THE WARRIOR

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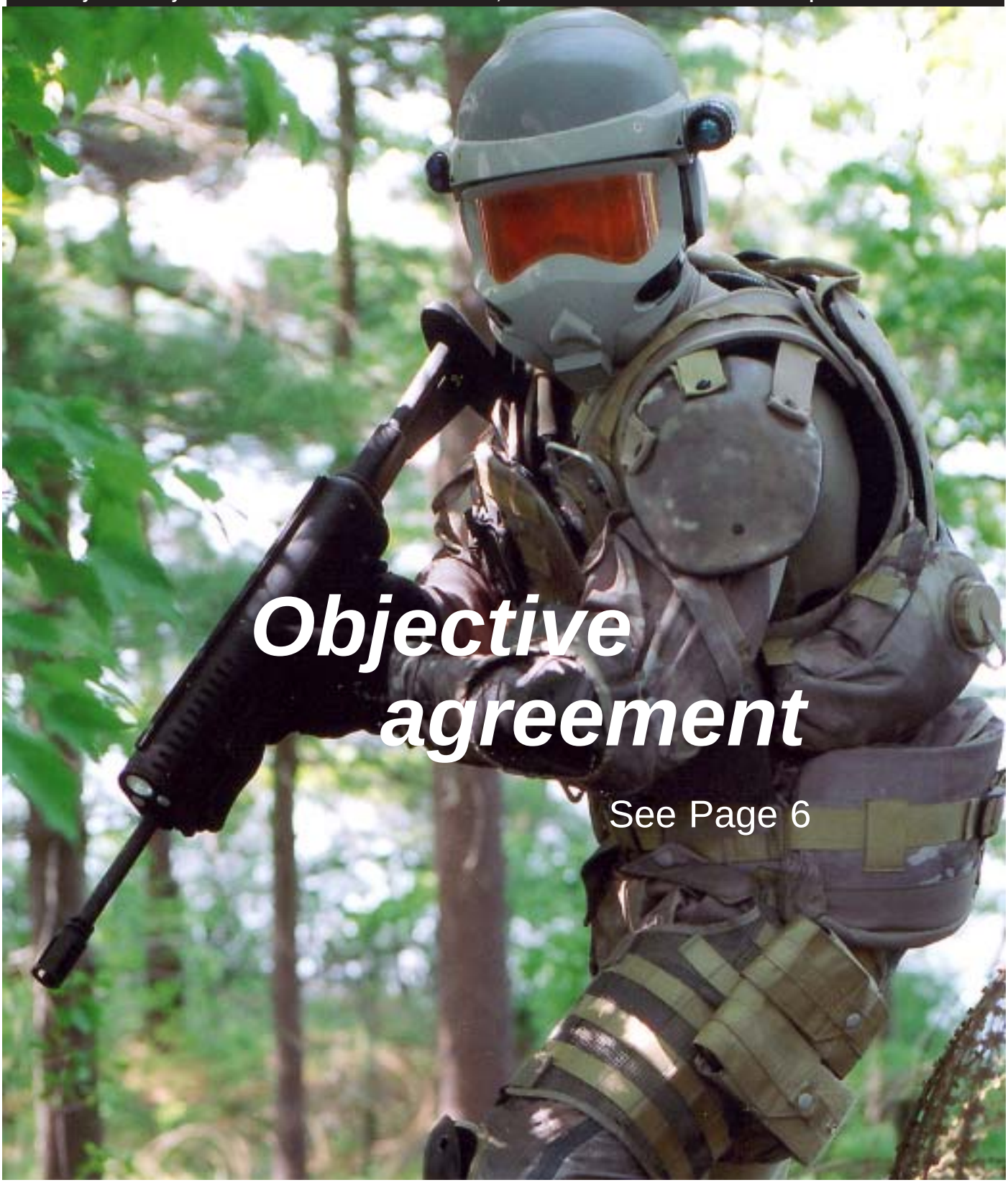

Objective agreement

See Page 6

Contents

Cover photo: Dan Harshman, with the Operational Forces Interface Group, portrays Objective Force Warrior. (Warrior/ Underhill)

THE WARRIOR
U.S. Army Soldier Systems Center

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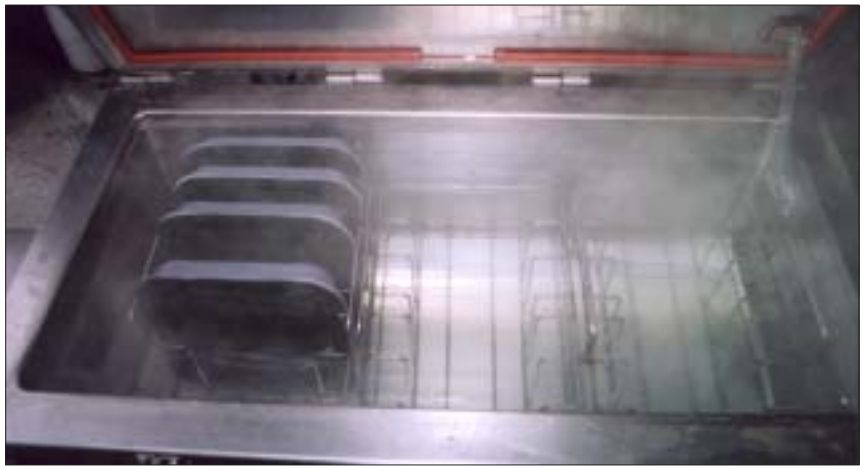
Heater prepares multiple rations

By Curt Biberdorf
Editor

Clouds of steam escaped the opened steel box and soon evaporated enough to clearly reveal its contents. The prototype Multi-Ration Heater being demonstrated will pave the way for Air Force cooks to prepare heat and serve meals.

"The Multi-Ration Heater has proven to be a cost-effective, reliable and safe piece of field-feeding equipment that meets the needs of the customer," said Mario Lucciarini, project officer for the Systems Equipment Engineering Team, part of the Department of Defense Combat Feeding Program at the U.S. Army Soldier Systems Center in Natick, Mass. "The Air Force has never used heat and serve rations before until the current requirements came along for the Single Pallet Expeditionary Kitchen."

The portable, stainless steel heater re-thermalizes as many as 18 polymeric tray packs or a combination of No. 10 cans in 30-45 minutes.



Warrior/Biberdorf

Polymeric tray rations are prepared with the Multi-Ration Heater.

Besides the kitchen, the heater is also designed for use on the back of a Humvee as a "heat-on-the-move" concept.

It uses a commercial burner manufactured by R.W. Beckett Corp. capable of operating on JP-8 or diesel fuel.

Fuel lines connected to a standard 5-gallon external tank provide the burner up to 10 hours of continuous operation.

Underneath the water tank, the burner supplies 56,000 BTUs of heat through a double-pass heat manifold with an 87 percent efficiency rating.

Water is heated to 185-195 degrees F required to achieve the proper serving temperature.

"Hot air enters and travels through the length of the heater, enters a heat manifold, then is directed back, making it fuel efficient by eliminating excess heat loss," Lucciarini said. "The low-cost commercial-off-the-shelf Beckett burner provides tremendous logistical support. Spare parts are readily available from the Beckett Corp. or any Beckett dealership across the country."

The skid-mounted heater has a watertight electrical control box with a circuit breaker and switches for main power and pre-heating.

A sensor automatically shuts off the burner if the water tank level drops below 2 inches or if the heater tips over.

Operation is as simple as placing the tray packs into a rack, filling the 15-gallon tank with water and turning it on.

Testing at the Soldier Systems Center's Climatic Chambers last year indicated that the Multi-Ration Heater will start and operate trouble-free in temperatures ranging from minus 25 to 120 degrees F.

Warrior/Biberdorf

The stainless steel Multi-Ration Heater operates with a simple control panel and uses a burner with an 87 percent efficiency rating.

Battlespeak

Communications system integrates into improved helmet

By Curt Biberdorf
Editor

Whether it's a bomb blast or gunfire, noise suppression against the deafening sounds of combat is one of several advantages of the Modular Integrated Communications Helmet (MICH) communications component.

The MICH is part of the Special Operations Forces Personal Equipment Advanced Requirements (SPEAR) program, a U.S. Special Operations Command modernization program managed by the Special Operations Forces-Special Projects Team at the U.S. Army Soldier Systems Center in Natick, Mass.

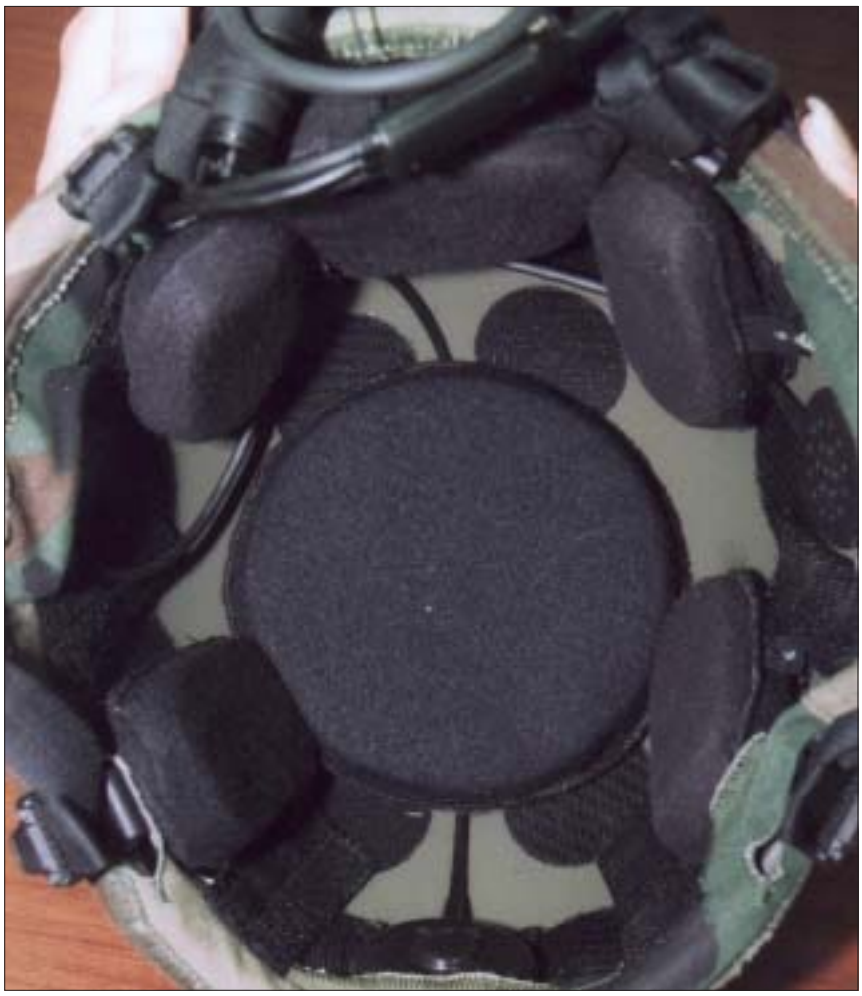
Conceived as a single integrated helmet program, MICH development was separated into helmet, land communication and maritime communication subprograms because of specific user-group needs, said Richard Elder, MICH project officer. The helmet began fielding in 2001, followed by land communications systems in 2002. Maritime communications are scheduled for delivery starting in 2003.

The helmet trims the edge off of the commonly used PASGT Kevlar helmet fielded since the early 1980s to reduce weight, increase situational awareness and better integrate with body armor. The MICH bumps up the ballistic protection and increases comfort by employing a seven-pad foam suspension system.

For paratroopers, the MICH four-point chinstrap keeps the helmet on and stable during jumps without a retention strap or shock pad necessary with the old helmet.

"We can take away the soldier's attention from equipment concerns so he can focus on the mission," Elder said.

Helmet covers are reversible for woodland or desert camouflage patterns, and the sizes have been reduced from five to two. Different suspension pads take up the slack for the array of individual sizes.



Warrior/Biberdorf

Foam pads provide a flexible suspension for the MICH. Headphones and a bone microphone fit neatly along the inside.

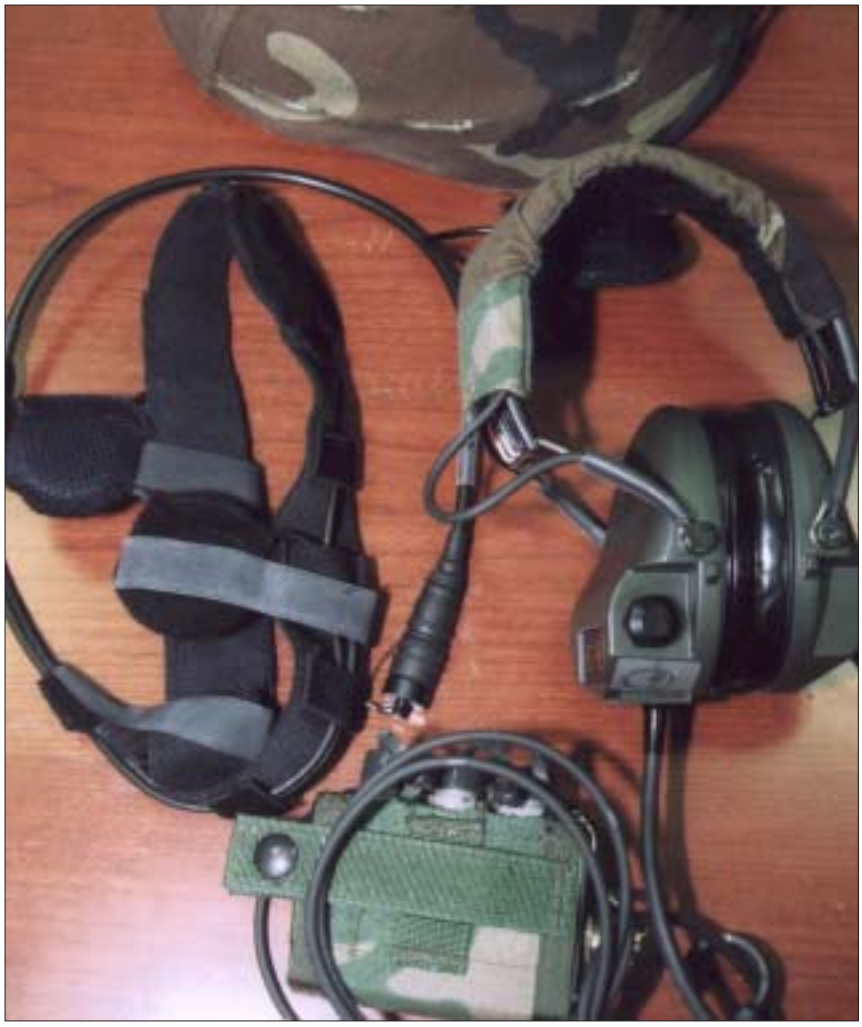
Elder said the helmet will eventually be issued to all troops, but the communication component for now will continue to be gear set aside for the Special Operations community.

The MICH communications suite is fully compatible with all 30 radio systems used by the Special Operations Forces and Marine Corps. This is accomplished by using modified commercial-off-the-shelf impedance matching technology with a version for land and maritime operations.

Before MICH, special operators could find themselves monitoring several radios with a specific handset for each one. It was stressful if they encountered difficulties.

"Our job was to funnel all of them into one product. Now, for the first time, a user is universal," Elder said. "They can plug into everything they're going to find—helicopter, fixed-wing aircraft and special boat units. He can monitor across the board."

MICH communication components consist of high and low-noise headsets with a microphone and speaker system that can be attached inside the helmet or worn alone. A headset cord connects to an impedance matching box to convert the



Warrior/Biberdorf

High or low-noise headsets can be worn alone or attached inside the helmet. An impedance matching box adapts to different radios.

Warrior/Biberdorf

A choice of cords, tailored to the user, connects the adapter box to the radio system.

radio signal, and then a selection of cords, based on the user, connects the box adapter to one or more radios. They have dual-radio channel capability with a simple press-to-talk button located on either the cord or box. Although it's a dual channel system, the user can plug into another radio with many more active channels. Headset speaker systems are configured to monitor separate radio systems.

"It's a catalog of gear that each individual unit can tailor to their profile," he said.

Low-noise headsets are worn on patrol or on reconnaissance and leave the hearing unprotected, allowing the user to monitor ambient environmental sounds from all directions.

High-noise headsets cover the ears completely and use unidirectional microphones on the front of each earphone to pick up and amplify ambient sounds out to 150 meters.

When sound levels exceed 85 decibels, which is the threshold of hearing damage, the microphones turn off automatically, and the headphones become hearing protection. They're intended for direct action, close quarters combat or lookout points. Because radio chatter and static is contained in the earphones, special operators can move silently.

The land system uses a bone microphone that works by "translating" the vibrations in the skull into electronic voice signals. This technology eliminates the background sound when used in noisy or windy environments. Elder said the microphone functions when placed anywhere on the head, but some users find that it works better in certain locations.

"We've freed that real estate in front of his face. He doesn't risk getting snagged on things in his way," Elder said. "The more sleek he is, the faster he can move and the more lethal he becomes."

The user also doesn't need to worry about getting it wet. All of the systems are waterproof and submersible, but the maritime communications can handle pressure down to 66 feet. The other difference between the land and maritime is that the maritime system uses a boom instead of bone microphone.

The Special Operations community has used the system on actual missions, according to Elder, and they are pleased with the performance.

"Users we come across think it's great. They've called us across theater to say thanks," Elder said, adding why the program's so important. "It's life or death, especially in a joint community. If you can't talk, you're in trouble."

OFW award marks milestone

The Objective Force Warrior Advanced Technology Demonstration Science and Technology program is taking the next step in the concept development phase with the announcement of the companies hired to be competing Lead Technology Integrators (LTIs).

Eagle Enterprise Inc., of Westminster, Md., and Exponent Inc., of Menlo Park, Calif., each will receive nearly $7.5 million in government funding for the eight-month Phase I effort.

"The award of these agreements marks a major milestone for Army Science and Technology," said A. Michael Andrews, deputy assistant secretary of the Army (Research and Technology)/chief scientist. "Our soldiers are the heart and soul of the Objective Force. We look forward to moving ahead in this transformational endeavor as partners with the LTIs."

The Objective Force Warrior Advanced Technology Demonstration (OFW ATD) consists of three phases. Phases I and II are led by the Natick Soldier Center in Natick, Mass., with an Army-wide team.

In Phase I, the two competing teams will work closely with the Army to develop the OFW concept design, and the Army will downselect to a single LTI. In Phase II, preliminary and detailed OFW designs will be performed by the downselected LTI, and component technologies and subsystems will be integrated into the OFW system of systems.

Phase III of the ATD will be conducted under Program Executive Office-Soldier (PEO-Soldier) leadership at Fort Belvoir, Va., to build 50 prototype systems of systems followed by Army field experiments and demonstrations to culminate the ATD.

This LTI approach seeks to develop technologies faster and to a higher level of maturity in Science and Technology (S&T) to shorten the time needed in the System Development and Demonstration phase, which will reduce total time needed to develop, test and field OFW by the end of this decade.

"It is very gratifying to have (the Natick Soldier Center) lead the Army effort with the LTIs," said Philip Brandler, director, Natick Soldier Center. "We have a strong team across the Army S&T labs, and a partnership with PEO-Soldier ensures that we can get this new capability to our soldiers soonest."

Col. James Moran, PEO-Soldier, added, "the selection of the LTIs marks an important decision by the Army in the transformation of the soldier and the Land Warrior program to the U.S. Army's Objective Force."

The LTI selection follows completion of several independent panel reviews to define the soldier system vision within the context of Army Transformation and begins the earnest and necessary partnership between OFW and Future Combat Systems to achieve the Army vision.

The following are general questions and answers about Objective Force Warrior.

What are the differences between Land Warrior and Objective Force Warrior (OFW), and how do the two relate?

Warrior/Underhill

Dan Harshman, a member of the Operational Forces Interface Group in Natick, Mass., portrays Objective Force Warrior. The OFW concept is a lightweight, fully integrated combat system for the individual soldier.

Land Warrior and OFW programs are synchronized and, together, are critical to transforming the soldier as the central piece of the Objective Force.

The Land Warrior program is principally focused on near-term improvements, using mature technologies in lethality, communications, situational awareness and mobility for all Army infantry units.

The path down the road to transformation for soldiers starts with the fielding of Land Warrior. Land Warrior will provide soldiers at the platoon-size unit and below with voice and data connectivity, enhanced target acquisition—including from concealed positions—and improved navigation capabilities.

Further capability enhancements to Land Warrior will be fielded in Fiscal Year 2005-2008 to the Stryker Brigade Combat teams, providing connectivity to the new Stryker vehicles.

The first units to be equipped with Land Warrior are the Rangers in FY2004. Capability improvements to Land Warrior will then be incorporated and fielded to the Stryker Brigade Combat Teams from FY2005-2008.

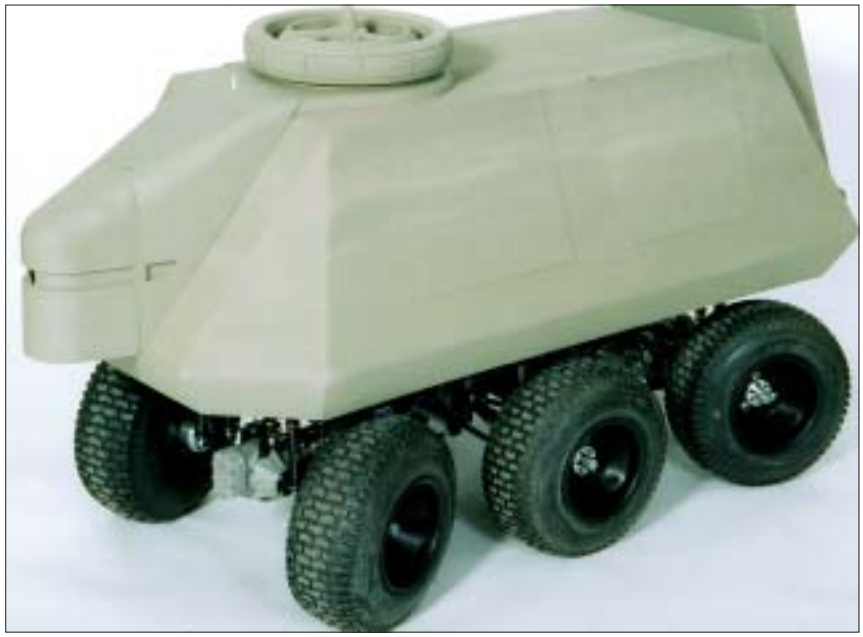
OFW is the Science and Technology (S&T) name for Land Warrior Block III and will expand from infantrymen to ultimately all soldiers in the Objective Force unit.

Similar to the Future Combat Systems (FCS) approach, after this first S&T phase transitions to Land Warrior Block III, a second S&T phase will integrate more advanced components in which the technologies are currently too immature.

How does OFW fit into the Objective Force?

The Objective Force is the future Army, the results of Army Transformation. The Objective Force requires that all aspects of doctrine, training, leader development, organizations, material, installations, infrastructure, and institutions be reconfigured and optimized to empower soldiers.

Soldiers will remain the centerpiece of our formations, not equipment or technology. Naturally, OFW, as a soldier system of systems, has direct impact on the capabilities of our individual soldiers.



Warrior/Underhill

This 1/3 scale model is a concept of a robotic mule that may be used by Objective Force Warrior. The Army is investigating robotic systems to lighten the soldier's load down to 40 pounds as well as perform other combat missions.

How big a difference will OFW make to the future Army? How will the Future Combat System (FCS)-equipped Army be different than today's Army?

The transformed Army, enabled in large part by FCS and OFW, will increase the strategic deployability and tactical mobility of our heavy forces while dramatically increasing the firepower and survivability of our light forces.

Most importantly, OFW-equipped soldiers and leaders linked to FCS will have an overwhelming advantage in future operations because they will be able see first, understand first, act first and finish decisively.

OFW includes an advanced combat ensemble providing enhanced mobility, broad spectrum individual protection, sensory inputs and physiological status monitoring, networked communications and collaborative situation awareness enabled by linkage to robotic air and ground platforms to form an adaptive, distributed sensor network.

OFW will have lightweight weapons with advanced fire control and netted lethality within the team and with FCS platforms, man-portable power sources, linkage to robotic ground platforms for load carriage and embedded training.

These capabilities will enable soldiers and small units to conduct dismounted maneuvers with a fighting load not to exceed 50 pounds over the course of a 24-hour mission without re-supply.

What is the weight goal for the OFW system and how will it be achieved?

The long-term weight goal of Objective Force Warrior is 40 pounds, with the goal to reduce the soldier's load to 50 pounds during the Advanced Technology Demonstration Phase.

The Army expects to achieve this by using an integrated, lightweight fighting system providing enhanced capabilities at reduced weight and by off-loading to a robotic mule. Technologies being pursued to achieve a lightweight fighting system include lightweight multi-functional materials and composites and higher efficiency power generation, storage and management.

When would units first be fielded Land Warrior Block III?

The Army will equip the first unit in FY2008 and attain the initial operational capability in 2010, commensurate with FCS, and assuming the extra System Development and Demonstration funds are provided to meet that initial fielding.

Unscorched

Nomex coverall affordably protects soldiers from fire risks

By Curt Biberdorf
Editor

Nomex coveralls sent to a group of combat support soldiers participating in Operation Enduring Freedom could be the beginning of affordable flash-flame protection for all soldiers.

Seventeen sets of the disposable garments were sent from the U.S. Army Soldier Systems Center in Natick, Mass., in July in response to a request in June that included flame-resistant clothing. The sage green, commercially-available coveralls were selected because of their ability to reduce burns from 88 percent to 8 percent at a three-second exposure on an instrumented manikin when worn over a Battle Dress Uniform (BDU), T-shirt and briefs.

"The problem is that soldiers are going to be at risk of burns from accidental flash fires because they don't have the right clothing," said Carole Winterhalter, a textile technologist with the Individual Protection Directorate, who responded to the request.

Furthermore, the coveralls cost $25 a set. Fitted over a regular BDU, the cost totals about $80 vs. $180 for a Nomex aircrew BDU.

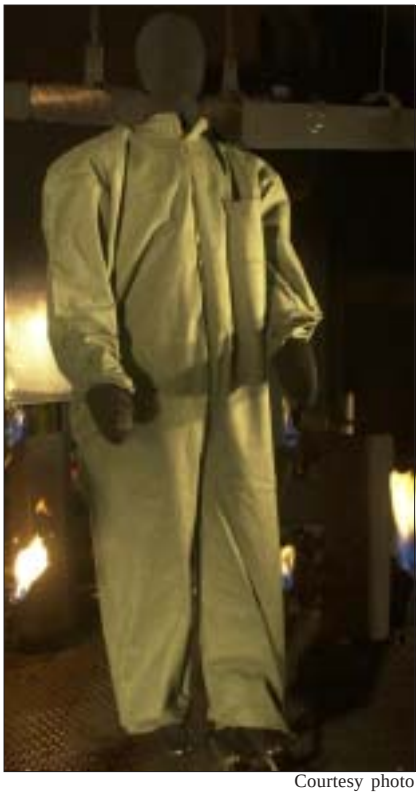
Soft, lightweight and air-permeable, the coveralls are made from a blend of 92 percent Nomex, 5 percent Kevlar—both flame-resistant fibers developed by DuPont—and 3 percent nylon.

Cost savings are credited in part because the non-woven material is made by direct fiber-to-fabric manufacturing that removes the steps of yarn spinning and fabric preparation yet retains high tearing strength. Another reason is the simple garment design with no cuffs and minimum stitching. If the sleeves or legs are too long, a soldier can snip off the extra length with scissors.

Army aviators and tank crew members are the only servicemembers authorized to wear flame-resistant clothing, which is made mostly from woven Nomex fabric. The fiber chars instead of melts and gives durable flame protection for the life of the garment. Although well-liked, Winterhalter said the clothing is too expensive to issue to every ground soldier.

A team of scientists at Natick has been working on a five-year research and development program to establish flame and thermal performance requirements for military clothing systems, demonstrate a flammability test methodology that simulates military flame and thermal hazards, and finally come up with an affordable protective clothing system for infantrymen.

"The thought was that everything from the skin out had to be flame-



Courtesy photo

An instrumented manikin wears a Nomex coverall before flame testing.

Courtesy photo

Flames engulf the manikin for three seconds.

Courtesy photo

The charred coverall shows little damage from the flames.

resistant," Winterhalter said. "We're finding that's not necessarily the case."

Depending on the application, only the outer layer needs to be flame-resistant.

"Based on laboratory testing, we found that just the insulation—the thickness of the material—provides thermal protection. Each additional clothing layer adds insulation and increases protection time," Winterhalter said.

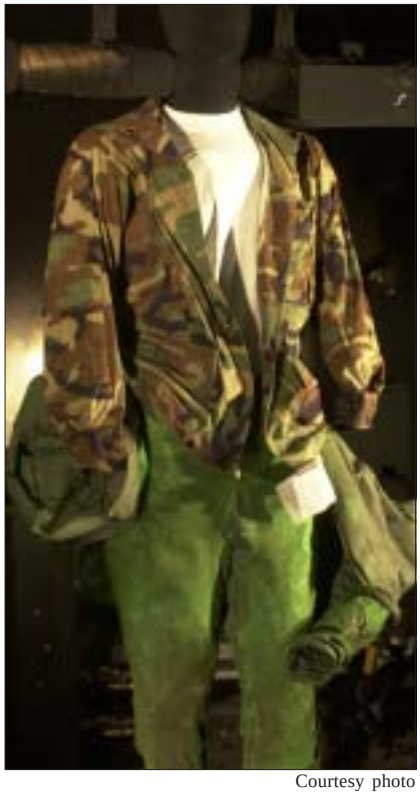
In an environmentally-controlled chamber, the scientists used an instrumented manikin equipped with 122 sensors that can determine the percentage of second and third-degree body burns on everything except the hands and feet. In testing, it simulates the effects of flash fires soldiers may be exposed to on the job.

The coveralls now supporting the soldiers were designed for industry. Not intended for fire fighting, they passed National Fire Protection Association standards for industrial workwear when independently tested by the Underwriters Laboratory. Winterhalter said it's a limited-wear garment with low-abrasion resistance and prone to pilling. For an industrial worker, it may last 10-12 washings before being disposed.

"We're hoping to get feedback from the soldiers and use it in conjunction with an ongoing development effort to come up with a military-specific version," she said.

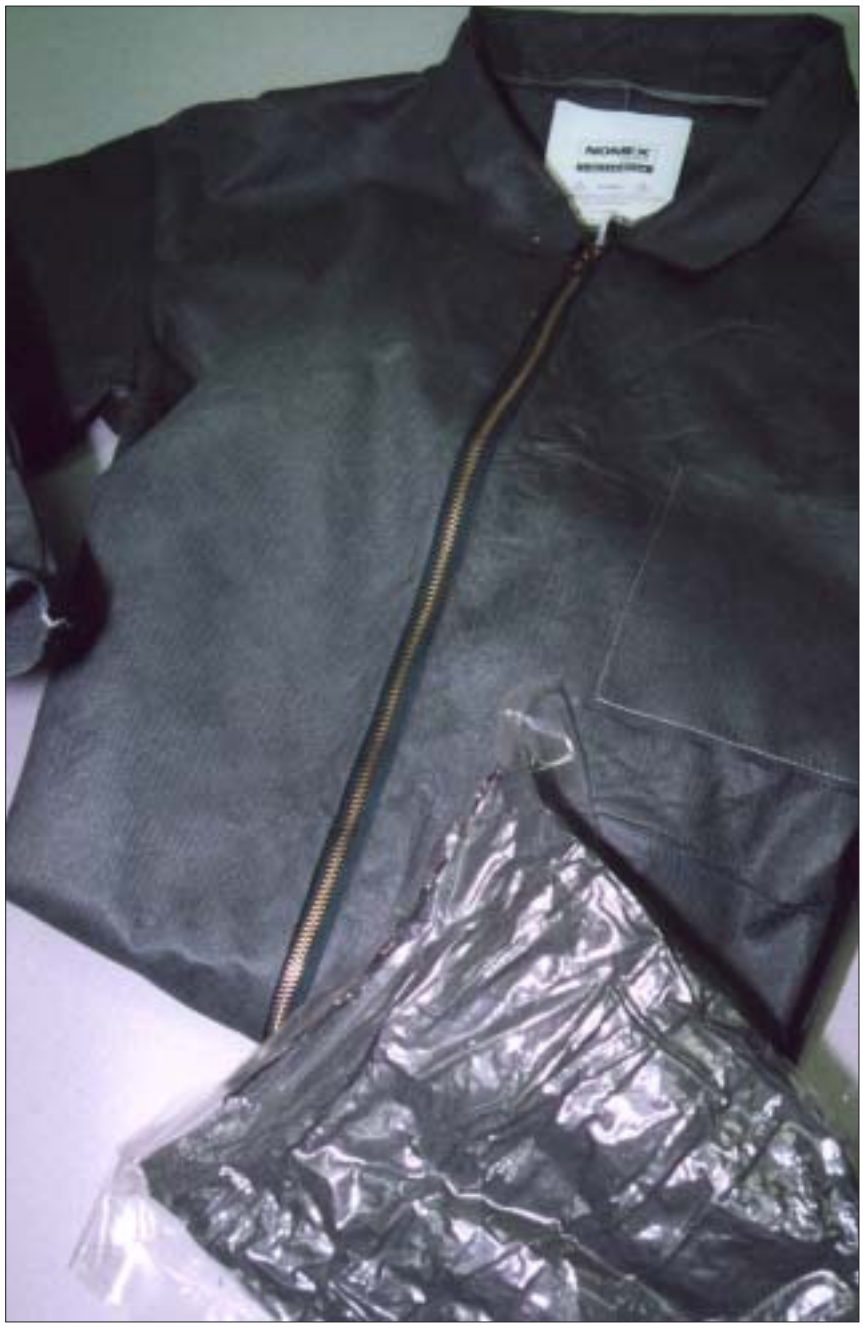
The military version will have a camouflage pattern, openings to gain access to garments worn underneath, sizing that fits the military population, and an oil and water repellency treatment that may also reduce pilling and enhance durability. Even at double the cost and worn over the BDU, Winterhalter said the system will still be 40 percent less expensive than existing flame protective clothing.

That would meet the team's final objective of developing a flame-protective clothing system that's 30-50 percent less expensive than existing Nomex-based systems.



Courtesy photo

Pulling off the coverall exposes an intact Battle Dress Uniform.



Warrior/Biberdorf

Commercially-available Nomex coveralls, originally designed for industrial workers, use a simpler manufacturing process to help lower the cost. Seventeen sets were sent to soldiers participating in Operation Enduring Freedom.

Group food

Unitized ration fuels troops when field kitchens arrive

By Curt Biberdorf
Editor

Soldiers don't live on MREs alone. In the earliest stages of deployment, the versatile Meal, Ready-to-Eat (MRE) dominates field feeding. However, once field kitchens arrive, cooks can begin serving up to two hot meals per day with the Unitized Group Ration (UGR).

Developed by the Department of Defense Combat Feeding Program (CFP) at the U.S. Army Soldier Systems Center in Natick, Mass., the UGR streamlines the process of providing the highest-quality group feeding meals in the field. The UGR Heat and Serve (UGR-H&S) uses shelf-stable tray entrees while the UGR A-Ration (UGR-A) uses frozen entrees. Both versions are integrated with brand-name commercial items to form a complete meal.

"They're very easy to prepare. Everything (on the UGR-A menu) is pre-cooked except for steak," said Susan Harrington, project officer for the CFP's Fielded Group Ration Improvement Program. "Since the prep time is significantly reduced, some cooks spend time spiffing up the meal by adding garnishes for a good presentation."

Before the UGR was introduced in the mid-1990s, cooks had to order an average of 34 items and hope they all arrived together to enable a complete meal. The UGR packages the main course, side dishes, desserts, drink mixes, condiments, spices and other ingredients along with disposable trays, cups, flatware and trash bags into one or two stock order items. Each three-box module feeds 50.

Supplements, such as bread, milk, cold cereal, and when possible, enhancements such as fresh fruits and salads, are still ordered separately. Harrington also said soldiers like to eat them, especially the UGR-A. Similar to the MRE program, UGR menu items are regularly changed to satisfy consumer requests. One-week field evaluations are conducted annually to identify shortfalls and test new components.

Warrior/Underhill

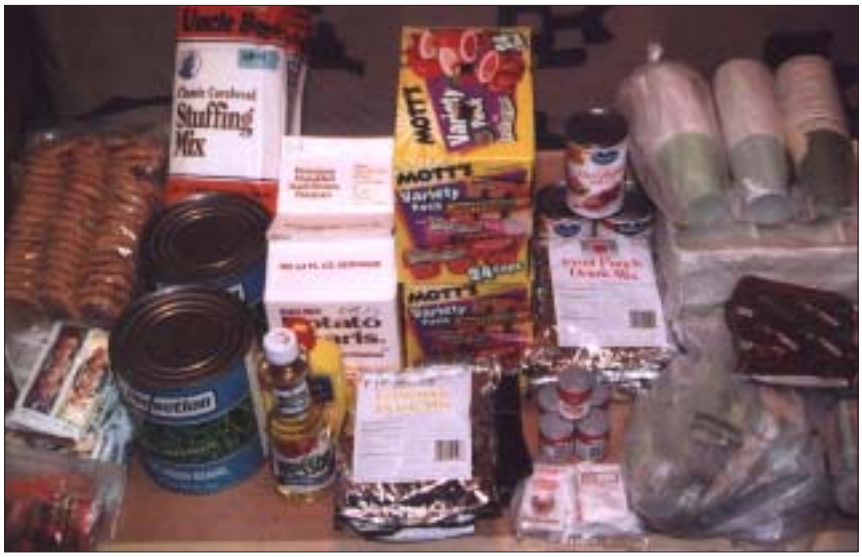
Each three-box module of the Unitized Group Ration feeds 50.

"I have to make sure that every food item is acceptable to the warfighters," Harrington said. "Most of the components do very well in our evaluations, and as more items become commercially-available, we can bring them into the UGR. We've introduced cappuccino to replace cocoa. Chai is another item we're looking into. Little things like that really seem to increase acceptability."

The UGR expanded from five to seven breakfast and 10 to 14 lunch or dinner menus for heat and serve and A-Rations in 2001.

Refrigerator-free

During Operation Enduring Freedom, troops were eating the UGR-H&S after 12 days, according to Harrington. They're the first hot meals served when kitchens are in



Warrior/Biberdorf

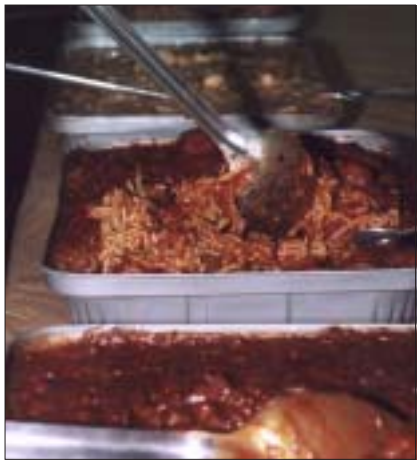
Unitized Group Ration components are shown unpacked from their box containers. One of the changes made to the UGR is more commercially-available items.

Warrior/Underhill

place but refrigerators and freezers are unavailable.

UGR-H&S modules are unitized into fiberboard boxes and assembled at two government depots. The primary component is the shelf-stable entrée contained in a polymeric tray.

Trays are heated in boiling water, opened and served directly from the tray. Stocks of the older metal traycans are quickly leaving the inventory because of increased usage during Operation Enduring Freedom and should be entirely replaced with polymeric trays by next year, according to Harrington. The new polymeric trays mean no more special can openers and the cuts often inflicted from the jagged metal lid. By contrast, opening the polymeric tray is as simple as cutting through the foil-laminated plastic lid with any sharp instrument.



Warrior/Biberdorf

Tray rations are packed with the UGR Heat and Serve.

Shelf life of the UGR-H&S was dropped from three years to 18 months at 80 degrees F to allow for more commercially-available items. "We wanted to get away from the generic white label products and substitute with brand-name products. Warfighters want recognizable brands, like the ones they would eat at home. We eat with our eyes, and generic is not always eye-appealing," Harrington said.

New UGR-H&S lunch or dinner items planned in the next two years include lasagna with vegetables, pork tamales, mashed potatoes with poultry gravy, jalapeno cheese spread, tapioca pudding and peanut butter chocolate chip cookies. Among the new breakfast items are omelet with ham and potato, cinnamon swirls and banana nut loaf.

Harrington said the warfighters participating in Operation Enduring Freedom are providing immediate and helpful information as they are becoming more familiar with the products than they would during training exercises. Because of the continually poor response to heat and serve tray eggs, she said her program is investigating replacing them with dehydrated eggs in a boil-in-bag pouch.

First string

Once established at a base camp with refrigerators and freezers, cooks can transition to the UGR-A as they become available. Warfighters were eating the UGR-A within 30 days after the start of Operation Enduring Freedom.

Cooks order a non-perishable module and a perishable module assembled and delivered directly by the vendor. Shelf life decreases to six months, but it's a trade-off.

"The UGR-A is as close to restaurant or garrison-quality in the field as you can get," Harrington said.

UGR-A menus were expanded and standardized with the UGR-H&S. Changes and improvements include new chicken fajitas and larger serving portions for the barbecue rib meat and hamburgers.

Add water

A new UGR-B is scheduled to replace the Unitized B Ration in 2003.

The Unitized B Ration comprises mostly canned and dehydrated components packaged in metal or non-metallic containers, and is ordered mainly by the Marine Corps. The Unitized B Ration currently consists of 10 breakfast and 10 lunch or dinner menus with a shelf life of 24 months at 80 degrees F. They require a kitchen to prepare but not refrigeration.

Harrington said the Marines requested more commercial items to be included in the new UGR-B and anticipates offering shelf-stable alternatives to the UGR-A's perishable components.

The UGR has other special-purpose options. An arctic supplement with extra snacks and beverages for cold weather climates is designed to provide extra calories and encourage fluid intake. In 2004, a medical diet supplement consisting of liquid foods, such as gelatin or instant breakfast drinks, will be revisited to replace cost-prohibitive medically-unique items with commercial foods.

"It's designed for patients in a field hospital who require special diets due to illness or injury. Low quantities are ordered, and they're expensive," Harrington said.

Staying on top of consumer preferences and restaurant capabilities as well as field evaluations are ways CFP researchers ensure consumer satisfaction with the UGR now and into the future. "We will be continually updating feeding trends and introducing new, highly acceptable items into the system," she said.