DoD Power & Energy

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ENERGY HARVESTING
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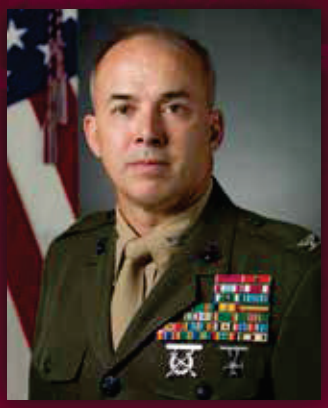
JOCOTAS PUSHES AHEAD
Quality of Life, Energy Efficiency, and Force Protection

Leadership Perspective



Col. Jim Caley
Director
USMC Expeditionary Energy Office
Arlington, VA

Asia-Pacific Operational Energy ■ Natural Gas & Military Vehicles ■ Latest Shelter Systems

MORE THAN TENTS

Improving Warfighter Quality of Life in Austere Base Camps

By Frank Kostka, JOCOTAS Support Contractor

General Gordon Sullivan (Ret), the Army Chief of Staff from 1991-1995, was a transformation agent. One of his many accomplishments was enhancing Soldier quality of life (QoL) after Operations Desert Shield and Desert Storm (1990-1991). His vision spawned many new and innovative solutions for today's Warfighters, including laying the foundation for modern expeditionary basing systems. The groundwork was executed at the U.S. Army Natick Soldier Research, Development, and Engineering Center (NSRDEC) and transitioned over to the Product Manager Force Provider. The initial program focus was to acquire Air Force Basic Expeditionary Airfield Resources (BEAR) Habitation Systems, test them with Soldiers, and establish QoL baselines. The work also led to the establishment of two basing science and technology (S&T) funding lines, Expeditionary Mobile Base Camp Technology (VT4) and Expeditionary Mobile Base Camp Demonstration (VT5), that came to fruition in 2012. The BEAR and Force Provider programs are major players in the Joint Committee on Tactical Shelters (JOCOTAS).

Understanding QoL

To prepare for the VT4 and VT5 start up, Phil Brandler, the former NSRDEC technical director, was recruited to assist in laying out an S&T strategy that included QoL. In order to secure user related input on a number of issues including QoL, Brandler and NSRDEC conducted an Expeditionary Base-focused wargame that included Soldiers with recent experience. The wargame took place from 16 to 19 October 2012 at the Maneuver Support Center of Excellence (MSCOE) facility at Fort Leonard Wood, MO, using Soldiers recruited from the Army's Forces Command units and the MSCOE staff.

The results indicated that Soldiers do not expect to have numerous QoL-related features at small patrol bases (PBs), but they expect that within weeks they will be able to rotate back to a combat outpost (COP) or forward operating base (FOB) with more capabilities and a better QoL. In fact, improving QoL at a PB is not always necessary or even wanted—mission always comes first. Personnel involved in the exercise noted that worse conditions equal fewer distractions and require Soldiers to become focused on the mission. They did agree that "one portable shower kit per platoon would make a world of difference in QoL and mission effectiveness." If deployed Soldiers had showers, they could stay for longer periods of time before rotating back to larger bases.

Participants told Brandler that at the larger bases it is essential for preserving QoL and mission effectiveness to have HVAC in tents during sleeping hours. They also desire enough outlets for mission and personal items for everyone in the shelter. In general, however, it's all about expectations: Soldiers are more apt to be accepting of the QoL capabilities available at a particular size camp if they match their expectations of what should be available.

Flash forward to 2014, and QoL, Force Projection, and Zero Footprint are intertwined into today's integrated solution for future basing operations.

FOB Hammer, Iraq, in 2007. The base housed the Army's 3rd Brigade Combat Team, 3rd Infantry Division, in support of General Petraeus' Baghdad Security Plan. (USAF)

QoL for the Warfighter is being investigated by all services as it relates to energy management, sustainment, and mission execution. Today's leadership is seeking strategies for balancing QoL with sustainment efficiencies. Justine Federici, a behavioral scientist at NSRDEC, is developing tools to assist decision makers in analyzing tradeoffs at expeditionary basecamps. Beginning with a wide-ranging set of interviews with Soldiers, Ms. Federici and her team identified 80 key attributes, such as billeting conditions, that define QoL on camps housing fewer than 1,000 personnel. Each attribute has a set of service levels defining a range of conditions from extremes of austerity to expanded and enhanced basecamp capabilities.

In August and September of 2014, 1,200 Soldiers from four posts will complete a survey on how these attributes and service levels affect QoL. This data will be used to create a preference model based on multi-attribute utility theory. The model allows decision makers to "plug in" basecamp conditions and compute a quantitative measure of QoL that can be compared with fuel, water, and waste values to assess potential basecamp technologies as well as tactics, techniques, and procedures. Ultimately, the goal is to help optimize Soldier readiness for missions while balancing sustainment demands.

This work is being leveraged by multiple agencies, including the Army G4, Product Director Contingency Basing Infrastructure, Engineer Research and Development Center, Logistics Innovation Agency, and Sandia National Laboratory.

Ongoing Transformation

In May of 2014, the U.S. Army Program Executive Office Combat Support and Combat Service Support integrated expeditionary basing development with power generation and management. Project Manager Mobile Electric Power (PM MEP) became PM Expeditionary Energy & Sustainment Systems (PM E2S2), incorporating MEP's core functions with Product Manager Force Sustainment Systems (PdM FSS) and Product Director Contingency Basing Infrastructures. This synergistically links ongoing efforts in contingency sustainment to expeditionary energy. In response to theater requests for additional capabilities that reduce operational energy requirements and the overall fuel consumption throughout Afghanistan, PdM FSS is rapidly evaluating and adopting force sustainment systems for immediate use. Another recent technology being fielded is a power-management microgrid kit that will be applied to select 60kW tactical quiet generators to provide automatic on/off capabilities for the generators based upon load demand within the camp. These combined improvements will cut the fuel consumed in the Force Provider base camps by more than 50 percent.

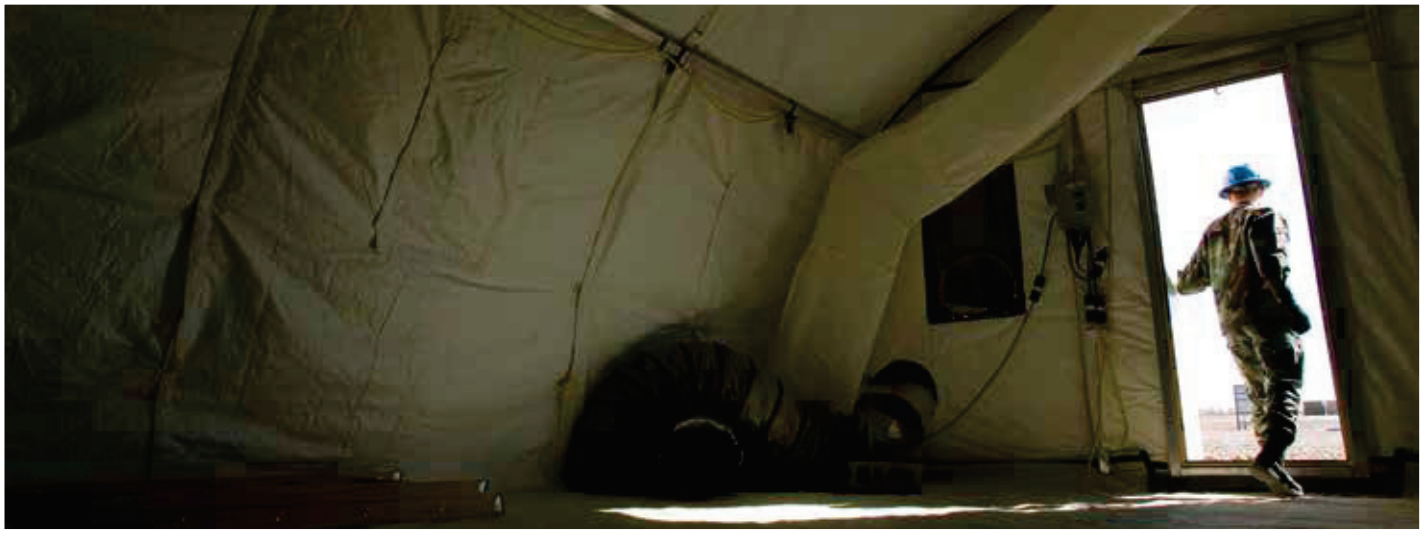
PdM FSS Lieutenant Colonel Ross Poppenberger and the Force Provider team led by Mike Hope are actively implementing a combination of energy efficient upgrades to

Large Area Maintenance Shelter supporting operations in Iraq. (JOCOTAS)

their program that reduce sustainment costs and improve QoL. With the approval of the Force Provider, Capabilities Production Document, QoL kits that include high-performance insulating liners, solar covers, ice making, water bottling, black water processing, modular ballistic protection systems, incineration, and power storage are all coming on line. The group is continuing to evaluate both soft and rigid wall shelter concepts for future basing applications. Force Provider is also looking for quick erect insulated flooring systems to replace hand-built wooden platforms that take several days to construct and require lumber not always available in remote locations. The wooden platforms improve Warfighter QoL by getting the out of the mud and providing a level surface for billeting functions.

Outdoor Venture Corporation (OVC) recently participated with a partner in a PdM FSS product evaluation of knock down panelized structures. The partner produced high-performance insulated structural panels used in building construction, a manufacturing capability OVC subsequently acquired. Their president, J.C. Egnew, believes the purchase will provide significant opportunities for OVC to diversify and expand its business. In discussions with Force Provider staff, he became intrigued with the idea of developing a multiuse basing platform on which tents could be erected initially and which later could be the foundation for a panelized building. His staff worked with Force Provider Technical Assistance Team members to develop a set of parameters for the system. They recently completed the first prototype for consideration.

PdM FSS's Don Stewardson continues to do "best of breed" commercial research to indentify candidate equipment for militarization. His work leads to the preparation of performance specifications and also assists the Combined Arms Support Command in writing Capabilities Development Documents, which are the basis for Programs of Record and will include a next generation of tents and rigid wall shelters. Evaluation projects to date include several iterations of high performance insulating liners, lighting, form fitting solar covers, knock down panelized structures, and flooring systems. He plans to assess commercial tents at Joint Base Cape Cod in the latter part of FY 14 on through FY 15.



An Airman steps out of a BEAR Small Shelter System after a final inspection during an exercise at Holloman Air Force Base, N.M. A more energy efficient version of the system will be acquired by the USAF and USMC upon the completion of research by the Air Force's Civil Engineering Center. (USAF)

Air Force Basing Tech: Driven by the BEAR

The Air Force continues to be a major player in the expeditionary basing technology arena, focusing on efforts that will enhance operations at BEAR bases worldwide. BEAR has an institutional need for the Large Area Maintenance Shelter (LAMS)—which supports force projection, helicopter maintenance, and staging bases—as a major component for their Program of Record applications. As a result, they are investigating better methods to reduce HVAC costs in these types of structures, and their efforts will provide benefits across the entire JOCOTAS community.

Beginning in 2001, the Army and NSRDEC have executed a robust LAMS program, erecting well over 100 shelters across the globe. Recently, 88 LAMS were added to the Force Provider War Reserve project. This will insure that systems are sustained and ready to deploy for future operations.

Force Protection Against All Threats

Kratos Modular Systems Division, through its Gichner Systems Group subsidiary, specializes in engineering and providing turn-key enclosures with high levels of system integration and has delivered modular units designed for a diverse range of mission-specific applications, including secure communications shelters, UAV ground control stations, accommodations modules, command and control facilities, maintenance shops, and data centers.

Gichner has recently developed a product group called Hardened Modular Structure that are designed to protect personnel and equipment from forced entry, ballistic, and blast threats during emergency security conditions. These custom built, fortified ISO containers have achieved Forced Entry, Ballistic Resistance (FE/BR) certification from the U.S. Department of State. Construction consists of welded steel plates and skeletal structure with secure utility connections below the floor and FE/BR doors, windows, and vents. The turn-key modules, which can be fabricated to offer ballistic protection up to NIJ Level IV, are providing a safer environment for personnel in hazardous locations around the world.

More info: kratosmsd.com

Kratos: Gichner

The growing importance of emerging operational energy capabilities and a fiscal imperative to improve efficiency and reduce sustainment costs wherever possible drives innovative solutions.

Industry is working on initiatives to broaden large shelter applications for tropical military applications. Canvas Specialty, a manufacturer of diverse shelters and shade structures, is working on a Controlled Humidity Protection (CHP) System that offers protection against corrosion, equipment degradation, and moisture induced failures. Company president Greg Naiman reports that "CHP incorporates radiant heat-reducing fabric so we can control both temperature and humidity." His company provides an all-in-one kit that includes the fabric shelter, dehumidification unit, flooring, hygrometric controls, and lighting. The system is modular and transportable.

Efficiency and Protection

The Air Force is investigating solutions to mitigate the use of fossil fuel in their existing family of shelters. The effort originated within the Joint Expeditionary Basing Working Group, and subgroups were created to jointly seek solutions. The Air Force's BEAR Small Shelter Systems (SSS) were identified as low hanging fruit. The strategy is to provide a more energy efficient system to Warfighters by replacing, through attrition, existing shelter stocks using a performance specification. A joint buy with the Marine Corps was originally planned and approved by a 10 November 2010 Joint Expeditionary Basing Working Group Council of Colonels. Due to the level of broad based assessment across JOCOTAS and rapid improvement in emerging technologies, the Marines and BEAR elected to wait until the Air Force's Civil Engineering Center completes all of the energy efficiency research before starting a new acquisition. The dimensions of the Next Generation Small Shelter (NGSS) System will be similar to the current BEAR SSS with the addition of energy efficient specifics (e.g., liners, more efficient ECU).

When we think of QoL, many would consider creature comforts; however, having a safe place to sleep at night is also important. NSRDEC began groundbreaking work in the area of expeditionary ballistic protection in 2004. Using the initial criteria provided by the Army's Rapid Equipping Force and partnering with in-house body armor experts and the University of Maine

New Shelter Fights Humidity

Canvas Specialty has developed a Controlled Humidity Protection (CHP) Shelter that offers "total protection against corrosion, equipment degradation, and moisture-induced failures," according to the company. Vital equipment is maintained in its original condition and combat-ready, regardless of the outside environment, and overall equipment maintenance costs are reduced by as much as 30 percent. This all-in-one system utilizes the powerful energy of a liner fabric with an extremely low moisture vapor transmission rate, a proprietary zipper seal to reinforce critical stress points, a dehumidifier with titanium-enhanced properties that aid in moisture removal of up to 9.1 pounds per hour, 75 degrees F at 300 scfm, and a heavy duty (yet lightweight) floor with a load capacity of 80,276 pounds per square foot at 72 degrees F.

More info: can-spec.com

Canvas Specialty

Advanced Structures and Composites Center, several concept demonstration modular ballistic protection systems (MBPS) were developed.

The rapidly deployed system provides Soldiers with complete sidewall protection on day one of their deployment. The system has evolved through multiple iterations, with each system providing more protection from threats affecting our expeditionary basecamps while stressing quick deployment and low system costs. The MBPS completed a Milestone A decision with a Milestone B decision scheduled for FY 15. MBPS is part of the Force Provider Program of Record.

In addition to the sidewall protection provided by MBPS, recent work has been done to investigate providing expeditionary Overhead Threat Protection (OTP). Given that the system would have to withstand a direct hit, this has been a large challenge to overcome. Initial work is being done with Technical Products, Inc. (TPI) through Small Business Innovative Research (SBIR) funding. In Phase II of the SBIR effort, TPI has produced a full-scale prototype and subjected it to live blast loads. Initial results look promising, and further development will be performed with Phase II enhancement funding. ■

Rigid Wall Hygiene Systems and Energy Efficient Shelters

The United States Air Force has awarded Sea Box a modification to their current contract to provide 45 additional BEAR Hygiene Systems over the next two years. Each hygiene system consists of shower and latrine shelters that are completely contained in expandable bicon containers that can be rapidly packed up for intermodal transport and redeployment anywhere in the world. The insulated, rigid wall shelters that make up this system can be heated or cooled to comfortable temperatures even in extreme weather conditions and are substantially more energy efficient than tent-based hygiene facilities.

Sea Box was also recently invited by the NATO Support Agency to travel to Luxembourg and exhibit at the Alternative Energy System Demonstration. The company demonstrated the innovative design features of their Collapsible Re-deployable Shelters (CRS) with roof-mounted solar panel platforms. The unique collapsible design allows four shelters to be shipped as one twenty-foot equivalent unit for cost-effective, intermodal transportation. The fully insulated wall panels create a comfortable living space for soldiers with approximately five times the thermal efficiency of a temper tent.

More info: seabox.com

Sea Box