



Winter 2014

Soldier

Science & Engineering

Science and Technology News from the Natick Soldier Research, Development and Engineering Center (NSRDEC)

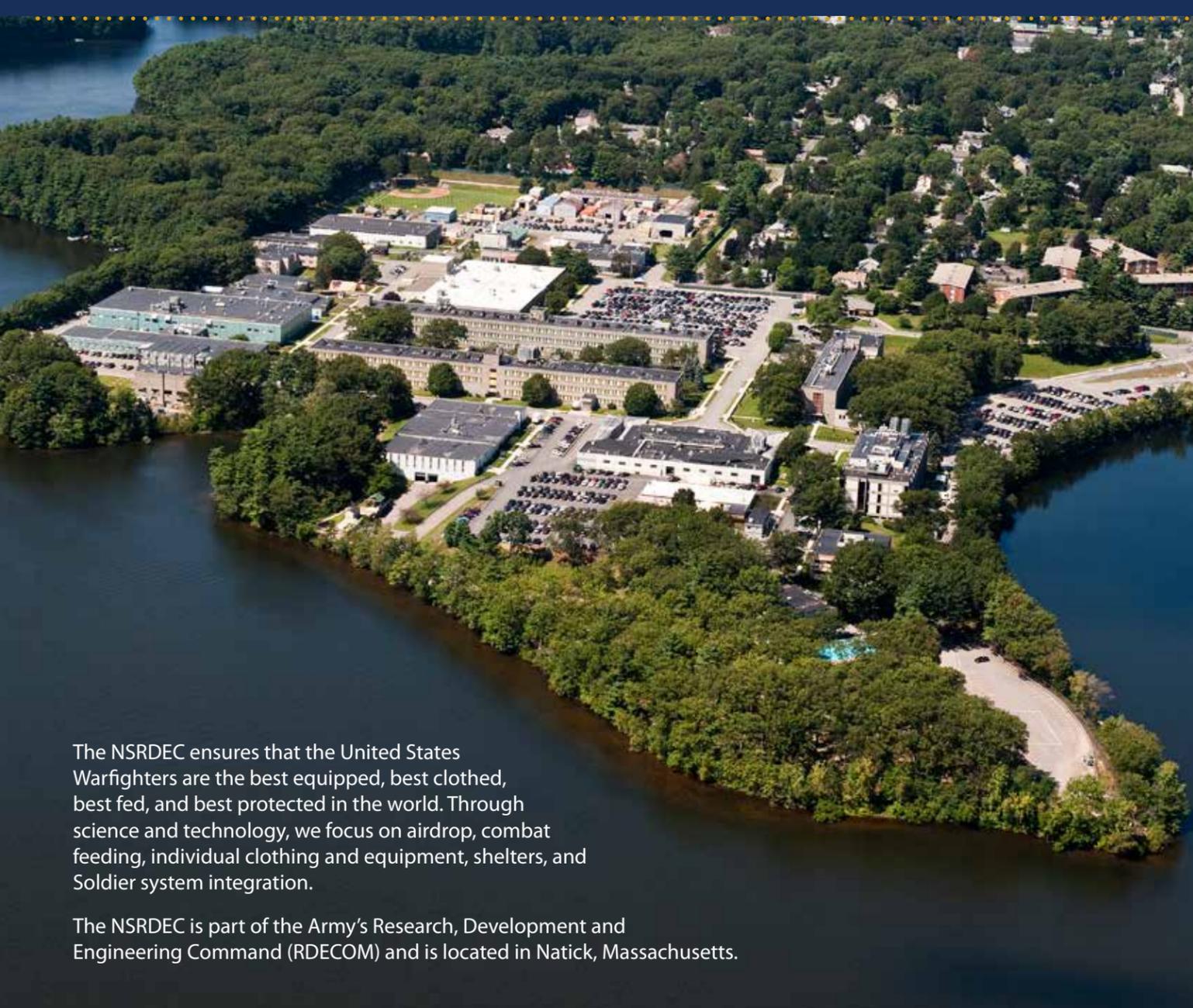
Department of Defense photo

FREE FALLING!

Imagine exiting an aircraft at 35,000 feet above sea level, deploying your parachute, and descending for 50 minutes to a drop zone up to 20 miles away before your feet finally hit the ground.

Also inside: 'Bright Future' • Soldiers Demand MORE • Waste Not • Going for Gold
A Few Good Meals • Feeling the Heat • Plenty on His Plate • All Fired Up
Energizing Army Base Camps • Career Choices • Space Food
AMC Commander Visits

U.S. ARMY NATICK SOLDIER RESEARCH, DEVELOPMENT & ENGINEERING CENTER (NSRDEC)



The NSRDEC ensures that the United States Warfighters are the best equipped, best clothed, best fed, and best protected in the world. Through science and technology, we focus on airdrop, combat feeding, individual clothing and equipment, shelters, and Soldier system integration.

The NSRDEC is part of the Army's Research, Development and Engineering Command (RDECOM) and is located in Natick, Massachusetts.

OUR MISSION

Research, Development and Engineering (RD&E) To Maximize the Warfighter's Survivability, Sustainability, Mobility, Combat Effectiveness and Field Quality of Life by Treating the Warfighter as a System.

ADDING VALUE THROUGH:

- Basic Science
- Technology Generation, Application, and Transition Enabling Rapid Fielding of the Right Equipment
- Soldier Systems Technology Integration and Transition
- Solving Field Problems Rapidly

OUR VISION

The Leader in Empowering the World's Most Capable Soldiers

OUR FOCUS

Deliver world-class research, development and systems engineering and services, with a unique Warrior-centric focus.



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Science and Technology News from the Natick Soldier Research, Development and Engineering Center (NSRDEC)

Some final thoughts...

After serving many years at Natick and in several leadership roles, I offer some thoughts on "Natick Labs" for this edition of *NSRDEC Soldier Science & Engineering*.

First, I refer to the collective organizations that comprise NSSC by the popular name "Natick Labs" because that is precisely how we are viewed by the outside world. The separate tenant organizations make tremendous innovative individual contributions to protect and sustain our warfighters. However, the real power of NSSC is that, together, we are much greater than the sum of our individual contributions. The synergies that we all have created here at NSSC are unparalleled and result in truly amazing capabilities for the Department of Defense. Everything from MRE pizza (the "holy grail" of operational rations), through high-efficiency basing, to medical knowledge products that are critical for warfighter health and performance, the Natick team keeps innovating, fielding and sustaining cutting-edge products.

Second, as I look forward, I believe Natick's future is, indeed, a very bright one (to paraphrase Army Chief of Staff General Raymond Odierno). Our incredible scientists and engineers are exploring new materials for protective equipment that will enable unprecedented Soldier protection at lower weight, designing new power-efficient systems to replace the high demand for fuel and batteries on the battlefield, new self-guided parachutes that will pinpoint resupply squads on the move, human augmentation to give Soldiers unmatched physical capabilities, and they are creating the systems engineering architecture that will take Soldier as a System to the next level.

Finally, with the challenges that will continue as budgets are reduced, keep your eye on the mission and always remember that America's sons and daughters are counting on you to continue doing great things!

Sincerely,

John P. Obusek, Sc.D.
Director, Natick Soldier RD&E Center



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Questions regarding NSRDEC Science & Technology?



NSRDEC is part of the U.S. Army Research, Development and Engineering Command, which has the mission to develop technology and engineering solutions for America's Soldiers.

RDECOM is a major subordinate command of the U.S. Army Materiel Command, whose mission is to develop and deliver global readiness solutions to sustain Unified Land Operations, anytime, anywhere.

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“What they do here is an incredibly important mission to the Army, as they continue to work what I consider to be our center of gravity, which is helping our Soldiers do their job. That’s something that will never change. The Army is about Soldiers. It’s about their ability to perform and conduct their mission.”

Gen. Raymond T. Odierno,
Army Chief of Staff



Photo: Allan Jang, MacroWest Daily News

By Bob Reinert, USAG-Natick Public Affairs / NATICK, Mass. (Nov. 18, 2013)

Army Chief of Staff Gen. Raymond T. Odierno visited Natick Soldier Systems Center Nov. 15 to tour its facilities and learn more about the research and development done to keep Soldiers safe and provide them with a better quality of life during deployments.

Odierno was briefed on female body armor and body armor design enhancements, human systems performance, Soldier power, multi-functional fibers, vision protection, and the operational energy savings that the Army will realize from work done at Natick.

“What they do here is an incredibly important mission to the Army, as they continue to work what I consider to be our center of gravity, which is helping our Soldiers do their job,” Odierno said. “That’s something that will never change. The Army is about Soldiers. It’s about their ability to perform and conduct their mission.

“This lab is focused on how they can do that better, how they can do it with less load, how they can do it in an expeditionary manner,” he continued. “And everything that they do here adds to that. So it’s a very, very important place in the Army, and the work they do here is critical for our future.”

Odierno pointed out that Natick civilians and contractors persevered despite the recent furloughs and government shutdown.

“I wanted to personally thank them for their tremendous dedication to their mission, their dedication to our Army, and

the dedication that they bring to their job every, single day,” Odierno said. “They are a critical part of the Army. They are a critical part of the joint force, because much of the work they do here not only impacts the Army, but the other services, as well.”

Odierno learned how Natick Soldier Research, Development and Engineering Center used anthropometric surveys of Army and Marine Corps personnel, including three-dimensional scans of thousands of Soldiers and Marines, to help develop body armor designed for females. He also heard about the next generation of body armor.

At the Center for Military Biomechanics Research, he was briefed about the collaboration between NSRDEC and the U.S. Army Research Institute of Environmental Medicine, known as USARIEM, to conduct basic and applied research in biomechanics, including current work on physical fatigue and cognition.

USARIEM researchers told Odierno of their work to develop gender- and age-neutral physical performance standards and predictive performance tests for several combat-related military occupational specialties.

Later, he heard about NSRDEC’s research into wireless power transmission technologies for Soldiers, fiber technologies that will respond to changes in temperature, fibers that actually can generate power, and the latest in vision protection to counteract battlefield threats.

Finally, Odierno was briefed on strides being made by Product Manager Force Sustainment Systems to reduce fuel and energy use at expeditionary base camps, which in turn will help keep convoys off the roads and Soldiers safer.

“All of these things are incredibly efficient as we look ahead, and that’s what we need,” Odierno said. “Those are the kind of technologies that we need, making our individual Soldier more effective, more efficient, better able to do (the) job.”

Odierno expressed great interest in anything that would lighten a Soldier’s load in the field, such as improved body armor.

“Having body armor that fits better and has better performance might not save direct money, but what it does do is allows our Soldiers to operate for longer periods of time without injury,” Odierno said. “That’s saving lots of money over time.”

Odierno spoke of Natick’s “bright future” and praised its “synergy” with academia and small businesses in the area.

“We couldn’t replicate that anywhere else, or it would be very difficult to replicate that anywhere else,” Odierno said. “In my mind, this is one of the key installations that we have, and it’s our only footprint in this area, and that’s important, as well, because this is such an important area for the Army. I can’t foresee any circumstances that would cause us to walk away from it.”

Army Chief
of Staff visits
Natick

‘Bright
Future’

FREE FALLING:

Natick helps military paratroopers

By USAG-Natick Public Affairs / NATICK, Mass. (Jan. 24, 2014)

Imagine exiting an aircraft at 35,000 feet above sea level, deploying your parachute, and descending for 50 minutes to a drop zone up to 20 miles away before your feet finally hit the ground.

The new RA-1 parachute will make this a reality for the high-altitude parachutist. Product Manager Soldier Clothing and Individual Equipment, or PM SCIE, working with the Natick Soldier Research, Development and Engineering Center, or NSRDEC, is tackling the capability gaps in oxygen supply, navigation and extreme temperatures associated with such missions.

Currently, missions are limited to parachute openings at a maximum of 25,000 feet, due in part to the existing canopy's ability to withstand the opening shock in the thin air of higher altitudes. PM SCIE and NSRDEC researchers are seeking to raise that ceiling to protect aircraft, aircrews and mission support personnel, and allow undetected infiltrations of airborne troops.

"The increased altitude will result in safer missions, and is going to increase the capabilities of the combat commander," said Nina Shopalovich, senior engineer for the PM SCIE Personnel Airdrop Team.

"This RA-1 canopy is going to be fielded to more conventional units as well as Special Ops units," said Dan Shedd, senior project engineer of the NSRDEC Airdrop Technology Team. "We don't know what their final operational range will be, but the objective requirement for this parachute is 35,000 feet. We don't know if we're going to get there, but we have to plan for that."

The RA-1 parachute is capable of achieving 30,000 feet, and the associated parachutist's equipment must also be functional.

Paratroopers need oxygen, navigation and thermal-protective clothing systems that can operate reliably at minus 60 degrees Fahrenheit. To that end, researchers recently engaged the NSRDEC Doriot Climatic Chamber's Arctic Chamber to run tests on the new parachutist oxygen bottle and Android-based navigation system. They suspended two retired military paratroopers from the chamber's ceiling and sat a third paratrooper on a chair, all in combat equipment, breathing from parachutist oxygen equipment. The temperature was set to 20 degrees below zero and the wind speed at 20 knots -- a wind chill of about 50 below zero.

Though the equipment performed well, during the test the engineers observed how inadequate current thermal-protective gear is for the mission.

"It was atrociously cold," Shopalovich said. "It is so cold that any kind of moisture in the air immediately turns into frost. It is scary. It really does give you an idea of the fact that it's very, very dangerous."

As Shedd pointed out, it's not just the cold at altitude that challenges the paratroopers on stand-off, High Altitude High Opening, or HAHO, missions, it's the perspiration generated in the jump preparation that's dangerous.

"We've seen swings in temperature of as much as 140 degrees throughout the mission," said Shedd, adding that paratroopers have boarded planes and jumped into areas in excess of 100 degrees.

"It's not just the cold," said Andy Margules, a mechanical engineer with the NSRDEC Airdrop Technology Team. "We can do cold. It's the hot to cold to hot again that really will just suck the energy out of you."

"Mountain clothing doesn't quite work. Ski clothing doesn't quite work. Arctic clothing doesn't quite work, because it's so bulky, and then you have all this moisture that's in there," added Margules.

Any moisture will freeze on the parachutist's body or his clothing, and it could possibly hinder the operation of his breathing and navigation equipment. The extreme temperatures, combined with the mismatch of available equipment, often leads to losses in dexterity -- affecting the paratroopers' mission effectiveness upon landing.

According to Shedd, a paratrooper under the RA-1 canopy will descend about 3,000 feet every five minutes as temperatures warm two to three degrees every 1,000 feet. Once he lands, a paratrooper must be ready for combat as quickly as possible.

"We just want the guys to be able to function when they hit the ground," Shedd said. "You don't want them to be stripping stuff off once they hit the ground."

Researchers at Natick hope to help the Army realize the full potential of the RA-1 parachute.

"Let's face it -- if anybody's going to do it, it should be Natick," Shedd said. "We've got the airdrop experience. We've got the clothing experience. Natick is the place that should work these efforts."

Warfighters in extreme, demanding operational environments need additional sustenance to complete their missions successfully — they simply need MORE.

In this case, MORE is the Modular Operational Ration Enhancement, developed by the U.S. Army Natick Soldier Research Development and Engineering Center's Combat Feeding Directorate as a direct result of requests from deployed warfighters.

"We received feedback from the field that some warfighters were losing weight and they needed extra calories," said Julie Smith, a Combat Feeding Directorate, or CFD, senior food technologist.

Smith, along with Jim Lecollier, chief of the Individual Rations Branch, Defense Logistics Agency Troop Support, worked with their respective teams from 2008 through 2013 to develop the MORE family of ration supplements specifically to meet this need.

MORE provides additional nutrition to warfighters operating in high-stress environments when their caloric requirements exceed those provided by their daily operational rations. MOREs are designed to augment the Meal, Ready-to-Eat, or MRE, First Strike Ration, or FSR, and Meal, Cold Weather/

Long Range Patrol, as well as the family of Unitized Group Rations.

The MRE satisfies the Army surgeon general's strict requirements for nutrition in operational rations. Each MRE provides approximately 1,300 calories. An FSR, which replaces three MREs, has an average of 2,900 calories per ration. The MORE has an average of 1,110 calories per package.

Army Regulation 40-25, "Nutrition Standards and Education," a joint regulation of the surgeons general of the Army, Navy and Air Force, establishes nutritional standards, termed "military dietary reference intakes," for military feeding. Among these are nutritional standards for operational rations and restricted rations.

When warfighters conduct dismounted

operations in challenging terrain, carrying more than 100 pounds of equipment up and down the mountains of Afghanistan with elevations as high as 12,000 feet, they can burn significantly more calories than when operating at sea level.

The MOREs are designed to provide the additional calories and nutrients to supplement their MREs or FSRs and give them the nutrition they need.

MORE, HOT AND COLD

Currently, there are two types of MOREs targeted for the different extremes of operational environments — high altitude and cold weather, and hot weather. Each type has three different varieties, for a total of six different MORE packs.

CFD collaborated with the U.S. Army Research Institute of Environmental Medicine to understand the unique nutritional needs of warfighters in these operational environments, said Smith.

"We reviewed literature and conducted focus groups to identify food preferences of warfighters when conducting missions in high altitude and cold weather, and hot weather environments."

Three MREs a day provide warfighters with a minimum of 3,600 calories, satisfying their nutritional needs for most missions.

"However, there are some instances during exceptionally heavy activity where warfighters

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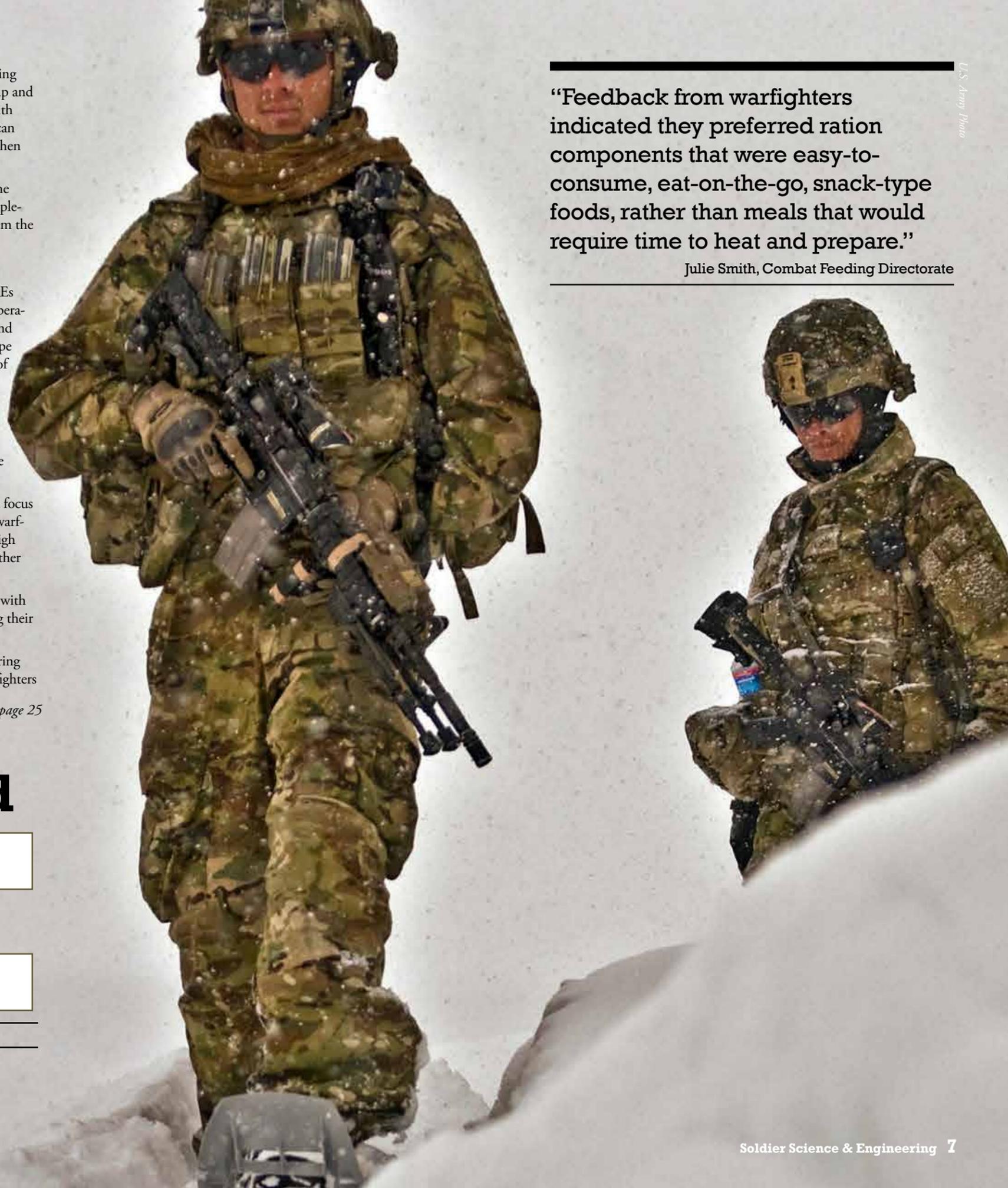
"Feedback from warfighters indicated they preferred ration components that were easy-to-consume, eat-on-the-go, snack-type foods, rather than meals that would require time to heat and prepare."

Julie Smith, Combat Feeding Directorate

Extreme environments demand

MORE

By Joseph Zanchi and Alexandra Foran, U.S. Army NSRDEC / NATICK, Mass. (March 10, 2014)



U.S. Army Photo

Waste Not

Turning base camp refuse into energy

By Bob Reinert, USAG-Natick Public Affairs / NATICK, Mass. (March 11, 2014)

One 150-person base camp in Afghanistan can produce as much as 1,000 pounds of solid waste a day.

One 150-person base camp in Afghanistan can produce as much as 1,000 pounds of solid waste a day.

That waste can become one big headache, according to Amy Klopotoski, the Contingency Basing Science and Technology lead in the Expeditionary Basing and Collective Protection Directorate of the Natick Soldier Research, Development and Engineering Center.

“The waste generated on base camps, it’s a big challenge and a problem, because Soldiers are either burning it — which is hazardous to your health, the environment, the host nation — or you have to backhaul it,” Klopotoski said. “Soldiers have to leave the protected camp to backhaul this waste to some other location for it to be processed.

“So it’s a logistics burden, it’s a safety hazard, it’s a health hazard, and quite a bit of waste is generated on these camps. So it is a continuous problem.”

Klopotoski would like to turn a negative into a positive, and solve another problem simultaneously, by converting that waste into energy that could help power U.S. base camps overseas.

“You can thermochemically process (the waste) so that you reduce the volume of it,” Klopotoski said. “It can be reduced ... up to 90 percent of the volume of the waste, so it basically turns it into an ash. Then you can actually use it as an energy source so that you can provide energy to the camp.

“That cuts down on the fuel dependence of the camp itself. Fuel, it’s a logistics burden for the Soldiers, as well.”

NSRDEC serves as technical manager of a group known as Joint Deployable Waste to Energy, or JDW2E, which is looking at how to take technology now available on a municipal scale and shrink it to a size that would be deployable and would work at base camps.

“It’s sort of been growing as an effort because people see the benefit,” said Klopotoski, “and you look at the technology that exists today, and you feel pretty confident that we can get this capability into a deployable package.”

Klopotoski said that JDW2E, which also includes Natick’s Product Manager Force

Sustainment Systems, is looking for systems that require no specialized training and are durable and transportable.

“It’s a new capability that doesn’t exist, so there aren’t really test procedures,” Klopotoski said. “So that’s part of the effort, too, is establishing the test procedures to assess these systems.”

In addition to establishing test procedures and assessing technology, JDW2E will conduct a workshop to solicit Soldier input.

“To find the right technology, you need to know ... what is acceptable or not acceptable in the field,” Klopotoski said. “How would the Soldiers prefer it to be used and operated, or how might they use it?”

“There’s such a wide mix of things that come up in a waste stream on a base camp. You want a system that can accept anything. You don’t want to have Soldiers sifting through stuff.”

Klopotoski said that JDW2E is striving to get a prototype to the Pacific Command area of operations for testing. “A lot of their island nations have a lot of the same challenges that some of our contingency bases do,” she added.

Given waste-to-energy conversion, solar technology and smart power management, Klopotoski said she can envision a day when base camps could be energy self-sufficient, taking vulnerable convoys off dangerous roads.

“The waste generated on base camps, it’s a big challenge and a problem, because Soldiers are either burning it — which is hazardous to your health, the environment, the host nation — or you have to backhaul it.”

Amy Klopotoski, NSRDEC

“You’re attacking two problems,” Klopotoski said. “It’s the waste problem, and it’s also the fuel-consumption problem. If we can get this to work, which we feel pretty confident that we can, that could tackle two of those pretty big problems that currently exist at camps.”



Master Sgt. Darryl Sterling tosses trash into a burn pit on March 10, 2008, at Balad Air Base, Iraq. (U.S. Air Force photo/Senior Airman Julianne Showalter)



Photo Credit: Tom Zikas

Going for GOLD in the COLD

Natick tests Olympic fabrics

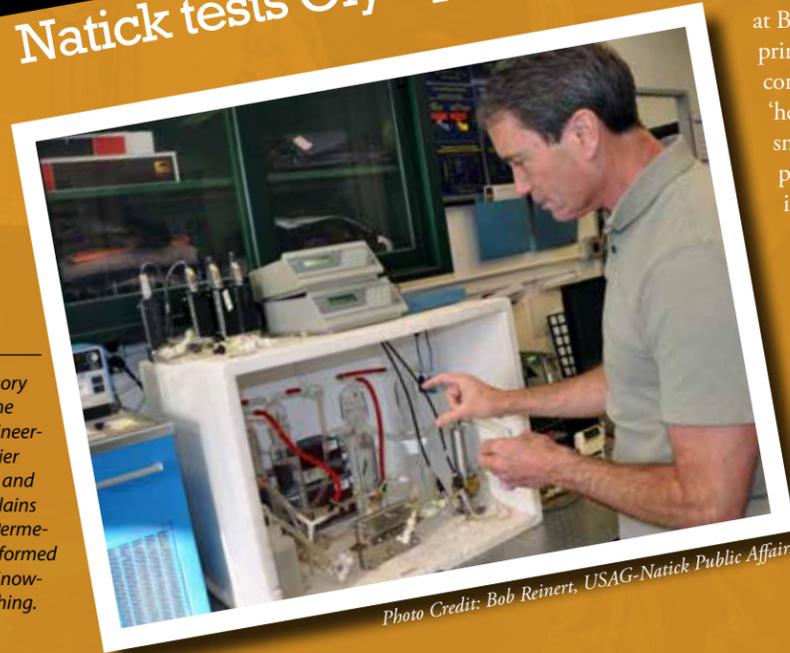


Photo Credit: Bob Reinert, USAG-Natick Public Affairs

Dr. Phil Gibson, supervisory physical scientist with the Molecular Sciences Engineering Team at Natick Soldier Research, Development and Engineering Center, explains the Dynamic Moisture Permeation Cell testing he performed on swatches of Burton Snowboard's proprietary clothing.

He shrugged it off as just another routine day in his lab, but testing conducted by Dr. Phil Gibson helped Burton Snowboards pick a fabric for uniforms that the U.S. Olympic Snowboarding Team will wear at next month's 2014 Winter Games.

"They just wanted me to test fabrics," said Gibson, supervisory physical scientist with the Molecular Sciences Engineering Team at Natick Soldier Research, Development and Engineering Center, or NSRDEC. "I do lots of testing for companies, and (Burton is) just one of the companies that asked me to do some testing."

The results of that testing, done last year under a Testing Service Agreement between NSRDEC and the Burlington, Vt., company, were used by Burton to develop its new "DRYRIDE Vaporshell laminate" for the unique patchwork quilt competition jackets that will be worn by such Olympic riders as Shaun White and Kelly Clark in Sochi.

"We're really proud that the 2014 uniform builds on Burton's legacy of creating fun, unconventional designs that stray from the formal, traditional look of most uniforms," said Greg Dacyshyn, chief creative officer at Burton. "The vintage quilt and flag print of the jacket combined with the corduroy pants give the uniform an 'heirloom hippy' vibe that lines up with snowboarding's laid-back culture, while paying respect to America's longstanding creative heritage. It will stand out in Sochi for sure."

Dr. Jack Obusek, NSRDEC director, said that Testing Service Agreements provide "an important technology transfer vehicle that can help promote working with the commercial sector to find military solutions. This provides a great opportunity for us to collaborate with industry, including small businesses, in understanding and advancing the state of the art

in our areas of expertise. Collaborations such as these provide us a great opportunity to engage based on our technical expertise with industry to find solutions for the Soldier."

Well into his third decade at NSRDEC, Gibson, a snowboarder himself, has considerable experience working with well-known outdoor clothing companies.

"This wasn't any different from the testing that I usually do," Gibson said. "The reason I do it is just sometimes I do see things that we would be interested in. So it's a way to kind of have a continuous survey of what the state of the art is.

"We're not endorsing," he explained. "We're just providing information, and they decide how they want to use it."

Gibson performed Dynamic Moisture Permeation Cell testing on swatches of Burton's proprietary clothing. After he developed the DMPC in the NSRDEC laboratories, the Army obtained a U.S. patent for the device and test method in 1999, which has since become a widely used standard in the outdoor clothing industry.

"They didn't even tell me what they were," Gibson said of the swatches. "You're just measuring how much water vapor goes through, how breathable it is.

"I have a set of standards that I test, and then I usually have whatever the company sends, and then I just provide them (with results that compare them to other fabrics)."

When he's not monitoring the commercial market, Gibson works with his Natick team on garments for American warfighters. He is especially proud of advances NSRDEC has made in flame-resistant and chemical-protective materials.

"That's, I think, been one of our big contributions over the past decade," Gibson said. "We've made a lot of advances here at Natick, which have been transferred to industry or are going into prototype garments that we're developing now."

Meanwhile, Gibson will continue to test for companies such as Burton in hopes of coming across materials that can benefit U.S. service members in the future.

"Things have gotten continuously better," said Gibson, "and people understand how to combine different materials together in different environments, even within the same garment."

The new U.S. Olympic Snowboarding Team uniform jacket features the "DRYRIDE Vaporshell laminate," which was tested by Dr. Phil Gibson of the Natick Soldier Research, Development and Engineering Center.

Photo Credit: Burton Snowboards





Looking for a few good meals

By Bob Reinert, USAG-Natick Public Affairs / NATICK, Mass. (Feb. 24, 2014)



The Marines were looking for a few good meals. Paul Mandile and other members of the

Natick Soldier Research, Development & Engineering Center's Combat Feeding Directorate helped deliver them.

The Combat Feeding Directorate, or CFD's Systems Equipment & Engineering Team has helped the Marines develop and procure the Expeditionary Field Kitchen, or EFK, which is designed to provide welcome hot food to as many as 750 forward-deployed warfighters within three hours, including cleanup.

"They love it," Mandile said. "It's a significant morale booster for the Marines in the field. It gives them a hot meal capability that is significantly more mobile, durable and sustainable than their previous large-scale feeding platform."

The EFK, which comes in a two-sided, expandable 20-foot-long, by 8-foot-high, by 8-foot-wide ISO container mounted on the Marine Corps MCC20 trailer, can prepare and serve any of the Unitized Group Ration meals developed by CFD. It eliminates the need to transport hot food over long distances to remote locations.

"Marines are all about being expeditionary," Mandile said. "They truly do move. The EFK, complemented by the other combat field feeding systems in the Marine Corps, meets the Corps' operational field feeding and mobility requirements by land, sea, and air. Meeting all the Marine Corps expeditionary requirements presented a significant challenge to CFD. Military Field Kitchens, believe it or not, encompass a lot of different engineering disciplines."

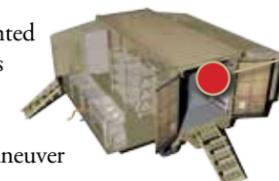
The first production the EFK was delivered in late 2012 to the Marines, who aim to acquire 109 EFKs in total. Sixty-one have already been fielded to date.

"Each EFK is run by four personnel and a supervisor, and its appliances operate from JP-8 fuel," Mandile said. "There are seven burners and seven major appliances in the EFK. The EFK's appliance suite provides the Marine cooks with the flexibility to roast, bake, grill, boil, braise, poach, and stew food items.

The EFK program has been a cooperative effort between Natick's CFD, the Natick Contracting Division, Headquarters Marine Corps, and Product Manager Combat Support Equipment, or PdM-CSE, Marine Corps Systems Command. PdM-CSE has life-cycle management responsibilities for all Marine Corps Combat Field Feeding equipment and Shelter products, and they also provide guidance to Combat Feeding to ensure all research, development and engineering support efforts are fully coordinated.

"It's definitely a partnership," Mandile said. "I'm on the phone with the PdM-CSE's Product Manager and Marine user on a daily basis addressing production, logistical sustainment, and fielding support challenges. Combat Feeding has the lead engineering-support role for Marine Corps Field Food Service Equipment, and the Natick Contracting Division is managing EFK production contract. We're supporting PdM-CSE's fielding of these systems to Marines worldwide. It's truly a team effort."

As Mandile pointed out, the Marines aren't much for using base camps. They maneuver and fight.



"It's all about running and gunning in small units and moving," Mandile said.

The Marines, at some point, want an alternative energy, heat-on-the-move capability. With that in mind, the Marines have identified a field feeding goal of reducing or eliminating their dependence on fossil fuels, which ultimately equates to fewer combat logistic patrols and, as a result, fewer casualties. In addition to the EFK, CFD has several other ongoing research and development efforts to meet their expeditionary mission and reduce the need for fossil fuels and fuel resupply missions.

"Our mission is to provide them with cutting-edge (research and development) in the field food service equipment arena that gives the Marines an enhanced field feeding capability, better quality food, and a significant morale boost," said Mandile, "all while working to reduce cook burdens and the Marine Corps total life cycle costs."

'Maj. Clo' sweats it out at Doriot Climatic Chamber

1 Feeling the heat at Natick

By Bob Reinert, USAG-Natick Public Affairs / NATICK, Mass. (Jan. 15, 2014)

If he's a bit of a hot head these days, you'll have to excuse him. "Maj. Clo" is just doing his job.

Lately, he's literally been feeling the heat at work, because Maj. Clo is the thermal test manikin at the U.S. Army Research Institute of Environmental Medicine.

Maj. Clo has been getting a real grilling recently as USARIEM researchers placed him under solar lamps at the Doriot Climatic Chambers of the Natick Soldier Research, Development and Engineering Center in an effort to measure the thermal burdens of different-colored garments.

"Different materials absorb different amounts of solar radiation," said Tony Karis, a research physical scientist at USARIEM, "and this testing will help us quantify how much solar radiation is being absorbed."

Doriot's Tropic Chamber became just the place to do that in January 2013, when it was outfitted with a Solar Simulation Unit

that brought daylight conditions indoors. The 18 1,500-watt metal halide vapor lamps, arranged in three rows of six apiece, allow Doriot to produce artificial sunlight that replicates different climates in every season at various times of day — in the mountains, desert and everywhere in between.

"All of the tests in the past that we've done for 50 years in this facility have been without sun," said Josh Bulotsky, Doriot's manager. "This is like real sunlight. You don't realize how really hot it is."

It was only a matter of time before Maj. Clo and his 5-foot-9-inch carbon fiber, epoxy resin and copper frame, featuring 200 sen-

sors and simulated sweat pores, would be deployed there.

"There (are) not too many places that have these solar lamps that we can actually use a full-size manikin," Karis said. "A lot of times, it's done on a smaller scale. To be able to use a full-size manikin in an operational room is something that — as far as I know — no other place is doing."

Karis explained that USARIEM researchers are measuring how much heat is being transmitted from the clothing to Maj. Clo.

"Another thing that complicates this is the coverage," Karis said. "As coverage changes, the absorbtivity changes, too. Short-sleeve shirt versus long-sleeve shirt, shorts versus long pants — each one of them, there's different coverage, so there are different thermal burdens to each ensemble."

Karis and his USARIEM colleagues have placed Maj. Clo in the chamber at 80 degrees and 50 percent relative humidity with a 3.5 mph breeze. Then they have hit him with either 1,000 or 500 watts of solar load.

"A thousand watts is a good choice for the highest value in most locations during the summer, but more extreme conditions may occur," Karis said. "We also did 500 watts, which may be a more representative value for conditions between late morning and early afternoon for the warmer part of the year."

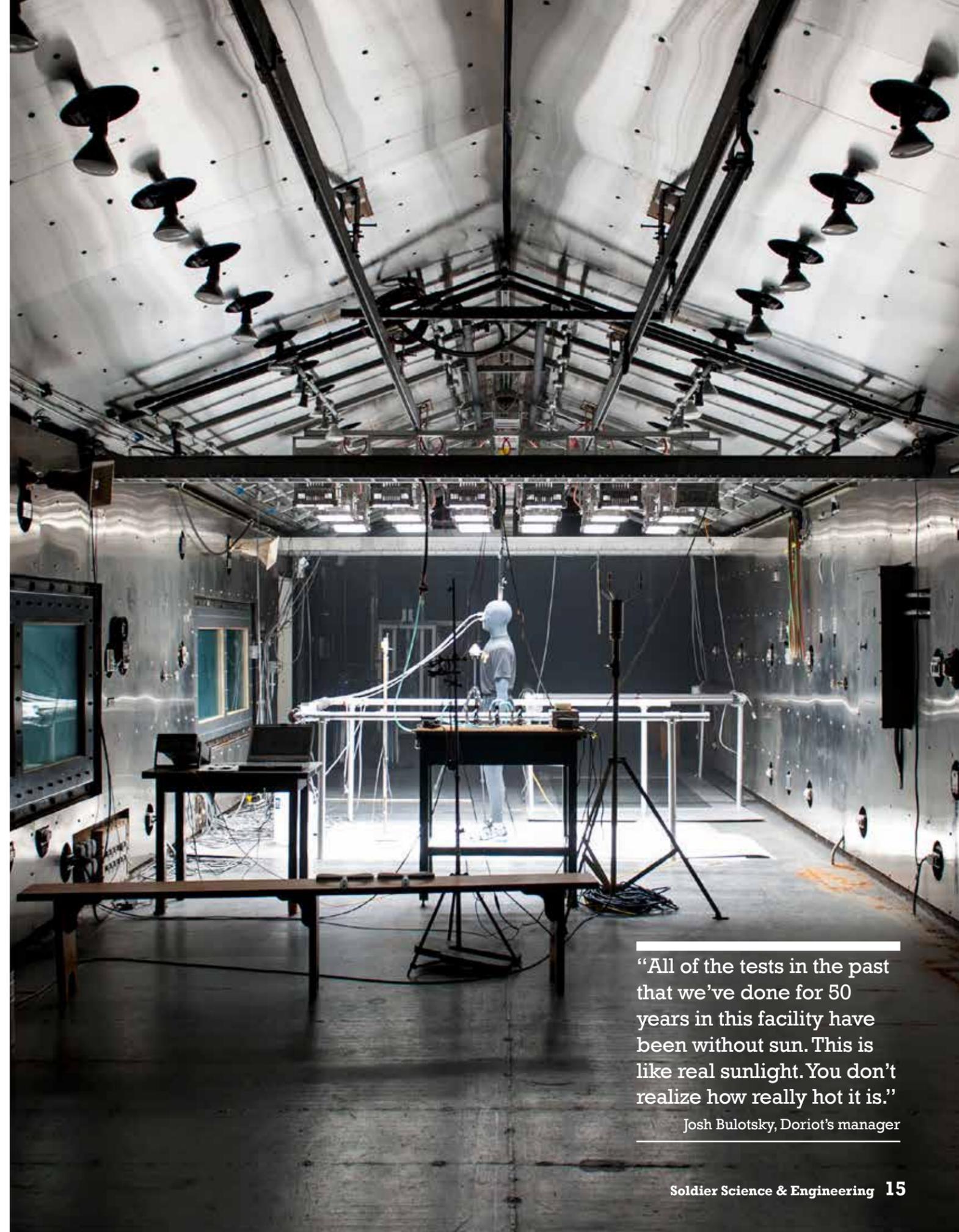
"The manikin measures heating over different parts of the body, and the heating just due to solar loading can vary widely for different parts of the body. But that's the idea — to monitor and measure the solar load on different garments and its effects on different parts of the body."

This validates models that USARIEM already has.

"It's nice to be reassured that your models are predicting correctly," Karis said. "We will use this information to make our models more robust."

Karis said USARIEM had done about a dozen tests with another half-dozen remaining. One day, the data could have real-world applications.

"The battlefield has changed from a jungle battlefield or woodland," Karis said. "Now we're in open desert or mountain regions where there's very little overhead coverage from plant life. So now you're in direct sunlight for the majority of the time."



"All of the tests in the past that we've done for 50 years in this facility have been without sun. This is like real sunlight. You don't realize how really hot it is."

Josh Bulotsky, Doriot's manager



Plenty on his Plate

PEO Soldier returns armor that saved Soldier

By Debi Dawson/PEO Soldier

Usually, a bruised rib is a cause for a Soldier's complaint. For a White Sands Missile Range-based Soldier who survived a direct rifle shot to his chest during combat in Afghanistan, it is cause for celebration.

Sgt. Thomas Dacey was serving in Farah Province, Afghanistan, June 4, 2013, when insurgents attacked his unit. He had already been involved in several hours of intense combat in when a burst of enemy fire struck him around 2:50 p.m. His body armor stopped the bullet — which Dacey still carries in his pocket.

Dacey said he was so “pumped up” that he didn’t notice he was hit at first.

“Later, when I got a moment to check myself out, I saw that I had been hit,” Dacey said.

“A bullet went through my optics, and a piece of it hit my face,” Dacey said. “Then I looked down and realized I had been shot. So I went around the wall real quick to see if I had been penetrated. When I saw it did not, I started returning fire.”

Dacey’s battle buddy described the NCO’s reaction after learning he was OK.

“He just kept on fighting,” said Pvt. Jacob Pinar.

Dacey killed at least one of the Taliban attackers using his grenade launcher. After the fight, the Army evacuated Dacey for medical care.

He received new body armor while his damaged gear went for forensic examination and analysis.

Dacey said an hour or so after he was hit, he began to experience pain when breathing. After another week or so, he went back to medical personnel. They told him that he had suffered a severely bruised lower rib from what would have otherwise been a lethal shot.

“This experience makes me grateful for life every day,” said Dacey, a native of Beverly, Mass., upon receiving his battle-damaged armor plate from Program Executive Office Soldier. This Fort Belvoir, Va.,-based organization is responsible for developing uniforms, helmets, small arms, night vision, and body armor for individual Soldiers. Dacey was grateful for receiving the plate and what it meant to him.

“Life’s short; appreciate what you have,” said Dacey as he held his 2-year-old son, Thomas M. Dacey IV. “Just be grateful for what you have.”

Dacey now lives in Las Cruces, N.M., and continues to serve with the 2nd Engineering Battalion, 36th Engineering Brigade at WSMR.

Dacey said the plate presentation gave him a chance to remember one of his battle buddies, Pfc. Errol Milliard of Birmingham, Ala. A rocket-propelled grenade killed Milliard that day.

“He was the newest Soldier in our squad,” Dacey said. “He was very religious and always had a smile on his face. No matter what was

happening, he always tried to make the best of it.”

As he presented Dacey with his life-saving hard armor insert, PEO Soldier’s Command Sergeant Major Doug Maddi said it was important to remember Milliard’s sacrifice.

“He was a hero who made the ultimate sacrifice,” he said.

Dacey’s commander spoke of importance of the plate return.

“I really appreciate PEO Soldier coming out to make this presentation,” said Lt. Col. Jim Koeppen. “That plate will always be in Sergeant Dacey’s house. And when his young son grows up, it will mean a lot to him.

“Sergeant Dacey is not a big guy. So when the Soldiers see him able to walk away after taking a 7.62 round, there is no doubt that they have confidence in their protective equipment.”





All Fired Up

NSRDEC and WPI interest in fire protection sparks sharing of expertise and facilities

By Jane Benson/NSRDEC Public Affairs, NATICK, Mass (Feb. 14, 2014)

During a recent tour of Worcester Polytechnic Institute's new state-of-the-art Fire Protection Engineering (FPE) Facility, researchers from the U.S. Army Natick Soldier Research, Development and Engineering Center (NSRDEC) met with WPI Professor Nicholas Dembsey to discuss the emerging collaborative effort involving the work of Dr. Esther Kim. Kim is on an Oak Ridge Institute for Science and Education (ORISE) fellowship with NSRDEC and will become a WPI Visiting Scholar, providing a framework for collaboration and sharing of laboratory facilities, equipment and high performance computing resources at WPI and NSRDEC.

Dembsey, whose role in this collaborative project is to provide guidance in the development of the material pyrolysis and fire dynamics modeling tools, explained, "The collaborative work between NSRDEC and WPI FPE focuses on developing new modeling tools which will enhance the protective fabric/clothing design process. These modeling tools involve computer simulation of material pyrolysis and standard test fire dynamics. It is expected that these tools will play an important role in efficient and effective screening of fabrics/clothing."

Dembsey said, "The role of Dr. Kim in this collaborative project is pivotal as she brings extensive modeling expertise to the project in terms of material pyrolysis and fire dynamics."

Kim's research is focusing on fire modeling of flame-resistant fabrics for protective clothing applications.

According to Kim, "Currently, my research is focused in two topics. First is to develop a kinetic model in a consistent manner for describing thermal decomposition of different fabrics, which can be used in a comprehensive pyrolysis model."

Kim added, "The second topic is to conduct computational modeling of the small-scale vertical flame test. This test is a critical go/no go test for determining whether a fabric may be considered flame resistant and self-extinguishing."

Research will benefit from the use of both organizations' facilities.

WPI's new facility has a collaborative education space for researchers and students to brainstorm and includes a fundamentals laboratory, a workshop space, and a large three-story burn room, which allows for the testing of two-story structures, giving researchers the ability to capture extremely accurate data.

NSRDEC's Tom Godfrey explained how NSRDEC will benefit from access to WPI's new facility, "We get access to experimental apparatus, such as the cone calorimeter, that we don't have at NSRDEC. Dr. Esther Kim is using the cone to characterize the response of Army fabrics to fire conditions. Also, we are using WPI computing resources to computationally model flame testing of fabrics. Eventually, NSRDEC will have access to fire modeling on Defense Department High Performance Computing resources once we get that capability established and benchmark it against results we obtain at WPI."

Future cooperative efforts may include WPI's use of NSRDEC's Ouellette Thermal Test Facility.

Regarding how WPI researchers may benefit from having access in the future to NSRDEC's Ouellette Thermal Test Facility, Godfrey said "This could be important for investigations at WPI that focus on personal protection -- firefighter gear for example. We have the standing manikin and we have head and hand forms that can be used to test head gear and hand wear."

Godfrey explained some of the unique features of NSRDEC's facility, "We have a standing instrumented manikin on which we can perform ASTM F 1930 tests of protective garments. The test simulates flame engulfment conditions of a flash fire. Only four laboratories in North America can perform this test. We also are setting up a high intensity radiant heat test system based on a CO2 laser that is quite unique."

WPI will also benefit from NSRDEC expertise.

Dembsey said, "WPI FPE will benefit from NSRDEC's extensive experience in development of protective fabric/clothing. This provides an excellent practical context for the application of WPI FPE's extensive material pyrolysis and fire dynamics modeling experience. Both organizations benefit from this natural synergy."

According to Kim, the collaboration will be beneficial in a few ways, "The collaborative work between the FPE-WPI and NSRDEC will allow me to bring expertise from both parties to further enhance the understanding of the fire behaviors observed in various tests conducted at NSRDEC for FR fabrics. Having discussions with both parties provides opportunities to bring new ideas to my research as they have different viewpoints of the same problem."

Kim added, "Having access to WPI allows me to take some of the testing procedures that are commonly applied at FPE-WPI

to understand materials' fire performances and apply it to FR fabric tests conducted at NSRDEC. For example, I have conducted several Cone Calorimeter tests at WPI with additional instrumentations for the FR fabric to gather data for fire modeling. This test is a well-known bench-scale calorimeter experiment that characterizes materials' burning behavior under a specified, constant radiant heat flux. The NSRDEC resources allow me to conduct various material characterizing tests such as measurements of thermal conductivity, specific heat capacity and more. All these information can come together to better model the fire behaviors of the fabrics."

All agree the collaboration and sharing of facilities will greatly benefit the warfighter.

"We need to provide our servicemen and servicewoman with protection against a variety of flame and thermal hazards on the battlefield: radiant flash from IED fireballs, secondary fires that are ignited by IEDs, vehicle fuel pool fires, to name a few," said Godfrey. "And that protection needs to be environmentally friendly, not excessive in cost, comfortable and durable. WPI brings in expertise in fire dynamics, fire modeling, and in materials response to fire that will enable NSRDEC to develop greatly improved protective garments."

Kim said, "Providing FR treated fabrics to the servicemen and women is important as they are the means of passive protection in situations where they are exposed to fire hazards. Understanding better about the fire behaviors of these fabrics will allow improvement to current paradigm of FR treatment or development of new textile materials with different FR treatments. Utilizing modeling to this research is useful in terms of having a tool in the designing stage that allows researchers to make changes to the material itself or the testing method, which can be done fairly easily and well-controlled compared with conducting actual experiments."

Dembsey, who has more than 25 years of scholarship and research related to fire behavior of materials, believes the nation's warfighters and eventually first responders will benefit from NSRDEC and WPI sharing expertise and facilities.

Dembsey stated "The future life safety of first responders and Soldiers will benefit from this collaborative project in terms of the enhanced fabric/clothing design process. A more efficient and effective design process will allow fabric/clothing to reach the market sooner."



By Bob Reinert, USAG-Natick Public Affairs / FORT DEVENS, Mass. (Nov. 6, 2013)

Innovations meant to improve Soldiers' quality of life during deployments – while saving lives, fuel, water and money – were on display Nov. 5 at the Army Base Camp Integration Laboratory.

The BCIL hosted its second annual "Base Camp Resource and Energy Efficiency Day." Situated on 10 acres at Fort Devens, the laboratory features two "Force Provider" 150-person base camps. One contains standard technologies; the other offers a glimpse into the Army's energy future.

Katherine Hammack, assistant secretary of the Army, Installations, Energy and Environment, and Lt. Gen. Raymond V. Mason, Army deputy chief of staff, Logistics, were among those attending the event. They were briefed about shelters, power management, energy storage, waste disposal and waste-to-energy systems, alternative energy, micro-grids, energy-efficient structures, rigid-wall camps, and fuel-fired kitchens.

"It's just great to see the strides that we're making, the systems that we're testing," Hammack said. "The team here is doing a fantastic job finding ... new technologies, testing them, getting modifications made, and determining the resiliency of the systems prior to deploying them with our Soldiers."

Mason said all the work toward resource and fuel efficiency was done to help Soldiers focus on their missions. He used the hypothetical example of a forward operating base in Afghanistan that has 20 fuel trucks pull up to its front gate.

"Soldiers are put at risk protecting that convoy," Mason said. "Then you've got to get those 20 fuel trucks through your front gate. Every one of those trucks could be a potential bomb."

"Then you've got to store all that fuel somewhere on your forward operating base, which means you've got to build a bigger

(FOB), and that fuel becomes a big target for either indirect or direct fire. Our purpose is to reduce down that risk by reducing down the amount of fuel that's needed to conduct combat operations."

And once it's stored, much of it goes to something other than fueling vehicles or aircraft, Mason noted.

"It's just great to see the strides that we're making, the systems that we're testing. The team here is doing a fantastic job finding ... new technologies, testing them, getting modifications made, and determining the resiliency of the systems prior to deploying them with our Soldiers."

Katherine Hammack, assistant secretary of the Army, Installations, Energy and Environment

"Nearly 50 percent of the fuel that's consumed in Afghanistan on Army operating bases is producing generator power," Mason said.

Hammack pointed out that 70 to 80 percent of all ground convoys in Afghanistan, as measured by weight, consist of fuel and water deliveries.

"And so through better power management, flexible power sources, lightening the energy load on our Soldiers – all combined – we're able to redirect our manpower and our equipment assets back to the mission," said Hammack, "and that increases our agility and it increases our effectiveness overall."

More than 12,000 service members training at Fort Devens rotate annually through the BCIL, providing invaluable user input about systems being developed here, with the ultimate goal of trimming fuel and water usage on base camps by 50 percent. Such innovations as micro-grids, solar shades, shelter

liners and shower water reuse systems have already brought that goal closer to reality.

"When you look at the reductions to date, in a few years, it's remarkable," said Kevin Fahey, Program Executive Officer, Combat Support & Combat Service Support. "And I think a lot of it is our ability to test things and get users on it and get feedback quickly,

and then (be) able to prove that this is the thing we want put in the Soldiers' and the Marines' hands in the field."

This progress has been made despite the budgetary headwinds faced by all Army programs.

"I think this BCIL will survive declining budgets because it's proved the return on investment and the capabilities, and shortened the acquisition process," said Hammack, "and all of those represent costs to the Army and costs to this nation."

Mason said it's critical to maintain funding for such programs as the BCIL.

"If we don't spend appropriately in science and technology, research and development, we're going to find ourselves on the battlefield in a situation where our enemies have a comparative advantage over us, as opposed to the other way around," said Mason, "and our Soldiers are going to be put at more risk."

Energizing Army base camps

Career Choices

NSRDEC chemical engineers talk with WPI students about options

By Jane Benson, NSRDEC Public Affairs / NATICK, Mass. (March 14, 2014)

Dr. Natalie Pomerantz and Laurel Doherty are helping Worcester Polytechnic Institute freshmen envision careers in the science, technology engineering and math, or STEM, fields.

The two chemical engineers, who work at the U.S. Army Natick Soldier Research, Development and Engineering Center, have taken the time to talk to students in Dr. Terri A. Camesano's "Introduction to Chemical Engineering" class.

"First-year students greatly benefit from seeing and hearing from professionals," said Camesano, assistant dean of engineering and a professor of chemical engineering. "It helps them to envision their future career paths, and see whether this is the right path for them. Once they get interested in a certain area, they start asking more specific questions about which courses to take, which major/minor is best for them, and how to define their internships or other educational experiences."

Camesano pointed out that Pomerantz earned her doctorate and Doherty picked up her bachelor's degree at WPI.

"It was nice for the class to see very different perspectives," Camesano said. "Laurel also talked to the students about her plans to pursue graduate work. These are all important ideas for the students to consider."

It's also important for students to learn more details about what the field entails.

"When students go into chemical engineering, they don't always know exactly what it is. That was the case for me," said Pomerantz, a research chemical engineer on the Chemi-

cal Sciences and Engineering Team. "I think the professor wants them to understand how broad a field chemical engineering can be. As far as careers go, you can do water filtration, semiconductors, biomedical."

Doherty, a chemical engineer on the Biological Sciences & Technology Team, added, "I interviewed for jobs ranging from pharmaceuticals to R&D to food processing to cement. There is just a huge variety of things you can go and do."

Pomerantz works with chemical protective clothing; particularly research involving selectively permeable membranes that block chemical warfare agents from getting in but let water vapor go through so Soldiers can sweat and cool off. She said another approach to chemical protection is to embed reactive compounds within the fabric of the uniform to decontaminate the agent on contact.

In addition to helping the Soldier, Pomerantz said she believes another important aspect of her job, and her duty as a civil servant, is to help the next generation by sharing her expertise and knowledge. She added that she believes in promoting STEM. She said she is thrilled to interact with students ranging from middle school to college.

"I love STEM outreach," Pomerantz said about the time she has spent with middle school students touring NSRDEC. "I can see in their eyes that I am inspiring them."

Pomerantz said that students in WPI's freshman engineering class "have chosen that major. And they are really into it. They want to participate. They want to see exactly what it is that you do. They ask a lot of questions.

You get to be the person that says, 'Yes! What I do is fascinating.'"

Pomerantz is judging an upcoming science fair and also a WPI graduate student competition. The latter gives her the chance not only to provide students feedback, but also to scope out future collaborations.

A senior project at WPI led Doherty to NSRDEC, and she liked the place and the work so much she wanted to return after graduation.

"I am on the bio end of things," Doherty said. "So I spend a lot of time in the lab with a lab coat, goggles, and gloves — that whole thing. A lot of what I do where I think chemical engineering really comes into play is method development/experiment development. You can take a set of parameters and try to optimize it to get the best result. I have also done some work with automation. For example, right now I'm automating a fermentation process.

"I brought a fermenter into the class, which is actually a small reactor, so they actually got to see what that was, and most of them will be using them in the future."

Doherty is working as a part of collaboration with the Combat Feeding Directorate to look at gut bacteria.

"Gut bacteria break down some foods that your body can't digest on its own," Doherty said. "They can have a lot of positive effects on your health, but what gut bacteria you have depends on a lot of factors, including what you eat. Learning more about gut bacteria can help with the design of future Soldier rations, along with any other supplements that would help them to stay healthy in the field."

What's the best part of Doherty's job?

"Do I have to pick just one?" she said. "I like that it helps the Soldier. That I can look at my work, and I can see some benefits down the line. I like that what we do will make their lives better."

Both Pomerantz and Doherty want students to consider working at NSRDEC. They also said it is helpful for students to see people — women, in particular — pursuing science and engineering.

"If they see an example right in front of them, it really helps," said Doherty.

"It is important for them to see the face," Pomerantz said.



Space Food

By Alexandra Foran, NSRDEC Public Affairs / NATICK, Mass. (Nov. 1, 2013)

Getting enough vitamins in one's diet is tough enough on this planet. Consider the health of astronauts in extended spaceflight.

The depletion of vitamins in astronauts' food during lengthier missions in outer space is one of the reasons NASA requires a five-year shelf life at 70 degrees Fahrenheit for stabilized foods.

The Department of Defense Combat Feeding Directorate, or CFD, at the Natick Soldier Research, Development and Engineering Center is looking at compressed bars and dried drink mixes to study essential vitamins in nutrient-dense foods and develop packaging that will better preserve essential vitamins for NASA.

This study is based upon a three-year contract for a possible mission to Mars, titled, "Stabilized Foods for Use in Extended Spaceflight: Preservation of Shelf-Life, Nutrient Content and Acceptability."

Blueberry granola bars and chocolate drink

mixes have already been developed by CFD to be used in this study. Since vitamins naturally chemically degrade through time, CFD will encapsulate vitamins in these food products with a protective shell material and also adjust the chemistry of the food based on its chemical environment.

"You have two different chemical environments in food," said Ann Barrett, CFD principal investigator for this project, "water-loving, or hydrophilic, and fat-loving, or lipophilic. Sometimes a water-loving antioxidant will have better survival and shelf life, and conversely, a non-polar or fatty-type antioxidant would have worse retention in a non-polar environment."

After encapsulating the vitamins with either a lipid coating or carbohydrate coating, CFD will be provided with data showing the percentages of essential vitamins retained during accelerated storage.

CFD is also analyzing different packaging

The Department of Defense Combat Feeding Directorate at the Natick Soldier Research, Development and Engineering Center is looking at compressed bars and dried drink mixes to study essential vitamins in nutrient-dense foods and develop packaging that will better preserve essential vitamins for NASA astronauts on extended missions.

prototypes to better preserve food's shelf life. The Advanced Materials Engineering Team has been developing advanced packaging materials for extended shelf-life during the past several years, both internally and externally.

"Packaging technologies similar to those developed in these past studies is required by NASA for deep-space missions," said Danielle Froio-Blumsack, CFD principal investigator for the project. "Meeting the shelf-life requirement is one of the biggest challenges involved in developing packaging for both space missions and military application."

Packaging for the NASA prototypes has to not only preserve vitamins, but also be compatible with advanced sterilization processes. These processes minimize the amount of time the food is exposed to high temperatures, which in turn reduces the degradation of vitamins during processing.

Thin nanocomposite and aluminum oxide barrier coatings are being used during this study to maximize durability and protection of food contents that will undergo more extensive testing. The packaging will undergo complete characterization and performance testing, both before and after the sterilization processes.

"This will allow us to pinpoint what material properties are most affected by the different sterilization techniques," said Froio-Blumsack.

The combined effort will provide data showing the ideal chemical environment and processing/packaging method to ensure food quality and, more specifically, nutrient retention.

"This study is important because it will help ensure the health of astronauts and it also has bearing on our Soldiers," said Barrett, "because if we learn techniques that preserve vitamins in these model systems, we can apply that to our own food for the troops."

This study will allow for better understanding of general food preservation, not only for retaining vitamins, but also for selecting the best packaging and sterilization processes to deliver quality food to Soldiers, astronauts and consumers.



AMC commander: Natick 'critical' to Army, nation

By Bob Reinert, USAG-Natick Public Affairs / NATICK, Mass. (Jan. 30, 2014)

The commanding general of the U.S. Army Materiel Command visited Natick Soldier Systems Center to learn more about what is done on the installation to support America's warfighters.

Gen. Dennis L. Via received briefings and witnessed demonstrations about Soldier systems engineering architecture, female body armor, the Improved Outer Tactical Vest, the Doriot Climatic Chambers, the Physical Demands Study, Product Manager Force Sustainment Systems, aerial delivery, Soldier power-wireless transmission, multi-functional fibers, vision protection and nutrition.

"Everything that we do to sustain the Soldier, and improve the performance of that Soldier, and protect that Soldier, and provide for quality of life is being done here," Via said. "So it's been a phenomenal visit."

Via pointed to the Soldiers who come to Natick fresh out of Advanced Individual Training to spend 90 days as human research

volunteers in experiments, before moving on to the initial assignments of their Army careers.

"I think that was a highlight," Via said. "I'm extremely impressed with the Soldiers."

Among the many technologies that stood out, Via mentioned "advancements in power and being able to lighten the load of what our Soldiers are carrying today -- some of the wireless capabilities that are being built. I think that was just absolutely phenomenal."

He added that he enjoyed speaking with scientists and engineers about "how they're researching those leap-ahead technologies for our Army -- very important work, across the board."

Via called Natick's work critical to AMC's mission of supporting the warfighter, today and tomorrow.

"We have to invest in research and development and science and technology to continue to make sure that our Army and our forces have that technological advantage that we

Gen. Dennis L. Via, Army Materiel Command commander, visited Natick Soldier Systems Center, Jan. 30, 2014, to learn more about the important work done there for warfighters.

helped build over the past decade-plus of war," Via said. "We want to continue to maintain that ahead of any potential adversary in the future."

No stranger to Massachusetts, Via earned his master's degree from Boston University. He said that he appreciates the importance of Natick Soldier Systems Center's proximity to some of the nation's finest colleges, universities and technology companies.

"I think it's critically important to continue to attract bright men and women, both those who want to join and serve our Army, (and) also those who want to join and support our Army as Department of the Army civilians," Via said. "This is an area very rich in being able to provide personnel who have those types of degrees (and) experience that can help us achieve our goals."

Via said he looked forward to seeing what Natick would produce in the future.

"It's a critical capability for our Army," said Via, "and it's a critical capability for our nation."

MORE *continued from page 7*

will need between 4,500 and 6,000 calories per day," said Smith. MORE provides that additional nutritional "oomph," giving warfighters approximately 1,000 extra calories in a balance of carbohydrates, caffeine, electrolytes and vitamins for these operational environments.

The first MORE enhancement pack developed by CFD was the MORE — High Altitude/Cold Weather. At the time, military service representatives tasked CFD to develop an enhancement pack to counter weight loss and fatigue, and to improve the cognitive and physical performance of warfighters operating in the mountainous terrain of Afghanistan. Increased energy requirements during high-altitude operations, coupled with symptoms of acute mountain sickness, made this a challenging requirement to meet.

Acute mountain sickness, with symptoms including anoxia, headache, nausea and vomiting, is caused by reduced air pressure and lower oxygen levels at high altitudes. The faster you climb to a high altitude, the more likely you are to get acute mountain sickness.

"The MORE is designed to be high in carbohydrates to combat acute mountain sickness. Research has shown that consuming a diet high in carbohydrates can lower the symptoms," Smith said.

In hot weather environments, hydration is particularly important, which is why the MORE — Hot Weather includes two carbohydrate-and-electrolyte beverages. These two drinks are similar to sports drinks, providing not only pure energy in the form of carbohydrate, but also electrolytes such as potassium and sodium that warfighters sweat out. The electrolyte beverages are energy gels that come in mixed berry, orange and lemon-lime flavors. The carbohydrate beverages come in mixed berry, fruit punch and lemon-lime flavors.

MORE RESEARCH, TEST AND DESIGN

During the course of research and development on MORE, CFD conducted several focus groups and field evaluations. NSRDEC's Operational Forces Interface Group and the Consumer Research Team collected feedback and input. Small focus groups involved warfighters from the 10th Mountain Division's Light Fighter School at Fort Drum, NY, units that had deployed to Afghanistan and Army medical personnel.

Additional component selection and survey participation on the design selection, acceptability, convenience and benefit involved warfighters from the U.S. Army Mountain Warfare Training School at Camp Ethan Allen, Vt., and the Connecticut National Guard's 1st Battalion, 102nd Infantry Regiment Mountain Training Group.

CFD received an urgent-need request from the U.S. Army Special Operations Command in 2009 for 10,000 units of MORE — High Altitude/Cold Weather to support the increase in troops deployed to Afghanistan.

MORE — Hot Weather prototypes were field-tested with the 75th Ranger Regiment at the Pre-Ranger Course at Fort Benning, Ga. MORE prototypes were also provided to special operations forces during high-altitude training in Colorado; deployed units of Combined Joint Task Force 82 in Afghanistan; and to Engineer and National Guard Scout units at Bagram Airfield, Afghanistan, during Operation Enduring Freedom.

"We assessed results from individual ration field evaluations to identify ration components with the highest acceptability and consumption rates," said Smith. "Feedback from warfighters indicated they preferred ration components that were easy-to-consume, eat-on-the-go, snack-type foods, rather than meals that would require time to heat and prepare."

Each pack is calorically dense and weighs only three quarters of a pound. Packs are filled with popular items including caffeinated pudding, energy gels, carbohydrate-enhanced beverages, First Strike bars, nut mixes, crackers, caffeinated gum and Zapplesauce, which is applesauce fortified with maltodextrin, an energy-dense carbohydrate and a source of energy to help maintain physical performance.

"Zapplesauce and First Strike bars provide the warfighter with essential complex carbohydrate," said Smith. Each food item serves a specific purpose for the warfighter. As with other operational rations, the goal is for the warfighter to consume every item to meet appropriate caloric needs.

AWARD-WINNING WORK

For their work in developing MORE, Smith and Lecollier received the prestigious Col. Rohland A. Isker Award in 2013 for leading their respective teams in developing, transitioning, acquiring and fielding MORE. The award is an annual honor from the Research and Development Associates for



Military Food and Packaging, better known as R&DA, to recognize civilian employees of the federal government or military personnel for outstanding contributions to national preparedness. Isker, a pioneer in Army food service research and development, founded R&DA in 1946.

"Our review board at R&DA felt the MORE project and the ultimate fielding of the ration supplement itself had the most beneficial impact on warfighters (Soldiers, Marines and special operators) of any recently introduced operational ration product," said John McNulty, executive director of R&DA.

"MORE met a very compelling need to introduce much-needed calories and other nutrients into the diets of these warfighters during particularly stressful situations on the battlefield during extreme weather conditions. It was a success story that worked and received very high accolades from the field," McNulty said.

MORE also provides warfighters with important enhancements to improve mental alertness and physical endurance and, like all CFD products, is "Warfighter Recommended, Warfighter Tested, and Warfighter Approved."



Soldier
Science & Engineering

Soldier Science & Engineering

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RDECOM



NSRDEC is part of the U.S. Army Research, Development and Engineering Command, which has the mission to develop technology and engineering solutions for America's Soldiers.

RDECOM is a major subordinate command of the U.S. Army Materiel Command, whose mission is to develop and deliver global readiness solutions to sustain Unified Land Operations, anytime, anywhere.