Assessment: Technical Feasibility Test of Human Factors and Safety Evaluation of R038 Grader: U.S. Army Combat Systems Test Activity (Prov), Aberdeen Proving Ground, MD. USACSTA-6078. DTIC ADB086061.

**Key Words:**

\*Road building equipment, \*Ground vehicles, \*Human factors engineering, Army equipment, Noise(Sound), Safety, Test and evaluation, Operators(Personnel), Feasibility studies, Standards, Military requirements

\*Road grader, Ground surface visibility, LPN-USATECOM-8-EG-785-000-002

Fields and Groups:

130300 - Construction Equipment, Materials & Supplies

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*Road building equipment, \*Ground vehicles, \*Human factors engineering, Army equipment, Noise(Sound), Safety, Test and evaluation, Operators(Personnel), Feasibility studies, Standards, Military requirements

Identifiers:

(U) \*Road grader, Ground surface visibility,

**System Description:**

US Army Combat Systems Test Activity (Provisional), Aberdeen Proving Ground, tested the R038 grader to determine accessibility of the operator's compartment to 5th through 9th percentile personnel, noise levels (and acoustical protection requirements) within the cab, and any obstructions affecting the operator's ground surface visibility around the vehicle. Results are compared to criteria in MIL-STD-1472C, SAE-J898, SAE-J88, and SAE-J919c. (Author)

Unclassified

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation; Sep 84. Other requests must be referred to Commander, TACOM, Attn: DRCPM-CE-T. Warren, MI 48090. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Vehicle- Tracked- FCS- 155mm- NLOS-C

**Reference** (Kykhuis, 2008):

Kykhuis, A. (2008). Manpower and Personnel Integration (MANPRINT) Assessment: Manpower, Personnel Capabilities and Training (MPT) Domain Assessment for the Non-Line of Sight Cannon (NLOS Cannon): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The Non-Line of Site Cannon (NLOS-C) is a cannon system currently under development which may become part of the FCS (Future Combat Systems) environment and was funded by the U.S. Congress shortly after cancellation of the XM2001 Crusader, M109 replacement. It is an 18 ton class vehicle that may be a replacement for current vehicle systems in the 40-60 ton weight class. If design parameters are

indeed reached, then it will provide a level of air transportability that current M-I09 systems cannot presently match.

NLOS-C Spl system is a self-propelled howitzer with a two man crew with the primary weapon system with a 155mm cannon. This system can provide networked, precision and area indirect fires of point and area targets with a suite of munitions that include special purpose capabilities. The system's primary purpose is to provide responsive fires in support of FCS BCTs and their subordinate units in concert with Line of Sight (LOS), Beyond Line of Sight (BLOS), NLOS, external and joint capabilities. These systems are a separate acquisition program with initial fielding at Milestone C (MSC) in FY 2010. NLOS-C Spl will not transition to low-rate or full-rate production. These systems will be fielded under a training release to the Army Evaluation Task Force (AETF) and are not combat deployable.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- FCS FOV

**Reference** (Harrah and Hawley, 2003):

Harrah, D. M., & Hawley, J. K. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the Future Combat System (FCS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Future Combat Systems (FCS) is an ACAT ID Department of Defense simulation-based acquisition under guidance of the Army's SMART Program. The Future Combat Systems Unit of Action (FCS UA) comprises approximately 2,500 Combat Operations and Support personnel in a brigade-size formation. The UA is significantly smaller in number of personnel from a Cavalry or Heavy Armor Brigade in today's US Army Legacy Force. FCS Unit of Action manpower formations are defined in the TRADOC Pamphlet 525-3-90 Objective Force Operational and Organizational Plan for Maneuver Unit of Action and the TRADOC Operational Requirements Document [commonly abbreviated as "the ORD"] for the Future Combat Systems. Key to successful development and use of FCS are: 1) C-130 deployability which limits vehicle size and weight, and thus crew size and space available, 2) 72 hours of high intensity combat or 7 days of mid-intensity combat with minimal resupply, 3) dependence on information dominance to offset lack of armor compared to legacy forces, 4) proliferation of unmanned systems to augment soldier capabilities, and 5) dependence on soldiers to adapt to a new method of waging combat.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- FCS FOV

**Reference** (Harrah, 2004):

Harrah, D. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Future Combat System (FCS). APG: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

Future Combat Systems is an Acquisition Category (ACAT) ID Department of Defense simulation-based acquisition. The Future Combat Systems Unit of Action (FCS UA) comprises approximately 2,976 combat operations and support personnel in a distributed Brigade Combat Team-size organization. While the UA is significantly smaller in number of personnel than today's U. S. Army Brigades, FCS units will be required to have more operational capability and fight over geographically larger areas. FCS Unit of Action manpower formations are defined in the Training and Doctrine Command (TRADOC) Pamphlet 525-3-90 Objective Force Operational and Organizational Plan (O&O) for Maneuver Unit of Action and the TRADOC Operational Requirements Document (ORD) for the Future Combat Systems. Key to successful development and use of FCS are: 1) C-130 aircraft deployability which limits vehicle size and weight, and thus crew size and space available, 2) 72 hours of high intensity combat or 7 days of mid-intensity combat with minimal resupply, 3) dependence on information dominance to offset lack of armor compared to current forces, 4) proliferation of unmanned systems to augment Soldier capabilities, and 5) dependence on Soldiers to adapt to a new method of waging combat.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- IFV- BMP-A

**Reference** (Akins, 1982):

Akins, R. C. (1982). Manpower and Personnel Integration (MANPRINT) Assessment: Follow-on Human Factors Evaluation of the Soviet Bmp-a Armored Infantry Combat Vehicle: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TN-4-82 LIMITED DIST. DTIC ADB065378.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*Combat vehicles, \*Human factors engineering, \*Armored personnel carriers, USSR, Anthropometry, Seats, Cupolas, Stations, Workplace layout

BMP-A vehicle

Fields and Groups:

190300 - Combat Vehicles

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*Combat vehicles, \*Human factors engineering, \*Armored personnel carriers, USSR, Anthropometry, Seats, Cupolas, Stations, Workplace layout

Identifiers:

(U) BMP-A vehicle

**System Description:**

The workspace provided in the Soviet BMP-A vehicle is severely restricted and does not generally accommodate personnel who exceed the 50th percentile man (USA/Soviet) in anthropometric size.

**Report Availability:**

Distribution limited to U.S. Gov't. Agencies only; Test and Evaluation; May 82. Other requests for this document must be referred to Director, U.S. Army Human Engineering Lab., Aberdeen Proving Ground, MD 21005. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Vehicle- Tracked- IFV- Bradley BFIST Striker

**Reference** (Singapore, 1998):

Singapore, M. (1998). Manpower and Personnel Integration (MANPRINT) Assessment for the Striker XM707 Fire Support Vehicle. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Striker XM707 Fire Support Vehicle is a part of the Bradley Fire Support Vehicle (BFIST) program. Stryker is designed specifically for the Combat Observation Lasing Teams (COLTs) in both the heavy and light divisions. The system replaces the M981s in the heavy divisions and provides the light, airborne and air assault divisions with an unprecedented fire support vehicle capability. The Striker system package will include new and improved fire support mission equipment and components mounted on a M102SA2 HMMWV platform. Striker is the only vehicle involved in the reconnaissance/counter reconnaissance fight that has the digitized communication capability, until the fielding of the Future Scout Cavalry Vehicle (FSCV) in FY06.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- IFV- Bradley BFVS A3

**Reference** (Stevens, 1997):

Stevens, W. L. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Bradley Fighting Vehicle Systems A3 (BFVS A3). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

(a) The Bradley A3 upgrade as shown in Figure 1 constitutes a major modification to the existing Bradley A2. It will have increased vehicle and personnel protection through improved survivability, increased command and control capability through the use of a new core electronic architecture structured around a 1553 database, and enhanced domination of the battlefield through the integration of the Improved Bradley Acquisition System (IBAS), coupled with the Commander's Independent Viewer (CIV). These improvements will provide the gunner and commander with increased target engagement capability, with automatic target tracking of two targets within the same field of view simultaneously and reduced engagement times for increased combat effectiveness. The Bradley A3 will be digitally compatible with the Abrams tank MIA2 system enhancement program (SEP).

(b) The crew stations for the vehicle commander, gunner, and driver will have integrated displays to handle information processing in a digitized battlefield. The commander's station includes a flat panel display, keyboard, remote binoculars, and controls to process digital battlefield information and allows the commander to prepare, transmit, and display tactical messages. In addition, diagnostic and built-in test capabilities are integrated into the vehicle. The driver's station improvements include an all-weather driver's vision enhancer, coupled with the POSNAV system to set multiple waypoints in the driver's display. It will enhance the driver's situational awareness and consequently improve the mobility of the Bradley A3. The improvements of the A3 target acquisition and fire control systems will provide the gunner a capability to acquire and track two targets with accurate range information displayed in the gunner's control display panel (GCDP).



(c) The Bradley A3 upgrade will improve personnel survivability of the mounted combat infantry squad and accommodate armored cavalry missions of reconnaissance and security operations. The installation of the squad leader's display unit in the squad compartment will enable the squad leader to receive selected tactical information relayed from the CIV, IBAS, Commander Tactical Display (CTD), and Driver's Vision Enhancer (DVE) while the dismount unit leader stays inside the vehicle. This capability significantly improves situational awareness of the dismount element and eases personnel transition from mounted to dismounted operations.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- IFV- Bradley BFVS BFIST

**Reference (Stevens, 1994):**

Stevens, W. L. (1994). Manpower and Personnel Integration (MANPRINT) Assessment: Human Engineering Assessment (HFEA) for the Bradley Fire Support Vehicle (BFIST): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The BFIST vehicle is a combat system that provides the Fire support Team (FIST) and the Combat observation Lasing Team (COLT) with mobility, survivability, maneuverability, speed and physical signature comparable to the heavy unit, it supports. The BFIST program will require the integration of the fire mission package into the Bradley A2 Operation Desert storm (ODS) and Bradley A3 vehicles. This system represents a major upgrade of the current M981 FISTV in the areas of surveillance, target acquisition, target identification, target tracking, target designation and communications.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- IFV- Bradley BFVS BFIST

**Reference (Stevens, 1995):**

Stevens, W. L. (1995). Manpower and Personnel Integration (MANPRINT) Assessment for the Bradley Fire Support Vehicle (BFIST). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Bradley Fire Support Vehicle (BFIST) vehicle is a combat system that provides the Fire Support Team (FIST) with mobility, survivability, maneuverability, speed, and physical signature comparable to the heavy units it supports. The BFIST program will require the in-egration of the fire mission package into the Bradley A2 Operation Desert Storm (ODS) and Bradley A3 vehicles. This system represents a major upgrade of the current M981 FISTV in the areas of surveillance, target acquisition, target identification, target tracking, target designation and communications.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- IFV- Bradley BFVS BFIST

**Reference** (Stevens, 1997):

Stevens, W. L. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Bradley Fire Support Vehicle (BFIST). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The BFIST vehicle is a combat system that provides the Fire Support Team (FIST) with mobility, survivability, maneuverability, speed, and physical signature comparable to the heavy units it supports. The BFIST program will require the in-egration of the fire mission package into the Bradley A2 Operation Desert Storm (ODS) and Bradley A3 vehicles. This system represents a major upgrade of the current M981 FISTV in the areas of surveillance, target acquisition, target identification, target tracking, target designation and communications.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- IFV- Bradley BFVS Linebacker M-6

**Reference** (Ainsworth, 1996):

Ainsworth, J. S. (1996). Manpower and Personnel Integration (MANPRINT) Assessment for the Bradley Linebacker (BL). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Bradley Linebacker (Bradley BL), formerly known as the Bradley Stinger Fighting Vehicle-Enhanced (BSFV-E), is an air defense system based upon minimal upgrades to the currently fielded Bradley Stinger Fighting Vehicle-MANPADS Under Armor (BSFV-MUA). The Bradley Linebacker will provide heavy maneuver forces with dedicated air defense against a variety of threat platforms. The Bradley Linebacker is a NonDevelopmental Item (NDI) rapid acquisition procurement to upgrade the existing M2A2 Bradley Fighting Vehicle (BFV) with the addition of a BSFV-E Modification Kit, a FAAD C3I Kit, and a BFV Operation Desert Storm (ODS) Kit. The BSFV-E Modification Kit includes an integrated externally mounted Standard Vehicle Mounted Launcher (SVML) with modified fire control to fire up to four STINGER missiles without reloading while the crew remains under armor. The FAAD C3I Kit provides the critical time sensitive function of alerting and cueing during stationary and on-the-move operations and receipt of air battle management information such as air defense warning, state of alert, and weapon control measures. The BFV ODS Kit integrates a digital compass which provides an integrated position, navigation, and north seeker capability for positioning and location. This heading data is provided to the FAAD C3I Simplified Handheld Terminal Unit (SHTU) for automatic slew-to-cue.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- IFV- Bradley BFVS M2A3/M3A3

**Reference** (Stevens, 1993):

Stevens, W. L. (1993). Manpower and Personnel Integration (MANPRINT) Assessment: Human Engineering Assessment (Hea) for the Bradley Fighting Vehicle (BFVS) M2a3/M3a3. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

(a) The Bradley A3 upgrade as shown in Figure 1 constitutes a major modification to the existing Bradley A2. It will have increased vehicle and personnel protection through improved survivability, increased command and control capability through the use of a new core electronic architecture structured around a 1553 database, and enhanced domination of the battlefield through the integration of the Improved Bradley Acquisition System (IBAS), coupled with the Commander's Independent Viewer (CIV). These improvements will provide the gunner and commander with increased target engagement capability, with automatic target tracking of two targets within the same field of view simultaneously and reduced engagement times for increased combat effectiveness. The Bradley A3 will be digitally compatible with the Abrams tank MIA2 system enhancement program (SEP).

(b) The crew stations for the vehicle commander, gunner, and driver will have integrated displays to handle information processing in a digitized battlefield. The commander's station includes a flat panel display, keyboard, remote binoculars, and controls to process digital battlefield information and allows the commander to prepare, transmit, and display tactical messages. In addition, diagnostic and built-in test capabilities are integrated into the vehicle. The driver's station improvements include an all-weather driver's vision enhancer, coupled with the POSNAV system to set multiple waypoints in the driver's display. It will enhance the driver's situational awareness and consequently improve the mobility of the Bradley A3. The improvements of the A3 target acquisition and fire control systems will provide the gunner a capability to acquire and track two targets with accurate range information displayed in the gunner's control display panel (GCDP).

(c) The Bradley A3 upgrade will improve personnel survivability of the mounted combat infantry squad and accommodate armored cavalry missions of reconnaissance and security operations. The installation of the squad leader's display unit in the squad compartment will enable the squad leader to receive selected tactical information relayed from the CIV, IBAS, Commander Tactical Display (CTD), and Driver's Vision Enhancer (DVE) while the dismount unit leader stays inside the vehicle. This capability significantly improves situational awareness of the dismount element and eases personnel transition from mounted to dismounted operations.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- IFV- Bradley BFVS M2A3/M3A3

**Reference** (Singapore, 2001):

Singapore, M. (2001). Manpower and Personnel Integration (MANPRINT) Assessment for the Bradley Fighting Vehicle Systems A3 (BFVS A3). 6 February 2001. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The BFVS A3 consists of the M2 Infantry Fighting Vehicle (IFV) and the M3 Cavalry Fighting Vehicle (CFV). The Bradley A3 is an upgrade to the current BFVS with significant improvements in the areas of command and control, lethality, survivability, and sustainability in order to enhance its ability to defeat current and future threat forces while remaining operationally compatible with the M1A2 System Enhancement Program (SEP) main battle tank. The soldier-machine interface (SMI) design of the A3 will optimize crew performance.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- ITV

**Reference** (Smith et al., 1980):

Smith, S., Thompson, T. J., & Nicolini, A. (1980). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors and Training Evaluation of the Improved Tow Vehicle (ITV) During OT/Dt III: U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. ARI-RR-1264 Project Number 2Q763743A773. DTIC ADA101917.

**Key Words:**

\*management information systems, \*management planning and control, \*human factors engineering, \*military training, \*man machine systems, test and evaluation, military personnel, performance(human), performance(engineering), command and control systems, pe63743a, as773

Fields and Groups:

050100 - Administration and Management

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*MANAGEMENT INFORMATION SYSTEMS, \*MANAGEMENT PLANNING AND CONTROL, \*HUMAN FACTORS ENGINEERING, \*MILITARY TRAINING, \*MAN MACHINE SYSTEMS, TEST AND EVALUATION, MILITARY PERSONNEL, PERFORMANCE(HUMAN), PERFORMANCE(ENGINEERING), COMMAND AND CONTROL SYSTEMS, DATA ACQUISITION, TABLES(DATA), QUESTIONNAIRES, TOWING VEHICLES

**System Description:**

This TRADOC System manager (TSM) for the Improved TOW Vehicle (ITV) asked ARI assistance in assessing human factors and training during the operational and developmental testing (OT/DT III) of the ITV. This report details this technical advisory service effort. The intent was to provide TSM with quantified information on human factors and training problems to aid in making equipment and/or training modifications before ITV system was fielded. Questionnaires, interviews, and field observations were used to obtain information from test soldiers, personnel playing the role of the threat force and from project personnel. The ITV was judged to be good in concept but to be lacking in durability and reliability throughout OT/DT III. It was also judged to have problems keeping up with other vehicles and to be somewhat slow getting into or out of action. Boresighting was a problem. Command and control problems were evident at the squad leader's station. Many recommendations to improve the vehicle and training to operate it were made. Many of these recommendations have already been heeded and major improvements have been implemented.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

**System Short Name:** MANPRINT- Vehicle- Tracked- LAVM/RV

**Reference** (Krohn, 1986):

Krohn, G. S. (1986). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Assessment: Light Armored Vehicle, Maintenance/Recovery Vehicle (LAVM/RV). Fort Hood, Texas: U.S. Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA. Fort Hood Field Element, ARI-RR-1434. DTIC ADA181149

**Key Words:**

Fields and Groups:

130600 - Surface Transportation and Equipment

230200 - Human Factors Engineering & Man Machine System

190300 - Combat Vehicles

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*ARMORED VEHICLES, \*LIGHTWEIGHT, \*RECOVERY VEHICLES, CALIFORNIA, MARINE CORPS, OPERATIONAL EFFECTIVENESS, TEST AND EVALUATION, SAFETY, PRODUCTION, MAINTENANCE, RECOVERY, VEHICLES, INTERFACES, MAN MACHINE SYSTEMS, CRANES, TOWING VEHICLES

**System Description:**

The LAVM/RV is the recovery variant of the light armored vehicle, having an eight-wheeled hull and chassis. Table 1 lists many of the unique features of the vehicle~ The purpose of the vehicle is to provide repair and recovery services for the light armored family of vehicles. To serve this purpose, the LAVM/RV must be able to travel as rapidly and as far as the other LAV combat vehicles. Moreover, it must be able to provide effective maintenance and recovery support at a great distance from rear area maintenance support facilities.

The LAVM/RV has 4 x 8 and 8 x 8 drive train capability. Cross-country high speed is approximately 40 mph (64.4 km), while on highways it is 70 mph (112.6 km). The vehicle crew consists of a driver, commander, rigger, and two mechanics.

The specialized features of the vehicle include:

1. HIAB Model 650 crane (L.C. 6.6 tons),
2. Braden Model AMSU-10-12 FL winch (L.C. 30,000 lbs),
3. Atlas polar auxiliary power unit/welder generator,
4. Fuel transfer pump and hoses,
5. Left and right outriggers for stabilizing during crane operations,
6. Left and right rear spades for anchoring the vehicle during winch operations,
7. Interior folding workbench,
8. Provision for oxygen/acetylene welding equipment.

This report describes the human factors evaluation of the Light Armored Vehicle Maintenance/Recovery Vehicle (LAVM/RV) that took place at Twentynine Palms, California, from December 1983 to April 1984. The evaluation was in conjunction with Operational Test II of the LAVM/RV conducted jointly by the Marine Corps Operational Test and Evaluation Agency (OTEA) and the Army OTEA. The report documents man-machine interface and safety problems recommended for correction before full-scale production if maximum effectiveness is to be realized.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Tracked- MAULER SNE

**Reference** (Garinther, 1963):

Garinther, G. R. (1963). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Mauler Weapon System: System Noise Evaluation: U.S. Army Human Engineering

Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-12-63  
LIMITED. DTIC AD0902676.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*hearing, noise, hazards, hazards, drivers(personnel), turbines, hydraulic equipment, ear protectors,  
speech recognition, measurement, velocity, audio frequency, range(distance), tolerances(physiology),  
frequency, attenuation, graphics, tables(data), vo

earphones, \*m-546 vehicles, noise pollution, \*xm-546 vehicles

Fields and Groups:

050900 - Personnel Management and Labor Relations

060400 - Anatomy and Physiology

130601 - Surface Effect Vehicles & Amphibious Vehicles

200100 - Acoustics

Descriptors:

(U) \*HEARING, NOISE, HAZARDS, HAZARDS, DRIVERS(PERSONNEL), TURBINES, HYDRAULIC  
EQUIPMENT, EAR PROTECTORS, SPEECH RECOGNITION, MEASUREMENT, VELOCITY, AUDIO  
FREQUENCY, RANGE(DISTANCE), TOLERANCES(PHYSIOLOGY), FREQUENCY, ATTENUATION,  
GRAPHICS, TABLES(DATA), VOICE COMMUNICATIONS, HUMAN FACTORS ENGINEERING,  
AMPHIBIOUS VEHICLES

Identifiers:

(U) EARPHONES, \*M-546 VEHICLES, NOISE POLLUTION, \*XM-546 VEHICLES

**System Description:**

A noise survey was conducted on the MAULER Engineering Model Pod No. 1 and the XM546 Guided  
Missile Equipment Carrier Pilot No. 2 to evaluate: (1) if a hearing hazard exists, (2) what communications  
problems can be anticipated, and (3) the detection distance of the system. At the time of this survey the  
following pod equipment was operational: (1) turbine, (2) air conditioner, (3) on-turret hydraulic system,  
and (4) azimuth hydraulic system. Measurements taken indicate that a hearing hazard exists for pod and  
driver personnel even when wearing the communications headset; this hazard is most serious in the  
driver's area. No hearing hazard exists for personnel if they remain farther from the turbine exhaust than:  
(1) two meters when wearing the communications headset, or (2) approximately nine meters if not  
wearing the communications headset. Data are presented which indicate that, with proper care, a  
communications headset may be obtained which provides 80-85% intelligibility.

**Report Availability:**

Distribution limited to U.S. Gov't. agencies and their Contractors; Specific authority; 1 Sep 72. Other  
requests must be referred to Director, Human Engineering Labs., Aberdeen Proving Ground, Md. 21005.  
02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Medical- Bradley AMEV

**Reference** (Headley, 1999):

Headley, D. B. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the Armored  
Medical Evacuation Vehicle (AMEV). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-  
ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The AMEV is an armored vehicle that will provide uninterrupted availability of lifesaving Combat Medical  
Support for casualties that will result from today's high intensity, short duration warfare. It is an improved

armored medical vehicle that will improve the survivability of casualties from Mechanized Infantry Battalions, Armor Battalions, and Armored Cavalry Squadrons. It will also provide support for Forward Support Medical Companies in direct support of these mechanized and heavy forces. The AMEV has the interior space and medical equipment required for the conduct of essential en-route monitoring of four litter patients and four ambulatory patients, or a combination. It will have mobility, survivability, situational awareness, and communication similar to other vehicles in mechanized and heavy task forces. The AMEV is constructed from excess M2A0 Bradley Fighting Vehicles (BFVs) which have the turret removed and the roof squared off and raised 13 inches.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- MICV

**Reference** (Smith et al., 1978):

Smith, S., Truesdale, A. J., & Finley, D. L. (1978). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Implications of MICV OT II for Infantry Fighting Vehicle (Ifv) Development: U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. ARI-TP-311. DTIC ADA060561.

**Key Words:**

Fields and Groups:

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*STATIONS, \*HUMAN FACTORS ENGINEERING, \*COMBAT VEHICLES, TEST AND EVALUATION, OPERATIONAL EFFECTIVENESS, QUESTIONNAIRES

**System Description:**

An intensive evaluation of the human factors aspects of the Mechanized Infantry Combat Vehicle (MICV) was conducted as a part of the MICV Operational Test (OT) II. Data from this evaluation are presented and analyzed for implication for the development of the new Infantry Fighting Vehicle (IFV). The methods used to obtain the human factors data also are discussed.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Tank- Abrams M1

**Reference** (Earl, 1984):

Earl, W. K. (1984). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the M1 Combat Tank in Operational Test III: U.S. Army Research Institute for the Behavioral and Social Sciences Field Unit, Fort Hood, TX. ARI Research Report 1388. DTIC ADA164538.

**Key Words:**

Fields and Groups:

190300 - Combat Vehicles

Descriptors:

(U) \*TANKS (COMBAT VEHICLES), PRODUCTION, BATTALION LEVEL ORGANIZATIONS, ARMY TRAINING, PROTOTYPES, HUMAN FACTORS ENGINEERING, LOADERS, CREWS, AMMUNITION, GUNS, ARMY, MILITARY COMMANDERS, LOW RATE, QUESTIONNAIRES

Identifiers:

(U) M-1 tanks

**System Description:**

The M1 combat (main battle) tank is a fully tracked armored-fighting vehicle powered by a 1500 horsepower turbine engine and operated by a crew of four. Presently, the primary armament is a 105mm, rifled tube, M68 high-pressure gun. The turret is designed, however, to mount a 120mm smooth-bore gun without structural modification to the vehicle. The secondary armament includes a caliber .50 M2HB machine gun for the tank commander and two 7.62mm M240 machine guns; one is mounted coaxially with the main gun, the other on a stake mount outside the loader's hatch. The M1 has smoke generation capability produced by an engine mounted device, and by two six-tube smoke grenade launchers. The tank incorporates a combination of armor materials and design features that provide ballistic protection against kinetic and chemical energy munitions. Survivability is further enhanced by ammunition and fuel compartmentalization and by increased mobility. The mission of the M1 tank is to attack and destroy enemy tanks, equipment, and forces. It achieves its mission by using high speed, maneuverability, and firepower, while its armor envelope and smoke generators provide protection for the crew.

The New Army Battle Tank Operational Test III (XM1 OT III) was conducted at Fort Hood, TX from September 1980 through May 1981. It was a comprehensive test of low rate initial production (LRIP) M1 tanks operated by members of a standard Army tank battalion in live-firing and non-firing field exercises. The test was designed to provide data and analyses of the capabilities of LRIP M1 tanks in an operational environment. The results were for use in the decision of whether or not to place the M1 tank system into full-scale production and fielding. The test agent for XM1 OT III was the United States Army Training and Doctrine Command's Combined Arms Test Activity (TCATA). The purpose of the human factors test objective was to provide data to determine if problems observed previously during XM1 OT II (March 1979) on prototype tanks had been corrected on the LRIP tanks and to identify additional needed modifications. The scope of the effort was to include the following activities: assess the ability of the tank commander to function in the M1's commander's weapon station; administer questionnaires to all crew members to obtain data on human factors engineering design considerations; collect performance data on the times required to accomplish loader's tasks involving loading and transferring main-gun ammunition.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Tank- Abrams M1 EDC

**Reference (Earl, 1984):**

Earl, W. K. (1984). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Design Criteria for Future Systems. Report Number 1. Tank Design Criteria Evolving from the M1 Tank Operational Test III: U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. ARI-RP-84-05 Project Number 2Q263739A793. DTIC ADA146694.

**Key Words:**

\*human factors engineering, weapon systems, standards, systems analysis, man machine systems, army planning, tank crews, tanks(combat vehicles)

M-1 tanks, PE63739A, AS793

Fields and Groups:

190300 - Combat Vehicles

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, WEAPON SYSTEMS, STANDARDS, SYSTEMS ANALYSIS, MAN MACHINE SYSTEMS, ARMY PLANNING, TANK CREWS, TANKS(COMBAT VEHICLES)

Identifiers:

(U) M-1 tanks

**System Description:**



Human factors engineering (HFE) design problems reported in the M1 battle tank Operational Test III were compared with criteria in MIL-STD-1472C and MIL-HDBK-759A to determine criteria adequacy. Adequate criteria were viewed as critical and should be given greater emphasis in future programs. New criteria were proposed for inadequate or missing criteria. Approximately 80 percent of the HFE problems related to conventional technological components were found to be covered by current criteria which provide adequate guidance for resolving such problems. The remaining 20 percent were covered by inadequate criteria. Revised criteria were proposed for these items. In contrast, only about 54 percent of HFE problems related to new technological components were covered by adequate criteria; 36 percent had inadequate criteria and nine percent had no criteria. Revised and new criteria were proposed for the latter two groups. The findings indicate that a large proportion of current criteria do not contain sufficient guidance for incorporating good HFE design into new technology.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Tank- Abrams M1A1

**Reference** (Lyons et al., 1988):

Lyons, L. E., Warnick, W. L., & Kubala, A. L. (1988). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors and Safety Assessment: M1A1 Abrams 120mm Gun Tank, Follow on Evaluation: U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. Contract to Essex Corporation, Alexandria, VA. ARI-RN-88-96. DTIC ADA202911.

**Key Words:**

\*tanks(combat vehicles), calibration, guns, gunnery, human factors engineering, logistics support, low level, platoon level organizations, refueling, reliability, safety, chemical warfare, biological warfare, protective equipment, temperature, test and  
PE63739A, \*M-1 tanks, Tank guns, 120-mm guns.

Fields and Groups:

190300 - Combat Vehicles

Descriptors:

(U) \*TANKS(COMBAT VEHICLES), CALIBRATION, GUNS, GUNNERY, HUMAN FACTORS ENGINEERING, LOGISTICS SUPPORT, LOW LEVEL, PLATOON LEVEL ORGANIZATIONS, REFUELING, RELIABILITY, SAFETY, CHEMICAL WARFARE, BIOLOGICAL WARFARE, PROTECTIVE EQUIPMENT, TEMPERATURE, TEST AND EVALUATION

Identifiers:

(U) PE63739A, \*M-1 tanks, Tank guns, 120-mm guns.

**System Description:**

This research note describes the MANPRINT assessment which forms part of the Follow-On Evaluation (FOE) of the M1A1 main battle tank conducted at Fort Bliss from December 1986 through August 1987 by the Army Operational Test and Evaluation Agency. MANPRINT evaluation support was provided by the Army Research Institute's Fort Hood Field Unit. The M1A1 FOE was conducted using 41 of the tanks assigned to the 3rd Squadron, 3rd Armored Cavalry, and their crews. Data for the assessment were obtained through structured interviews, questionnaires, observation of squadron operations and evaluation of calibration/gunnery performance of crews during the FOE. The primary issues investigated were: ease of calibration of M1A1 main armament, logistic supportability, and NBC system operations. Inquiry was also made as to the number of previously identified MANPRINT/human factors deficiencies uncorrected in the production version. Significant findings during the FOE were: insufficient refueling capacity in the tested support platoon, low reliability of the Simplified Test Equipment, when used in high ambient temperature conditions, and an NBC backup system which does not filter out carbon monoxide gas (a deficiency discovered during the M1E1 operational test II in 1984).

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Tank- Abrams M1A2

**Reference** (Singapore, 1994):

Singapore, M. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the M1A2 Abrams Tank: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The M1A2 tank system is a full tracked, low profile, armored, land-combat assault weapon. This system represents a major upgrade of the Abrams tank. The integration of current technology and state-of-the-art tank subsystems and electronic components are designed to provide the M1A2 a significant increase in lethality, fightability, survivability, and suitability. The M1A2 holds a four-man crew consisting of a commander, gunner, loader, and driver. It has the capability to engage the full spectrum of enemy ground targets with a variety of accurate point and area fire weapons. The M1A2 enhancements consist of Improved Commander's Weapon Station (ICWS), Commander's Independent Thermal Viewer (CITV), Position/Navigation System (POS/NAV), Commander's Integrated Display (CID), Gunner's Control and Display Panel (GCDP), Driver's Integrated Display (DID), and Core Tank, which includes the Intervehicular Information System (IVIS), MIL-STD1553B Data Bus, improved power distribution and management, and embedded diagnostics.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Tank- Abrams M1A2 ARAT XM19

**Reference** (Zubal, 2008):

Zubal, O. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the XM19 Abrams Reactive Armor Tiles (ARAT): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The XM19 is an explosive reactive armor tile intended to be mounted on the side skirts of the Abrams Tank. One single design makes it possible to interchange each tile on the vehicle when necessary. There are 62 tiles, each weighing approximately 65 pounds, for mounting on the vehicle. The Abrams reactive tiles are designed to counter armor penetrating attacks on the tank.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Tank- Abrams M1A2 ARAT XM19

**Reference** (Zubal, 2009):

Zubal, O. (2009). Manpower and Personnel Integration (MANPRINT) Assessment for the XM19 Abrams Reactive Armor Tiles (ARAT): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The XM19 is an explosive reactive armor tile intended to be mounted on the side skirts of the Abrams Tank. One single design makes it possible to interchange each tile on the vehicle when necessary. There are 62 tiles, each weighing approximately 65 pounds, for mounting on the vehicle. The Abrams reactive tiles are designed to counter armor penetrating attacks on the tank.

The XM19 ARAT is a ACAT III item and is an explosive reactive armor designed to be mounted on the side skirts of the Abrams Tank and uses two pins for mounting on the vehicle. Each pin contains two BBs to prevent the pins from falling out during unintentionally. Presently 62 tiles are the Basis of Issue for the tank. Each XM19 ARAT's external configuration is 14 1/4 inches high by 12 3/4 inches wide by 7 inches in depth. The total weight of each tile is approximately 65 pounds with a net weight of explosive of 7 pounds. Each tile is a self contained sealed box composed of metal and explosive and designed not to be take apart. Each tile contains no self-initiating device and is designed not to be vulnerable to burning or deflagration from small arms threats.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Tank- Abrams M1A2 TMS

**Reference** (Padden, 1997):

Padden, M. (1997). Manpower and Personnel Integration (MANPRINT) Assessment: Abrams System Enhancement Package Thermal Management System (TMS): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The TMS will maintain an average crew compartment temperature in the MiA2 SEP tank below 88 F and keep vehicle electronic component surface temperatures below 140 F when the tank is operated in a 125 F environment. The primary components of the TMS are the Vapor Compression System Unit (VCSU) and the Air Handling Unit (AHU). Both units are self-contained and serviceable Line Replaceable Units (LRU). The VCSU is mounted in the turret bustle rack and contains the entire vapor compression refrigeration system loop and a portion of the Propylene Glycol and Water (PGW) loop. The AHU is mounted inside the turret in front of the Gunner's Primary Sight. The AHU absorbs heat from the crew compartment via a PGW-air heat exchanger. This heat is then transferred to the external VCSU and rejected to the ambient atmosphere by a hydraulically driven HFC-134a vapor compression system. The TMS is electronically controlled and powered by the tanks hydraulic system when the main engine is running. During main engine-off operation the TMS is powered by an Under Armor Auxiliary Power Unit. The TMS is currently scheduled to be cut into tank production as part of the SEP program in July 1999.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Tank Driving From Turret

**Reference** (Horley et al., 1966):

Horley, G. L., Eckles, A. J., III, & Krogh, R. V. (1966). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Tank Driving from a Turret Position (U): U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-6-66 LIMITED. DTIC AD0374286.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*operators(personnel), \*tanks(combat vehicles), \*gun turrets, vibration, control systems, acceleration, stress(physiology), test methods, terrain, human factors engineering, visibility, army, periscopes  
cross-country movement

Fields and Groups:

190300 - Combat Vehicles

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*OPERATORS(PERSONNEL), \*TANKS(COMBAT VEHICLES), \*GUN TURRETS, VIBRATION, CONTROL SYSTEMS, ACCELERATION, STRESS(PHYSIOLOGY), TEST METHODS, TERRAIN, HUMAN FACTORS ENGINEERING, VISIBILITY, ARMY, PERISCOPES

Identifiers:

(U) CROSS-COUNTRY MOVEMENT

**System Description:**

This report gives the results of a tank-driving test conducted at Lansburg, Germany, for the US/FRG MBT program. Two separate driver's position were evaluated: a driver's position in the hull and a driver's position in the turret. The subjects were five tank drivers and two tank commanders from the Federal Republic of Germany and U. S. forces stationed in Germany. The test measured driver-vehicle performance and driver-commander-vehicle performance under selected tactical-terrain conditions. The driver's 'g' environment was also measured for the two driver's stations with the test vehicle traversing a straight cross-country course at its maximum speed. Human engineering recommendations are made for improving the design of a tank-turret driver's station.

**Report Availability:**

Distribution limited to U.S. Gov't. agencies and their Contractors; Specific authority; 17 Apr 1986. Other requests must be referred to Army Materiel Command, Attn: Joint US/FRG Main Battle Tank Program Management Office. Washington, DC 20315. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Tank GPFU

**Reference** (Houff, 1965):

Houff, C. W. (1965). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Analysis and Design of a Control Panel for the Gas-Particulate Filter Unit (GPFU), E49: U.S. Army Chemical Research and Development Laboratory, Edgewood Arsenal, MD. CRDL-TM-2-14 Task Number 1C622401A09701. DTIC AD0461780.

**Key Words:**

\*ventilation, remote control, human factors engineering, display systems, operation, warning systems, systems engineering, air intakes, air filters  
particulate filters

Descriptors:

(U) \*VENTILATION, REMOTE CONTROL, HUMAN FACTORS ENGINEERING, DISPLAY SYSTEMS, OPERATION, WARNING SYSTEMS, SYSTEMS ENGINEERING, AIR INTAKES, AIR FILTERS

Identifiers:

(U) PARTICULATE FILTERS

**System Description:**

This study was performed as a Human Factors Engineering project in support of the program of development of a gas particulate filter unit (GPFU) for the main battle tank (MBT). Placement of the GPFU in the engine compartment of the vehicle requires that a control panel, capable of efficiently and reliably operating the unit, be located in the pressurized crew compartment. The approach to the task taken included an overall analysis of the system operation; use of a logic diagram, to determine the required and desired man-system interactions and the requirements for appropriate controls and displays; an evaluation of the possible components that could satisfy the control and display requirements; a preliminary design of the control panel; and an evaluation of the design adequacy and efficiency by means of an operational sequence diagram analysis and evaluation. The panel design described incorporates all the required and desired controls and displays necessary to accomplish the remote operation of the GPFU.

Unclassified Annotation: Human factors engineering analysis and design of a control panel for the gas particulate filter unit, E49.

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies and their contractors; Administrative/Operational Use; Aug 93. Other requests shall be referred to Director, U.S. Army Research Lab., Attn: AMSRL-HR, Aberdeen Proving Ground, MD 21005-5005. 02 - U.S. GOVT. AND THEIR CONTRACTORS:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Tank- HAB- Wolverine M1A2 SEP

**Reference** (Akens, 1997):

Akens, R. C. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Heavy Assault Bridge (HAB), Wolverine. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Heavy Assault Bridge (HAB), Wolverine, consists of a German (MAN-GHH) Military Load Class (MLC) 70 bridge system-mounted on an M1 Abrams main battle tank chassis. It will employ a crew of two and will provide a gap crossing capability in support of heavy maneuver forces (Abrams and Bradley equipped forces) during worldwide climatic conditions in a military environment.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Tank- HAB- Wolverine M1A2 SEP

**Reference** (Singapore, 2000):

Singapore, M. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the Heavy Assault Bridge (HAB), Wolverine, XM104. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Wolverine Heavy Assault Bridge (HAB) system consists of a military load class 70 (MLC70) bridge and launcher integrated into an M1A2 System Enhancement Package (M1A2 SEP) chassis. The system's launcher includes a hydraulic launcher mechanism, stabilization spade, and other HAB unique components, and incorporates much of the Vetronics of the M1A2 SEP chassis. The bridge consists of four-quarter sections with a length of 26 meters, a width of 4 meters, and a weight of 10,886 kilograms. The bridge is horizontally launched and capable of spanning gaps of 24 meters on both prepared and unprepared abutments. It can be launched under armor protection from either of the two crew positions (commander and driver) within 5 minutes after reaching the crossing site, and can be retrieved from either crew position in 10 minutes, from either end. This permits the chassis to cross the same obstacle that it is used to span. The Wolverine HAB is designed to have the same mobility, survivability, and transportability as the M1 Abrams tank. Fourteen Wolverine HABs will displace the Armored Vehicle Launched Bridge (AVLB) at a rate of one Wolverine per AVLB in selected Active Component units, increasing gap crossing profile by 13%.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Tank- Patton M48

**Reference** (Charney et al., 1956):

Charney, E., Rose, A. J., & Lee, L. T. (1956). Manpower and Personnel Integration (MANPRINT) Assessment: Human Engineering Survey of M48 Tank. City: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum TM-16. DTIC AD0627817.

**Key Words:**

HFEA- Human Factors Engineering Assessment

Fields and Groups:

190300 - Combat Vehicles

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, HUMANS, TANKS(COMBAT VEHICLES), MILITARY PERSONNEL, OPERATORS(PERSONNEL)

Identifiers:

(U) M-48 TANKS

**System Description:**

The purpose of the study was to find out from the user what significant human engineering problems with the M-48 tank were being encountered. In addition, an attempt was made to discover field expedients employed by the crewmen to solve these problems and to elicit any suggestions for pertinent design improvements on the tank. Thus, the liaison team has attempted to serve as a middleman, to inform the human engineering research personnel and designers what difficulties the users are having with equipment that the Ordnance Corps created for them. It is the opinion of the liaison team that, on the whole, the troops are well satisfied with the performance and handling of the tank.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Tank- Patton M48A5

**Reference** (Brodeur and Dickinson, 1978):

Brodeur, D. H., & Dickinson, N. F., Jr. (1978). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of Scheduled and Proposed Modifications to M48A1, M48A2 and M48A3 Tanks for Conversion to M48A5: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-26-80 / HEL-TM-8-78. LIMITED. DTIC ADB027475.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*Tanks(Combat vehicles), \*Human factors engineering, Tank crews, Gunners, Cupolas, Tank turrets, Hoses, Modification, Job analysis, Particulates, Gases, Maintainability

\*M-48 Tanks, M-48A5 tanks, Crew stations

Fields and Groups:

190300 - Combat Vehicles

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*Tanks(Combat vehicles), \*Human factors engineering, Tank crews, Gunners, Cupolas, Tank turrets, Hoses, Modification, Job analysis, Particulates, Gases, Maintainability

Identifiers:

(U) \*M-48 Tanks, M-48A5 tanks, Crew stations

**System Description:**

The purpose of this evaluation was to assess the scheduled and proposed modifications for the M48A5 tank system, to determine their effects on the operational and maintainability of the total system, and to make recommendations for improvement of the man-system interface within the crew stations and the internal and external turret areas. The integration of these modifications was evaluated to determine the human factors impact on the inner and outer turret configuration, available work space, station layout, workflow, location of controls and crewman tasks.

**Report Availability:**

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation; Apr 78. Other requests for this document must be referred to Director, Army Human Engineering Lab., Aberdeen Proving Ground, MD 21005. 03 - U.S. GOVT. ONLY; DOD CONTROLLED:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Tank- Patton M60

**Reference** (Foster, 1960):

Foster, K. D. (1960). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Evaluation of the M60 Main Battle Tank. City: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum TM-8-60. DTIC AD0627820.

**Key Words:**

HFEA- Human Factors Engineering Assessment

Fields and Groups:

190300 - Combat Vehicles

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) ORDNANCE LABORATORIES, TRACKED VEHICLES, MAN MACHINE SYSTEMS

Identifiers:

(U) M-60 TANKS

**System Description:**

This study reports the results of an evaluation of the M60 Tank from a human factors engineering standpoint. The report is primarily concerned with noise evaluation and crew area evaluations to determine their conformity with human factors design practices.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Tank- Patton M60

**Reference** (Haggard and Wight, 1961):

Haggard, D., & Wight, A. R. (1961). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Tank, Combat Full Tracked: 105mm Gun, M60: U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600. Contract to George Washington University, Alexandria, VA., Human Resources Research Office. DTIC AD0487893.

**Key Words:**

\*tanks(combat vehicles), performance(human), man machine systems, human factors engineering, operators(personnel), safety, tank turrets, fatigue(physiology), posture(physiology), control panels, display systems, visibility, seats, acceptability  
105mm ordnance items, interviews, m-60 tanks.

**System Description:**

Tank, Combat Full Tracked: 105mm Gun, M60.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Tank- Patton M60E1

**Reference** (Brown, 1962):

Brown, G. L. (1962). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the Main Battle Tank, 105mm Gun, M60E1. City: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum 14-62. DTIC AD0627821.

**Key Words:**

HFEA- Human Factors Engineering Assessment

Fields and Groups:

190300 - Combat Vehicles

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, HUMANS, TANKS(COMBAT VEHICLES), MILITARY PERSONNEL, OPERATORS(PERSONNEL)

**System Description:**

The workspace available to each crew member in relation to his task and the efficiency of maintenance operation including proper utilization of available tools, skills, and supplies were investigated.

**Report Availability:**



Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Tank- T42

**Reference** (Hollis and Imhof, 1953):

Hollis, J. R., & Imhof, J. F. (1953). Manpower and Personnel Integration (MANPRINT) Assessment: An Evaluation of the Human and Space Engineering Studies - Tank, 90mm Gun, T42: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum TM-3. DTIC AD0063044.

**Key Words:**

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING

Identifiers:

(U) \*[TANKS (COMBAT VEHICLES)], [], 90-MM ORDNANCE ITEMS, T-42 TANKS

**System Description:**

Tank, 90mm Gun, T42.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Tracked- Tank- Walker Bulldog M41A1

**Reference** (Kurke and Stephens, 1957):

Kurke, M. I., & Stephens, J. A. (1957). Manpower and Personnel Integration (MANPRINT) Assessment: Systems Evaluation of the Tank, 76mm Gun, M41A1: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-1-57. DTIC AD0126990.

**Key Words:**

HFEA- Human Factors Engineering Assessment

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*TANKS (COMBAT VEHICLES)

Identifiers:

(U) 76-MM ORDNANCE ITEMS, M-41 TANKS

**System Description:**

This study reports the methodology and results of an evaluation of the man-machine relationships in the 76mm Gun Tank, M41A1. A frequency index of operational use derived from service school data was used in performing a job segment analysis. This, in conjunction with a detailed study of user crews operating a combat loaded M41A1 tank and the resulting recommendations comprise this evaluation.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- Artillery- 155mm- Howitzer- IAV

**Reference** (Smootz, 2000):

Smootz, E. R. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the Interim Armored Vehicle (IAV). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

(3). Annex C of the Interim Armored Vehicle (IAV) ORD describes a 155mm Self-Propelled (SP) wheeled howitzer. Presently the only vehicle maintainer for SP artillery is the 63D MOS. This maintainer works exclusively on SP tracked vehicles and the associated fire support and NBC systems. It is necessary to consider whether the 63D can acquire the required skill base for a wheeled vehicle.

(4). Important insights gained from the livPRINT modeling runs are:

(a). Addition of FBCB2 tasks could lead to significant visual, auditory, and cognitive workload increases for the IFV commander, or in any variant equipped with the FBCB2.

(b). Modeling of the Mobile GunJAV suggests that the Vehicle Commander may suffer down time in performance of cognitive tasks if repositioning of rounds is required. Also, target acquisition time and accuracy could be affected by any vehicle instability. Finally, consideration of a 3-man crew with autoloader versus a 4-man crew (no autoloader) should include not just "cost" factors from a soldier financial or task performance (e.g., rate of tiring) point of view, but also from a tactics perspective - if the decision is made to go with a 3-man crew, are certain platoon-level duties such as security, operator maintenance, etc. affected?

(c). Modeling of a RSTA squadron showed a decrease in performance (increased time and errors) for performance of cognitive tasks especially for the S2 function (e.g., analyze intel) and S6 function (e.g., establishing LAL "1" and com equipment) under conditions of sleep deprivation, up to 25 per cent degradation per day. The issue of quality of performance under continuous operations is important: Given that the IAV is to be able to "operate effectively, employ weapon systems, and rapidly maneuver 24 hours per day including night" [para 4.a. (3), ORD, 30 Jan 00], what consideration has been given for the likelihood that soldier performance will degrade over time (say a 72 hour period)? What options are under consideration for crew rotations and rest periods to counteract the effects of fatigue from long work periods (FM 22-9).

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- Artillery- 155mm- Howitzer- IAV

**Reference (Burns, 2001):**

Burns, C. (2001). Manpower and Personnel Integration (MANPRINT) Assessment for the Interim Armored Vehicle (IAV). 31 January 2001. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

(3). Annex C of the Interim Armored Vehicle (IAV) ORD describes a 155mm Self-Propelled (SP) wheeled howitzer. Presently the only vehicle maintainer for SP artillery is the 63D MOS. This maintainer works exclusively on SP tracked vehicles and the associated fire support and NBC systems. It is necessary to consider whether the 63D can acquire the required skill base for a wheeled vehicle.

(4). Important insights gained from the livPRINT modeling runs are:

(a). Addition of FBCB2 tasks could lead to significant visual, auditory, and cognitive workload increases for the IFV commander, or in any variant equipped with the FBCB2.

(b). Modeling of the Mobile GunJAV suggests that the Vehicle Commander may suffer down time in performance of cognitive tasks if repositioning of rounds is required. Also, target acquisition time and

accuracy could be affected by any vehicle instability. Finally, consideration of a 3-man crew with autoloader versus a 4-man crew (no autoloader) should include not just "cost" factors from a soldier financial or task performance (e.g., rate of tiring) point of view, but also from a tactics perspective - if the decision is made to go with a 3-man crew, are certain platoon-level duties such as security, operator maintenance, etc. affected?

(c). Modeling of a RSTA squadron showed a decrease in performance (increased time and errors) for performance of cognitive tasks especially for the S2 function (e.g., analyze intel) and S6 function (e.g., establishing LAL "1" and com equipment) under conditions of sleep deprivation, up to 25 per cent degradation per day. The issue of quality of performance under continuous operations is important: Given that the IAV is to be able to "operate effectively, employ weapon systems, and rapidly maneuver 24 hours per day including night" [para 4.a. (3), ORD, 30 Jan 00], what consideration has been given for the likelihood that soldier performance will degrade over time (say a 72 hour period)? What options are under consideration for crew rotations and rest periods to counteract the effects of fatigue from long work periods (FM 22-9).

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- Cargo- FMTV

**Reference** (Akens, 1995):

Akens, R. C. (1995). Manpower and Personnel Integration (MANPRINT) Assessment for the Family of Medium Tactical Vehicles (FMTV). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Family of Medium Tactical Vehicles (FMTV) includes both 2 1/2-ton Light Medium Tactical Vehicles and 5-ton Medium Tactical Vehicles. Maximum practical commonality and several mission oriented body configurations and kit applications are employed to satisfy the Army's ground transportation requirements within the specified payloads.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- Cargo- HEMTT-LHS

**Reference** (Nickel, 2000):

Nickel, J. D. (2000). Manpower and Personnel Integration (MANPRINT) Assessment for the Heavy Expanded Mobility Tactical Truck-Load Handling System (HEMTT-LHS). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The HEMTT-LHS is a HEMTT M977/978 model with improved suspension and a Palletized Loading System (PLS) flatrack load handling system (LHS). The LHS consists of a fielded PLS lift arm and a set of control devices that allows the HEMTT truck to load and off-load standard flatracks. It provides

improved transshipping and transport capability. HEMTT-LHS will be assigned to forward support companies and to base support companies of the forward support battalions of the Digitized Heavy Division.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- Cargo- HETS

**Reference** (Akens, 1993):

Akens, R. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the Heavy Equipment Transport System (HETS), Which Includes M1000 Semitrailer and the M1070 Truck Tractor: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

1. Background HETS

a. The M1000 70-ton Semitrailer and the M1070 Truck Tractor combination is designated HETS. The HETS is required to effectively transport the 70-ton M1 Main Battle Tank (MET), which exceeds the capacity of the predecessor 60-ton M747 Semitrailer and M911 Truck Tractor combination. The HETS also provides transport for other heavy oversized track and wheeled vehicles and for cargo of similar weights and sizes. The HETS is capable of transporting loads on highways, secondary and unimproved roads, trails and limited cross-country terrain at normal convoy speeds of 25 to 35 mph. It has a range of at least 325 miles at these speeds.

b. The HETS will be operated and maintained by the Designated Target Audience which includes Military Occupational Specialties as follows: MOS 88M (Motor Transport Operator), MOS 44B (Metal Worker), MOS 63G (Fuel and Electrical System Repairer), MOS 365 (Heavy Wheeled Vehicle Mechanic), and MOS 63W (Wheeled Vehicle Mechanic) wearing the full range of army clothing including arctic and MOPP IV, as required by the operational environment. These MOSs include female personnel, and therefore, the smallest percentile female (the 5th percentile) will be assigned to operate and maintain this vehicle. These same individuals may have been assigned to operate and maintain the predecessor HETS. Some additional training will be required to thoroughly familiarize the Designated Target Audience with the characteristics of the more modern and sophisticated HETS, but this does not appear to be a problem.

2. System Description

a. M1000 Semitrailer

1. Vehicle Description. The M1000 HETS 70-ton Semitrailer Lowbed features a hydraulically adjustable gooseneck, which houses an Auxiliary Power Unit (APU) and provides storage space for spare tires, a hydraulically adjustable flat nonskid semitrailer deck with manually adjustable landing legs, two laterally positionable and retractable rear loading ramps and five hydraulically jackable axles, with 40 tires--the four rearmost axles are steerable. The HETS Semitrailer also provides hydraulics to raise each isolated set of four wheels to permit tire changing without the use of a jack.

2. Personnel Description Interface The primary soldier-machine interfaces for the M1000 Semitrailer include operation of the APU; operation of the hydraulic panel to raise and lower the trailer deck height and angle; operation of the gooseneck hydraulics to optimize the interface between the trailer and the truck tractor; manual lateral positioning and spring assisted extension and retraction of the rear ramps; and manual (cranking) raising and lowering the dual forward and rearward landing legs. The crew also serves as ground guides during retrieval and unloading of disabled vehicles and performs preventive maintenance checks and services, as well as other designated trailer maintenance functions.

b. M1070 Truck Tractor

1. Vehicle Description. The M1070 HET Truck Tractor features a 500-horsepower diesel engine coupled to a five-speed transmission, a truck tractor cab which seats six personnel including a HET crew of two

and four passengers, two hydraulic drum-type winches (to haul disabled vehicles onto the HETS trailer) and a Central Tire Inflation System (CTIS) to adjust and maintain tire air pressure. The HETS truck tractor also provides a tilt forward hood design to facilitate engine maintenance.

2. Personnel Description Interface The primary soldier-machine interfaces for the M1070 truck tractor include driving the vehicle utilizing standard driver's controls and displays from within a conventional driver's workspace, operation of the Central Tire Inflation System (CTIS) for the truck tractor's tires only, operation of the dual winches from a winch station at the rear of the vehicle to haul disabled vehicles on and off the companion semitrailer, and performing crew preventive maintenance checks and services and other designated truck tractor maintenance functions.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- Cargo- HETS

**Reference** (Akens, 1994):

Akens, R. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Heavy Equipment Transporter System (HETS), Which Includes the M1000 Semitrailer and the M1070 Truck Tractor: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The HETS consists of the M1000, 70-ton Semitrailer and the M1070 Truck Tractor. It employs a crew of two and provides transport for heavy oversized track and wheeled vehicles and for cargo of similar weights and sizes.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- Cargo- TT-LET M916A2

**Reference** (Akens, 1997):

Akens, R. C. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the M916A2 Truck Tractor, Light Equipment Transporter, 34-Ton Gross Vehicle Weight Rating (GVWR) 6 X 6 with Winch. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

(a) The M916A2 truck tractor is a reacquisition of the M916A1 truck tractor, both of which are manufactured by Freightliner Corporation. The M916A2 is an enhanced M916A1, and it includes the changes discussed in paragraph II D 3, i.e., positive aspects of the vehicle. The M916A1 was tested and its performance assessed before type classification and materiel release. Because of extensive previous testing of the M916A1 and its similarity to the M916A2, no Production Verification Test was performed on the M916A2.

(b) The M916A2 is a commercially designed, nondevelopmental item (NDI), with a conventional cab, which is used primarily as a light equipment transport to tow the M870, 40-ton low bed trailer. The M172~1, 25-ton low bed trailer may also be towed as required.

(c) The M916A2 operates in local, line haul, and maintenance evacuation missions on primary and secondary roads and during off-road operations. It has an on board winch which is capable of pulling engineer construction equipment onto the M870 and M172A1 low bed trailers. It is used in worldwide climatic conditions.

(d) The M916~2 will be used and maintained by the designated target audience which includes female soldiers. It is designed for a crew of two.

(e) The primary soldier interfaces include:

(1) Driver (motor transport operator, i.e., MOS 86M) functions.

(2) crew-performed preventive maintenance checks and services and other designated maintenance functions or kit installations.

(3) Operation of the winch.

(4) Crew access and manipulation of tractor-to- trailer functions.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- Engineer- Forklift- ATLAS

**Reference** (Akens, 1993):

Akens, R. (1993). Manpower and Personnel Integration (MANPRINT) Assessment for the Truck, Lift, Fork, Variable Reach, Rough Terrain, 10,000-Pound Capacity, Formally Known as the All Terrain Lifter Articulated System (ATLAS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The 10,000-pound capacity M-10A forklift is the predecessor vehicle for both the previous ATLAS program which could operate at highway speeds and the current off-highway forklift program. The predecessor M-10A and the current off-highway forklift are transported on the M871 22 1/2-ton semitrailer which is towed by the M915A2 or other truck tractor.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- Engineer- Forklift- ATLAS

**Reference** (Akens, 1994):

Akens, R. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Truck, Lift, Fork Variable Reach, Rough Terrain, 10,000-Pound Capacity, Formally Known as the All Terrain Lifter Articulated System (ATLAS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

Truck, Lift, Fork Variable Reach, Rough Terrain, 10,000-Pound Capacity, Formally Known as the All Terrain Lifter Articulated System (ATLAS).

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- Engineer- IVMMD

**Reference** (Augustus, 2007):

Augustus, C. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the Interim Vehicle Mine Mounted Detection (Ivmmd): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The IVMMD is a wheeled, armored platform designed to operate in an area where large metallic anti-tank (AT) mines and IEDs have been employed. It has a mine detection array for locating and pinpointing suspected metallic mines and IEDs. The IVMMD directly supports the U.S. Army's Buffalo, Mine Protected Clearance Vehicle (MPCV) and the Medium Mine Protected Vehicles (MMPV) as a protected platform for providing the greatest crew survivability. The IVMMD has the capability to detect, pinpoint and mark mine locations for EOD personnel and to proof routes that have been previously cleared.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- HMMWV ASV

**Reference** (Singapore, 1999):

Singapore, M. (1999). Manpower and Personnel Integration (MANPRINT) Assessment for the Armored Security Vehicle (ASV). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The ASV is a light armored, combat support (CS) vehicle needed for minimum essential protection to selected MP units in highly exposed threat environments. The primary requirement is for ballistic protection (wraparound and overhead) and ventilated face piece nuclear, biological, and chemical (NBC) protection. Additional requirements include achievement of comparable mobility, communications, and firepower capabilities of the current M1025 High Mobility Multipurpose Wheeled Vehicle (HMMWV).

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- HMMWV FAAD-GBS

**Reference** (Nichols, 1995):

Nichols, D. E. (1995). Manpower and Personnel Integration (MANPRINT) Assessment for the Forward Area Air Defense (FAAD) System Ground Based Sensor (GBS) High Mobility Multipurpose Wheeled Vehicle (HMMWV). Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Forward Area Air Defense (FAAD) System Ground Based Sensor (GBS) High Mobility MultiPurpose Wheeled Vehicle (HMMWV) system is the combat FAAD system sensor that provides the low altitude air picture over and beyond the Forward Line of Own Troops (FLOT), contributing to the FAAD mission of defeating the low altitude air threat. The GBS radar set is a subsystem of the FAAD Command, Control and Intelligence (C2I) system. The radar set, after initialization, automatically acquires, tracks, classifies and identifies fixed and rotary wing aircraft and unmanned air vehicles (UAVs). Communications and support elements are included to form a complete radar system that can be deployed in a forward combat zone. All mission essential elements of the radar can be transported by standard military vehicles and by C-130 or larger aircraft.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- IFV- 120mm- Stryker Mortar Carrier-B

**Reference** (Singapore, 2004):

Singapore, M. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Stryker-Mortar Carrier-B (Mounted). APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The family of Interim Armored Vehicles (IAV) includes ten separate systems organized under two basic variants: the Infantry Carrier Vehicle (ICV) and the Mobile Gun System (MGS). The ICV is the core vehicle for nine configurations that share the same platform to optimize commonality and reduce logistics support requirements. Non-developmental mission equipment packages are applied to the basic ICV to establish the other configurations. The MGS variant has no related configurations.

Mortar Carrier (MC) Vehicle. The MC is designed to provide immediate and responsive indirect fire support to the maneuver forces in the conduct of its operations. The approved IAV System Acquisition Strategy requires that the contractor provide vehicles that meet the Key Performance Parameters (KPP) initially, and that meet all non-KPP by the fielding of the fifth brigade. The contractor is therefore providing a dismounted Mortar Carrier solution initially, and will meet all of the requirements of the Mortar Carrier as a part of the Block Improvement Program to be delivered in time for third brigade fielding. The initial Delivery Mortar Carrier is essentially an ICV chassis that has the capability to transport a 120-mm mortar system that is fired dismounted, and that is equipped with the appropriate racks for stowing the mortar ammunition. At battalion level, the initial MC will store and transport a 120-mm mortar system (fired dismounted) and an 81-mm mortar system (fired dismounted). At company level, the initial MC will store and transport a dismounted 120-mm mortar system and a dismounted 60mm mortar system. The Block Improvement MC to be delivered in time for the third brigade will have an integrated (mounted) 120-mm mortar system, and an integral Mortar Fire Control System (MFCS). At battalion level, the MC will be



integrated with a mounted 120-mm mortar system and will store and transport a dismantled 81-mm mortar system. At company level, the MC system will be integrated with a 120-mm mortar system and will store and transport a dismantled 60mm mortar system.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- IFV- Stryker FOV

**Reference** (Burns, 2002):

Burns, C. (2002). Manpower and Personnel Integration (MANPRINT) Assessment for the Stryker Family of Vehicles (Fov)- System Evaluation Plan (SEP). APG: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The family of Interim Armored Vehicles (IAV) includes ten separate systems organized under two basic variants: the Infantry Carrier Vehicle (ICV) and the Mobile Gun System (MGS). The ICV is the core vehicle for nine configurations that share the same platform to optimize commonality and reduce logistics support requirements. Non-developmental mission equipment packages are applied to the basic ICV to establish the other configurations. The MGS variant has no related configurations.

Infantry Carrier Vehicle (ICV). The ICV is designed to operate during all conditions of weather and illumination. As the baseline vehicle for the IAV family, it maintains maximum commonality at the system, subsystem, essential Line Replaceable Unit (LRU), and spare and repair part level with other variant/configurations of the family.

Mortar Carrier (MC) Vehicle. The MC is designed to provide immediate and responsive indirect fire support to the maneuver forces in the conduct of its operations. The approved IAV System Acquisition Strategy requires that the contractor provide vehicles that meet the Key Performance Parameters (KPP) initially, . and that meet all non-KPP by the fielding of the fifth brigade. The contractor is therefore providing a dismantled Mortar Carrier solution initially, and will meet all of the requirements of the Mortar Carrier as a part of the Block Improvement Program to be delivered in time for third brigade fielding. The initial Delivery Mortar Carrier is essentially an ICV chassis that has the capability to transport a 120-mm mortar system that is [fired dismantled, and that is equipped with the appropriate racks for stowing the mortar ammunition. At battalion level, the initial MC will store and transport a 120-mm mortar system (fired dismantled) and an 81-mm mortar system (fired dismantled). At company level, the initial MC will store and transport a dismantled 120-mm mortar system and a dismantled 60mm mortar system. The Block Improvement MC to be delivered in time for the third brigade will have an integrated (mounted) 120-mm mortar system, and an integral Mortar Fire Control System (MFCS). At battalion level, the MC will be integrated with a mounted 120-mm mortar system and will store and transport a dismantled 81-mm mortar system. At company level, the MC system will be integrated with a 120-mm mortar system and will store and transport a dismantled 60mm mortar system.

Antitank Guided Missile (ATGM) Vehicle. The ATGM vehicle is designed to provide the BCT with its primary tank killing capability. It possesses the means to defeat any armored threat out to extended ranges. The ATGM provides standoff for the force by use of its precision long-range fire control and weapons capable of destroying enemy armor beyond tank gun effective ranges.

Fire Support Vehicle (FSV). The FSV provides automation-enhanced surveillance, target acquisition, target identification, target designation, and communications necessary to support the BCT with accurate fire support from all available means.

Engineer Squad Vehicle (ESV). The ESV transports the engineer squad personnel and equipment and is equipped to perform mobility and counter-mobility missions. It is based on the ICV variant, and will accept mission packages for obstacle neutralization and marking, mine detection, and a control device for remote system operations.

Medical Evacuation Vehicle (MEV). The MEV is designed to have the capability to move forward covered by over-watching fires, recover casualties, and protect the patient and medical team during evacuation operations. The medical team will be able to use on-board medical equipment to perform emergency care with adequate lighting and power while en route to field medical sites.

NBC Reconnaissance Vehicle (NBCRV). The NBCRV incorporates existing and planned NBC sensor suite detection packages to enable it to perform NBC reconnaissance missions as required.

Mobile Gun System! (MGS) The MGS provides integral weapons designed to provide rapid and lethal direct fires to supported assaulting infantry. The primary weapon is designed to defeat bunkers and create openings in reinforced concrete walls through which infantry can pass to accomplish their missions. It is also required to defeat Level II armor up to the T-62 tank.

**Report Availability:**

Distribution Is Limited To DOD Components Only To Protect Information And Technical Data That Address Current Technology In Areas Of Significant Or Potentially Significant Military Application. Other Requests For This Document Must Be Referred To Co. Army Test And Evaluation Command, Attn: CSTE-AEC-ECC, 4501 Ford Avenue, The Ford Building, Alexandria, Virginia 22302. This Determination Was Made On 25 March 2002. :

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**System Short Name:** MANPRINT- Vehicle- Wheeled- IFV- Stryker ICV

**Reference** (Singapore, 2004):

Singapore, M. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Stryker-Infantry Carrier Vehicle (ICV) and Seven Configurations. APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The family of Interim Armored Vehicles (IAV) includes ten separate systems organized under two basic variants: the Infantry Carrier Vehicle (ICV) and the Mobile Gun System (MGS). The ICV is the core vehicle for nine configurations that share the same platform to optimize commonality and reduce logistics support requirements. Non-developmental mission equipment packages are applied to the basic ICV to establish the other configurations. The MGS variant has no related configurations.

Infantry Carrier Vehicle (ICV). The ICV is designed to operate during all conditions of weather and illumination. As the baseline vehicle for the IAV family, it maintains maximum commonality at the system, subsystem, essential Line Replaceable Unit (LRU), and spare and repair part level with other variant/configurations of the family.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- IFV- Stryker MGS

**Reference** (Singapore, 2004):

Singapore, M. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Stryker-Mobile Gun System (MGS). APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The family of Interim Armored Vehicles (IAV) includes ten separate systems organized under two basic variants: the Infantry Carrier Vehicle (ICV) and the Mobile Gun System (MGS). The ICV is the core vehicle for nine configurations that share the same platform to optimize commonality and reduce logistics support requirements. Non-developmental mission equipment packages are applied to the basic ICV to establish the other configurations. The MGS variant has no related configurations.

Mobile Gun System! (MGS) The MGS provides integral weapons designed to provide rapid and lethal direct fires to supported assaulting infantry. The primary weapon is designed to defeat bunkers and create openings in reinforced concrete walls through which infantry can pass to accomplish their missions. It is also required to defeat Level II armor up to the T-62 tank.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- IFV- Stryker MGS

**Reference** (Singapore, 2008):

Singapore, M. (2008). Manpower and Personnel Integration (MANPRINT) Assessment for the Stryker Mobile Gun System (MGS): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The family of Interim Armored Vehicles (IAV) includes ten separate systems organized under two basic variants: the Infantry Carrier Vehicle (ICV) and the Mobile Gun System (MGS). The ICV is the core vehicle for nine configurations that share the same platform to optimize commonality and reduce logistics support requirements. Non-developmental mission equipment packages are applied to the basic ICV to establish the other configurations. The MGS variant has no related configurations.

Mobile Gun System! (MGS) The MGS provides integral weapons designed to provide rapid and lethal direct fires to supported assaulting infantry. The primary weapon is designed to defeat bunkers and create openings in reinforced concrete walls through which infantry can pass to accomplish their missions. It is also required to defeat Level II armor up to the T-62 tank.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- IFV- Stryker NBCRV

**Reference** (Singapore, 2004):

Singapore, M. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Stryker-NBCRV. APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The family of Interim Armored Vehicles (IAV) includes ten separate systems organized under two basic variants: the Infantry Carrier Vehicle (ICV) and the Mobile Gun System (MGS). The ICV is the core vehicle for nine configurations that share the same platform to optimize commonality and reduce logistics support requirements. Non-developmental mission equipment packages are applied to the basic ICV to establish the other configurations. The MGS variant has no related configurations.

NBC Reconnaissance Vehicle (NBCRV). The NBCRV incorporates existing and planned NBC sensor suite detection packages to enable it to perform NBC reconnaissance missions as required.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- IFV- Stryker NBCRV

**Reference** (Singapore, 2007):

Singapore, M. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the Stryker - Nuclear, Biological, and Chemical Reconnaissance Vehicle (NBCRV): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The family of Interim Armored Vehicles (IAV) includes ten separate systems organized under two basic variants: the Infantry Carrier Vehicle (ICV) and the Mobile Gun System (MGS). The ICV is the core vehicle for nine configurations that share the same platform to optimize commonality and reduce logistics support requirements. Non-developmental mission equipment packages are applied to the basic ICV to establish the other configurations. The MGS variant has no related configurations.

NBC Reconnaissance Vehicle (NBCRV). The NBCRV incorporates existing and planned NBC sensor suite detection packages to enable it to perform NBC reconnaissance missions as required.

**Report Availability:**

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**System Short Name:** MANPRINT- Vehicle- Wheeled- MFS

**Reference** (Burcham, 1996):

Burcham, P. M. (1996). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Assessment (HFEA) of the Mini-Flail System (MFS): U.S. Army Research Laboratory, Aberdeen Proving Ground, MD 21005, Human Research and Engineering Directorate. ARL-TN-79. ADA321235.

**Key Words:**

HFEA- Human Factors Engineering Assessment

Fields and Groups:

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, MARYLAND, MILITARY REQUIREMENTS, CONTROL SYSTEMS, ARMY RESEARCH, HAZARDS, TRAINING, ARMY PERSONNEL, MILITARY STANDARDS, MILITARY VEHICLES, AVAILABILITY, MISSIONS, VIDEO SIGNALS, REMOTE DETECTION, ANTIPERSONNEL AMMUNITION, BOSNIA HERZEGOVINA

Identifiers:

(U) MINI FLAIL SYSTEMS

**System Description:**

A human factors engineering (HFE) assessment was conducted on the mini-flail system whose basic mission is to neutralize anti-personnel hazards. The assessment revealed numerous HFE design problem areas. Recommendations for design modifications to fulfill the military standard requirements are discussed. The Soldier Systems Control Branch (SSCB), Human Research & Engineering Directorate (HRED) of the U.S. Army Research Laboratory was tasked by the Office of Special Technology, Fort Washington, Maryland, to conduct a human factors engineering (HFE) assessment of the mini-flail system. The HFE assessment was conducted at Aberdeen Proving Ground, Maryland, from 5 through 7 September 1995. A thorough HFE assessment was not possible because of limited item availability. ARL devoted much of the allotted time to labeling the system and developing a training video before its release to U.S. troops in Bosnia.

The basic mission of the mini-flail is to neutralize (by detonation, mechanical destruction, or displacement from chosen path) a variety of anti-personnel hazards, such as anti-personnel land mines, booby traps, improvised anti-personnel explosive devices, scatterable anti-personnel mines, and dud air-dropped cluster munitions by use of chains attached to a spinning shaft. Because of hazards associated with explosive devices, flailing operations are conducted from a safe stand-off distance via radio remote control.

The mini-flail consists of a John Deere® 375 skid steer loader chassis with a Yamar 3 cylinder diesel engine. This system is fully armored with steel, aluminum, and SPECTRA (a ballistic material similar to KEVLAR), possesses four solid foam-filled tires, and is controlled with a commercial radio control. The mini-flail weighs approximately 2,200 pounds and is about 4 feet wide, 4 feet high, and 9 feet long. The flail section consists of a self-articulating, hydraulically powered shaft with 84 chains, each 1.4 feet long, attached with break rods, providing a 42-inch clearing width. The chain assembly can be rotated forward to detonate mines or backwards to clear objects out of its path. It operates at approximately 120 rpm and operates at least 20 hours on a single 6-gallon tank of diesel fuel. The estimated life of the 9-volt battery housed within the transmitter is 8 hours.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- MRAP- MPCV Buffalo

**Reference** (Augustus, 2007):

Augustus, C. (2007). Manpower and Personnel Integration (MANPRINT) Assessment for the Mine Protected Clearance Vehicle, MPCV (Buffalo): Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Buffalo MPCV system is a blast protected vehicle that will operate in explosive hazardous environments to conduct route clearance operations. The system will have an articulating arm with an attachment for digging or lifting and a camera to remotely interrogate a suspected explosive hazard and allow the crew to confirm, deny and or classify the explosive hazard. It will provide a blast protected platform to transport Soldiers and to allow Soldiers to dismount in order to neutralize or mark explosive hazards.

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- MRAP- MPCV Buffalo Hatch

**Reference** (Animashaun, 2007):

Animashaun, A. F. (2007). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Engineering Assessment of the Buffalo Mine Protection Clearance Vehicle (MPCV) Roof Hatch: U.S. Army Research Laboratory, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland. ARL Technical Report ARL-TR-4272. DTIC ADA472736.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*human factors engineering, \*mine clearance, emergencies, clothing, exits, platoon level organizations, kansas

**System Description:**

The project was initiated at the request of two platoons of Combat Engineers, military occupational specialty 21B, who serve as part of the Kansas National Guard. The U.S. Army Research Laboratory's (ARL's) Human Research and Engineering Directorate performed an evaluation of the emergency egress characteristics of the Buffalo. ARL developed a plan to evaluate the emergency egress characteristics of the Buffalo using human figure modeling. A detailed analysis of the vehicle roof hatch was performed to identify whether the larger end of the male Soldier population, with equipment and clothing, could fit through the hatch. The results of the egress modeling identified some shortcomings with the emergency egress characteristics of the Buffalo and two recommendations were made: (1) increase the hatch size to 69 cm by 50 cm or (2) use a circular hatch with a diameter measuring 61 cm instead of a rectangular or square hatch. The results and recommendations from the modeling were used to help drive design modifications that, if implemented, could enhance the emergency egress characteristics of the Buffalo.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- Rocket- HIMARS

**Reference** (Cook, 2003):

Cook, T. C. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the High Mobility Artillery Rocket System (HIMARS): U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The HIMARS is a C-130 transportable, wheeled, indirect fire system that is Joint Technical Architecture-Army (JTA-A) compliant and capable of firing all rockets and missiles in the Multiple Launch Rocket System family of munitions (MFOM). The HIMARS will provide tactical and operational support during both offensive and defensive operations. The HIMARS will be deployable worldwide and will operate in all climatic conditions in which the M270A1 operates. The HIMARS units will be functionally and operationally compatible with current MLRS units, and will be assigned to Corps FA Brigades in support of light, airborne and air assault divisions, and in early entry contingency force operations. The HIMARS includes the launcher, ammunition trucks and trailers, MFOM, and the Command and Control (C2) System.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- Rocket- HIMARS

**Reference** (Cook, 2005):

Cook, T. C. (2005). Manpower and Personnel Integration (MANPRINT) Assessment for the High Mobility Artillery Rocket System (HIMARS). Redstone Arsenal, AL,: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The High Mobility Artillery Rocket System (HIMARS) is a wheeled, indirect fire launch system that is C-130 transportable and capable of firing all rockets and missiles in the current and future MFOM. HIMARS provides inter- and intra-theater deployability by C-130 or larger aircraft. The C-130 permits rapid deployment of HIMARS into a contingency area and re-deployability to critical areas within the theater of operations. Under the Current Force construct, HIMARS units will perform the same types of missions as current MLRS units and will be assigned to Corps field artillery brigades and Division Artillery in support of airborne and air assault divisions, joint expeditionary forces, and forced/early entry contingency operations. HIMARS units will tactically execute general support, general support reinforcing, reinforcing and (on very specific occasions usually involving the aviation units) direct support missions. The HIMARS is employed to destroy, suppress, or neutralize enemy equipment, materiel, personnel, fortifications, and facilities. The HIMARS deployment package will be mission dependent and may consist of deploying (in very unusual conditions) a single launcher up through the more traditional deployment of an entire battalion with all support equipment or in any combination the force commander determines necessary for the mission. HIMARS will operate with existing and developmental systems for target acquisition, command and control (C2), fire support, survey, meteorology, maintenance support, and ammunition resupply.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- Rocket- HIMARS

**Reference** (Hernandez, 2007):

Hernandez, C. L. (2007). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Evaluation of the High Mobility Artillery Rocket System (HIMARS) in the Combined HIMARS-

Guided Multiple Launch Rocket System (GMLRS) Initial Operational Test: U.S. Army Research Laboratory, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland. ARL Technical Report ARL-TR-4112. DTIC ADA468506.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*human factors engineering, \*artillery rockets, \*multilaunching, test and evaluation, training, questionnaires, army personnel, performance(human)

\*himars(high mobility artillery rocket system), \*gmlrs(guided multiple launch rocket system), iot(initial operational test), hfe(human factors engineering)

Fields and Groups:

190700 - Rockets

230200 - Human Factors Engineering & Man Machine System

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, \*ARTILLERY ROCKETS, \*MULTILAUNCHING, TEST AND EVALUATION, TRAINING, QUESTIONNAIRES, ARMY PERSONNEL, PERFORMANCE(HUMAN)

Identifiers:

(U) \*HIMARS(HIGH MOBILITY ARTILLERY ROCKET SYSTEM), \*GMLRS(GUIDED MULTIPLE LAUNCH ROCKET SYSTEM), IOT(INITIAL OPERATIONAL TEST), HFE(HUMAN FACTORS ENGINEERING)

**System Description:**

The High Mobility Artillery Rocket System (HIMARS) is a wheeled, indirect fire launch system that is C-130 transportable and capable of firing all rockets and missiles in the current and future MFOM. HIMARS provides inter- and intra-theater deployability by C-130 or larger aircraft. The C-130 permits rapid deployment of HIMARS into a contingency area and re-deployability to critical areas within the theater of operations. Under the Current Force construct, HIMARS units will perform the same types of missions as current MLRS units and will be assigned to Corps field artillery brigades and Division Artillery in support of airborne and air assault divisions, joint expeditionary forces, and forced/early entry contingency operations. HIMARS units will tactically execute general support, general support reinforcing, reinforcing and (on very specific occasions usually involving the aviation units) direct support missions. The HIMARS is employed to destroy, suppress, or neutralize enemy equipment, materiel, personnel, fortifications, and facilities. The HIMARS deployment package will be mission dependent and may consist of deploying (in very unusual conditions) a single launcher up through the more traditional deployment of an entire battalion with all support equipment or in any combination the force commander determines necessary for the mission. HIMARS will operate with existing and developmental systems for target acquisition, command and control (C2), fire support, survey, meteorology, maintenance support, and ammunition resupply.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- Utility HMMWV-HV

**Reference** (Krohn and Spiegel, 1988):

Krohn, D. A., & Spiegel, D. K. (1988). Manpower and Personnel Integration (MANPRINT) Assessment for the High Mobility Multipurpose Wheeled Vehicle Heavy Variant (HMMWV-HV): U.S. Army Research Institute for the Behavioral & Social Sciences (ARI), 5001 Eisenhower Avenue, Alexandria VA 22333. Working Paper WP-FH-8808. DTIC ADA395943.

**Key Words:**



MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA  
Fields and Groups:

130600 - Surface Transportation and Equipment

Descriptors:

(U) \*AMBULANCES, MILITARY REQUIREMENTS, PERFORMANCE(HUMAN), EXPERIMENTAL  
DESIGN, HUMAN FACTORS ENGINEERING, RELIABILITY

Identifiers:

(U) HMMWV-HV(HIGH MOBILITY MULTIPURPOSE WHEELED VEHICLE-HEAVY VARIANT),  
WORKING PAPER

**System Description:**

The MANPRINT Assessment was conducted for the HMMWV-HV maxi- and mini-ambulance and S-250 communication shelter configurations. The test design plan emphasized the MANPRINT areas of human factors, safety, and health hazards. Other MANPRINT areas assessed included training, and crewman and mechanic literature. The purpose of the assessment was to identify MANPRINT findings which could lead to system improvements and refinements.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- Utility- HMMWV HV

**Reference** (Krohn and Spiegel, 1990):

Krohn, D. A., & Spiegel, D. K. (1990). Manpower and Personnel Integration (MANPRINT) Assessment: MANPRINT Evaluation of the High Mobility Multipurpose Wheeled Vehicle-Heavy Variant (HMMWV-HV). U.S. Army Research Institute for the Behavioral and Social Sciences (PERI-SM). 5001 Eisenhower Ave, Alexandria, VA 22333. ARI Research Report 1546. ADA220025.

**Key Words:**

Fields and Groups:

050900 - Personnel Management and Labor Relations

190300 - Combat Vehicles

Descriptors:

(U) \*HUMAN FACTORS ENGINEERING, ARMY RESEARCH, HAZARDS, MANPOWER, PERSONNEL,  
SYSTEM SAFETY, SOCIAL SCIENCES, BEHAVIORAL SCIENCES, QUESTIONNAIRES,  
INTEGRATION, HEALTH, TERRAIN

**System Description:**

This report presents the results of a MANPRINT (Manpower and Personnel Integration) evaluation of the High Mobility Multipurpose Wheeled Vehicle--Heavy Variant (HMMWV-HV). The evaluation was conducted by the Army Research Institute for the Behavioral and Social Sciences in conjunction with operational assessment of the HMMWV-HV by the U.S. Army Operational Test and Evaluation Agency (OTE). Three configurations were examined: the maxi- ambulance, the mini-ambulance, and the S-250 communications shelter. Realistic missions were simulated in a field setting over a variety of terrains, and critical incidents and system operations problems were recorded as they occurred. These data were supplemented with interview and questionnaire data. Fifty-eight areas in which system improvements may be warranted are identified. Nine of the areas involve training; five involve maintenance; 20 involve human factors and operations; and 24 involve systems safety and health hazards.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- Utility- HMMWV SICPS Variant

**Reference** (Martin, 1994):

Martin, J. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Standardized Integrated Command Post System (SICPS) HMMWV Variant: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Standardized Integrated Command Post System (SICPS) provides platforms from which to conduct Command Post (CP) Command and Control (C2) activities. SICPS will facilitate CP operations by providing the flexibility, commonality, and operational capabilities needed to enhance unit mobility and integrate Army Battle Command Systems (ABCS) (i.e. Global Combat Service Support-Army (GCSS-A) and associated communication and networking equipment). It supports the integration of command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) capabilities into Command Post Platforms (CPPs) that can serve as a stand alone CP or as an integrated element in a larger digitized CP or Tactical Operations Center (TOC). SICPS allows for the integration of fielded ABCS and supporting systems consistent with the operational needs of interim and objective forces. The SICPS provides a local area network (LAN) infrastructure with connectivity to the Army's tactical communications systems. This infrastructure is comprised of sets of modular, re-configurable and standardized automatic data processing equipment (ADPE), based on common hardware and software (CHS) developed for the ABCS and defense information infrastructure common operating environment (DII-COE). It also provides the Large Scale Display (LSD) - Controller and Command Post Communications System (CPCS) components used in digitized command posts.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- Utility- Jeep M151A2 ROPS

**Reference** (Steinberg and Clingan, 1988):

Steinberg, S., & Clingan, J. N. (1988). Manpower and Personnel Integration (MANPRINT) Assessment: Human Factors Field Evaluation of Soldier-Machine Interface (SMI) for Rollover Protection System (ROPS) on M151A2 Vehicles: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum HEL-TM-5-88 LIMITED. DTIC ADB125320.

**Key Words:**

MANPRINT

MANPRINT Assessment

Human Factors Engineering Assessment

MA

HFEA

\*military vehicles, \*human factors engineering, \*man machine systems, maryland, army personnel, interfaces, volunteers, field tests, terrain, base lines, missions, safety, ground vehicles, restraint, roads, males, posture(general), guns, offroad traffic  
m-151a2 vehicles, export control

Fields and Groups:

230200 - Human Factors Engineering & Man Machine System

230400 - Protective Equipment

Descriptors:

(U) \*MILITARY VEHICLES, \*HUMAN FACTORS ENGINEERING, \*MAN MACHINE SYSTEMS, MARYLAND, ARMY PERSONNEL, INTERFACES, VOLUNTEERS, FIELD TESTS, TERRAIN, BASE

LINES, MISSIONS, SAFETY, GROUND VEHICLES, RESTRAINT, ROADS, MALES,  
POSTURE(GENERAL), GUNS, OFFROAD TRAFFIC, TEST FACILITIES, FEMALES, UNIFORMS

**System Description:**

This report presents the details on a human factors field evaluation of the soldier machine interface (SMI) for the rollover protection system (ROPS) installed on M151A2 vehicles. The field tested for the evaluations ran from 9 to 11 September 1987 at the Perryman Test Range at Aberdeen Proving Ground, Maryland. Ten volunteer military subjects (8 males, 2 females) with percentile stature, ranging from 35th through 98th for males and 45th through 99th for females were used for the evaluations. Two baseline vehicles (standard and M60 pedestal-mounted (referred to as 'gun jeep') and two identical vehicles but modified with the ROPS were compared in the evaluations. The evaluations addressed issues of time and difficulty for ingress, egress, and vehicle operability on improved roads and cross-country terrain. Also evaluated were associated SMI involvements with the subjects wearing different uniforms including operations with full MOPP (mission-oriented protective posture IV gear. Keywords: Safety wheeled vehicles, Restraint systems.

**Report Availability:**

Distribution authorized to U.S. Gov't. agencies and their contractors; Critical Technology; Jun 1988. Other requests shall be referred to Director, U.S. Army Human Engineering Lab., Aberdeen Proving Ground, MD 21005-5001., This document contains export-controlled technical data. 02 - U.S. GOVT. AND THEIR CONTRACTORS 57 - EXPORT CONTROL:

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**System Short Name:** MANPRINT- Vehicle- Wheeled- Utility- Jeep- XM151

**Reference** (Weiss and Taylor, 1956):

Weiss, E. C., & Taylor, A. L. (1956). Manpower and Personnel Integration (MANPRINT) Assessment: Human Engineering Evaluation of Truck, 1/4 Ton, 4x4, XM151 (Jeep). City: U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005. USA HEL Technical Memorandum TM-21-62. DTIC AD0116136

**Key Words:**

HFEA- Human Factors Engineering Assessment- M151 Jeep

Descriptors:

(U) \*VEHICLES, HUMAN FACTORS ENGINEERING, TESTS

Identifiers:

(U) M-151 TRUCKS(1/4-TON).

**System Description:**

The XM151 offers some definite improvements over the M38A1. It provides very superior riding qualities for a vehicle of this type, which should increase comfort and therefore tend to reduce driver fatigue. The four speed transmission in conjunction with its location is a definite advantage over previous models in terms of ease and simplicity of operation. While the suspended foot pedals are an improvement, they have not been utilized to their best advantage. The location of the starter reporesnts a vast improvement over the M38A1 where it was placed in an almost inaccessible position. The ball joint front suspension provides steering characteristics which are in a sense, too responsive and may have to be reduced to provide more positive control.

However, the XM151 is deficient in certain respects. The accessibiity, especially to the rear compartment, is restricted. The visibiliity and seat height and adjustability could be improved. The instrument panel is inferior to that of the M38A1 in terms of the lack of necessary components and its location in relation to the driver's line of sight.

**Report Availability:**

Approved for Public Release, Distribution Unlimited. Report available from U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland:

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**System Short Name:** MANPRINT- VLAD

**Reference (DeBellis, 2004):**

DeBellis, W. B. (2004). Manpower and Personnel Integration (MANPRINT) Assessment for the Vehicle Lightweight Arresting Device (VLAD). APG: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The Vehicle Lightweight Arresting Device (VLAD) vehicle arresting system is a man-portable device which can be rapidly deployed to arrest automotive vehicles up to 5,500 pounds gross vehicle weight. It is to be deployed at checkpoints, roadblocks, and area denial security missions to capture wheeled vehicles. It is a single use system. The device was developed by the United Kingdom and is manufactured in the United Kingdom and in the United States. It is commercially known as (X-Net). The program is an accelerated acquisition effort approved by the Joint Non-Lethal IPT and partially funded by the Joint Non-Lethal Weapons Directorate (JNLWD).

**Report Availability:**

Distribution Statement: For Official Use Only (FOUO). Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

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**System Short Name:** MANPRINT- Volcano- Towed

**Reference (Harris, 2002):**

Harris, S. (2002). Manpower and Personnel Integration (MANPRINT) Assessment for the Mounting Kit, Mine Dispenser: Volcano, 2 1/2 Ton Trailer Towed with Track-Mobility Kit: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

- a. The VOLCANO system is a modular mine delivery system for rapid dispensing of up to 160 mine canisters from UH60 Blackhawk Helicopters, 5-Ton Wheeled Vehicles and Tracked Cargo Carriers. It consists of four launcher racks, one dispenser control unit, inter-connecting cables and the mounting hardware for the appropriate vehicles. Each launcher rack holds up to forty mine canisters. Each M87 canister contains one antipersonnel and five antitank mines. Each M87A1 canister contains six antitank mines. M88 Practice and M89 Training Canisters are used to train with the VOLCANO.
- b. The VOLCANO program entered Engineering Development in 1983. Its Requirement Document (JSOR) was approved in June 86. The System was Type Classified in Sep 87. The M139 VOLCANO system entered production with the 5-Ton truck mounting kit in FY88. Additional mounting kits were Type Classified: The M548 mounting kit – FY89, and the UH-60 Blackhawk mounting kit in FY91.
- c. The Towed VOLCANO design of the A-Frame mounting bracket and the Dispenser Control Unit (DCU) pallet adaptor was accomplished within the TACOM-ARDEC engineering lab. A stress analysis was been completed and a test prototype was fabricated. Reliability and safety qualification testing was completed using hardware from an existing M139 system. This hardware includes the Volcano DCU and launcher racks, all cables and the Hand Control Unit. The Towed VOLCANO uses two launcher racks instead of the four on the earlier variants.

**Report Availability:**

Unpublished report containing results of MANPRINT Assessments and related evaluations. Requests for distribution shall be referred to Director, Human Research and Engineering Directorate, U.S. Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB, Aberdeen Proving Ground, MD 21005-5425.:

**System Short Name:** MANPRINT- WPS

**Reference** (Promisel, 1994):

Promisel, D. M. (1994). Manpower and Personnel Integration (MANPRINT) Assessment for the Worldwide Port System (Wps) Maisrc III C: Unpublished Report. U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA; MPT; MPTA

**System Description:**

The WPS replaces the combination of four predecessor systems while achieving more effective and efficient performance. It provides enhanced capability in a number of ways, including the preparation of new management reports. The opportunity for obtaining more comprehensive management information is presented in the Block II program. This requires extensive analysis on the part of the PM WPS and could benefit from features available in forthcoming versions of the ORACLE relational data base management system. It may also prove desirable to take advantage of new ORACLE features by upgrading the Block I system.

**Report Availability:**

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**System Short Name:** MANPRINT- WRAP

**Reference** (Keesee et al., 1997):

Keesee, R. L., Pierce, L. G., Davison, A. D., Heuckeroth, O. H., Anderson, B. W., & Ainsworth, J. S. (1997). Manpower and Personnel Integration (MANPRINT) Assessment for the Seven FY98 Warfighting Rapid Acquisition Program (WRAP) Candidates. Alexandria, VA: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The U.S. Army's Warfighting Rapid Acquisition Program (WRAP) accelerates fielding of systems which emerge from particularly successful U.S. Army Training and Doctrine Command (TRADOC) Advanced Warfighting Experiments (AWE). The TRADOC Commander initiates a WRAP Army Systems Acquisition Review Council to approve candidates based upon two criteria: 1) compelling experimental success and 2) urgency of need. Additionally, Congress has asked that notification of intent to procure WRAP systems include the following information:

- Technical Merit and Maturity
- Criticality and Priority to Warfighting Requirements
- Affordability
- Effectiveness
- Sustainability in Future Budget Submissions

Seven FY98 WRAP candidates were evaluated during the Division Advanced Warfighting Experiment (DAWE) conducted at Fort Hood, Texas (5-13 Nov 97). They were:

- Analysis and Control Team (ACT) Enclave
- Air and Missile Defense Workstation (AMDWS)
- Battlefield Desktop Video Teleconferencing (BDVT)-Prototype
- Digital Topographic Support System (DTSS)
- Tactical Engineering Command and Control System

- High Speed Multiplexer
- Near Term Digital Radio

**Report Availability:**

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**System Short Name:** MANPRINT- WRUE

**Reference** (Murnyak, 2003):

Murnyak, G. (2003). Manpower and Personnel Integration (MANPRINT) Assessment for the Water Recovery Unit from Exhaust (WRUE), Project No. 69-MP-02sy-05: U.S. Army Research Laboratory, Attn: AMSRD-ARL-HR, Human Research and Engineering Directorate, Aberdeen Proving Ground, Maryland.

**Key Words:**

MANPRINT; MANPRINT Assessment; Human Factors Engineering Assessment; MA; HFEA

**System Description:**

The WRUE is a program designed to test the feasibility of producing drinking water by recovering water from the exhaust of diesel engines. If successful the program can reduce the logistical load on Army forces by supplementing water supplies with water recovered from tactical vehicle exhaust systems. The current objective of the program is to design, fabricate, install, test/analyze, conduct training on and deliver three prototype water recovery systems, fitted on three M1097A2 vehicles.

**Report Availability:**

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## **10. Summary of Volume II.**

It has been the intent of this report to consolidate and preserve the historical knowledge contained in previous MANPRINT and MANPRINT related investigations and assessments conducted by the U.S. Army up to the date of this bibliography for use as a reference tool by future MANPRINT practitioners and principal investigators.

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