COMMANDER’S CORNER

COL Lee H. Harvis
USAF, MC, CFS
Command Surgeon
U.S. Air Force Special Operations Command
Hurlburt Field, FL

LEADERSHIP PERSPECTIVE

Matt Cartwright
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U.S. Air Force Special Operations Command (AFSOC)

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Seeking Enhanced Veterans’ Care  
Matt Cartwright  
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By Barbara Romiti
With the dawn of the Trump administration, those of us working in or in support of the Department of Defense wait with baited breath to see if and how projected new funding will be implemented. From a combat medic’s perspective, new funding or not, the tools required to save the lives of fellow servicemembers who fall casualty on the battlefield had simply better be there. In today’s world of simulated real-time training and advanced mobile care, the needs that drive medical readiness amidst the chaos of combat casualty realities remain largely constant: targeted care at point of injury in timely fashion within a prioritized order to ensure the most-likely positive outcome. In other words, maximized training and technology implementation equals best quality of care where nothing less is acceptable.

In this, the Spring 2017 issue of Combat & Casualty Care, we delve into advances being made to make medical care more mobile and effective closer to the point of trauma. This edition of C&CC also addresses some key efforts within the special operations medical community. In a targeted cover interview from U.S. Air Force Special Operations Command (AFSOC) HQ, Hurlburt Field, AFSOC Command Surgeon COL Lee Harvis speaks to the challenges of maintaining comprehensive medical readiness, operational performance, and medical modernization as a focal point for Air Force medicine going forward. From the field, we examine efforts to address perpetual challenges presented by massive hemorrhage, the undisputed king of kill on the battlefield. From the U.S. Army Institute of Surgical Research (USAISR), C&CC spoke with Dr. Michael Dubick, Chief of the Damage Control Resuscitation Program, regarding efforts to maximize proven capabilities and adopt new technologies to “impede the bleed”. In another feature related to addressing blood loss injury, AFSOC, under the auspices of U.S. Special Operations Command (SOCOM), is working to implement the first iteration of a freeze-dried plasma kit to deployed U.S. forces using a French-made product in a drug prototype effort to field a proven life-saving material.

From an innovation vantage regarding government and industry efforts to field capabilities that keep U.S. combat medics the best prepared in the world, leading training and medical lighting companies are bringing products such as hi-tech manikins and vein detection capabilities to bear in the war on delayed treatment in the combat environment. From the field test and R&D sides, the U.S. Army’s implementation of a versatile personnel/cargo litter device capable of operation in extreme environments has passed testing at Yuma Proving Ground while the U.S. Defense Advanced Research Projects Agency (DARPA) is leading efforts to field a next-generation, brain to sensor-driven bionic arm for use with limb amputees and an integrated end-to-end platform that uses nucleic acid sequences to halt the spread of viral infections. Rounding off this issue, C&CC spotlights an effort to shine light on the need for increased veteran’s access to care for conditions such as Post-Traumatic Stress Disorder (PTSD), as Rep. Matt Cartwright, PA 17th District, U.S. House of Representatives, provides insight regarding a bill intended to streamline veterans’ access to psychiatric treatment for positive outcomes.
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After more than 20 years in the field, rigid wall shelters (RWS), an integral part of Army field hospitals, are starting to show their age. There are problems with stability, transportation issues and the need for more energy efficiency. The U.S. Army Medical Materiel Development Activity (USAMMDA) Medical Support Systems Project Management Office (MSSPMO) has found a solution to meet those needs.

An RWS starts out as a 20 feet long, 8 feet high, and 8 feet wide container and unfolds to triple in size, providing a floor, ceiling and four walls. It is a very efficient design, which maximizes available floor space and can be set up by four to six people in less than an hour. However, because the RWS is made of aluminum, which enables the shelter to be light-weight, it has its drawbacks.

Working in coordination with Melvin Jee and Roger Masadi of the Tactical Shelters Team, U.S. Army Natick Soldier Research, Development & Engineering Center and also Core Composites, a division of ROM Development Corporation in Bristol, Rhode Island, the MSS PMO will use a carbon composite retrofit kit to refurbish the current shelters and address the deficiencies.

“Carbon composite [carbon fibers coated in resin] is two times stiffer and overall the shelter will be 20 percent lighter than the current aluminum design,” said Richard O’Meara of Core Composites, a division of ROM Development Corporation.

The RWSs are used for the core parts of the hospital, housing the operating room, the C-arm [portable radiology], and the laboratory; where the floor needs to be stable and free of vibration.
According to Jaime Lee, MSS PMO product manager, “Instability has always been an issue. We kind of fixed it by placing scissor-jacks underneath the middle section of the shelter. This works for a while until the ground settles.”

The kit provides a single fixed floor with two expandable floors. Now that they are made of carbon composite, they are double the stiffness of the previous floors, which makes them less susceptible to unwanted vibration.

Also included are four vertical corner posts fabricated out of carbon composite. Each post only weighs 50 pounds as opposed to the current aluminum post which weighs 71 pounds. These posts bear the load of additional containers stacked on top of the shelter. Currently, each aluminum corner post is designed to support 100,800 pounds, which allows for the shipping containers to be transported in a six-high stack. The carbon composite corner posts are designed to meet the current transportation standards which require each corner post to support 211,675 pounds in order to withstand the weight of eight shipping containers resulting in a nine-high stack. This increased capability improves transportation efficiency and will reduce the cost of shipping.

Additionally, when taken as a whole, the reduced panel and corner post weights serve to lower the overall empty shelter weight by several hundred pounds. This allows for an increase in the amount of cargo the shelter can carry.

A carbon composite retrofit kit will be used to refurbish and address deficiencies in the current Rigid Wall Shelters. Steve Hawbecker, project manager for the Medical Support Systems Project Management Office at the U.S. Army Medical Materiel Development Activity, discusses the carbon composite retrofit kit during the site visit. (Photo courtesy of Barbara Romiti, USAMMDA)
According to O’Meara, the posts are also much more corrosion resistant than the current aluminum posts that corrode when in contact with the steel corner fittings.

### Deeper Core Enhancements

In the past, shelter refurbishment has involved more of a facelift approach in that the floors are redone, and the shelter is painted and resealed. Now, Core Composites, a division of ROM Development Corporation, will make the retrofit kits and send them to Defense Depot Hill, Utah. There, the original shelter will be disassembled and over half of the major components will then be replaced with the new kit.

Also, since current shelters are not energy efficient, Tnemec’s Aerolon 945 will be applied to the ceiling as either a sprayed-on coating or a peel-and-stick “wallpaper,” which will help provide better insulation thereby reducing heat and cold loss through the top of the shelter. This will double the insulation efficiency of the shelter.

According to Lee, retrofitting 24 shelters using FY16 funding has begun this year and will continue with 24 shelter retrofits per year, subject to availability of funding.

“We are procuring the kits now as an Engineering Change Proposal to the original shelter,” said Lee. “In two years we will reassess and do a cost-benefit analysis to see if we should just replace the entire shelter with a carbon composite shelter. It might be just as cost-effective to stay with the kit.”

Either way, carbon composites are the future. Whereas aluminum is a limited resource with inadequate capabilities, carbon composite as a building material is more abundant, stronger and lighter. Carbon composite also has more possible applications and producing it leaves a smaller carbon dioxide footprint.

### New Field Hospital Equipment Verification

Over the duration of two hot and humid weeks on an expansive parade ground field, the U.S. Army Medical Research and Materiel Command’s U.S. Army Medical Materiel Development Activity conducted a non-medical equipment verification exercise with support from the 115th Combat Support Hospital (CHS) at Fort Polk, Louisiana. USAMMDA led the exercise in coordination with the Army Medical Department Center and School/Health Readiness Center of Excellence, Capabilities Development Integration Directorate, the AMEDD Board, and the U.S. Army Medical Materiel Agency.

The new field hospital is modular in concept, consisting of smaller sections that build into a larger hospital configuration. The hospital starts with a 32-bed early entry section, which provides hospitalization and outpatient services in support of deployed forces. Next, either the surgical capabilities are expanded with a 24-bed capability, or intensive and intermediate medical care is increased with a 32-bed expansion. Finally, a 60-bed intensive care capability is added depending on what is required at the time.

During the course of the verification exercise, the two resulting 116-bed and 124-bed configurations were established including Tent Extendable Modular Personnel air-supported shelters, rigid wall shelters, and power and water infrastructure to verify the non-medical equipment requirements.

“The layout of the power and water is the main focus of the exercise,” said Jaime Lee, USAMMDA Medical Support Systems Project Management Office product manager. "Documenting that is important."

### Focusing on Necessities

For the water/waste water configuration, information gathered during this event was needed to make sure there were enough hoses and fittings necessary to make new medical equipment sets into the modular components that now make up the new field hospital design.

The power team needed to make sure there was enough Power Distribution Illumination System electrical equipment to support the new field hospital conversion, which refers to the military family of power distribution equipment.
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Maj. Gen. Barbara R. Holcomb, USAMRMC Commanding General and Chief, U.S. Army Nurse Corps, visited the site for a day during the exercise along with Col. William Geesey, USAMMDA commander, to see the work in progress.

Col. Maria Summers, Chief Nurse, 115th CSH, spoke about how things worked on Fort Polk and introduced personnel from the 115th staff who took part in the exercise. A few of them provided input into what goes into their daily experiences and how they could gain and lend knowledge and support to the exercise.

Holcomb, having served in a few field hospitals herself, including the 47th CSH during Desert Storm, stressed the importance of going through the training of employing a field hospital, including integrating power and water.

“This is the environment that I love; I spent a lot of time in it,” said Holcomb.

Maximizing Application

During the tour, Lee pointed out the Rigid Wall Shelters and explained the need for Retrofit kits in order to address inadequacies of the ageing shelters. He mentioned three main benefits of the kits: the carbon-composite material allows for more floor stability and minimizes vibration during surgery; the containers can stack nine-high, which lessens shipping costs; and Tnemec’s Aerolon 945 will be applied to the ceiling, which will help provide better insulation, thereby reducing heat and cold loss through the top of the shelter. The USAMMDA will begin retrofitting shelters in fiscal year 2017.

According to Lee, an additional item available for the TEMPER air-supported shelters is a solar shade which reduces the solar loading by 90 percent. It is laid over the top of the shelter before it is deployed. The newer 32-foot tents displayed onsite are 10 inches shorter than the current tents to accommodate the new collective protection liners, which can be used in case of a chemical or biological attack.

Having attended the briefing and seen the deployment of a TEMPER air-supported shelter, Holcomb indicated that she was impressed that a 64-foot section of the shelter had just been inflated in about 15 minutes as she stood and watched.

In addition, Holcomb said, “There is a huge improvement in the material being lighter and more air tight. It offers better infection control, as the old TEMPER could get sand in it. It was also much more labor intensive.”

All of the improvements, now available to the shelters themselves, are excellent additions to the new modular concept in providing a better way of organizing and providing hospitals to troops in the field.
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The U.S. Army Medical Materiel Development Activity (USAMMDA), Ft. Detrick, MD, is leading efforts to deliver an updated expeditionary field hospital into service.

By Barbara Romiti, USAMMDA

The U.S. Army Medical Materiel Development Activity’s (USAMMDA) Medical Support Systems Project Management Office (MSS PMO) has spearheaded several modernization efforts to outfit and deploy a more expeditionary and energy efficient modular field hospital, by updating Soft Wall Shelters (SWS) and Rigid Wall Shelters (RWS), which enable triage, hospitalization, surgical and outpatient services in support of servicemembers.

“The newer shelters are more modern, lighter and easier to ship, and more energy efficient. They will carry the AMEDD well into the next 15 years for operational requirements. This was done by making changes to both the SWS and RWS,” said Jaime Lee, MSS PMO product manager.

Research and Development

The basic building blocks for the field hospital are TAS, which were developed by the AMEDD and adopted by Product Manager Force Sustainment Systems for general Army shelter requirements. These replace old TEMPER shelters. The original TEMPER shelter was comprised of a tent placed over a metal A-frame.

“These were bulky and heavy systems, which took 10 to 12 Soldiers one to two hours to assemble,” said Steve Hawbecker, MSS PMO project manager. “Soldiers were prone to injuries from having their fingers pinched in the frames, and others would pass out from heat exhaustion in extreme temperatures while assembling the shelters.”

The old TEMPER shelter material was made of a fabric that had a shelf life of 10 years. The majority of the current stock is older than that and in need of replacement.

“As late as 2014, TEMPER testing showed that the old shelters were not passing fire resistant requirements and were potentially unsafe to patients and staff,” said Hawbecker.

The newer shelters, made by HDT Global, are comprised of a self-healing fabric. They incorporate four high pressure air-filled arches to provide the framework for the shelter. The interior of the shelter has a 10-foot height, a 20-foot width, and a 32-foot length. It will withstand wind gusts of up to 65 miles per hour and a snow load of 10 pounds per square foot. With a shelf life of 15 years, these shelters also include a thermal liner to improve energy efficiency and provide a more
comfortable environment for the staff and patients during hot and cold extremes.

The new shelter is streamlined for shipping purposes, which also makes it easier for Soldiers to maneuver. The TAS weighs about 1,600 pounds, which is about 50 percent lighter than the old TEMPER.

"Reducing the weight of the new field hospital by 17 tons, while deploying 50 percent faster, is a real game changer to be more expeditionary for the AMEDD," said Lee.

It takes four personnel eight minutes to roll out the shelter for deployment and a diesel or electric compressor does the rest. The shelter can be erected in about 15 minutes.

The air beams, end walls, floor and liners are already part of the shelter itself. Self-contained vestibules allow for covered entrance protection against the elements. Additionally, easy-to-assemble corridors are provided for sanitary climate-controlled inter-shelter passage.

Among the additional items available for the TAS is a solar shade, which is laid over the top of the shelter before it is deployed. The shade reduces the solar loading by 90 percent and keeps the temperature in the hospital more comfortable for patients and staff. This also saves fuel and energy.

In case of chemical or biological attack, newer 32-foot tents accommodate advanced collective protection liners. This allows for a 72-hour continuation of medical and surgical functions and sustenance of patients and staff in a contaminated environment.

"Changes made to the TAS mitigate multiple hazards that we have with the TEMPER system and enable medical to be compatible with other Army assets in the field. We’re now compatible with Force Provider, we’re now compatible with rest and relaxation shelters, dining shelters, etc.,” said Hawbecker. "This means that components can be interchangeable and logistics support can be shared. We now have commonality of parts and resources. This moves us in the right direction for meeting the Chief of Staff of the Army’s vision for expeditionary forces for making medical much more expeditionary."

**Out-dated Design Modularity**

Another integral part of field hospitals, rigid wall shelters (RWS), are starting to show their age after more than 20 years in the field. The MSS PMO will refurbish the current shelters with a carbon composite retrofit kit developed in coordination with the Tactical Shelters Team, U.S. Army NSRDEC and also Core Composites, a division of ROM Development Corporation in Bristol, Rhode Island.

The RWS begins as a 8 feet high, 8 feet wide and 20 feet long container. The efficient design unfolds to triple its size, providing a floor, ceiling and four walls; maximizing available floor space. However, the current shelters are made out of lightweight aluminum, which causes instability in the design.

"The RWS retrofit kits will improve our ability to provide better patient care with a more stable floor and more energy efficient shelter," said Lee.

The carbon-composite material is two times stiffer, which allows for more floor stability and minimizes vibration during surgery. The shelter itself will be 20 percent lighter than the current aluminum design and the containers can now be stacked nine-high, as opposed to the previous six-high, which lessens shipping costs. Additionally, an application of Tnemec’s Aerolon 945 to the ceiling will provide better insulation, making the shelters more energy efficient.

"The USAMMDA has begun retrofitting the shelters this year," said Lee.

More info: usammda.army.mil
Dr. Dubick: It has been reported repeatedly that hemorrhage accounts for about 50 percent of deaths on the battlefield in conventional warfare. In addition, a retrospective evaluation of pre-hospital deaths in Operations Iraqi Freedom and Enduring Freedom found that approximately 24 percent of hemorrhage deaths were potentially survivable with appropriate first aid. Of these potentially survivable injuries, nearly 33 percent involved junctional and peripheral extremities (19.2 percent junctional and 13.5 percent arms and legs). Based on research in our laboratory that suggests every drop of blood counts, rapid hemorrhage control is essential for improving survivability of the casualty. After years of laboratory studies and observational studies of combat casualties, the Committee on Tactical Combat Casualty Care (CoTCCC) has recommended several hemorrhage control devices to stop life-threatening bleeding and prevent the casualty from going into shock. These include the CAT tourniquet for injuries to the extremities, Combat Gauze, Celox Gauze and Chitogauze as hemostatic dressings for external application, and the Combat Ready Clamp, JETT and SAM junctional tourniquets to control bleeding at the groin or axilla areas where standard limb tourniquets cannot be applied. Of the junctional tourniquets, the Army Combat Developer has recommended the SAM junctional tourniquet for inclusion in the sets, kits and outfits. In addition, another junctional tourniquet, the Abdominal Aorta and Junctional Tourniquet is FDA-cleared for use around the umbilicus as well as junctional areas. Also X-stat hemostatic sponges in two applicator sizes are available and approved for junctional wounds. All these devices have been shown to be safe and effective when used as recommended by the manufacturer.

In addition, several other hemorrhage control devices have been developed and are available, but have not been recommended by CoTCCC. These include several new tourniquets and the iTClamp approved for temporary control of bleeding in the extremities, axilla, groin, scalp and neck. Another product, the Air Wrap, is essentially an ace wrap with a bladder that may have utility as a hemorrhage control device in junctional and extremity regions of the body. The take home message is that the recommended devices should be applied safely as early as possible and they are all for temporary control of severe bleeding until the casualty can get to a Medical Treatment Facility.

C&CC: In terms of maximizing positive pre-surgical condition post-hemorrhage, speak to scenarios that raise the likelihood of patient operability when arriving in facility.

Dr. Dubick: As mentioned before, the medical and scientific literature implies that keeping the casualty from going into shock is key to their survivability. The tourniquets and hemostatic dressings mentioned are important to that aim, but injuries do occur where these devices may not be placed. For example, an epidemiological
The SAM® Junctional Tourniquet for hemorrhage control is designed to control bleeding in areas where standard tourniquets would not be effective, such as with IED/Blast injuries or high level amputations. With these types of injuries, time is of the essence. The SAM® Junctional Tourniquet is compact and designed for quick application. The patented Autostop buckle provides the optimum range of force required to safely and effectively close an unstable pelvic fracture, as documented by almost 100 peer reviewed journals since 2002.
study from OIF and OEF indicated that truncal non-compressible hemorrhage accounted for about 67 percent of deaths from potentially survivable injuries. Although use of body armor has mitigated torso injuries, they still occur. Currently, there is nothing short of giving some resuscitation fluid to try and keep the blood pressure above a Mean Arterial Pressure of 60-65 mmHg (palpable radial pulse) to maintain perfusion to vital organs without increasing bleeding. Laboratory research has shown repeatedly that some fluid is necessary to maintain casualties from severe hemorrhage. The current top CoTCCC recommendations for resuscitation fluids include whole blood, plasma and 1:1 ratio of plasma and red blood cells or 1:1:1 ratio if platelets are also available. Although crystalloids such as Plasma-Lyte or colloids such as Hextend are still on the recommended list, minimal volume should be administered so as to minimize hemodilution of blood clotting factors that may worsen developing coagulation dysfunctions.

Another important factor in stabilizing the casualty is body temperature. It has been shown that if the patient arrives to a treatment facility with hypothermia, they have a much higher mortality rate. Keeping the casualty warm in the pre-hospital environment is a challenge. Several warming devices and fluid warmers are available, but many require power. However, there are warming products such as the Hypothermia Prevention and Management Kit that supplies a chemical heating blanket and wrap that provides warmth for several hours. In addition there are several battery-powered warming blankets, but they may have significant weight. Nevertheless, research shows that these devices work more efficiently at maintaining body temperature than actually warming the person. Therefore, every effort should be made to prevent hypothermia from developing in austere environments.

A very important approach to improve survivability is rapid transport to a treatment facility. It has been shown that survival is improved when transport times from point-of-injury to definitive care was less than 60 minutes compared to greater than 60 minutes. The ability to transport casualties rapidly is best achieved by having a command-directed trauma system established so the right casualty goes to the right treatment facility in the least amount of time. Establishing and maintaining such a system even in a mature battlefield remains a challenge, but clearly has been shown to be a major advance in improving survival of the severely injured.

C&CC: Feel free to speak to other current/forward-looking techniques in use by USAISR for addressing the need to minimize non-survivable casualty numbers due to combat hemorrhage.

Dr. Dubick: Research into improved hemorrhage control continues so that no casualty dies from a potentially survivable injury. Several companies continue to work on improving hemostatic dressings, including products that may be used internally and would be bioabsorbable. Efforts are also underway to further refine wound packing techniques which have seen little attention previously. In addition, efforts to develop or improve new or existing tourniquets are focused on making them easier to use and efforts continue to investigate pneumatic tourniquets to extend their application into pre-hospital situations. With respect to both limb and junctional tourniquets, important aspects of their safety and effectiveness have recently identified user performance as a key element. Thus research continues in improving training, understanding learning curves and minimizing skill decay of both instructors and users of these devices.

As mentioned, a major issue is treating non-compressible torso hemorrhage. Resuscitative Balloon Occlusion of the Aorta is being investigated as an endovascular approach to hemorrhage control where a balloon catheter is inserted through the groin into different zones of the aorta to maintain circulation to the brain, lung and heart and stop lower body bleeding until the bleeding location can be repaired. Other products such as hemostatic foams and other devices to address non-compressible torso hemorrhage are under development. Approaches involving neural stimulation of select nerves are also being investigated to reduce blood flow and bleeding from torso hemorrhage.

It is important to recognize that many of the current products have been investigated only for short periods of time or under rapid evacuation times. With new scenarios such as prolonged field care where evacuations times will easily exceed one hour, new devices and treatment regimens will be required and evaluated under realistic battlefield scenarios. This highlights the importance of the Joint Trauma System that was established at the U.S. Army Institute of Surgical Research at Fort Sam Houston, Texas, early into OIF. Its focus on data collection of casualties and performance improvement is centered on clinical outcomes, the ultimate endpoint of any hemorrhage control strategy. In this way the trauma care experience from conflicts is captured, integrated into the research program at USAISR and then systematically translated into striving for best care of the warfighter.
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Colonel Lee H. Harvis is the Command Surgeon, Air Force Special Operations Command (AFSOC), Hurlburt Field, Fla. Colonel Harvis is responsible for establishing, coordinating, and sustaining a health care system for AFSOC personnel and for organizing, training, and equipping AFSOC medical forces for contingency medical support. As the air component surgeon to USSOCOM, AFSOC/SG plans the execution of all Air Force medical support for Air Force Special Operations Forces (AFSOF) and serves as the principal Air Force medical service advisor to USSOCOM.

Colonel Harvis entered the Air Force on a ROTC Scholarship to study aerospace engineering at the University of Michigan and was commissioned in 1985. He was awarded pilot wings in 1986 and served as an HH-3E aircraft commander in Iceland, Patrick AFB, and Korea. In 1992, Colonel Harvis was awarded a USAF Health Professions Scholarship and graduated from Medical School in 1996. He was a distinguished graduate at the USAF Aerospace Medicine Primary Course and was the Chief Resident, USAF Residency in Aerospace and Occupational Medicine, School of Aerospace Medicine. During his career, he served as the Commander, 374th Medical Group, Yokota, Japan, the Command Surgeon for the 5th Air Force and U.S. Forces Japan, a UH-1N mission pilot for the 459th Airlift Squadron and 6 SOS, AFSOC’s 23rd Air Force Surgeon and Chief of Aerospace Medicine, NATO Air Training Command-Afghanistan Command Surgeon and 438th Air Expeditionary Wing SG, the Commander of the 51st Aerospace Medicine Squadron, a rescue liaison to the NASA Space Shuttle program, and he commanded the 66th Expeditionary Rescue Squadron (HH-60 helicopters) in Operation NORTHERN and SOUTHERN WATCH. In January 2002, following the events of “9-11”, Colonel Harvis was deployed to Operation ENDURING FREEDOM where he established a forward operating helicopter unit in Kandahar, Afghanistan, serving as the 66th Expeditionary Rescue Squadron’s first Detachment Commander, and was awarded the Bronze Star. Colonel Harvis also served as the Joint Special Operations Air Component Surgeon in Haiti during Operation UNIFIED RESPONSE and as the US Forces Japan Surgeon for Operation TOMADACHI’s earthquake, tsunami, and nuclear disaster medical response.

Colonel Harvis is board certified in Aerospace Medicine, board eligible in Occupational Medicine, and is one of the Air Force’s few pilot-physicians. A Command Pilot and Chief Flight Surgeon, he has more than 2,500 hours, including 80 plus combat hours in Afghanistan and Iraq.

Interview conducted by C&CC Editor Kevin Hunter
An Operational Detachment Alpha (ODA) team provided round-the-clock security, while these combat medics utilized cutting-edge battlefield medical techniques to rigorously treat gunshot wounds, blast injuries, and chemical weapons exposure. Over 750 freedom fighters and civilian casualties were treated in the first 48 days. Such missions are the focus of AFSOC, which provides USSOCOM unique air support and special tactics ground personnel for combatant commanders.

The Office of the AFSOC Command Surgeon organizes, trains, and equips over 1000 personnel, who provide support for military operations spanning more than 30 countries and 70,000 beneficiaries. In line with the strategic priorities of the AFSOC Commander and the Air Force Surgeon General, medical personnel are assigned to medical treatment facilities (MTFs), operational support medical units (OSMs), SOST, preservation of the force and family providers (POTFF), irregular warfare/global health engagement teams, and pararescuemen (PJs). These personnel concentrate on comprehensive medical readiness, operational performance, and medical modernization. Furthermore, the SG office directs a robust case management program overseeing in excess of 150 wounded warriors daily. With the highest combat injury rates in the Air Force, AFSOC leadership prioritizes the support of our wounded Air Commandos and their families.

C&CC: Please discuss some key areas of focus and how AFSOC is working to partner with industry to broaden and strengthen medical capability implementation.

COL Harvis: COMPREHENSIVE MEDICAL READINESS: Recent modifications to the 2017 National Defense Authorization Act (NDAA) dictate significant changes to DoD medical operations. The guiding principle of the NDAA asserts that “readiness is the primary mission.” The focus of AFSOC is readiness. Adapting to multi-domain and cross-functional operations requires our medics to perform independently in remote environments for extended periods of time. The locations to which AFSOC Airmen deploy have limited or no external clinical support. Sustainment training has been restructured over the past three years, with an emphasis on clinical proficiency. Our medics are now required to spend more time between deployments in primary care and specialty clinics in order to retain perishable medical skills.

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In 2010, the AFSC SG identified that our SOSTs were not treating enough trauma cases at DoD medical facilities to maintain surgical proficiency. The decision was made to embed several surgical teams into civilian Level 1 trauma institutions. For the past seven years, three SOSTs have been detailed to the University of Alabama, which admits over 2300 trauma patients each year. Partnerships have also been established with the University Medical Center (UMC) Las Vegas and Miami Ryder. UMC and Miami admit over 2800 and 3500 trauma patients per year, respectively. These partnerships conform to the NDAA, which states that "the Secretary [of Defense] will enter into partnerships with civilian academic medical centers and large metropolitan teaching hospitals that have Level 1 trauma centers," and that "trauma teams will embed within these trauma centers." AFSC is leading the way. The most advantageous approach to support our austere surgical team requirements and manage the expanding battlefield is to supplement our surgical teams with expert civilian clinicians. Therefore, I am presently working with the Air Force Reserve Command to build the first SOST Individual Mobilization Augmentee (IMA) team to leverage the Total Force.

**OPERATIONAL PERFORMANCE:** Special Operations Forces (SOF) invest heavily in recruiting, selecting, and training AFSC’s Special Tactics (ST) teams. This small cadre of high-performance athletes must be prepared for exposure to direct combat. Statistically, this physically-elite group has the greatest morbidity and mortality rate in the Air Force. Due to the high-risk nature of their occupation, repetitive injuries render the majority of them inoperable for strenuous duty, within six to eight years.

Five years ago, SOCOM began to embed physical therapists, mental health professionals, physical trainers, and other medical providers into ST squadrons as part of the POTFF program. This multi-functional team develops a rapport with each patient and becomes thoroughly familiar with their medical, psychological, and social history. This approach shaves months off of post-deployment recovery time and has nearly doubled the functional years of members in the ST community. In light of this achievement, AFSC is expanding the POTFF model to improve the health of even more Air Commandos, and the USAF is bringing additional psychological and physical health resources to the rest of the conventional force. It is interesting to note that about one-third of our deployed service members are treated for non-combat injuries. Approximately 50% of these injuries are musculoskeletal in nature, acquired while wearing a flak vest twelve hours a day, or exercising. Three-quarters of those seeking care will require multiple treatments. In a resource-constrained environment, we can get the most "bang-for-the-buck" focusing on the health issues that account for the highest medical utilization rates.

Keeping deployment injuries in mind, we have added a sports medicine provider to our SG staff, and intend to add one to each of AFSC’s primary locations. The goal is to deliver care in synergy with physical therapists, strength and conditioning coaches, and athletic trainers in a "pit crew" approach. Other aspects of the operational performance program include commercial off-the-shelf (COTS) testing of human performance technology devices, and pharmacological and non-pharmacological enhancements. We have also developed partnerships with the Air Force Research Lab (AFRL) and Wilford Hall to study ways to combat overtraining injuries, androgen use, and neck strain from night vision equipment.

**MEDICAL MODERNIZATION:** All military leaders must rapidly respond to the warfighter’s needs. Lessons learned are developed from afteraction reports and gap analyses, but a majority of the recommendations are not acted upon. However, AFSC’s Medical Modernization Division (SGR), which researches battlefield trauma care, austere support, force health protection, and human performance, has a close relationship with the Medical Readiness Division (SGX). As soon as SGX receives an after-action report, SGR investigates ways to fill the gaps, providing mission-enabling capability through rapid equipping, COTS-first procurement, and research and development.

Initiatives for 2017 include the implementation of a freeze-dried plasma and fresh whole-blood program, expansion of 3D printing capabilities, development of IV fluid warmers, innovation of hemorrhage and resuscitation monitors, and deployment of portable diagnostic systems. Our modernization success is built on collaboration with SOCOM, the Air Force Medical Service (AFMS) advanced development unit, Army MEDCOM, Navy BUMED, DARPA, and the FDA. The modernization staff is also partnering with DARPA and the Global Good Organization to design ultrasound devices that have intuitive evaluation techniques and diagnostic algorithms. This technology will be capable of providing ‘on the battlefield’ point-of-injury diagnoses.

Ultimately, the mandate of the modernization team is to rapidly deploy the lightest, most up-to-date capabilities, with the smallest footprint, keeping patient safety as a priority. Since 2010, this medical footprint has been reduced by 87%, from more than 1000 pounds to less than 200 pounds, and with greater effectiveness. Reducing the medical package expands the types of transport aircraft that can be used, and increases the mobility of on-the-ground medics. Over a four-year timeframe, nearly 200 new items have been operationally tested, evaluated, and fielded for Air Commando medic utilization downrange.

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**COMMANDER’S CORNER**

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Part of this achievement can be attributed to the safe-to-fly agreement with the Aeromedical Testing Lab. Once, it took two years to get through the safe-to-fly process; today, most items are cleared in six months. All items approved, under development, or found unsuitable for AFSOC needs, are published in an online catalog that is distributed semiannually to our medics and many joint partners.

C&CC: How is AFSOC addressing healthcare training readiness in preparing personnel for contingency medical support?

COL Harvis: The foundation of AFSOC’s training readiness is clinical proficiency. As the idiom goes, “amateurs practice until they get it right; professionals practice until they don’t get it wrong.” Providers must first be masters in their medical field, not necessarily expert marksmen. This is the very reason AFSOC embeds surgical teams into Level 1 trauma centers. Our Special Operations Squadron Medical Element (SOFME) medics are required to engage in a broad range of primary and specialty care on a weekly basis, to prepare for deployments, in addition to many other critical training requisites. All AFSOC medics have an annual training plan that may include point-of-injury training scenarios (POINTS).

A cornerstone of our healthcare training platform is the Tactical Operations Medical Skills (TOMS) simulation lab. The lab was built in 2005 for trauma sustainment training and designed to accommodate joint DoD and international partners. The CASEVAC course was added in 2007, and demand for training has increased every year. In fiscal year 2016, the TOMS lab operated at maximum capacity, training 1,186 personnel in 178 training events, lasting up to two weeks. 142 units were trained, to include members from other MAJCOMs, SOCOM, Army, Navy, Department of State, and eight foreign countries. Recently, six manikins were purchased for the program at a total cost of $500,000, and a CV-22 mock-up trailer with full-length fuselage was procured, adding to the MH-53 mock-up. The current course list is extensive and includes Tactical Combat Casualty Care (TCCC), ISOM, ACLS, Paramedic Refresher, SABC, Readiness Skills Verification training, and point-of-injury training scenarios (POINTS).

C&CC: Are there any other challenges AFSOC medical is addressing going forward in 2017?

COL Harvis: Major Jonathan Letterman, the father of modern battlefield medicine, treated 21,000 Union and Confederate troops at Gettysburg in 24 hours. He understood the importance of bringing surgeons to the battlefield. Today, the joint medical community continues to re-invent Dr. Letterman’s far-forward surgical team concept. Currently, there are 28 validated joint taskings for agile and austere surgical teams, with eleven of these requirements unfilled. The number of required surgical teams will only increase with the intensifying conflicts in EUCOM, CENTCOM, PACOM, and AFRICOM, making it implausible for the DoD to meet the demand. For instance, even if AFRICOM was the only area of responsibility (AOR) in need of medical support, the sheer size of the continent makes it impossible to provide full medical coverage. The only practical solution to safeguard the AFRICOM AOR is with Air Evacuation, using partner nation facilities and coalition air support. In addition, planners must strategically align mobile field surgical teams with high risk missions. The Services can no longer work independently and must be interoperable and interchangeable.

As global conflicts spread, the greatest challenge is to ensure that our civilian and senior military leaders have a realistic expectation of medical capabilities, as well as of casualty and survival rates. Modern technology, improved medical knowledge, and mobile damage control surgery cannot make up for the lack of medical manpower and resources. The best way to mitigate the escalating requirements is to bring the Total Force to the fight. AFSOC has been collaborating closely with the Air Combat Command (ACC) and Air Mobility Command (AMC) for the past two years, to redesign conventional force surgical team capabilities. The Air Force and Army are reorganizing their future surgical teams, using the SOST equipment package and manning doctrine as a foundation. The Navy is not far behind.

In closing, I would like to express how proud I am to be an Air Commando, working side by side with the most dedicated medics in the world. Furthermore, I want to thank the AFSOC and SOCOM commanders, and the USAF Surgeon General, all of whom provide our Special Operations medics with superior leadership and unwavering support.
Joint components of U.S. Special Operations Command are working to field an environmentally stable blood plasma product critical to increasing positive outcomes in hemorrhagic injury events.

By Kevin Hunter, C&CC Editor

Following the traditional Air Force Special Operations Command motto, 'Any Place, Any Time, Anywhere...', the Air Force Special Operations Command (AFSOC) Medical Modernization Division is responsible for ensuring that AFSOC medics have the right equipment and capability to save lives in any environment throughout the globe.

In 2003, The Air Force Medical Service (AFMS) had the foresight to establish teams dedicated to ensuring deployed medics had the appropriate equipment for the mission at each Air Force Major Command. Since that time, AFSOC Medical Modernization has focused on connecting medical needs to solutions derived from research and development or from current equipment available in the commercial marketplace. This mission is part of a much larger Joint DOD and US SOCOM effort to target gaps and ensure the best and safest solutions are in the hands of Airmen and Joint service members on a global battlefield.

"AFSOC's Medical Modernization Division was established by AFMS almost 15 years ago, but we have really hit our stride since 2012," said Lt. Col. Rebecca Carter, Chief of Medical Modernization, U.S. Air Force Special Operations Command. "We have established networks and processes that support continued success and made
major advancements toward enhancing our medical team capabilities while simultaneously reducing our logistical footprint. Our leadership is behind us and fully supports our efforts. It is a very challenging and rewarding mission.”

According to AFSOC Command Surgeon, Col. Lee Harvis, Medical Modernization provides a critical link between medics, combatants, and the ‘research and development’ community.

“We rapidly transform user needs from concept to development, equipping our medical personnel so they can provide the highest quality care under very austere conditions,” said Harvis. “The instant a gap is identified, we investigate ways to field solutions, delivering mission-enabling capability with commercial-off-the-shelf products that can be modified for maximum utility with the smallest footprint. We also produce a ‘virtual catalog’ of items that are in development or have completed evaluation. This catalog has been well received throughout the DOD and by several international partners.”

Carter emphasized that their success is built on a strong network.

“We start with a core group of AFSOC medics and tie into an extensive team within and outside of USSOCOM, including partners in the AFMS, Defense Health Agency, U.S. Defense Advanced Research Projects Agency, U.S. Food and Drug Administration, and academia. It starts and ends with our medics. Saved lives are the true barometers of our success.”

AFSOC medical modernization focuses on providing flexibility to medical teams with equipment that can be employed across the spectrum of “ruck, truck, and plane” mission needs, according to Carter. Advancements encompass a broad range, from novel pharmaceuticals and improved austere surgical capabilities, to new ways to provide power.

Carter said some top priorities for 2017 include better access to blood and blood products, enhanced fluid warming, advanced ultrasound and diagnostics, mobile surgical shelters, and 3D printing rapid prototyping. She said previous successes also include new intra-team communications, flexible power management, advanced oxygen delivery systems, compact ventilators, portable surgical table enhancements, Resuscitative Endovascular Balloon Occlusion of the Aorta (ER-REBOA) field evaluations, and a technical refresh of the Special Operations Surgical Team equipment set.

**Alternative Format for a Proven Life-saver**

One of many priorities under AFSOC’s medical modernization effort is improved access to blood products. “Hemorrhage is still the leading cause of preventable death in combat casualties,” said Carter.

Normal blood is comprised of roughly 45% red blood cells, 50% plasma, and 5% white blood cells and platelets. The plasma portion contains coagulation factors which are critical in aiding the clotting process in the body. These factors need replacement during severe bleeding.

“Traditionally, Fresh Frozen Plasma (FFP) is used here in the United States but this liquid product requires freezing and once
thawed has a dramatically shortened shelf life. The requirement to freeze and maintain this temperature makes the product impractical for use in the forward deployed environment. The French have developed a freeze-dried plasma (FDP) that has been in use by the French since 1994 and has been approved for use by the French equivalent to the FDA. We are able to obtain and use this product through the cooperation of the French, U.S. Army Medical Research and Materiel Command (MRMC), USSOCOM, and the FDA under an Investigational New Drug (IND) agreement. The plasma used to make the freeze-dried product is pathogen reduced and all leukocytes (white blood cells) have been removed. This greatly reduces the chance of a transfusion or allergic reaction. Additionally, the plasma is screened for infectious diseases, to include hepatitis and HIV, among others. All of these safeguards help ensure our soldiers receive the safest life-saving product available.

Since the FDP falls under an IND, all potential SOCOM personnel that may receive the plasma must be “consented,” Carter emphasized. “This means they will all be briefed on the product and each Airman, sailor, or soldier will decide, if circumstances warrant, whether they choose to receive the product or not. Also, each medical provider will be fully trained on how to give FDP.”

Fortunately, Carter said preparing the product is easy and straightforward. “The kit comes with the freeze-dried product and, separately, sterile water for injection. The medic needs only to take the enclosed dual spike, insert it into the sterile water and place the other end of the spike into the freeze-dried bottle while gently swirling. The product will be available to infuse within 3 – 5 minutes. Additionally, prior to reconstitution, it can be stored at room temperature and has a 2-year shelf life.”

The U.S. Army Special Operations Command was the first unit to deploy with the French product. Carter said due to its proven potential as a life-saving product, Marine Special Operations Command and Navy Special Warfare Units, are following suit along with AFSOC.

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Battlefield, transport, bedside, and beyond
The speed and sophistication of military health care has leapt forward in recent years, driven not only by advancements in technology, but by a commitment to improvement across the continuum of care. A focus on continuity from injury, to diagnosis, treatment, to follow-up leads to improved triage protocols and outcomes.

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Should the need arise for a service member or their family to obtain care, the DHA’s Health Systems Performance Branch (HSPB) promotes improved patient quality and safety. With a focus on evidence-based safe practices and clinical performance, HSPB helps drive quality care throughout the MHS. Philips drives access to care through telehealth and telemedicine solutions, with a focus on quality and standards.

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Deployed Soldiers are constantly loaded down with gear, but nowhere more so than when operating in a cold weather environment.

In addition to their conventional weapons, Soldiers need to utilize heavy equipment such as space heaters, cooking stoves, fuel, and heavy duty thermal tents in order to survive in an extreme cold weather environment.

In order to effectively conduct dismounted operations in these environments, a sled is the only practical means of transporting all of this equipment, and it needs to be rugged enough to carry not only the aforementioned items, but even a wounded Soldier across many miles of the world’s most dangerous and unforgiving terrain.

Harsh Conditions-Proven

Enter the Ahkio sled, a venerable piece of Army cold weather gear which was recently subjected to two weeks of punishing use by testers at U.S. Army Cold Regions Test Center with participation from Soldiers stationed at Fort Wainwright, Alaska.

“It is a system you use to move big loads across snow and arctic terrains in all seasons,” said Isaac Howell, test officer. “The scope of the test was to accumulate 45 miles on each sled, dragging it in the full spectrum of terrain encountered in the cold weather environment. Regardless of where you are in cold regions, including the Arctic, you will always encounter snowless terrain, so we really needed to see how the sled held up: One day we dragged it over seven miles of rocks.”

Over the course of the evaluation, testers were interested not only in the Ahkio sled’s durability across punishing terrain, but in how easily it could be packed in extreme cold and how much weight it could support. The days were long and exhausting, but testers tried to

The U.S. Army is testing a state-of-the-art casualty sled to transport injured personnel and equipment in austere conditions such as Arctic cold.

By Mark Schauer, Public Affairs Specialist, U.S. Army Yuma Proving Ground
make them as fun as possible. For example, one day Soldiers and testers trekked to two stunning glaciers in the area around CRTC’s ranges.

“That was in part a motivational thing for the Soldiers,” said Howell. “We needed deep snow, and that’s where the deep snow was. Seeing something cool was the carrot at the end of the stick: the glaciers themselves were not a component of the test.”

In a typical squad of Soldiers utilizing the Ahkio, three to five pull the sled while others walk ahead in snow shoes to break a trail. On this day, four feet of virgin snow stood between the Soldiers and test team and their objective, seven miles away.

“That day was pretty daunting. We, the test team, functioned as trailbreakers because we didn’t have a full group of 10 Soldiers.”

Howell walked in the center, while two men behind him would put one of their steps within one of his footprints, ensuring the thinner trail the sled would be traversing would be the most densely packed.

A former infantry officer, Howell is cognizant of the Ahkio sled’s vital importance to cold regions Soldiers in all seasons.

“It has applicability to the non-cold seasons,” he said, “It all depends on the terrain.”

**Tough in the Rough**

One particular type of Arctic terrain is particularly disliked by hikers — muskeg. These are Arctic bogs that, from a distance, look like short-grassy plains but are, in reality, stagnant pools of waterlogged, spongy vegetation in various states of decomposition. Muskeg is interspersed with stunted trees and concealed ponds of acidic water that can trap unwary animals.

“I have walked in many different terrain types on this planet, and nothing has been harder than walking in muskeg,” said Howell. “You have these tussocks that rise two feet above the ground and it’s nearly impossible to traverse with a load on your back.”

All told, the Soldiers and test team dragged the sled 52 miles on foot in ten grueling days. After each march the Soldiers and test officers recorded their comments on the sled’s performance.

The test team saved the last day of testing for a destructive test, loading the Ahkio to 350 pounds of weight and dropping it from a forklift raised to different elevations onto its front, back, side, and bottom.

When dropped nose-first from 15 feet, the sled’s aluminum frame bent at its impact point, but otherwise remained intact, a fitting end to a punishing test of one of a cold regions Soldier’s most important accessories.
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Innovative Tactical Training Solutions (ITTS) is a recognized Service Disabled Veteran-Owned Small Business. Founded in 2009 with the vision of creating a tactical operations medical training mannequin that would endure the austere environments special operations community members often encounter. The Tactical Operations Medical Manikin (TOMManikin) set the industry standard for ruggedization, hyper-realistic trauma injuries and ease of operation.

In the years that followed, the special operations community guided research and development to create a broad spectrum of combat simulation training platforms, to include helicopter MEDEVAC and crash simulators, blast/ballistic simulators, a K9 trauma simulator, prolonged field care patient monitoring simulators and force-on-force engagement systems. To replicate environmental stressors, ITTS engineered a suite of environmental sensory control units that introduce (instructor-driven) elements that include wind, smoke, lighting effects and loud speakers that create an overwhelming introduction to sensory influence on student’s performance. Proprietary communications software enables a single operator to simultaneously control all devices from a tablet.

Memorable training must be conducted in an environment that depicts the climate where the skills are to be used. Further, scenarios must be replicable to ensure evaluation consistency and metric capture. Combining years of innovative technology and simulators, ITTS engineers have created a series of unique, multi-purpose, simulation facilities that are specifically designed to accommodate complex training requirements of both government and civilian agencies.

These fully customizable and configurable freestanding structures are designed for use in a warehouse, hanger, or outdoors. The following available ITTS training facilities:

The Combat Medical Simulation Lab (CMSL) is a customizable, fully configurable, training platform that realistically replicates a variety of training venues. From CQB room clearing to point of injury care to mass casualty triage and complex medical/surgical case management, the CMSL provides the capability to train personnel in a safe and reproducible area. This multi-purpose, freestanding structure is designed for use in a warehouse or hanger and features an overhead catwalk, allowing cadre an uninterrupted view of simulation rooms and student's performance. Center room walls are hinged to create a variety of simulation rooms. The CMSL includes a full compliment of wirelessly controlled ITTS environmental sensory control devices, to include multiple brilliant LED lighting effects, smoke/fog machines and loud speakers, creating multi-sensory stressors for learners. PTZ cameras record student activity from a variety of angles.

The Confined Space Training Center features a 40’ inclined section designed to simulate disaster scenarios inside unstable structures, complete with debris and obstacles. Hatches in multiple locations allow access to a 30” circular (vertical and horizontal) duct system. A custom confined space assembly features a ‘pancake-style’ collapsed floor section with restrictive access points. A full suite of environmental sensory control units is included.

The Climbing Tower Training Center features a 40’ high 270-degree wrapped climbing rock wall with both ITTS HH-60 Salvage helicopter fuselage and CV-22 fuselage mounted on opposing towers to facilitate rappelling. Five interior connecting rooms can be used for CQB, medical triage, etc. and are complete with the ITTS suite of environmental sensory control units.

The Mobile Search & Rescue Training Center is a 3-tier structure with covered breezeway for both indoor and outdoor training. Side crates contain an interior stairwell allowing access to the 3rd floor training area that features an extensible folding wall room maze. All rooms feature the company’s environmental sensory control units.

The Kentucky Tower Training Facility provides a single solution multi-purpose personnel-training facility with combined elements of training centers listed above. Offering a diverse range of scenarios from which to utilize, the Kentucky Tower Training Facility contains three distinct zones that cover Confined Space/Collapsed Structure, Helicopter Landing/Unloading with AIE/Rappelling, Rock Climbing, CQB and trauma lanes. Each area is configurable to team’s specific training needs and includes a full compliment of ITTS environmental sensory control devices throughout.
DARPA’s first production versions of groundbreaking upper-limb prostheses are becoming available to military amputees at Walter Reed National Military Medical Center, Bethesda, MD.

By DARPA Public Affairs

The U.S. Defense Advanced Research Projects Agency (DARPA), in conjunction with Walter Reed National Military Medical Center (WRNMMC) in Bethesda, Md., has delivered the first two advanced “LUKE” arms from a new production line—to the commercial sector. As part of that transition process, DARPA is collaborating with WRNMMC to make the advanced prostheses available to service members and veterans who are rehabilitating after suffering upper-limb loss.

The limbs are being manufactured by Mobius Bionics LLC of Manchester, N.H., a company created to market the technology developed by DEKA Integrated Solutions Corp., also of Manchester, under DARPA’s Revolutionizing Prosthetics program. The prosthetic system—“LUKE” stands for Life Under Kinetic Evolution, but is also a passing reference to the limb with which Luke Skywalker was endowed in Star Wars: Episode V The Empire Strikes Back—enables extremely dexterous arm and hand movement with grip force feedback through a simple, intuitive control system. The modular, battery-powered limb is of near-natural size and weight. It features a hand that has six user-selectable grips and an arm that allows for simultaneous control of multiple joints using a variety of inputs, including wireless signals generated by innovative sensors worn on the user’s feet.

“The commercial production and availability of these remarkable arms for patients marks a major milestone in the RP program and, most importantly, an opportunity for our wounded warriors to enjoy a major enhancement in their quality of life,” Sanchez said. “And we are not stopping here. In addition to supporting the initial production of these near-natural prostheses, the RP program is continuing to make huge strides in the restoration of upper arm control. Ultimately we envision these limbs providing even greater dexterity and highly refined sensory experiences by connecting them directly to users’ peripheral and central nervous systems.”

Evolutionary Hurdles Overcome

The technology underlying prosthetic legs has advanced steadily over the past couple of decades, but prosthetic arms and hands have proven to be a far tougher challenge, in part because of the need for much greater degrees of dexterity. When the LUKE arm first went into development, people who had lost upper limbs were largely relegated to using the relatively primitive “split-hook” device that had changed little since its introduction in 1912.

DARPA launched the Revolutionizing Prosthetics program with a radical goal: gain U.S. Food and Drug Administration approval for an advanced electromechanical prosthetic upper limb with near-natural control that enhances independence and improves quality of life for amputees. Less than eight years after the effort was launched, that dream of development and FDA approval became a reality.

Under a recently finalized agreement between DARPA and WRNMMC, DARPA will transfer LUKE arms from an initial production run to the medical center for prescription to patients yet to be selected. Mobius Bionics will train the WRNMMC staff on fitting the prostheses as well as provide service and support of the arms.
DARPA aims to develop an integrated end-to-end platform that uses nucleic acid sequences to halt the spread of viral infections in sixty days or less.

Over the past several years, DARPA-funded researchers have pioneered RNA vaccine technology, a medical countermeasure against infectious diseases that uses coded genetic constructs to stimulate production of viral proteins in the body, which in turn can trigger a protective antibody response. As a follow-on effort, DARPA funded research into genetic constructs that can directly stimulate production of antibodies in the body. DARPA is now launching the Pandemic Prevention Platform (P3) program, aimed at developing that foundational work into an entire system capable of halting the spread of any viral disease outbreak before it can escalate to pandemic status. Such a capability would offer a stark contrast to the state of the art for developing and deploying traditional vaccines—a process that does not deliver treatments to patients until months, years, or even decades after a viral threat emerges.

“DARPA’s goal is to create a technology platform that can place a protective treatment into health providers’ hands within 60 days of a pathogen being identified, and have that treatment induce protection in patients within three days of administration. We need to be able to move at this speed considering how quickly outbreaks can get out of control,” said Matt Hepburn, the P3 Program Manager. “The technology needs to work on any viral disease, whether it’s one humans have faced before or not.”

Global Challenges

Recent outbreaks of viral infectious diseases such as Zika, H1N1 influenza, and Ebola have cast into sharp relief the inability of the global health system to rapidly contain the spread of a disease using existing tools and procedures. State-of-the-art medical countermeasures typically take many months or even years to develop, produce, distribute, and administer. These solutions often arrive too late—if at all—and in quantities too small to respond to emerging threats. In contrast, the envisioned P3 platform would cut response time to weeks and stay within the window of relevance for containing an outbreak.

Key to this undertaking are nucleic-acid-based technologies—that those that are centered on DNA and RNA—including some developed under DARPA’s Autonomous Diagnostics to Enable Prevention and Therapeutics (ADEPT) program. Using these tools, scientists can identify protective antibodies from recovering patients and then, through a biological version of reverse engineering, manufacture genetic constructs that, when delivered, can instruct an individual’s body to produce similar protective antibodies. Significant quantities of these nucleic acid “blueprints” can be rapidly manufactured compared to state-of-the-art antibody production methods.

What is required now are breakthroughs in three other technology areas to bridge those past DARPA achievements and overcome the remaining bottlenecks that hinder rapid response to pandemic threats. The P3 program will pursue innovations in those three areas:

- Growing virus needed to support evaluation of therapies in laboratory tests;
- Subjecting antibodies to rapid rounds of evolution outside of the body to increase their potency beyond that of even the most effective antibodies obtained from infected patients; and
- Developing means of efficiently delivering nucleic-acid-based protective treatments, since the technologies used to administer conventional vaccines do not readily translate.

Multi-Focused Effort

Achieving and integrating breakthroughs in all of these areas will require choreographed cooperation among researchers and engineers specializing in such areas as immunology, microbiology, virology, medical infectious diseases, molecular biology, and medical countermeasure product development and manufacturing.

DARPA-funded teams will be required to demonstrate their integrated platforms in five simulations during the planned four-year program; they will initially test their platforms using pathogens of their choice, but ultimately they will test using DARPA-selected pathogens, including two demonstrations in which the identity of the pathogen will remain opaque to the teams until the 60-day clock starts. To ensure the developed platforms can produce a quality product with a viable pathway for regulatory review, each team will be required to complete a Phase I clinical safety trial before the end of the program.

A benefit of the nucleic-acid-based approach to limiting the spread of infection is that the genetic constructs introduced to the body would be processed quickly and would not integrate into an individual’s genome. Similarly, the antibodies produced in response to the treatment would only be present in the body for weeks to months. This is consistent with DARPA’s intent with P3, which is to safely deliver transient immunity to a virus, halting the spread of disease by creating a firewall.

“Our country asks our military Service members to deploy globally and provide humanitarian assistance in all manner of high-risk environments. We owe it to them to develop the best protections possible,” said Hepburn, a U.S. Army physician who previously served as Director of Medical Preparedness on the White House National Security Staff. “If we’re successful, DARPA could take viral infectious disease outbreaks off the table as a threat to U.S. troops and as a driver of global instability.”

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SEEKING ENHANCED VETERANS’ CARE

U.S. Representative Matt Cartwright was first sworn into Congress on January 3, 2013. During his time in the House of Representatives serving the people of northeastern Pennsylvania and the eastern Lehigh Valley, Cartwright has stepped forward as a leader, having been elected class president in his first term and Regional Whip by his colleagues thereafter. Further, Cartwright has introduced over 60 pieces of legislation that aim to help seniors, military families, veterans, students, workers, consumers, the middle class, and the environment – the majority of which were introduced with bipartisan support. Cartwright serves on the House Committee on Appropriations and the House Committee for Oversight and Government Reform. He serves on the Appropriations Subcommittee for Commerce, Justice, Science, and Related Agencies and the Appropriations Subcommittee on Financial Services and General Government. Cartwright also serves on the House Steering and Policy Committee, which advises the House Democratic Leadership on policy and appoints other Democratic Members of Congress to House committees. Cartwright is a former member of the House Committee on Natural Resources. During his time in Congress, Cartwright has introduced more bipartisan bills than any other House Democrat. Introduced measures have proposed expanded rights and benefits for Americans who deserve more favorable treatment under the law. Cartwright’s legislative portfolio has also focused heavily on protecting the environment from exemptions and loopholes in fundamental environmental protection statutes and promoting equity for wage-grade federal workers at federal installations such as VA hospitals, federal prisons, and military depots. Cartwright has been independently recognized as a leader in gaining cosponsorships and high-powered support within the House of Representatives for his bills. He has also been named a Moderate Democratic Leader in the House by a leading legislator ranking organization. Prior to coming to Congress, Cartwright worked as an attorney with Munley, Munley & Cartwright for 25 years. He spent his time at the firm fighting for the middle class and working families, and served as a member of the Board of Governors of the American Association for Justice. Cartwright is a magna cum laude graduate of Hamilton College, where he earned Bachelor of Arts in History in 1983. He is a law review graduate of University of Pennsylvania’s Law School, where he earned a Juris Doctorate in 1986. Cartwright is married to Marion Munley Cartwright and is the father of two sons, Jack and Matthew. The Cartwrights live in Moosic.

Combat & Casualty Care had the pleasure of speaking with Matt Cartwright, U.S. Representative from the 17th Congressional District of Pennsylvania, regarding recent bipartisan legislation entitled the Expedited Hiring for VA Trained Psychiatrists Act. Rep. Cartwright re-introduced the legislation to reduce wait times for veterans seeking mental health care by allowing the Department of Veterans Affairs (VA) to establish a fast-track process for hiring psychiatrists.

Interview conducted by C&CC Editor Kevin Hunter

Rep. Matt Cartwright
U.S. Representative
17th Congressional District of Pennsylvania (PA-17)

C&CC: With lessons learned over the past 16 years of wartime engagement regarding symptoms and likely factors known to enable PTSD, what prompted you to put your belief in increased psychiatric treatment availability as a therapeutic course of action to address the condition?

Rep. Cartwright: I believe that we owe our veterans a great debt, and I will always work to protect and expand their access to health care and other hard earned benefits. Since taking office I have worked hard to introduce legislation that benefits our nation’s veterans and service members. PTSD is one of the signature injuries of the wars in Iraq and Afghanistan. The VA reports that 29% of the OEF/OIF veterans within its healthcare system have PTSD. An estimated 10% of Gulf War Veterans and about 30% of Vietnam Veterans also have PTSD. Despite systematic efforts to screen for PTSD and to encourage diagnosed veterans to seek treatment, concerns have been raised by VA clinicians that the VA does not have the resources to handle the growing number of veterans with mental health issues. The VA nearly doubled its mental health staffing between 2006 and 2010, yet testimony given before the Senate VA Committee indicated that the VA
LEADERSHIP PERSPECTIVE

may still be unable to meet its own guidelines in many cases for providing prompt access to mental health care for those who request it. The costs are clear – 22 veterans a day take their own lives. These facts are unacceptable. One veteran lost to suicide is one veteran too many. Allowing the VA to hire directly without regard to civil service or classification laws will allow psychiatrists who have completed a residency at a VA facility to be hired as full time staff. Providing veterans expanded access to psychiatric treatment is a step toward providing veterans who suffer from PTSD with the care they deserve. It is my priority to ensure that veterans have access to the resources they need.

C&CC: From a past to present VA hiring process perspective, how do you see the EHVTP Act as a disabler of bureaucratic “red tape” keeping veterans from the treatment they need and deserve? And in follow on, how do you see the legislation as an enabler of better VA hiring across the board?

Rep Cartwright: Currently, the VA lacks the resources to support the growing number of veterans seeking help. According to the VA, almost a third of veterans within its health care system suffer from post-traumatic stress disorder. This bill creates a more efficient hiring process for psychiatrists so veterans are able to seek the care they need. The Expedited Hiring for VA Trained Psychiatrists Act streamlines the hiring process for trained, talented mental health professionals who can assist veterans struggling with PTSD. It also would allow any veteran, regardless of the dates of service, to be eligible for mental health care through the VA so long as the issue is service connected. We have a responsibility to do all we can to make sure the brave men and women who served our country get the care they need and deserve when they return. As far as the ongoing treatment process, the best course of treatment is the one that the doctor and patient determine together rather than through legislation.

C&CC: In terms of long term treatment of PTSD, do you see any challenges to the increased psychiatric availability to patients?

Rep. Cartwright: As a member of Congress, it is my priority to ensure that veterans have access to the health care resources that they need. As such, the goal of this legislation is simply to provide those veterans seeking mental health treatments the ability to do so. With the service they've provided to our country, no veteran should be left waiting or hoping to eventually receive access to care. It is time we ensure that the veterans living in northeastern Pennsylvania and across America have the fullest access to the health care benefits they have earned. We have a responsibility to do all we can to make sure the brave men and women who served our country get the care they need and deserve when they return. As far as the ongoing treatment process, the best
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