

ARMOR & Mobility

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Shelters



Commander's Corner

COL Robert "Rocky" Kmiecik

Director

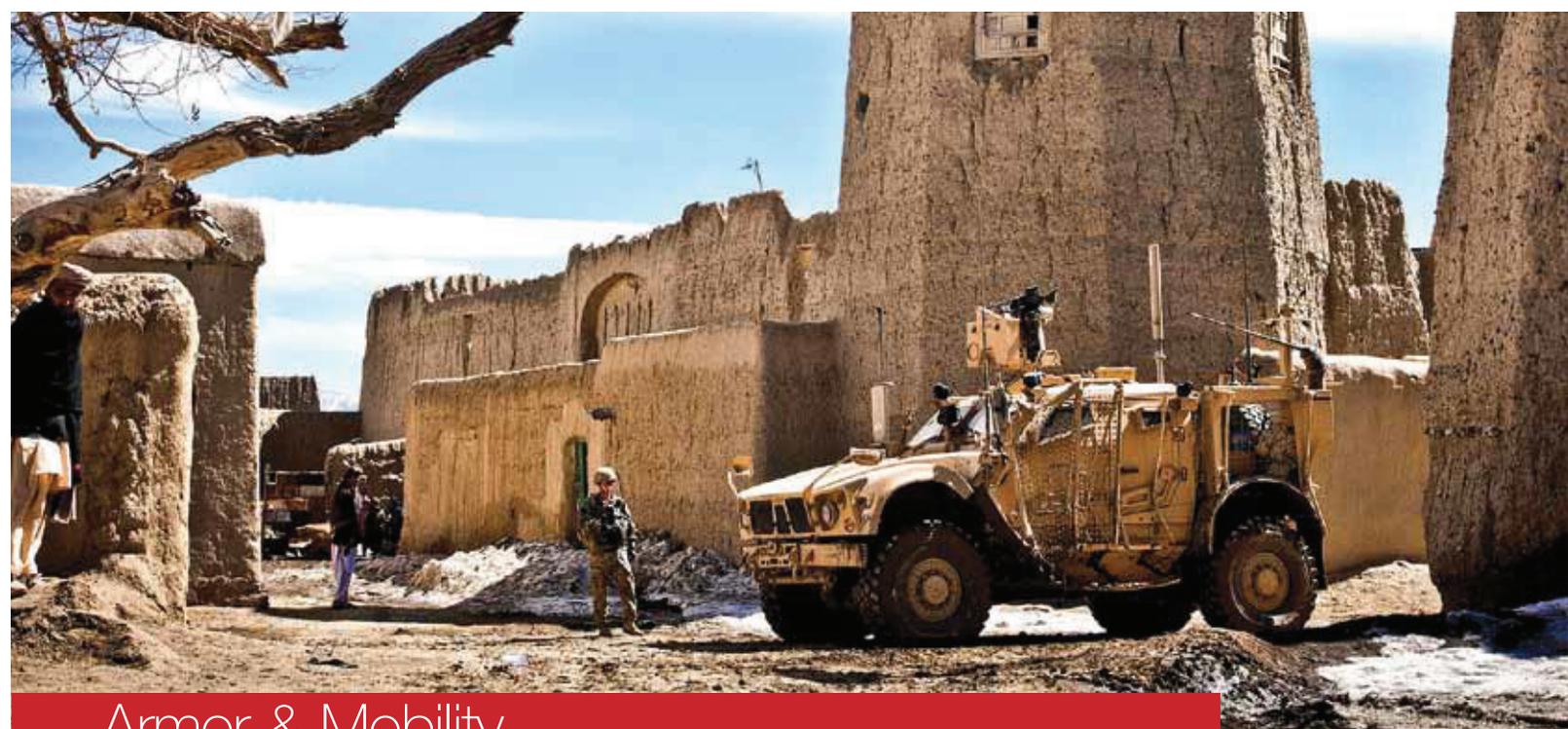
Mounted Requirements Division

U.S. Army Maneuver Center of
Excellence (MCoE)

Ft. Benning, GA

JLTV  MCoE  USMC CIED  Maneuver Support Center CDID  MARCORSYSCOM

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SPECIAL SECTION SHELTER DEVELOPMENTS



U.S. Army Natick Soldier Research, Development, and Engineering Center (NSRDEC) is testing and qualifying the best in multi-capable shelter system technology for the nation's defenders.

By Amy Soo Klopotoski, U.S. Army NSRDEC

Warfighters are continuously diverted from their mission to set up, operate and maintain inefficient and ad hoc base camps in austere environments. Also known as Contingency Bases, these camps are meant to provide life support such as sleeping quarters, showers, latrines, food preparation and dining areas to the warfighter in deployed areas around the world. Some Contingency Bases even provide specialty functions like command and control centers, medical facilities, and recreational areas.

CONTINGENCY CONGLOMERATION

Unfortunately, historical methods of establishing Contingency Bases consisted of piecemeal combinations of equipment that weren't necessarily designed for that application or use. Those inefficient systems require a lot of time and manpower to set up, consume excess amounts of fuel and water, and generate large volumes of waste. Every resupply delivery of fuel and water and every backhaul of waste diverts the Warfighter from their mission focus and puts them in harm's way.

The U.S. Army Natick Soldier Research, Development and Engineering Center (NSRDEC), located in Natick, MA, is leading an effort to address expeditionary Contingency Bases from a system-level perspective, leveraging emerging technologies to provide the warfighter a better quality of life in a package that is optimized for performance, efficiencies, durability, and ease of use. There are new and advancing technologies in industry,

academia and government laboratories that can provide a wide range of life support and self-sustaining capabilities to the Warfighter at Contingency Bases. The challenge is to identify the best and most applicable technology while designing a system that balances trade-offs between performance, logistics demand, manpower requirements, durability and cost.

REDUCING LIFE SUPPORT DEPENDANCY

The technology advances that have the most potential in benefiting the warfighter are those that reduce the dependence on fuel and water resupply, as well as remediate the liquid and solid wastes generated. Traditional shelter systems are not energy efficient; they consist of single layer fabric shells and liners with no consideration for energy efficiency. This results in the requirement for a 5-ton environmental control unit (ECU) to cool each small shelter system, a one-for-one ratio. This translates into almost 800 kilowatts required to cool shelters at a 600-person camp. Advances in energy efficient shelter systems dramatically reduce the heating and cooling requirements, which in turn reduces the fuel consumed on the battlefield. For example, solar barriers reduce the solar load on shelters, which reduces the cooling demand of the ECU. Also, thermal barriers that apply advanced insulation materials and concepts such as cellular insulation further enhance the thermal efficiency and reduce heating and cooling requirements.

Ultimately we will be able to put two tents on one ECU, cutting the number of ECUs in half, or downsize the ECU to a smaller, more efficient package. Advances in light emitting diode (LED) technology are a more energy efficient solution than the currently fielded fluorescent lights and have a longer lifespan. Introducing ruggedized renewable energy technologies and smart power management advance efficiencies of Contingency Bases even further towards eliminating dependence on diesel fueled generators. Waste-to-energy technologies, such as pyrolysis and

PM FSS: Ensuring Critical Shelter Support

Product Manager Force Sustainment Systems (PM FSS), part of

the Program Executive Office for Combat Support and Combat Service Support's (PEO CS&CSS) Project Management Force Projection (PM FP) office, as the Army's Life Cycle Manager for Soldier sustainment systems, is responsible for the development, fielding and sustainment of shelters and shelter systems to support the mission of the Army and our joint warfighters.

PM FSS works closely with the Natick Soldier Research Development and Engineering Center (NSRDEC) to provide future direction to improve rigid and soft wall shelter structures on the battlefield. PM FSS continues to pursue near and long term technologies to improve energy efficiency, shelter modularity, and to minimize the logistical foot print. This includes reducing the system weight, packing volume, and the manpower needed to employ the shelter systems across a broad range of environmental conditions and military missions.

CONSERVING "MISSION GO" CAPACITY

Specifically, PM FSS has been evaluating existing industry solutions for containerized, lightweight, deployable, thermally insulated, rigid wall structures and alternative technologies for energy conservation and thermal efficiency at its Base Camp Integration Lab (BCIL) located at Fort Devens, MA. Energy efficient and deployable rigid wall shelters have significant potential to replace existing soft wall shelters and other structures being employed in theater for use in billeting, tactical operation centers, dining facilities, medical facilities and other applications. Additionally, PM FSS and NSRDEC are working to right-size with more efficient environmental control units to provide increased energy efficiency and decreased fuel consumption for heating and cooling these structures.

For temporary soft-wall shelters and tentage, PM FSS is focusing its near term efforts on developing integrated extreme weather liner systems that will improve energy efficiency by retaining heat better in the winter heating season and reducing the external heat load in the summer cooling season. Additionally, during hot weather conditions, solar shading systems like the existing Ultralightweight Camouflage Net System (ULCANS), used in conjunction with insulated liners, have proven to significantly reduce the energy load required to cool the tent which results in a reduction of fuel usage and lower fuel costs.

The Ultra-lightweight Camouflage Net System (ULCANS) is designed to provide Multispectral Camouflage to counter visual detection and sensors in the Near IR (Night Vision), SWIR, MWIR/LWIR (Thermal) and Radar Spectrums. Because of the Thermal requirement it also reduces Solar/Thermal Transmission by 85-90% as well as UV exposure. Testing at the National Training Center in Fort Irwin showed that covering a shelter/tent with ULCANS reduces power requirements for cooling by 22%, which translates to significant fuel savings for a base camp.

More info: nsrdec.natick.army.mil

gasification, will make it possible to not only remediate solid waste generated at Contingency Bases, but also potentially generate power from that waste.

PARTNERING FOR WARFIGHTER SUCCESS

While the NSRDEC is dedicated to leveraging such emerging technologies to advance Contingency Basing, this technology work is being done in joint efforts with a wide range of partners. NSRDEC collaborates with the technologies and expertise across the Army's Research, Development and Engineering Command (RDECOM), as well as with other government laboratories. The Joint Committee on Tactical Shelters is an organization chartered to implement standardization and to leverage technology efforts across the Joint Services. NSRDEC is partnered with universities to create concepts for futuristic, next-generation self-sustaining living modules that would provide plug-and-play capabilities to meet various Warfighter mission needs.

NSRDEC is also partnered with Hunter Defense Technologies (HDT), an industry leader in the design and manufacture of expeditionary shelter and power technologies, to design these emerging technologies into Contingency Basing systems that are optimized for Warfighter needs. This system-level design will take into consideration key, critical military needs such as reduced weight, packing volume, durability in a variety of environments and minimized manpower requirements to set up and operate. The ultimate goal of these combined efforts is to provide the Warfighter with a place to live and rest in a Contingency Basing system that is designed for ease of use, self-sustainment, and can be rapidly moved and re-established.

JOCOTAS:

Managing Tactical and Energy Contingencies



Advanced Combat Outpost
(JOCOTAS)

For thirty-five years, the Joint Services have worked together under the Joint Committee on Tactical Shelters (JOCOTAS) to mitigate worldwide battlefield threats by delivering state of the art shelters to the warfighter. In 2012, JOCOTAS formally broadened its activities to include Contingency Basing (C-Basing) with a focus on energy management and sustainment.

By Frank Kostka, Executive Secretary
for the Joint Committee on Tactical Shelters (JOCOTAS)

Energy Management across the battlefield remains a major initiative among all services. The Navy recently completed a seven month deployment of the USS Makin Island, a new generation of amphibious assault ships with a hybrid propulsion system. Reports indicate that the new approach reduced fuel consumption in by 55% and saved \$18M over typical expenditures for similar operations. The Air Force is investigating adaptive engine technology development, because of its potential to save up to 25% in fuel burn over state-of-the-art engines. The Army and Marine Corps have specific land based requirements that

utilize contingency bases as force projection platforms. Energy use in basing operations was documented from March 2011-Aug 2012 and found to approximately equal the fuel required to power all vehicle and rotary wing aircraft in theater that support the mission. This area has key leadership interest.

ENERGY OUTLOOK

On 8 August 2012 senior members from OSD and the Army gathered at Fort Devens, MA for the Army Base Camp Integration Laboratory (BCIL) Operational Energy Day hosted by LTG Raymond Mason, the Army Deputy Chief of Staff for Logistics (G4) and Mr Kevin Fahey the Program Executive Officer, Combat Support & Combat Services Support. To emphasize the importance of Energy Management within the military many other key leaders from across DoD also participated.



A patrol base in Afghanistan employing joint operational shelter systems (JOCOTAS)

The Assistant Secretary of Defense for Operational Energy Plans and Programs Ms. Sharon Burke, Ms. Katherine Hammack, Assistant Secretary of the Army for Installations, Energy & Environment, Ms Barbara Machak, Acting Deputy Director of the Research Development and Engineering Command (RDECOM), and Ms. Gayle von Eckartsberg, Deputy Director of the Marine Corps, Expeditionary Energy Office, were among the participants. The BCIL is managed by PM Force Sustainment Systems, LTC (P) James Tuten and his Force Provider Team and consists of two, 150 Soldier Camp modules set up side by side and fully instrumented to assess energy and water usage. One camp is a baseline and uses current state of the art fielded equipment. The other camp is a test bed for new technologies providing a direct comparison to existing hardware. The BCIL hosts user troops on training missions at Ft. Devens.

In addition other evaluations are taking place on site including the assessment of off the shelf Smart and Green Energy (SAGE) alternatives and high performance commercial rigid wall shelters. The SAGE program is led by the Army's Logistics Innovation Agency (LIA) that works for G4 under the leadership of Dr. Vic Ramdass, Dir LIA.

A JOINT COLLABORATIVE EFFORT

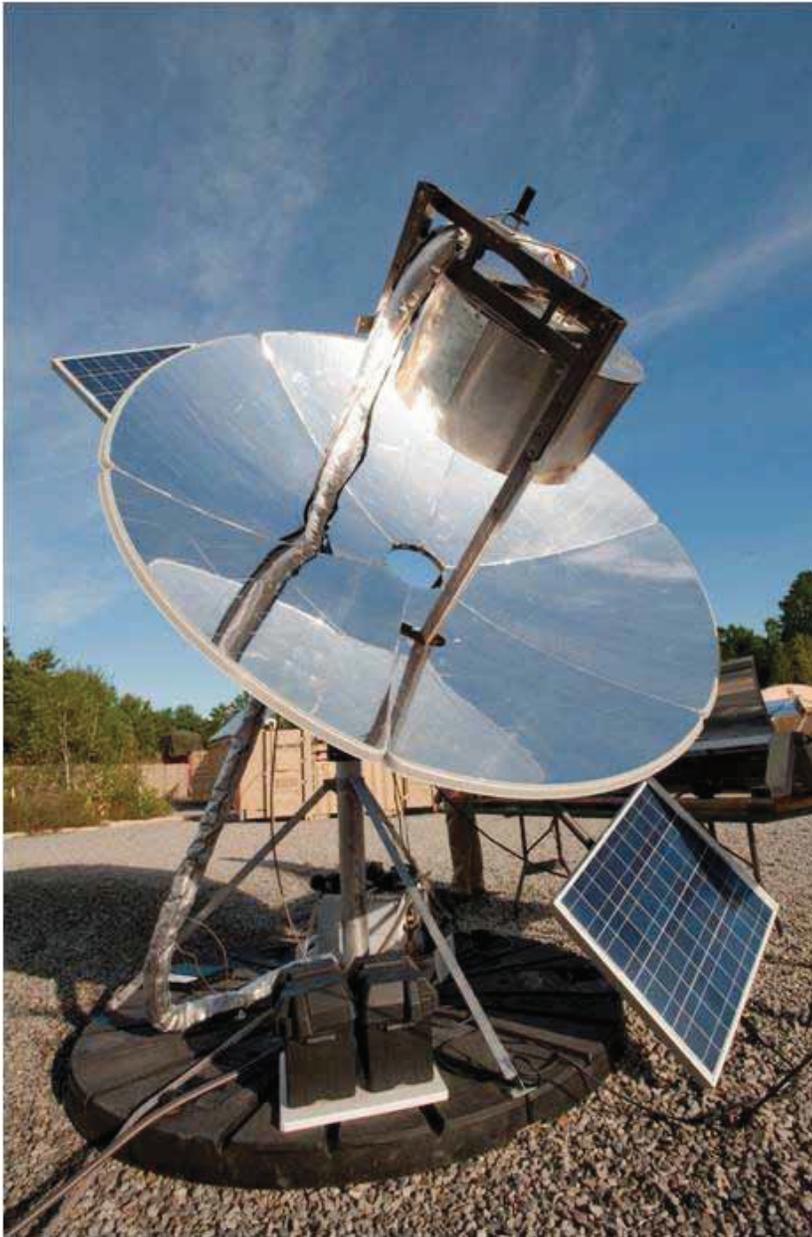
For over thirty five years, the services have worked together under the Joint Committee on Tactical Shelters (JOCOTAS) to mitigate these threats, reduce redundant research and development expenditures, establish common shelter solutions, exchange technical information and maintain a family of standard shelters. When energy became significant issue for the military, JOCOTAS teamed under the OSD Joint Combined Technology Demonstration (JCTD), NET-Zero to identify near and midterm solutions to this problem. After 18 months of test and evaluation it was clear that energy consumption could be reduced at least 30% by combining outer thermal shields with high performance liners.

The group broadened its efforts and assessed energy efficient lighting and green power generation using photovoltaic arrays. PM FSS was a key partner in the JCTD and as the results became clear on the effectiveness and simplicity of the thermal shields and liners they initiated a program to procure energy reduction packages for the Force Provider System. They concurrently assessed the state of the art in LED lighting

and identified additional potential energy savings. Ms. Burke's office funded the initial phase of the energy reduction program and industry was a key enabler ramping up production to meet the services' needs.

One leading historical indicators of the health of the shelter world was the JOCOTAS budget. A yearly review captured projected shelter program funding data from the services across the six year POM (Program Objective Memorandum) cycle. Mission areas begin with technology development and transition into engineering and manufacturing Programs of Record that include production, deployment, sustainment and disposal. We recently began capturing actual data over a shorter period of time due to the significant fluctuations related to the buildup of forces and the current scaling down of operations. We expect to complete the 2011 numbers this month and based on what we know Research and Development appears stable. Actual production contract funding has been trending down over the past two years when compared to projections. I believe it is safe to say that production will continue to ramp down over the next couple of years. The current Budget Control Act that President Obama signed into law a little over a year ago increases the complexity of making any projections as hard choices will have to be made and no matter how it shakes out and a \$50B reduction across all Government Services would not be out of the question.





Small unit solar water heaters are being used to produce hot water for Joint Field Installations. (JOCOTAS)

One of the strengths in the shelter world that may help mitigate the anticipated cuts in defense spending is the strong strategic relationships between the Services and, within industry and academia. The many partnerships across the non-Government sector allow consortiums to avidly compete for developmental and manufacturing projects while remaining lean and focused in the areas of expertise. There are several large organizations that play in this realm, with broad based life cycle in-house capabilities that also play a critical role in meeting warfighter shelter and contingency basing needs.

SHELTER TACTICS EVOLUTION

Another interesting concept that may be on the horizon is a possible increase in the use of commercial rigid wall shelters for contingency basing applications. The thought process is that many times we quickly move from tentage

into semi fixed facilities that provide enhanced energy management, with superior quality of life for the warfighter. PM FSS ran a competitive evaluation of knock down panelized structures and expandable shelters in 2011. The Rapid Equipping Force will assess similar structures at Ft. Benning in the fall. The topic was briefly discussed by senior leadership at the BCIL Operational Energy Day. How this plays into asset deployability, the JOCOTAS Standard Family of Shelters, transportability criteria for shipment on military systems, relocatable building regulations and safety will be vetted as potential solutions are identified.

Natick Soldier Research Development and Engineering Center (NSRDEC), one of the RDECOM family, has the Army lead for C-Basing Research and Technology (R&T) in the areas of shelters, individual and squad level warfighter protection, Aerial Resupply, Combat Feeding, Cognitive Performance and Basic Sciences. Other RDECs within RDECOM, the Corps of Engineers, Air Force Research Laboratory (AFRL) and the Department of Energy Laboratories also play a major role. PM FSS is the test and evaluation partner through leadership and management of the BCIL and, the transition agency for emerging technologies. Warfighter requirements in Programs of Record are envisioned, vetted and articulated by the Training and Doctrine Command (TRADOC). The Sustainment Center of Excellence (SCoE) located at Ft Lee, VA and The Maneuver Support Center of Excellence, situated at Fort Leonard Wood, MO are the TRADOC components that provide the guidance and insights to the R&T and PM community.

Over 1200 C-Bases ranging from small observation posts to mega installations were constructed during the Iraq and Afghanistan conflicts. The majority of these were constructed in an ad hoc fashion from local and imported materials. Initially many of these were very austere and had to be established from the ground up by the warfighters who would inhabit the compound. This puts the unit at risk of attack by enemy combatants and reduces that number of warfighters how are outside the "wire" i.e. the base perimeter. The troop to task ratio that faces each field commander is, with limited recourses how do they get the mission accomplished. Tasks include perimeter defense, command and control, access control, base construction, maintenance, sleeping, patrols, on down the line. A set number of troops are required for certain tasks and that cannot be omitted. Ultimately, base construction takes away for patrols and reduces situational awareness. In severe case such as Camp Kahler, this leads to disaster. One of the goals of the current programs is to utilize standard systems, kits and design concepts to mature the base infrastructure as quickly as possible. This will

incorporate energy efficient shelters and system, water and waste management and quickly deployable infrastructure.

GAME CHANGING DESIGN SHIFT

Tents and rigid wall shelters are major consumers on energy on the battlefield due to the demands of 24/7 operations and environmental control. Shelters are critical elements that protect warfighters from a wide range of hostile activities. Deployed personnel may be exposed to severe weather, temperature extremes, chem/bio warfare agents, ad hoc toxic industrial chemical weapons, electronic target identification and ballistic threats.

A major game changer in the shelter world emerged in 2011 with the advent of wide scale fielding of the Airbeam TEMPER tent within the Force Provider system. The shelter is supported by, integral Inflatable arches, integrated with liners and floors and almost self erects after staking down the perimeter and turning on a compressor.

The shelter was down selected from 5 candidates including the best of breed standard and military hardened commercial shelters. The system offers three distinct advantages; it is flexible and can be rolled up into a compact shipping configuration that fits into TRICON container. It can be slid off of vehicles, dragged around on its shipping diaper without damaging structural components, and requires few people to erect. In a recent assessment conducted at the Network Integration Exercise 12. 2, users and test officers

documented that the Airbeam TEMPER “requires fewer Soldiers to set up and reduces emplacement time compared to the legacy system” Exact specifics of the test are procurement sensitive, however, the results are consistent with those of the Force Provider evaluation team in 2006 at Ft. Polk, LA with five systems evaluated..

As the future unfolds our strategy is to replace ad hoc contingency bases that are labor intensive to erect, difficult to retrieve and expensive to sustain with a new generation of modular, scalable, self sustaining systems. The Science and Technology community is harvesting technologies across government laboratories, industry and academia to design modular basing systems optimized for efficiencies and ease of use to provide a greater quality of life in theater and free the warfighter to focus on the mission. Future Contingency Bases will be established within hours, include adequate initial perimeter defenses, reduce current energy demands by 50%, generate 25% of its power requirements through renewable sources, recycle 90% of water and reduce solid waste by 60%. Our capabilities will need to expand to meet worldwide environmental threats. To meet these challenges will require a strategic partnership between military developers, academic institutions and the commercial marketplace.

More info: nsrdec.natick.army.mil/jocotas

