



PROGRAM EXECUTIVE OFFICE SOLDIER

THE BEST
FOR THE BEST

Interceptor Body Armor

Advanced Planning Brief for Industry

2009

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Soldier Survivability



Briefing Topics



- IBA Description
- Evolution and Capability Enhancements
- Soft Armor Focus Areas
- Soldier Protection Demonstration (SPD VII)
 - IOTV Improvements
 - Plate Carrier
- ESAPI vs XSAPI
- Future Focus Areas



Interceptor Body Armor



System Description:

- IBA: Combines an Outer Tactical Vest (IOTV/OTV) with two (2) Enhanced Small Arms Protective Inserts (ESAPI), two (2) Enhanced Side Ballistic Protection (ESBI) and Deltoid Axillary Protection Systems (DAPS).
- IOTV: Replaces OTV and DAP. Side opening vest, increased area of coverage, decreased weight, emergency quick release: 11 sizes

Capabilities:

- OTV, IOTV & DAP – Fragmentation and 9mm protection
- ESAPI & ESBI – 7.62mm (M-80 Ball), 7.62 LPS, 5.56 (M855) and 7.62 APM2 protection

Objective:

- To improve Soldier survivability

BOI:

- One (1) complete IBA ensemble per Soldier
- Army Acquisition Objective is 966,000 Systems





Evolution of Body Armor



Vietnam Era



Military Flak Vest

**Post Vietnam Era
Through 1999**



**Personnel Armor System
Ground Troops (PASGT) Vest**

1996



**Interim Small Arms
Protective Overvest**

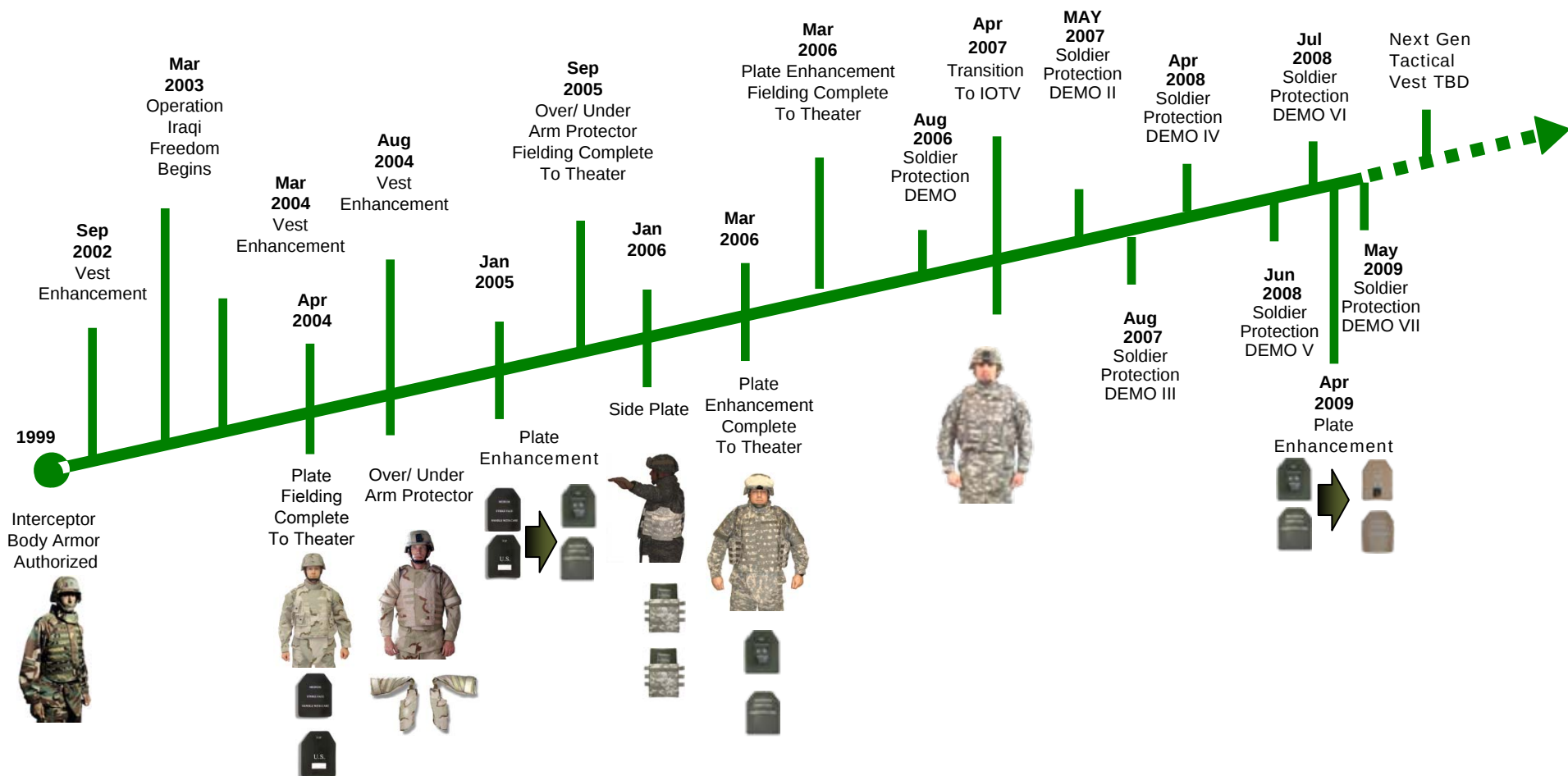
Today



Interceptor Body Armor



Interceptor Body Armor (Capability Enhancements)



The Army Continually Improves Soldier Protection



Soft Armor Focus Areas



- **Improved Ballistics**

- Decreased Aerial Density
- Protection against Increased Threats
- Increased/Decrease Area of Coverage (AoC)

- **Modular / Scalable**

- Providing different levels of protection based on threat level
- Body Armor Kit allowing Soldiers to tailor the amount of protection (mission/threat dependent)
- User verified improvements for the IOTV



Soldier Protection Demonstration (SPD) VII



IOTV Enhancements

May 11-21 2009

▪ Organizational Participants include:

- PM SSV
- ATEC
- U.S. Infantry Center (USAIC)

Soldier Requirements Division (SRD) Ft Benning , GA

- Yuma Proving Grounds (Tropical Region Test Center)
- The Maneuver Battle Lab (MBL)
- Natick Labs

▪ Purpose:

- Assist in determining body armor system that satisfies the needs of
of “lightening the load / reducing the weight “
- Obtain data on proposed improvements to the IOTV design

▪ Why

- Assess proposed design improvements to IOTV
- Assess body armor system(s) (and/or system characteristics) which are more conducive to the duties and functions of light weight mountain environment combat.



Soldier Protection Demonstration (SPD) VII



Soldier Plate Carrier System

May 11-22, 2009

■ Purpose:

- Assist in determining plate carrier systems that satisfies the needs of Soldiers in mountainous terrain
- Addresses "Lighten the Load"

■ Why

- Assess body armor system(s) which are more conducive to the duties and functions of Soldiers during combat operations in mountainous terrain to afford greater mobility.





Where are we headed?



Corps Issues Smaller, Lighter Body Armor

August 22, 2008

Military.com by Christian Lowe and Kimberly Johnson

The Marine Corps has issued thousands of new body armor vests that are lighter, more comfortable and allow more freedom of movement than the current vest, but offer less ballistic protection than the Corps' standard-issued armor.

The weight of soldiers' gear has become a top concern for the Army.

This month, Gen. Peter Chiarelli, the Army's vice chief of staff, told U.S. senators the average soldier's load of rucksack, weapon, ammunition, helmet and gear can top 130 pounds. That weight makes soldiers tired and more prone to injury, Chiarelli said.

U.S. Military Seeks Lighter Vehicles, Gear for Afghanistan

By kris osborn

Published: 6 Feb 13:46 EST (18:46 GMT)

The U.S. Army and Marine Corps are sending more vehicles, gear and UAVs to Afghanistan, in part to adapt to the high and mountainous terrain, service officials said.

Military: Improved body armor is too heavy
By Richard Lardner
Posted : Friday Feb 6, 2009 6:20:43 EST
WASHINGTON — Concerned that U.S. troops are already saddled with too much heavy gear, military officials will not require them to wear improved body armor until manufacturers cut the weight of the new protective plates.
The Associated Press

Army leaders and experts say the **injuries — linked to the stress of bearing heavy loads** during repeated 12- or 15-month combat tours — have increased the number of soldiers categorized as “non-deployable.” Army personnel reported 257,000 acute orthopedic injuries in 2007, up from 247,000 the previous year.



ESAPI-vs-XSAPI



Size	ESAPI	XSAPI
XS	3.80	4.18
S	4.75	5.23
M	5.45	6.00
L	6.25	6.88
XL	7.10	7.81





Future Focus Areas



- ESAPI / XSAPI Weight Reduction
- Smart Armor Sensors
- Flexible Body Armor
- Blunt Trauma Testing Methodologies



Future Focus Areas

“ESAPI / XSAPI Weight Reduction”



■ ESAPI / XSAPI Weight Reduction

- Near Term (1-2 yrs): 10%
- Mid to Long (3-5 yrs): 20-30%
- New ceramic or other novel materials
 - Understand the properties of ceramics and the affects on ballistic performance
 - Hardness, modulus, density, porosity
 - Microscopic levels (grain size distribution, grain boundary, etc)
 - Academia / Industry: Concepts & ideas for new materials that combine properties
 - ceramic hardness & fiber flexibility &/or rate dependence (harder/stronger with higher strain rates)
- New fiber composite (backing) development
 - New fibers with tenacity (60-100 g/d) – dyneema and spectra have about 40 g/d strength
 - New resin systems (impact on composite ballistic performance)



Future Focus Areas

“ESAPI / XSAPI Weight Reduction”



- **ESAPI / XSAPI Weight Reduction (continued)**
 - Out of box thinking of integration technique for optimization
 - Understand defeat mechanism, dynamic response of materials, and each part of the material
 - Understand impedance match or non-match effects on hard armor (shock wave propagation mechanism within different materials and the end item as the result of the integration)
 - Understand how and why the interlayer bonding is important and sensitive to the performance. The optimization of bonding strength between each component must be studied and understood
 - Correlation of non-destructive properties and ballistic performance
 - Develop non-ballistic or non-destructive testing to evaluate ceramic ballistic performance to include dynamic testing, residual stress testing, etc.. no one in the world has done anything like that
 - Create new testing techniques, methodologies to better understand and correlate the “unknown non-ballistic properties” to ballistic performance



Future Focus Areas

“Smart Sensor”



- **Smart Armor System**

- Armor integrity can be inspected at the individual level with a simple quick “key chain” type
 - Sensitivity – proven good
 - Repeatability – large number samples need to be tested
 - Universal* – the technique should be able to be applied to all types of ceramic based armor systems. All hard armor contractors will have to work with new sensor system to develop the manufacturing process to incorporate the technology into the production line
 - Environmental – temperature, humidity, fluids, etc.. will not affect the sensor



Future Focus Areas

“Flexible Body Armor”



- **Flexible Rifle Protection Armor System**

- Long Term
- New materials, such as ceramic fibers which would provide the strength, hardness and other properties to defeat hard steel core bullets
- Innovative designs which would provide high mass efficiency in monolithic ceramic tiles
- Dynamic smart materials which may have different mechanical/physical properties when impacted by high velocity projectiles
- Flexibility definition, the testing methodology, and evaluation criteria



Future Focus Areas

“Blunt Trauma Testing Methodologies”



- **Blunt trauma testing methodology**

- We need to understand the correlation between clay deformation (currently used universally) and blunt trauma
- We need to study the correlation between clay deformation and max force/pressure behind the armor to include soft/hard armor, and helmets
- The testing methodology for blunt trauma needs to be developed to replace the clay procedure

Meeting The Warfighters' Requirements



Saving Lives Every Day