



THE WARRIOR

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Future cop

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Cover photo: Massachusetts State Trooper Craig McGary wears a mock-up version of the Law Enforcement/Corrections Tactical Uniform System. (Warrior/Underhill)

**Deputy Commanding General for
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Jeremiah A. Whitaker

Editor

Curt Biberdorf

Staff Photographer

Sarah E. Underhill

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U.S. Army Soldier Systems Center
Public Affairs Office
ATTN: AMSSB-OPA(N)
Bldg. 45, Kansas Street
Natick, MA 01760-5012
(508) 233-4300/5340
DSN 256-4300/5340

U.S. Army Soldier Systems Center
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Studies held at Pikes Peak

By Karen Fleming-Michael
Contributing Writer

Scaling new heights in science takes on a whole new meaning each summer for U.S. Army scientists who travel to Colorado to test how environmental factors, such as cold and altitude, affect soldiers' performance.

"In general, the better we understand how a soldier responds to a particular environment, with respect to both physical performance and susceptibility to illness, the better we can prepare him for that environment," said Dr. Allen Cymerman, a research physiologist at the U.S. Army Research Institute for Environmental Medicine (USARIEM), an installation partner at the U.S. Army Soldier Systems Center in Natick, Mass.

Cymerman was among the researchers returning from a six-week stay in Colorado Springs. At the 14,110-foot summit of Pikes Peak, in the John Maher Memorial Laboratory, a team from USARIEM annually conducts studies with volunteers in July and August.

With data in hand, USARIEM researchers return to the Soldier Systems Center, interpret the results and then disseminate them through published biomedical journals, technical reports and information papers, all of which ultimately impact Army doctrine.

Army leaders are quick to turn to USARIEM's 35 years of research for answers, said Sgt. Dave DeGroot, research assistant at USARIEM.

When the United States entered Afghanistan last fall, the 18th Airborne Corps' surgeon tapped USARIEM's Drs. Cymerman, Stephen Muza and Charles Fulco to provide information papers on what troops should expect in the cold mountains of the region.

In a collaborative study conducted this spring and summer with scientists from the Palo Alto Veterans Affairs Medical Center, researchers conducted baseline, sea-level tests on 18 men from the Palo Alto, Ca-

lif., area in March and April. In July, the research volunteers traveled to the summit for two weeks to burn 1,500 calories a day more than they consumed to test the effect of antioxidant supplements and carbohydrate drinks on physical and mental performance at altitude.

"The theory is that oxidative stress may contribute to the development of acute mountain sickness, but an antioxidant supplement with vitamins A, C and E, plus selenium and zinc may improve how someone feels and adapts to altitude," Cymerman said. "The carbohydrate drink study tested the hypothesis that carbohydrate supplementation during an exercise test at altitude will improve physical performance."

Studies like this add to USARIEM's body of knowledge but also show the impact collaborative partnerships offer the Army and the civilian sector. This year marks the third and final year of a series of studies between USARIEM and the Palo Alto VA Medical Center.

Keeping the research volunteers at a negative caloric balance meant exercising continuously, DeGroot said. The group, including researchers, embarked on hikes in the Rocky Mountains, where they encountered cool temperatures, 40 mph winds and fast-developing thunderstorms. Ad-

ditionally, a 16-foot by 32-foot tent was erected to house treadmills, exercise bikes and weight training equipment to keep the 18 volunteers moving. Research volunteers were tested on everything from their breathing, to their physical and mental performance, to their food intake.

Despite the rigorous tests and workouts, the volunteers did not have to rough it in the mountains. The Maher Lab, a mid-1960s construction named for a former director of USARIEM's Altitude Research Division, boasts one large and two small labs, two bunk rooms for subjects and researchers, a kitchen and dining area as well as bathrooms and laundry facility.

Researchers descended Pikes Peak pleased with the preliminary information they gleaned for warfighters.

"This year's study examines if an antioxidant supplement will reduce the incidence and severity of acute mountain sickness, and if a carbohydrate supplement improves exercise performance at altitude," Cymerman said. "As appropriate, this information will be included in future guidance that we provide to the rest of the Army."

Editor's Note: Karen Fleming-Michael is a staff member of the Fort Detrick Standard newspaper.



Photo by Sgt. Dave DeGroot

Two human research volunteers exercise atop Pikes Peak during a study to test the effect of antioxidant supplements and carbohydrate drinks at altitude.



Warrior/Biberdorf

Inside a TEMPER tent, the SPEK is set up with food storage and beverage containers, tables, lighting, a drying rack, flooring, Multi-Ration Heater and Sanitation Hot Water Heater.

Complete SPEK

Kitchen on a pallet lands on Air Force packing list

By Curt Biberdorf
Editor

Serving seven airmen per minute, the Single Pallet Expeditionary Kitchen (SPEK) proved its efficiency during operational testing at Tyndall Air Force Base, Fla., in March and could soon find widespread use in the Air Force.

The SPEK, designed by the Systems Equipment and Engineering

Team at the Department of Defense Combat Feeding Program, located at the U.S. Army Soldier Systems Center in Natick, Mass., was created to satisfy the Air Force's requirement for a rapidly deployable, temporary kitchen for use in remote and undeveloped locations.

Testing showed it exceeded the standard of feeding Unitized Group Rations-Heat and Serve (UGR-H&S) to 300 airmen twice a day in

two hours. Instead, 420 ROTC cadets picked up their dinner in an hour. Better yet, the airmen liked their meals.

"When we fed those cadets and their Air Force commanders, it was unbelievable. They said it was the best meal they had in six weeks since being in the field," said Ken Ryan, SPEK project officer.

The Meal, Ready-to-Eat (MRE) is the first if not only source of food on the first days and weeks of a deployment before a base camp has been established. The UGR-H&S, also called tray rations, are normally the next step up in quality, and their popularity is increasing.

"(The SPEK) allows us to transition away from MREs. As much as possible, we're trying to go to UGRs and eventually get to A-Rations," said Master Sgt. Joe McNamara, with the Air Force Services Agency in San Antonio, Texas. "The guys at Natick put a lot of effort into it, and it's a really good product."

A simple design and setup, the SPEK progressed from a concept to prototype to a finished product in a few years. Everything but fuel,



Courtesy photo

Every item for the SPEK but fuel, water and food is packed onto a single air cargo pallet and flown in an Air Force C-130.

water and food is packed onto a single air cargo pallet and flown in an Air Force C-130. The entire SPEK can be set up by eight airmen in less than two hours and requires a four-person crew to operate the equipment and serve the food.

“Once the SPEK is set up and food prepared, it’s ready to grab and go,” Ryan said.

A three-section TEMPER tent forms the shell of the kitchen. Overhead and mobile interior lighting is powered by a 2-kilowatt military generator while pieces of reinforced plastic form 480 square feet of easy-to-clean flooring.

Besides cleanliness, the floor pieces require little space on the pallet, lock simply together and hug the contours of the ground they are placed on.

Food storage containers and tables with folding legs hold trays ready to be moved to the serving line and trays already on the serving line. After the food is served, airmen can fill up at the beverage container and find a place to eat.

A Multi-Ration Heater warms tray packs and No. 10 cans of vegetables, and the Sanitation Hot Water Heater cleans, washes and sanitizes kitchen utensils and serving pans.

The ration heater and sanitation heater, both developed by the Systems Equipment and Engineering Team, operate using the same kind of efficient, low-cost and reliable commercial burner powered by JP-8 or diesel fuel. They can withstand temperatures ranging from minus 25 to 120 degrees F and up to 100 percent relative humidity. A spare parts kit for these components is included, and extra parts are readily available from R.W. Beckett Corp. or their dealerships across the country.

Operation of the ration heater is as simple as placing the tray packs into the rack, filling the 15-gallon tank with water and turning it on. An affixed menu guidelines plaque provides a chart of cooking times for tray packs and No. 10 cans on either a boil or an automatic mode.

Just as significant is the sanitation system. It’s composed of a burner base, steam generator, three-compartment sink—each compart-

ment holding up to 17 gallons of water—and steam manifold sparger system. The system’s steam generator maintains water temperature for washing at 120 degrees F, rinsing at 140 degrees F and sanitizing at 180 degrees F.

Radiant heat and hot combustion gases flow upward through the steam generator, transferring heat to the water to produce steam. Steam from the generator passes through hoses, control valves and spargers into each sink to maintain water temperatures. The system’s low pressure is safe, and the generator automatically refills with water as it’s converted to steam.

“This gives you amenities you don’t normally see in an initial deployment field kitchen,” Ryan said. “After a base camp is built, the kitchen can be packed onto the pallet and sent elsewhere.”

The Special Operations Command has ordered SPEKs, and the regular Air Force and Air National Guard is preparing to order the kitchens.

Although designed to serve tray rations, Ryan said at some point in the future the SPEK may be upgraded to also prepare A-Rations to extend its mission.



Warrior/Biberdorf

The sanitation system’s spargers emit steam to maintain water temperature in the sinks.



Warrior/Biberdorf

The Sanitation Hot Water Heater has a burner base, steam generator and three-compartment sink for washing, rinsing and sanitizing.

Police officers and prison guards may reach ground-breaking levels of performance with the...

Law Enforcement/Corrections Tactical Uniform System

Story by Curt Biberdorf
Photos by Sarah Underhill

Not quite turning them into Robocops, the Law Enforcement/Corrections Tactical Uniform System may nevertheless reshape special operations law enforcement and corrections officers' ability to perform their jobs.

A prototype uniform designed by the National Protection Center (NPC) at the U.S. Army Soldier Systems Center in Natick, Mass., is demonstrating how the current and future wave of warfighting research and development applies to crimefighting and prisoner control.

Drawing from the many resources at the Soldier Systems Center, the NPC has taken existing and potential future military technology and transferred it to the law enforcement and corrections community.

"We're transforming their capabilities by bringing them into the next century of technology," said David Querim, project engineer for the new uniform. Just as important as technology is integration of the components.

"We're engineers who think of all these things and bring it to the civilian first responder," Querim said. "Nobody has done this before for them. That's our advantage—to integrate the equipment into one usable item."

Still, the Law Enforcement/Corrections Tactical Uniform System leaves room to adapt to the individual or group user. Querim said he envisions a base model that can be fitted with different options for police officers on a special operations team or corrections officers called to disperse riots or extract an uncooperative inmate from his cell.

"I could almost guarantee you that this suit could save a life within its first year of use," said Trooper Craig McGary, with the Massachusetts State Police. An 11-year veteran, the last five as a member of the Special Tactical Operations team, McGary has been picked to model the uniform system.

"A lot of the technology we have right now is 20-year-old Army surplus," he said. "This condenses everything into one suit that could take 20 guys to carry. Each man can be self-sufficient, carrying compact, cutting-edge technology."

The prototype uniform lays the

groundwork and offers a vision of the future.

Connected

The uniform system will adopt the Army's Objective Force Warrior helmet design for fragmentation and impact protection. It incorporates an illuminator, global positioning system and radio antenna suite, image intensifier and infrared imaging device that will send the information into an adjustable head-ups display.

"Everyone on the team could have (an imaging device) instead of just one person, and it would be with them at all times," Querim said.



The system's helmet will carry an illuminator, global positioning system and radio antenna suite, image intensifier and infrared imaging device that will send the information into an adjustable head-ups display.



The uniform system will integrate all of its components. Modularity will enable upgrades as technology improves.

Laser detectors will identify the wearer as friendly while drop down eyewear guards against laser beams and debris. Forced-air cooling from an electric blower is planned to prevent the eye protection from fogging.

A detachable mask will protect against thrown objects or punches during a riot. Another mask will protect against chemical and biological agents while enabling the user to communicate, drink water and breathe filtered air or compressed air from a tank.

Active hearing protection will detect loud noises, suppress them and restore natural hearing. Gel sensor technology will enable users to communicate without a radio or microphone, yet still pick up differences in voices. The same acoustic sensor can monitor physiological conditions, such as heart rate and breathing, to keep a leader informed of the condition of his team members.

Covered

Physiological status monitors also find their way into the suit. In the first layer, lightweight fabric under-

wear will incorporate monitors for system redundancy in case other sensors are disabled. Querim said he expects sensor technology to mature in the next five years and allow communication between the user and team chief for locating position and determining the health condition.

The second or main layer is a one-piece suit made of blended nylon and cotton with 3 percent Lycra for stretch comfort. Cordura nylon reinforces the elbows, seat and knees for durability, and plastic guards are located on the elbows, forearms and knees. A finish will also be available for flash-flame protection. Zippers are designed for easy donning and doffing, and slanted utility pockets are sewn on the upper arm area of each sleeve.

An optional third layer of the suit, either manufactured as a separate component or integrated into the main layer, is intended for protection from the weather and chemical or biological agents.

Equipped

The uniform system's vest protects against projectiles and fragmentation with freedom to move. Snaps and Velcro fasteners ease donning and doffing.

"They'd rather have the ability to move quickly than be completely covered," Querim said. "We've designed it for maximum movement."

Outer pockets hold plate inserts to stop 9 mm rounds and fragmentation. An interior pocket can hold a hands-free hydration system. Stab protection may be developed later, according to Querim, but an articulated armor will line the back of the vest to guard against blunt trauma to the spine. Similar to the Army's MOLLE vest, officers will have webbing in front to attach various items, such as handcuffs and ammunition cases, according to their preference.

"We're focusing on what the users want and need because we know it's not a combat uniform," Querim said. "We're giving them options based on what they think is important."

A pistol holster not yet available is expected to be similar to the tactical holsters that drop down from the belt and attach to the thigh. Around

the waist, a computer belt will hold a battery and small computer processor to run a variety of software, such as language translation, mapping and face recognition. It also will track the physiological data measured on the suit and helmet sensors.

Gripped

Leather pat/search gloves offer high dexterity and dexterity with cut-resistance but no puncture protection. The leather riot control glove lined with para-aramid fiber has padding consisting of fire-resistant foam on the back of the hand and fire-resistant wool for the fingers.

Boots are adopted from the Special Operation Forces. The black leather upper comes with blunt trauma protection for the ankles and abrasive-resistant toe. Nomex laces provide flash-flame protection, and a high traction sole keeps officers on their feet. Shock absorption is found in the cushioned mid-sole and ankle support strap.

The initial working version of the uniform system is expected to be ready by 2005. The uniform's modularity will enable designers to make upgrades as technology improves, Querim said.



An articulated armor will line the back of the vest to guard against blunt trauma to the spine.

Better blend

Camouflage patterns for future uniforms undergo evaluation

By Curt Biberdorf
Editor

Variations of “all over brush”, “shadow line” and “track” patterns in four combinations of colors, along with the all-purpose “Crye”, are in the running for the next generation of Army camouflage clothing.

These patterns for woodland, desert, urban and a combination of desert and urban terrains are undergoing evaluation by the Materials Integration Team at the U.S. Army Soldier Systems Center in Natick, Mass. If selected and approved, up to four new patterns will help conceal soldiers wearing the Army’s future Advanced Combat Uniform and the Objective Force Warrior’s Scorpion uniform.

Existing designs have been around for years, and changes are in order.

Woodland camouflage has been fielded since 1981, with desert camouflage arriving about a decade later. The Army has never fielded an urban camouflage uniform but is interested in adding that capability.

“Woodland camouflage is still based on the European threat of the Cold War. There are new threats today, and there’s always room for improvement,” said Anabela Dugas, a textile technologist. “Until we do an evaluation, we don’t know if there’s a better alternative.”

Camouflage allows a soldier to blend into his environment. Better matching of the color and pattern to the background yields better concealment.

“Trying to get one uniform that blends for everything is the toughest part of the job,” Dugas said. “It really is background dependent. What gets lost in one background stands out in another.”

She said the Army had a goal for its next generation uniform to be one pattern, but it would be difficult to develop because vegetation has a reflectance that’s off the scale compared to rocks and sand. Instead, Dugas along with Kellie Zupkofska,

also a textile technologist, and Richard Cowan, a chemist, are working on the best compromise across the variables.

“Woodland camouflage is the easiest because you can hide in vegetation,” Dugas said. “Desert is complicated because you are out in the open, but urban is really complicated because you’re so close.”

In all the designs, soldiers can expect to see a common color so that the gear is interchangeable with the uniform.

To generate fresh ideas, the team contracted a designer to draw new patterns on paper using information based on decades of camouflage research at the Soldier Systems Center.

Seven initial designs in color printouts were reduced to three after benchtop testing in the Camouflage Evaluation Facility at Natick.

“It’s a quick way to eliminate the least effective patterns before field testing,” Zupkofska said.

“All over brush” has swirls of



Warrior/Biberdorf

The “all over brush” design is shown in desert colors on the manikin. The other types are woodland (left), desert/urban (front) and urban.



Warrior/Biberdorf

“Shadow line” is shown on the leftside photo with “track” on the right. In each, the desert colors are worn on a manikin. Woodland (left), urban/desert (right) and urban colors lie in front for the shadow line pattern. Woodland (left), urban/desert (front) and urban colors lie in front of the track pattern.

shapes and colors, and strays from the more conventional “shadow lines,” which has horizontal lines and “track,” which has vertical lines to its elements. “Crye” is the camouflage intended for all environments that’s now being modeled by Objective Force Warrior and was included in evaluations.

Each of the three designs was printed on a nylon and cotton blend fabric from an ink jet printer. Enough material was printed to fabricate a helmet cover and Battle Dress Uniform shirt and trousers for the first field evaluation at Fort Benning, Ga., in August.

Urban camouflage evaluation was conducted at the McKenna

Military Operations in Urban Terrain (MOUT) site while woodland patterns were evaluated in the adjacent woods. Twelve trained military observers evaluated soldiers posing in the experimental uniforms against different backgrounds at a range of distances and in several positions. The observers then answered a questionnaire rating blending, contrast, shape and pattern.

The best four out of nine woodland and four out of 13 urban uniforms were selected. The same process for the desert uniforms was conducted at several locations at Fort Irwin, Calif., in October. These desert sites were carefully selected and were analogous to locations in

the Middle East. Of the 10 choices, four were selected.

“We wanted to look at every possible yet realistic combination of color and pattern, including the current patterns,” Dugas said.

After the Product Optimization and Evaluation Team at Natick analyzes the data based on the surveys, Dugas said the next step is to fine-tune the shape and color before examining infrared properties. Night testing with evaluators wearing night vision goggles is scheduled for February at Fort Polk, La., and at Fort Irwin.

The final designs could be selected for recommendations as soon as April 2003.

Menu mavens

Armed Forces Recipe Service retains flavor, trims fat

By Curt Biberdorf
Editor

Less fat and sodium. More complex carbohydrates and fiber. All the flavor. Healthier menus are part of an ongoing effort of the Armed Forces Recipe Service (AFRS) to improve the quality of the military's food service.

At 1,700 standardized recipes that expand by nearly one per week, the list is also being modified to reflect changes in consumer tastes and simplify life for cooks while increasing food safety.

"We're serving garrison dining halls on land and at sea. We want to keep soldiers fit by reducing the fat to an acceptable level," said Elizabeth Painter, a food technologist with the Department of Defense Combat Feeding Program at the U.S. Army Soldier Systems Center in Natick, Mass.

"When we create or revise a recipe, it must meet consumer preferences, assure efficient use of personnel, ingredients and equipment, and meet the Office of the Surgeon General nutrition initiatives for lower



Warrior/Biberdorf

Elizabeth Painter, a food technologist, adds chopped onions for a New Brunswick stew recipe.

salt, fat and cholesterol, and higher complex carbohydrates and fiber," she said.

Painter along with Anthony Lee, also a food technologist, completed a three-year project this year to revise every recipe in each section to meet healthier guidelines, but the AFRS mission continues.

"We're competing with readily available fast food and restaurant fare, and we're trying to keep the soldier in the dining hall," Painter said. "(The recipes) should reflect what's available on the outside. We've developed new entrees that include a lot of diverse, ethnic foods. We incorporate authentic flavor profiles from specific regions to make it a satisfying experience that brings them back."

Wrap sandwiches, lime chicken soft tacos, southwestern shrimp linguine and Asian barbecue turkey fillets are among the newer menu items. Halal recipes are also part of the mix and were sent to Guantanamo Bay, Cuba, during the spring to assist the military in feeding the alleged Al-Qaeda and Taliban prisoners detained at Camp X-Ray.

Although the history of military rations is as old as the military itself, it wasn't until 1896 when the Commissary General of the U.S. Subsistence

Department published a manual for Army cooks with recipes for 100 servings, the same serving size still used today.

By 1941, military food services began using standardized recipes with precise quantities of ingredients and preparation methods to ensure recipes met nutritional requirements and were approved by soldiers. After the war, a military food program was established in Chicago that moved to Natick in 1963.

The first edition of the AFRS list was published in 1969, after representatives of each service reviewed and selected those most adaptable, Painter said.

Tasty substitutions

Painter said she and Lee revise and develop new recipes, but many originate from various outside sources unknown to her and are passed along by the Naval Supply Systems Command in Mechanicsburg, Penn., which prioritizes the testing effort and edits the recipes. All recipes are tested in the Combat Feeding Program's food laboratory using the same equipment that is issued for garrison feeding.

For improved nutritional demands, Painter and Lee have adopted a number of strategies. They've al-



Warrior/Biberdorf

Armed Forces recipes are printed on colored index cards.

tered and increased seasonings, substituted soup and gravy-based dishes with chicken or beef broth, changed to marinated meats, and used nuts and chow mein noodles as a garnish instead of a main ingredient.

Dried plum puree instead of vegetable oil makes a non-fat, yet moist fudgy brownie. Replacing half of the vegetable oil in banana bread with applesauce or using non-fat cream cheese and egg whites to make a light cheesecake dramatically lowers the fat and calorie count.

One way they've increased complex carbohydrates is by increasing the portion size of vegetables and by incorporating more vegetables, wild rice and beans into the recipes.

Other ingredients are substituted for newer commercial items. Some industry changes in products, such as leaner pork, farm-raised catfish, or pre-portioned boneless, skinless chicken breasts and turkey fillets,

also make reducing the fat easier, but not at the expense of good taste.

"We don't want to compromise the recipe. If the fat can be lowered, it is lowered, but some dishes like buffalo chicken wings are intrinsically higher fat options," Painter said. "All of the food technologists give their impressions of each other's work, and we have to be honest about our sensory perceptions. Whenever possible, we try to introduce the new entrees to the mess hall on base so we can get feedback from our target audience."

Some shelf-stable field rations use the formulations of the armed forces recipes, she said, but different starch thickeners as well as two to three times the amount of seasoning are necessary because of retort processing. The recipe service is now in the process of redeveloping some of the Unitized B Rations.

Once divided into a book for the

Army and Air Force, and 5-inch by 8-inch index cards for the Navy and Marines, all the services merged into colored index cards separated into different sections in 1967.

The cards once had variations, but now each variation is its own recipe. Recipes are reviewed with attention toward reducing the number of steps and equipment necessary to prepare a dish. Another push is for ready-to-use products.

Efficient cooks

Replacing multiple seasonings with commercial seasoning blends for the existing and newly created recipes is a new project under way.

"Military cooks are always in a hurry. They just don't have time to weigh and measure a lot of different seasoning ingredients," Painter said. "One-pot entrees also help with limited time and manpower."

Switching from conventional to convection ovens has brought changes to the cooking times and temperatures that need updating. Improving recipes helps cooks perform their jobs more efficiently while preventing food-borne illnesses.

"We're including the hazard analysis critical control points for thawing, rinsing and internal cooking temperatures on every recipe card," Painter said. "These guidelines are part of the overall training procedures for the cooks."

Outside the military mission, AFRS assisted the U.S. Department of Agriculture in 1997-2000 by performing yield studies on more than 700 food items and then re-writing their Food Buying Guide for Child Nutrition Programs. The guide is used by food service personnel to purchase the right amount of food for the School Breakfast and Lunch Programs as well as other Adult and Child Nutrition Care Programs and the Summer Food Service Program. Fortunately, Painter said the AFRS, as well as industry, can use the guide to order food.

Although some recipes have been dropped from the cards, they remain electronically archived. Painter said any business or organization serving large-quantity meals can purchase the cards, but there is no cookbook available for family-size servings.



Warrior/Biberdorf

Anthony Lee and Elizabeth Painter, both food technologists, prepare a new dish for the Armed Forces Recipe Service in the Combat Feeding Program's Food Pilot Plant.