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FIRST LOOK

Firefighters' Newest Weapon

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Mother Nature's Fury from Little Rock to Minot

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Air Force firefighters, including Tyndall AFB's SSgt Matt Portka, Crew Chief (right), and A1C Jared Levitt, Lead Firefighter, will soon welcome a new high-tech vehicle, the P-34 Rapid Intervention Vehicle, to their installations' crash response fleet. *(photo by Mr. Eddie Green)*

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GOALS and OPPORTUNITIES

Driven by pressure to reduce the federal deficit, our nation, the Department of Defense, and the Air Force are operating in a fiscally constrained environment where budgetary realities are leading to reductions in DOD spending. To meet this new reality, the DOD is driving to be more efficient while continuing to ensure operational effectiveness. These challenges provide us *opportunities to excel!*

To help the Air Force find savings, civil engineers will continue on the path of transformation begun in 2007. Over the past four years we have made great progress towards transforming the way we do business to be more ***efficient*** while being ***effective***. Now we ***must accelerate*** the transformation by working to reduce overhead, realign and rightsize manpower, and minimize support operations, while also continuing our support to installations and contingency missions worldwide. Efficiencies through standardization and centralization will occur at every level, from bases to the Pentagon.

As we work to become more efficient it is important that we not lose sight of our mission. The recently released 2011 *Air Force Civil Engineer Strategic Plan* provides the necessary focus by codifying our vision, mission, and goals and outlining our objectives. In this issue we provide an overview of our strategic plan and our three keys goals: Build Ready Engineers, Build Great Leaders, and Build Sustainable Installations.

Now more than ever, civil engineers must be ready to respond and lead whenever and wherever needed, to meet current and emerging Air Force and combatant commander requirements. To do this we have to ensure that we develop, train, equip, and retain a highly capable Total Force of civil engineers.

The demand for our engineers' skills and leadership abilities continues with the successful completion of every job they're given, whether at home station or contingency locations. In Afghanistan, a team of active duty and Guard RED HORSE Airmen "delivered" two runways to the commander of a forward operating base in just 45 days. When floods struck Minot AFB, N.D. and a tornado hit Little Rock AFB, Ark., civil engineers responded quickly to support their bases and local communities. Their stories — related in this issue — are a testament to our ability to build ready engineers and great leaders.

Our third goal, to build sustainable installations, is critical as we take a holistic view across the enterprise. We must ensure we are efficiently and effectively planning, acquiring, sustaining, operating, managing, and divesting our installations' infrastructure. We must focus on "rightsizing" our infrastructure to support the future force structure and execute the mission and on diverting valuable resources away from excess, obsolete, and underutilized facilities. The consolidation efforts at Thule AB, Greenland, recounted on page 8, provide an outstanding example of building a sustainable installation through asset management.

Along with other Air Force communities, Civil Engineering is committed to finding new ways to reduce operating costs and conduct installation support more efficiently. Achieving our mission, vision, and goals will take innovation, hard work, and attention to detail, all inherent qualities of Air Force civil engineers. Our "Will do. Can do. Have done!" attitude will serve us well as we move forward. Most importantly, I need each of you to foster the innovative thinking we require while we focus on being brilliant at the basics of our core mission areas. It will take each of you to be responsible and accountable for your budgets and to find ways to do things smarter, faster, better, and cheaper. I have no doubt we will be successful as we ***Build to Last and Lead the Change***.

Timothy A. Byers
Major General, USAF
The Civil Engineer

2011 Strategic Plan
Prepares CE for Challenges Ahead

Maj Gen Timothy Byers
The Civil Engineer

The new 2011 *Air Force Civil Engineer Strategic Plan* codifies our vision, mission, and goals, with updated objectives so that we are better positioned to meet current and future mission requirements. It also postures civil engineers to support the Air Force through future funding challenges, seeking opportunities to "Build Ready Engineers, Build Great Leaders, and Build Sustainable Installations."

Looking ahead to the DOD Future Years Defense Program, the Air Force Civil Engineering enterprise must achieve major efficiencies savings while being effective and providing expeditionary combat support. These savings will come in large part by reducing overhead, realigning and rightsizing manpower, and enacting efficient, standardized business processes across all our installations. We must do things smarter, faster, better, and cheaper.

We as Air Force Civil Engineers have a clear vision and mission:

Our vision is to provide global combat support and efficient, sustainable installations worldwide using transformational business practices and innovative technologies supporting combatant commanders to enable the projection of global air, space, and cyber power.

Our mission is to provide, operate, maintain, and protect sustainable installations as weapon-system platforms through engineering and emergency response services across the full mission spectrum.

To achieve vision and mission success, civil engineers work toward three key goals that form the foundation of our strategic plan:

Build ready engineers

Build great leaders

Build sustainable installations

The updated strategic plan builds upon the 2009 plan with a number of key changes in the objectives that will better prepare Air Force civil engineers at all levels to operate in the current fiscal environment and provide opportunities for success. Pursuing initiatives that support the objectives found in this plan will posture your installation to be aligned to Civil Engineering's goals, while supporting the Air Force's goals and priorities.

Goal One – Build Ready Engineers

Air Force civil engineers are focused on improving deployment capabilities, optimizing emergency management capabilities, and ensuring deployed engineers are properly equipped. They must be ready to respond wherever needed throughout the world. When called upon to deploy, Civil Engineering Airmen must have the agility, training, and resources to hit the ground with boots on, ready to do the job. The current high ops tempo and deployments affect everyone in Civil Engineering. All personnel, including civilians, have a responsibility to mentally and physically prepare for their own deployment or support those heading out to the area of responsibility in support of the mission.

Power Production Airmen break down a mobile runway edge sheeve as part of a Silver Flag training exercise designed to improve their readiness capability. (photo by SSgt Grant Saylor)

In addition to personal readiness, civil engineers must ensure installation emergency preparedness and response. Emergency responders are developing risk- and capabilities-based plans, ensuring that installations are ready to respond to, mitigate, and recover from emergencies.

Achieving personal and installation readiness will be helped by an ongoing initiative to establish total visibility

of expeditionary and emergency services assets. This will enable us to manage readiness resources to provide accurate data for mission-critical decisions and resourcing.

Goal Two – Build Great Leaders

The Civil Engineering community must take an active role in promoting professional development and mentorship to optimize recruitment and retention for the entire officer, enlisted, and civilian workforce. Leaders must provide opportunities for professional development, including enhanced training and education and clear career path guidance. Air Force civil engineers must seek out opportunities such as technical courses, on-the-job training, and pre-deployment preparation, to build enhanced understanding and knowledge of Civil Engineering capabilities.

An Air Force civil engineer on a provincial reconstruction team talks with local Afghan contractors during a quality control inspection. (photo by SSgt Kyle Brasier)

Civil engineers have a wealth of information and expertise which makes them great resources as mentors. Supervisors are encouraged to foster a mentorship culture in their offices. Instituting a formalized mentoring process and providing opportunities for people to take on additional job responsibilities are great ways for them to "grow" their career and skills while promoting recruiting and retention.

Goal Three – Build Sustainable Installations

The *2011Civil Engineer Strategic Plan* provides a clear outline of how Civil Engineering will approach installation support in the coming years. Civil engineers are tasked with conserving resources as they continue to effectively manage Air Force installations and reduce the Air Force physical plant by 20 percent by 2020. Civil engineers must find smarter, faster, better, and cheaper ways to accomplish the mission, and think holistically about sustainable installations.

The foundation of this approach is an asset management methodology for managing the Civil Engineering portfolio. Leaders at all levels will make resource decisions based on the amount, availability, and condition of our assets, so it is vital that all personnel understand the importance of providing accurate data to ensure these decisions are correct. I challenge supervisors and managers to lead by example in embracing the concepts of asset management and inspire their people to understand and implement these practices.

The new Tyndall Fitness Center is the first Air Force facility to achieve the U.S. Green Building Council's LEED Platinum rating. (photo by Ms. Lisa Norman)

Civil Engineering must also focus on effectively managing Air Force natural infrastructure assets, increasing energy efficiency, and executing comprehensive installation planning. We must do all we can to ensure our environmental assets are managed appropriately and overall energy demand in the Air Force is reduced. We must also support building thriving Air Force housing communities, so that installations are places where families and unaccompanied Airmen want to live.

Build to Last … Lead the Change

Civil Engineering Airmen are encouraged to read the new 2011 *Civil Engineer Strategic Plan* to become familiar with our goals and objectives to explain where we are headed in briefings and commander's calls. I challenge all officer, enlisted, and civilian civil engineers to think about how they directly impact the success of our initiatives and stay connected to their community to learn about advances in these efforts.

Civil Engineering headquarters, MAJCOMS, FOAs, and installations all must work together to achieve our 2011 *Civil Engineer Strategic Plan* goals and objectives. This will ensure Air Force Civil Engineering is on track to meet current and emerging mission requirements and prepare us to "Build to Last … Lead the Change."

The new strategic plan can be accessed on the Air Force Civil Engineering Portal at https://cs.eis.af.mil/a7cportal/Pages/default.aspx.

Message from the Chief of Enlisted Matters:

Building Ready Engineers and Leaders

The Civil Engineer enlisted force continues to do amazing things for the Air Force and the nation.

Despite remaining in high demand in the U.S. Central Command area of responsibility, our Airmen continue to support missions throughout the world. This year we participated in Operations New Horizons in Suriname and Pacific Unity 2011 in Vietnam, where we built and repaired schools, clinics, and other facilities for impoverished communities. Closer to home, we continue to receive positive feedback regarding the recently implemented base-level large multi-craft work order program, which provides realistic deployment training and leadership opportunities for our Airmen, allowing them to practice construction skills while improving home station job satisfaction.

Speaking of training, we are making huge strides in right-sizing our training programs, from contingency and career field courses and computer based training (CBT) to mission essential equipment training (MEET) and Silver Flag. In 2009-2010 we took a hard look at the timing and relevancy of our training requirements to ensure our Airmen and civilians are getting the right training at the right time. We have since consolidated or eliminated excess and redundant courses and CBTs, and examined training plans to pinpoint the most appropriate timeframe in an individual's career to receive training that will maximize his or her capability within the Civil Engineering team.

> ***"Our future efforts will continue to focus on training, as well as other initiatives that make us more efficient and effective."***

We have also improved our Silver Flag programs with annual reviews focused on establishing the correct "war task standard" that evolves with the wartime mission. Improvements include standardizing plans across Silver Flag and regional training sites to provide consistent training regardless of location.

Our future efforts will continue to focus on training, as well as other initiatives that make us more efficient and effective. Such efforts include the possibility of sourcing vendor courses and adding certifications to career field training plans to keep our forces aligned to the most current industry standards while reducing the number of courses maintained in-house. Another goal is developing a training plan for wage grade civilians modeled after the enlisted career development path to enable our technicians to manage their careers and ultimately "build great leaders."

Aside from training, we are creating "tiger teams" to evaluate our engineering technical letters and Air Force instructions. These tiger teams will be made up of "boots on the ground" Airmen and civilians with the knowledge and experience necessary to strike a balance between meeting requirements and being efficient and effective. As with training, this will be a comprehensive look at what is correct, relevant, and useful, while eliminating excess and redundancy.

I'm proud to be a part of this extraordinary team, and I look forward to helping our career field Build to Last and Lead the Change!

CMSgt Jerry Lewis
Chief of Enlisted Matters
Office of The Civil Engineer

Lighting the Way!

How *Strategic Sourcing* leads to smarter, cheaper airfield lighting

Mr. John Burt
HQ AFCESA/CEBH

The Air Force is changing the way it acquires lighting for airfield taxiways and, in the process, transitioning to energy saving light-emitting diode (LED) technology. This extensive change marks the first strategic sourcing project initiated by AFCESA, Tyndall AFB, Fla., and the Air Force Civil Engineer Commodity Council (CECC), part of the Enterprise Sourcing Group (ESG), at Wright-Patterson AFB, Ohio.

Strategic sourcing is a collaborative process that analyzes an organization's resource needs and spending habits to find ways to acquire commodities and services more efficiently and effectively. However, the goal is more than just identifying items that can be purchased in bulk.

"Everything we are doing with strategic sourcing applies to the Air Force's goal for efficiency and cost savings over the [Future Years Defense Program]," said Mr. Mike Bascetta, who leads AFCESA's Strategic Sourcing team. "It's not just about writing contracts or consolidating like-type items into a contract. The goal is to identify a gained efficiency or cost savings."

In 2008, the newly organized team asked the MAJCOMs to list their priorities for a strategic sourcing initiative and airfield lighting was at the top. With extensive data on many factors (e.g., number of lights, suppliers, prices, and current maintenance and energy costs) the team — in collaboration with CECC and AFCESA's subject matter experts — concluded traditional incandescent technology could immediately be replaced with newer, energy-efficient LED lights for the Air Force's approximately 33,000 semi-flush and elevated taxiway edge fixtures.

"The Air Force will buy 23,000 taxiway lights during the next two years," said Mr. Bascetta.

A majority of the taxiways now have older quartz or incandescent lamps that consume 45 watts, last 1,000 hours (41 days of continuous use) and cost the Air Force about $1.7M annually on replacement and repair. The proposed LEDs consume only 5.5 watts, have a projected life of about five years, and could save as much as $750K in labor costs.

The potential energy savings were significant enough to warrant some funding from AFCESA's Air Force Facility Energy Center (AFFEC).

"We looked at the building life-cycle cost analysis for this sourcing, including the range of utility rates over the locations," said Mr. Mike Rits, AFFEC's Capital Investment Branch chief. "If the installation's utility rates are above a certain cost per kilowatt hour, replacing fixtures would be cost effective. We have $990K in initial seed money designated for specific locations, and $2.2M to potentially award this year."

Initial funding has been provided for airfield lighting conversions at Lackland, Sheppard, and Laughlin AFBs in Texas, Vance AFB, Okla., and Tyndall AFB, Fla.

AFCESA and the CECC also found that installations already using LED lighting were buying assorted fixtures from multiple sources at different prices ($185-600 per elevated and $300-805 per in-pavement fixture), as well as instances where bases bought the same fixture at different prices.

"There was no standardization because there was no negotiation of pre-pricing," Mr. Bascetta explained. "The goal of this initiative was to standardize the types of fixtures we buy, reduce our energy consumption, and reduce the labor required to continually replace the existing lamps."

The CECC identified potential vendors based on market analysis and product requirement criteria (i.e., price, delivery, and defect replacement) and awarded the LED taxiway fixture contract in August 2011.The Air Force-wide, five-year indefinite delivery-indefinite quantity contract is designed to ensure each installation gets the same best price (50 percent below the pre-contract median price for elevated fixtures and 80 percent below for in-ground).

Mr. Jonathan Clark, Chief, CECC Flight said, "This strategic sourcing initiative helps reduce the cost to the Air Force to procure these items, as well as generates a significant reduction in energy and maintenance costs."

Currently, AFCESA Strategic Sourcing and the Enterprise Sourcing Group has launched four more sourcing initiatives, including elevator maintenance and inspection, flooring maintenance, and procurement of paint and protective coatings, and others are under consideration.

Mr. Burt provides contract support as a communications coordinator at HQ AFCESA, Tyndall AFB, Fla.

Thule Air Base Consolidation: "The Thule Triangle"

The consolidation plan for this Northern-most base may arguably be the Air Force's best case for asset management and sustainable installations

Capt Robert Marcucci
Maj Patrick C. Suermann, Ph.D., P.E., LEED A.P.
821 SPTS

At 76 degrees north latitude, hundreds of miles north of the Arctic Circle, Thule AB, Greenland, is the DOD's northernmost installation. Established in 1951's Operation Blue Jay in only 104 days and under a shroud of secrecy, Thule continues to this day to be a base where American ingenuity and tenacity prevail. Taking recent asset management directives and executive orders directing energy savings to heart — and hand — Thule is becoming a sustainable Installation through asset management implementation, a key premise of the Air Force Civil Engineer Strategic Plan.

For many bases, asset management might mean demolishing no longer needed buildings or turning over tracts of old housing to a local community. Thule is taking a much more comprehensive approach — demolishing entire sections of the base to reduce the building square footage by 25 percent and the active main base footprint by 92 percent, from more than 2,800 acres to 200 acres. The base is also undertaking revolutionary energy initiatives to drastically drop energy consumption and recycling thousands of tons for scrap metal for reinvestment at no cost to the DOD. Such outside-the-box thinking is not just achieving Air Staff Directives, but transforming an old Cold War construct into a new age one of leaner, more agile combat support.

One of the two radar faces of the Ballistic Missile Early Warning System, or BMEWS, site is shown during a short period of twilight at Thule AB, Greenland. (photo by Mr. Michael Tolzmann)

Rising Out of the Cold War

When the Cold War mission came to an end, so did the need for Thule to support 10,000 personnel. Today, the base's primary mission is to support the 12th Space Warning Squadron Ballistic Missile Early Warning System that tracks ICBM launches and polar orbiting satellites. It also hosts Detachment 1, 23rd Space Operations Squadron, which monitors and controls the Air Force Satellite Control Network. Thule AB is now home to approximately 600 personnel, including 450 Danish and Greenlandic base support contractors, 3 Canadians, and about 140 American military and contractors. Fuel expenditure is incredible: the base annually consumes about 10 million gallons of JP-8 (the sole energy source) for power generation and steam production and for aircraft and vehicles.

Directives Lead to a Plan

Fuel costs, coupled with maintenance of oversized, underused, and unused facilities, made creating a reduction solution a necessity. Three directives brought home the reality that a Thule consolidation plan was also a mandate with backing from high-ranking Air Force officials, including The Civil Engineer, Maj Gen Timothy Byers, AFSPC's Civil Engineer, Col Joseph Schwarz, and the 821st Air Base Group Commander, Col William Uhlmeyer. The first was the Air Force's "20/20 by 2020" goal that calls for a 20 percent reduction in base footprints by 2020 to achieve a 20 percent reduction in associated installation sustainment costs. The second, Executive Order 13423, requires a 30 percent increase in energy efficiency by 2015 and the third, an Air Force Chief of Staff initiative, requires that all dormitories be brought up to code and standards of living by 2017.

Together, these made for a truly daunting task for the small base, but the BCE, Ms. Helle Hallberg, immediately set out to meet these objectives. Several precursor plans were the foundation for the Thule Consolidation Plan, such as the original 10-Step Plan and the Consolidation Annex (now part of the general plan's section 4).

Thule AB is sectioned into areas in which the main business and dorm areas are centralized close to runway functions and old industrial warehouses and civil engineering shops are on the western side. It made sense to the base maintenance contractor, Greenland Contractors, and their

civil engineering department to consolidate the base and shrink it into what is called the "Thule Triangle," with facilities and functions closer together and easier to maintain in the harsh arctic climate and drastically reduced lengths of steam lines and electrical runs. The plan calls for 18 major dormitory projects, including two MILCON projects for new high-rise, three-story dorms, renovations to three other high-rise dorms, and renovation of 33 flattop dorms that have had little external renovations since their construction in 1951. The plan also programs 18 energy conservation and renovation projects to move users out of facilities scheduled for demolition and into reconfigured, renovated facilities in the Thule Triangle. The consolidation plan will see the demolition of 58 facilities (> 744,000 square feet) — a tremendous feat for the Air Force.

A view of Thule AB, Greenland during daytime darkness. (photo by 2Lt Lisa Meiman)

Energy Initiatives and Savings

Central to the Thule Consolidation Plan are groundbreaking energy initiatives that should increase the base's energy efficiency by 35 percent. Chief among these are ongoing projects by the U.S. Army Corps of Engineers to install gas exhaust boilers into the primary power plant. Between powering the base from this primary plant and heating it from two steam plants, Thule consumes seven million gallons of JP-8 annually. The boilers are designed to capture exhaust heat off the primary power plant's five massive 3-megawatt engines and use it to produce steam for distribution throughout the Thule Triangle. This direct energy savings could potentially see the shutdown of both current steam plants. An additional, tandem project will capture the heat off of the engine coolant systems and transfer it to 12 facilities in the adjacent area. Coupled with energy efficiency projects in all 127 current, renovated, and new buildings, Thule expects to see annual JP-8 consumption plummet from a little more than 7 million gallons on the 2003 baseline to 6.5 million in 2011, and finally to a little less than 2.5 million gallons by 2018. The ever escalating price of energy makes these figures even more significant.

To help battle rising costs, Thule AB implemented a project last year to recycle over 11,740 tons of scrap metal from the deconstruction of 28 old fuel tanks and other demolition projects across base. In June of this year the first shipment of scrap metal to leave Thule left behind a check from the contractor for $1,026,000 to be reinvested into environmental remediation projects around the area. The future could also see a recycling project for over 200 kilometers of 50s- and 60s-era electrical cable running from the main base out to old decommissioned sites across the Thule Defense Area. Early estimates for this possible windfall could be between five and ten million dollars.

As part of a recycling project, the first shipment from Thule of scrap metal from deconstructed fuel tanks and other demolition netted the base more than $1M for reinvestment in environmental remediation projects. (photo by Mr. Todd DeGarmo)

A New Base for a New Era

Thule AB remains brilliant in its inception and original construction. Smart and efficient engineering will ensure this critical installation is sustainable far into the future, and the Thule Consolidation Plan may well become a benchmark for application at other Air Force locations. Thule is still in the middle of this epic transformation and ready to overcome any obstacles with innovative ideas.

In Greenland, 750 miles north of the Arctic Circle, Thule AB is where engineers triumph over the frozen elements and minus 70 degree temperatures. It's here that the members of the 821st Support Squadron, the Knights of the Valiant Order of the Blue Nose, live up to their motto, "Venimus conglaciati vicimus" — "We came, we froze, we conquered."

Capt Marcucci is the Civil Engineering Flight Commander and Maj Suermann is the Commander, 821st Support Squadron, Thule AB, Greenland.

CEMIRT Retrofits Thule's Circuit Breakers

Mr. Gabriel Garza
AFCESA/CEMR

When the Air Force's northernmost installation needed help with its outdated electrical system, base engineers called the Civil Engineer Maintenance, Inspection and Repair Team (CEMIRT), which is headquartered at Tyndall AFB, Fla., as part of AFCESA.

"Thule AB in Greenland houses a crucial radar site," explained TSgt Ernest Crook, a CEMIRT electrical technician. "But, their current 1950s-era electrical system is unreliable and equipment failure at such an isolated location can mean extended outages while a team is sent to make repairs."

In 2007, AFCESA conducted an electrical engineering study on Thule's system. The findings revealed the critical condition of the electrical switch gear and the immediate need to address the aging system. Modernizing Thule's electrical grid, however, would be an extensive project for Air Force planners to tackle and one that could take several years to fund.

"Thule faced the prospect of catastrophic power failure," stated CEMIRT Chief, Mr. Robert Gingell, "but we were able to develop an interim solution for their unique circumstances."

In 2009, CEMIRT started a multi-phase process of replacing Thule's approximately 100 outdated low-voltage (<600V) breakers with switch gear components they had retrofitted and commissioned. The initial parts for the project were rebuilt from inoperable equipment and abandoned breakers found on site.

During retrofitting, the old breakers are disassembled and parts like the frame are media-blasted and repainted and all electrical contact points are replated. CEMIRT technicians also replace the breaker's outdated mechanical components. "The switch gear installed in the early 1950s uses an old oil-filled dash pot that can sense the over current on the breaker and tell it when to trip," said TSgt Crook. "It's unreliable and causes a lot of nuisance trippings. We replaced the dash pots with a solid state electronic control that provides the ultimate in versatility and reduces exposure to arc-flash hazards. It's safer and more reliable – a much better product."

For Thule's 35 medium voltage (up to 5,000V) breakers in need of replacement, retrofitting was not a cost-effective option. CEMIRT helped procure, install, and commission new breakers compatible with Thule's existing switch gear.

In summer of 2011, a team of four CEMIRT technicians went to Greenland to install and commission 33 newly retrofitted low-voltage breakers. While there, they also trained Thule personnel on the new electrical equipment, and crated 50 old breakers for shipping back to CEMIRT for the next retrofitting phase.

TSgt Crook is pleased with the support CEMIRT is providing Thule. "We provided the customer a system that can be remotely monitored, responds faster to a fault situation, facilitates the troubleshooting process and makes the day-to-day operations safer for the technician out in the field."

"This project has been an excellent example of the specialized support CEMIRT provides," said Mr. Gingell. "As the Air Force leader in circuit breaker maintenance, CEMIRT acts as a service center to assist civil engineer squadrons in meeting maintenance requirements."

Mr. Garza is the Electrical Foreman for CEMIRT, Tyndall AFB, Fla. CEMIRT has operating locations at Tyndall and at Travis AFB, Calif.

SSgt Justin Swanberg and TSgt Ernest Crook move one of Thule's newly retrofitted low-voltage circuit breakers for testing .
(Photo by Mr. Eddie Green)

Trouble in River City

Minot CEs Respond to Record Floods

Capt Samuel Logan
5 CES/CEO

Throughout the summer of 2011, Airmen of the 5 CES fought a ferocious battle against the worst flooding in their part of North Dakota in more than 130 years.

Between October 2010 and April 2011, the Minot AFB, N.D., area had the highest single-season snowfall in history and was pummeled with torrential downpours in the spring, causing major flooding along the Souris River. In late spring, the city of Minot and U.S. Army Corps of Engineers began preparing the city's levees for an expected water level of 1,556 feet above sea level and a flow of 9,000 cubic feet per second (cfs).

The Souris River (also called the Mouse River in the United States) begins in Canada and flows south into northern North Dakota along Burlington and Minot to the city of Velva before looping northward into Canada again. On June 1, when the river crested at 1,554 feet and forced precautionary evacuations, the city thought the worst was over. But on June 20, heavy rainfall in Canada caused a sustained flow of over 28,000 cfs that flowed downstream to Minot, which resulted in expanded evacuations. On June 26, the river crested at 1,562 feet (6 feet over the levees), topping by 4 feet the previous all-time high in 1881. The flood inundated over 3,000 homes in Minot and displaced over 12,000 people, including more than 1,000 military and dependents. Members of the 5 CES went into action, responding to installation and community emergencies as their primary mission continued.

Flood Response in Burlington, Minot, Velva

On June 21, the 5 CES divided into two 12-hr shifts for flood response and was given their first task — filling (with the help of volunteers) over 11,000 sandbags for Burlington, upstream and 22 miles away. Squadron members also drove over 5,500 truck-miles in 24 hours to deliver about 630 tons of loose sand to the town.

Starting on June 22, the squadron provided a 42-person response team on each shift, including a master sergeant acting as liaison for heavy equipment. The teams were assigned to support the Minot Public Works Department with taskings coordinated through the Minot emergency operations center (EOC) and the North Dakota National Guard tactical operations center (TOC). From June 22-26, equipment operators ran as many as 11 dump trucks 24/7 and worked 14-hour overlapping shifts, hauling material for building and repairing levees and constructing HESCO barriers and trap bags around high-priority infrastructure. They raised the height of levees around the northeast quadrant of Minot and kept the main north-south thoroughfare, U.S. 83, open throughout the crisis. Airmen teamed with Guard forces to fill, sling load, and drop 1-ton

"super sack" sandbags by helicopter in areas where levees were failing, and to clear a bridge of large debris.

By June 26, the river had reached its peak in Minot and 5 CES personnel were tasked to support levee construction efforts downstream in Velva, where the situation could only be described as dire. Equipment operators quickly began hauling material from local sources to raise the levees and also reinforcing them with rip-rap where the river scoured away fill material. At the end of a 24-hr period the town stayed dry, drawing high praise from city officials.

FEMA Trailer Beddown Planning

In the initial days of the flood the unit control center was tasked to develop beddown options in case FEMA or the Air Force decided to erect displaced-persons camps on base. Young CGOs and experienced SNCOs worked together to develop numerous layout and utilities plans and cost estimates for scenarios ranging from 38-spot camper trailer camps to 600+ trailer FEMA villages.

SMSgt Ken York, a CE from Vandenberg AFB, Calif., helped volunteers at Minot with some of the 25,000 sandbags they filled in the first two days of flood preparation. (photo by SrA Kelly Timney)

ROWPU Planning/Set Up/Operations

Flooding rendered many of the city of Minot's drinking water wells inoperable or unusable, forcing the city to return to its stand-by source — surface water from the river — and adjust their treatment process accordingly. Production capacity dropped from 12-14 MGal/day to 5 MGal/day and the city and base instituted water conservation measures. (Per the utility agreement, Minot AFB is permitted up to 1,000,000 gallons/day; average summer daily consumption is 750,000 gallons.)

By coincidence, the base's main water supply pumps were out of service for upgrades to bulk storage tanks and the transfer pumps that refilled the water towers. Anticipating a water scarcity, the base topped off the storage tanks, and rented a portable pump with sufficient head to draw water out of the tanks and recharge the water towers through a hydrant connection after isolating the system from the municipal supply.

After raw water infiltrated the city's treated water supply cistern through a plugged overflow outlet, the state's health department declared a boil water order. Mandated actions for lifting the boil water order for the city and base included raising chlorine concentration from the normal 0.5-1.0 ppm to 2.5-3.0 ppm, collecting samples for bacteriological cultures, and flushing the distribution system. The city of Minot discovered catastrophic breaks in water mains in the river valley under floodwaters and instituted even more stringent water restrictions, temporarily limiting Minot AFB to less than 400,000 gallons per day.

At this point, Minot AFB requested BEAR Reverse-Osmosis Water Purification Unit (ROWPU) assets from the 49 MMG at Holloman AFB, N.M., to ensure the base had potable water. Water and Fuels Systems Maintenance (WFSM) Airmen from the 5 CES and 49 MMG determined Minot's needs as eight 1,500 GPH ROWPUs, ten MEP-806s, one ROWPU Source Run Kit (because of uncertainty of water source), and four increments of the BEAR Water Distribution Kit (for dual pumping station). The unique layout and elevations of the site required that water be pumped to six 20,000-gallon bladders, drawn from them, re-chlorinated, and then pumped up a hill to the bulk storage tanks to be drawn by the rental pump to push into distribution piping and recharge the water towers.

The 49 MMG dispatched five Airmen to set up the plant with 5 CES personnel and ensure they were trained in routine operations and maintenance of the system. The "Dirt Boyz" graded a pad for the ROWPUs and generators and built a pad and road out of asphalt millings. They constructed an expedient concrete ballast rock dam in a drainage ditch coming from the airfield to supply water to the ROWPUs. They laid out a large sand bed for the bladder farm and filled low-lying areas with more ballast rock to prevent water pooling. Structures erected two sections

of TEMPER tents as a personnel shelter and HVAC set up a field deployable environmental control unit. Power Pro set up light carts and maintained and fueled generators while the WFSM Airmen kept the plant running and monitored chlorine levels.

The ROWPUs were set up and fully producing within two days of arrival on station, but distribution was delayed significantly by water quality testing that required 24 hours. From July 1-20, more than 3.9 million gallons of water were produced from the ROWPUs and average daily production ranged between 180,000 to 260,000 gallons. The two bulk water tanks served two purposes – as a reservoir for ROWPU water ready for distribution, and as a segregated tank to verify quality of drawn city water before pumping into distribution.

The city was released from the boil order on July 13, but the base wasn't released until July 23 because of extra testing requirements. The 5 CES teamed with Bioenvironmental Engineering to flush and sample lines across the base at 43 locations. An unexpected side effect of the water conservation measures was that several of the large 10" and 14" mains sat stagnant and lost their chlorine residuals, requiring significant flushing to get the numbers back up.

Housing Situation

The flood destroyed 20 percent of housing in the city of Minot, worsening an already existing housing shortage. After the initial flooding, the Air Force Personnel Center issued a stop-movement order that, as of this writing is still current. Unaccompanied personnel are still proceeding direct from tech school and personnel with dependents must get permission to proceed to Minot and will proceed unaccompanied until they secure housing for their family members. The 5 CES Asset Management Flight developed different housing options for displaced Airmen and their families and any inbound personnel. The courses of action include designating dorms scheduled for demolition as unaccompanied CGO and SNCO dorms, expediting change of occupancy in vacant family housing, and doubling up Airmen in dorms.

Conclusion

In the end, 5 CES Airmen contributed more than 10,400 man-hours to supporting flood response efforts in Burlington, Minot, and Velva, N.D., while simultaneously supporting ongoing dual-wing global nuclear deterrence missions. Engineer assistants and Airmen from every shop within the Ops Flight supported the ROWPU plant set up and operations with more than 1,700 man-hours. In the process, they also met the SORTS-reportable requirement for Prime BEEF troop construction project. During the flood crisis at Minot, 54 squadron members and 69 of their dependents were displaced from their homes. Despite this personal impact, many still worked daily shifts of more than 12 hours and then immediately continued working on their homes or the homes of their neighbors or other unit members.

The men and women of 5 CES performed spectacularly in the face of a real-world contingency to support the needs of the dual nuclear deterrence mission, their fellow Airmen, and the local and surrounding communities. I am honored to work alongside so many of our outstanding civil engineering Airmen.

Capt Logan is the chief of Facilities Systems and Heavy Repair, 5 CES, Minot AFB, N.D. From March to October 2011 he was the interim Operations Flight commander.

The ROWPU "plant" at Minot included eight 1,500 GPH ROWPUs and six bladders and from July 1-20, produced more than 3.9 million gallons of usable water. (photo by SrA Jesse Lopez)

CAN DO, WILL DO, HAVE DONE.

Putting the RED in Readiness

Capt W. Donald Horn
809 ERHS/DO

Airmen from the 809th Expeditionary RED HORSE Squadron (ERHS) recently proved again why this premier military engineering and construction unit is routinely called upon by joint commanders to take on highly visible, time-sensitive construction projects.

Spanning a period of less than 45 days, our unit constructed two runways at a forward operating base (FOB) in southern Afghanistan. Eighteen Airmen, comprising pavements and construction equipment operators, vehicle maintainers, structures, power production and engineering technicians, went to the base with a battery of heavy equipment to take on the tasking.

The Airmen working on this project came from four different units: 823 RHS, Hurlburt Field, Fla.; 673rd Logistics Readiness Squadron, JB Elmendorf-Richardson, Alaska; 202 RHS, Camp Blanding, Fla.; and 203 RHS, Virginia Beach, Va. Operating as a single team, vehicle maintainers ran equipment, equipment operators assisted with surveying, and engineering assistants swung hammers. Everyone worked outside of their expertise and epitomized the RED HORSE motto of "Can do, will do, have done."

The plot of land identified for the airfield was just outside of the FOB perimeter berm and required extensive work before it was capable of handling any aircraft. Time was of the essence with this project; the 525th Battlefield Surveillance Brigade wanted the airfield operational in time to support an anticipated uptick in Taliban-led violence in the area. The 809 ERHS teamed with Seabees from Naval Mobile Construction Battalion 26, deployed out of Selfridge ANGB, Mich., to develop a plan for Level II demining, extending the base perimeter to encompass the airfield, and constructing the runway. To meet the required operational timelines despite the lead time needed to procure more than one million pounds of cement, the team developed a plan to construct two parallel runways. The first could be done expediently with materials found on site and the second would provide the more durable, weather-resistant surface the user required.

Using a Cat D7 dozer, CEs break through a berm (formerly the FOB perimeter) to access the project site and begin construction.

RED HORSE Airmen spread-dump and grade base course across the runway.

RED HORSE was given the green light to begin construction on May 18 and our equipment operators immediately got to work leveling out the 1.5 million square-foot site. Anyone who has done horizontal work in southern Afghanistan knows that as soon as a blade is put in the ground, it turns to "moon dust" and that was exactly the condition we were dealing with. Neither of the two requirements to compact moon dust — water and time — was readily available. The austere base was critically low on water but was able to support our construction with a combination of gray and non-potable water.

When the first 3,000-foot long runway was leveled, graded, and compacted, project leadership and the user's representative decided that the runway surface was still too inconsistent to support the intended airframe. The fear was that a tire on a landing aircraft would hit a pocket of soft

SSgt Colin Bennett (823 RHS) oversees the delivery of bagged cement to be used for runway cement-stabilization. Local Afghan contractors delivered more than 20 dump truck loads of cement over a two-day period to fulfill the one-million-pound requirement. At right, a rotary tiller is used to blend the base course, cement, and water in 6' wide lanes to begin the stabilization process. The tiller is followed by a grader and a double steel wheel roller.

material or break through the top crust, causing the aircraft to veer off the runway or tumble nose-over-tail.

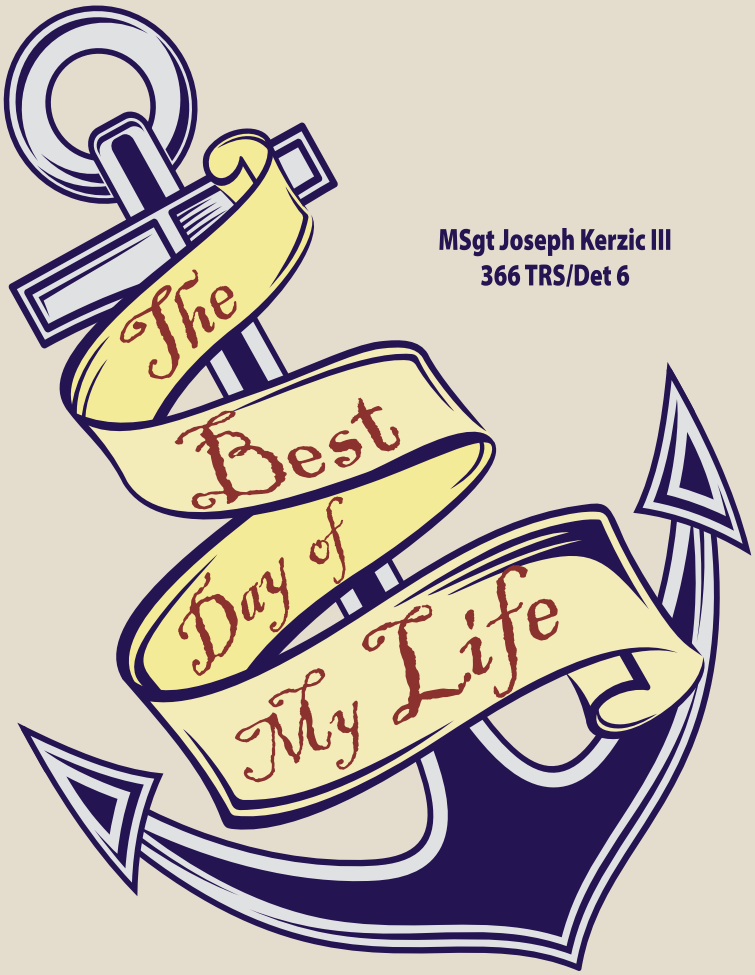
Over the next 20 hours, our Airmen pulled 2,000 cubic yards of material out of a "borrow pit" they established, spread it across the runway and watered, compacted, and final-graded the material to provide a much improved surface, able to support operations. For the airfield to be declared operational, we also had to construct a hangar and support structures. Scheduling deliveries of batched concrete from a location three hours away was a problem, so we set up the hangar in a temporary location until we could get the concrete issues worked out. Eventually, we reached an agreement with the supplier to deliver the cement/aggregate mixture in transit trucks and add water to it on site. This was not the ideal or quick way to place concrete, but it met the requirement. In only 13 days, our Airmen turned a field recently chewed up during mine clearing into an operational airfield that could support aircraft operations.

However, to be fully mission capable, the second, cement-stabilized runway needed to be completed. The team quickly surveyed and rough-graded the second runway site and placed and graded out 7,000 cubic meters of base course to await stabilization. This large-scale cement stabilization effort on was no small undertaking. Our team broke almost 11,000 110-pound bags of cement, spread it over the 3,000-foot runway with rakes and shovels and blended it with the base course and water using a rotary tiller. They then graded and rolled the runway until proper compaction was achieved and an acceptable surface developed.

By the last week of June, the cement-stabilized runway was completed and full operational capability was declared. Two weeks after the work was complete, members of the construction team — who also made up most of the 809 ERHS Combat Logistics Patrol team — convoyed back to the FOB to pick up the construction equipment, officially closing the chapter on another successful project.

Capt Horn is the director of operations, 809th Expeditionary RED HORSE Squadron; he was the site officer-in-charge during the 809th's runway construction projects.

(*above*) A loader with boom attachment is used to position a section of a hangar frame in place.
(*below*) RED HORSE Airmen spread cement from a loader bucket onto the runway.
(*background picture*) work on the runway continues despite a dust storm. (*all photos by the author*)



MSgt Joseph Kerzic III
366 TRS/Det 6

Every year the Navy pins its newest Chiefs on the same day — September 16— a day known to all Navy Chiefs as, "the best day of my life." Every once in a while someone from another service is allowed the unique opportunity to be accepted into the Navy Chief's Mess. I got that chance in 2010 at my current duty location, the Naval Construction Training Center in Gulfport, Miss., and just recently, another Air Force civil engineer, TSgt Jeremiah Grisham, a master sergeant-select, received his "anchors" at Eglin AFB, Fla. Although Airmen, we're both also genuine Chief Petty Officers (CPOs).

Within the Navy all three senior enlisted ranks (E-7 Chief, E-8 Senior Chief, and E-9 Master Chief) are CPOs and get the title of The Chief. The Navy's traditional method of training its Chiefs is long-standing, with reports of it first appearing during WWII when those aspiring to be a ship's next Chief had to meet every Chief on board, create a "charge book" listing all their duties, and then learn how to perform them. This method has evolved into the current leadership training, or induction, on how to be "The Chief."

Imagine going through the NCO Academy in a boot camp-type of environment and instead of having one drill instructor, you have over 100. During the induction process, your leadership "trainers" or drill instructors are every single inducted SNCO on base. Chiefs come from everywhere to make sure you have what it takes to be The Chief. And, during induction your training is nonstop — it's go, go, go from 4 a.m. until whenever you can get some sleep.

Like me, TSgt Grisham was afforded the opportunity to go through Navy Chief induction because he made master sergeant in a tri-service environment, as an instructor at the Naval EOD School at Eglin AFB, Fla. Here's a part of his story:

"Day one begins with a PT Test, a seemingly innocuous military function. I look down at my plain white cotton shirt with "GRISHAM" stenciled on the front in large black letters and I'm immediately transported back to basic training. I feel like I have a huge target painted on my back, but rather than sharks in black hats, yellow shirts are circling.

"The next 40 days or so seem to go by in a blur, with life stuck in fast forward. Task after task, fundraisers, speeches, training, PT, PT, and —you guessed it — PT. The lessons (and there were many) all revolved around getting things done by helping each other out, breaking up seemingly insurmountable workloads into manageable bites, and managing time wisely. Many times, figuring out the point of a given exercise or lesson was part of the lesson itself. Excellence was the only standard and anything short of perfect resulted in massive amounts of PT as well as a 'public training' in the confines of the Chief's Mess (nothing that occurs during induction is for the uninducted).

"Looking back, I wouldn't trade the experience for anything. I survived my induction season, represented my service well (I think) and received my anchors on 'the best day of my life.'"

TSgt Grisham is now my "brother" CPO and with the deeper perspective gained as one of this past year's trainers, I believe he proved he has what it takes to wear the Navy Chief anchor. He understands that it's about one voice, a unified front. He understands that "it's the power to influence major decisions that impact every person within that command and to aid the commander in viewing the organization through the lens of an enlisted perspective."

We are truly fortunate to have had the privilege of participating in the Chief's induction, but are honor bound not to tell you specifically what we went through. However, if you ever have the rare opportunity to earn your anchors, I recommend that you put your Navy request "chit" in, quickly and without hesitation. The opportunity for inter-service cooperation and respect is immeasurable, as is the personal growth and self-realization you will gain in six short weeks, regardless of how long they seem.

MSgt Kerzic is the Instructor Supervisor for the 366 TRS/Det 6, Gulfport, Miss., and is now a third generation SNCO: his father was a Navy Chief and his grandfather, an Air Force Master Sergeant.

Fight Fire with Force

The Air Force's New P-34 RIV

Mr. John Burt
AFCESA/CEBH

Air Force firefighters will soon have a new weapon in their arsenal. The P-34 Rapid Intervention Vehicle (RIV) is the newest addition to the Air Force's crash response fleet and the first vehicle to use new ultra high pressure (UHP) firefighting technology. Able to discharge 100 gallons of firefighting agent per minute at 1,350 pounds per square inch (psi) with a range of 100 feet, the P-34 RIV packs a punch.

The P-34 RIV program was spearheaded by the Air Force Civil Engineer Support Agency, headquartered at Tyndall AFB, Fla., with support from the MAJCOMs. Col Michael Mendoza, Chief of Readiness Support at AFCESA, is pleased with what the vehicle will mean to Air Force firefighters. "Everything in the design of the P-34 was done with our firefighters and vehicle maintainers in mind. Not only will the vehicle be easy to inspect and operate, it will be easier for our vehicle maintainers to maintain."

The UHP technology was developed and tested by the Air Force Research Laboratory (AFRL) at Tyndall. "With ultra high pressure, we can put out fires using significantly less volume of firefighting agent," explained Mr. Mike McDonald, an engineer providing contract support to AFRL's UHP technology research. "The Europeans have had good success with this technology in the 600 to 800 psi range. We've taken it a step further to the 1,100 to 1,500 psi range."

UHP expels smaller water droplets than a low pressure system. The smaller droplets mean an increase of up to four times the total water surface area, yielding more surface area contact with a fire with less water wasted. This technology allows the P-34 RIV to perform 3 to 3.5 times more effectively than conventional firefighting vehicles and increases the length of time a vehicle can remain on the scene without having to be resupplied. Mr. Jim Podolske, Civil Engineering's firefighting subject matter expert explained, "A 1,000-gallon vehicle that discharges 1,000 gallons per minute yields one minute of firefighting capability at the scene. With new UHP technology that same 1,000-gallon vehicle now has firefighting capability equivalent to a 3,500-gallon vehicle."

With a 500-gallon capacity, the P-34 is smaller than older vehicles in the fleet. Built on a Ford F550 chassis with an enhanced front axle, the cab is designed to accommodate three firefighters and their equipment. Mr. Donald Warner, the Air Force Fire Chief, said there are benefits with a vehicle of this size. "The goal of firefighters is to rapidly intervene at fires and extinguish them before they become catastrophic. The P-34 provides the ideal platform because it is designed to be easier to maneuver around busy flightlines and, with the enhanced capability provided by the UHP, easier to use."

The UHP system uses a four-stage centrifugal water pump powered by a Deutz 6-cylinder, 174 horse-power diesel

"I have been very impressed with the teamwork and collaboration between AFCESA, AFRL, the major air commands, our vehicle modernization, sustainment, and maintenance partners at Robins Air Logistics Center, and our A4 Air Staff counterparts. This initiative has also been supported by the entire Air Force Fire Emergency Services community. Working together, we have embraced change, new firefighting technology, and ultimately provided our people with the best tools and equipment so they can safely and effectively perform their very demanding jobs in support of the Air Force mission. The results are impressive and I greatly appreciate their teamwork and selfless efforts."

Maj Gen Timothy Byers
The Civil Engineer

engine. The UHP turret is mounted on the P-34's front bumper and is operational with the vehicle in a static position or while maneuvering around a fire. The system is operated from the cab by the driver or passenger using a joystick. The speed of the turret's movement is proportional to the amount of pressure exerted on the joystick and settings.

The vehicle also has a pair of 200-foot, one-inch hand lines that discharge 15 gallons per minute, which allows firefighters to perform interior firefighting and rescue operations. "We can operate the turret and two hand lines simultaneously," Mr. Podolske said. "This new UHP technology can also penetrate a hidden fire or a three-dimensional running fuel fire without impacting the safety of our firefighters."

The P-34 RIV will replace authorizations for some older P-19 vehicles, some of which have been in service since the 1980s. The Civil Engineer, Maj Gen Timothy Byers, said the P-34's development works toward achieving the Air Force's efficiency goals and will help recapitalize an aging vehicle fleet. "The P-34 RIV is not only going to be cheaper to purchase, it's going to be less expensive to maintain. Our replacement cost of a 1,500 gallon P-19 cost is approximately $564,000. The new P-34 RIVs are about $160,000 each — about 28 percent of the cost of a P-19."

"This cost reduction enables us to buy more vehicles and buy them quicker, reducing the average age of our vehicle fleet and helping us reduce our Air Force vehicle recapitalization rate from 33.6 years to our goal of 20 years," said Maj Gen Byers. "These initiatives have allowed us to take a 20 percent cut in the vehicle modernization program over the next five years with no negative impact on the program or our emergency responders."

Primarily designed as a crash response vehicle, the P-34 could be used for other firefighting applications. "We're excited about the RIV's versatility and the possibility to use it to support wildland firefighting operations," said Mr. Podolske. "Because it has off-road 4X4 pump-and-roll capability, we could theoretically deploy the hand lines so firefighters can walk the fire ground. With the extendable LED lights, we could also safely light up the scene. AFCESA will be looking at the feasibility of using the vehicle for this application in the months to come."

AFCESA will provide two RIVs to the Special Vehicle Maintenance School in Port Hueneme, Calif., so that Air Force vehicle maintainers can learn how to maintain them at the installation level. "As a part of the contract, the vendor will provide thorough on-site training at each installation," said Mr. Podolske. "AFCESA will also develop curriculum to show firefighters in the flight how to properly inspect, operate, and maintain the vehicle. This is serious business. This vehicle will be in the Air Force inventory for a minimum of 12 years allowing firefighters to save lives and protect vital Air Force assets."

Mr. John Hawk, an AFRL senior engineer, said this vehicle will have an impact outside the Air Force as well. "The Air Force is taking the lead on UHP and a lot of people in the commercial firefighting industry are watching. That's why the release of the P-34, the first unit based on this technology, is so significant. I think groups like the Federal Aviation Administration and the National Fire Protection Association will be closely watching how these trucks perform in the field."

"The work on UHP has not ended," said Mr. Hawk. "We have other projects in development or in a concept stage. Industry already recognizes that UHP is a big thing coming down the line and will impact firefighting significantly. It might take five or 10 years before everyone gets on board with it, but eventually it's coming."

The Air Force plans to buy a total of 238 P-34s; production and delivery of the first 90 should be completed by early 2012. Each Air Force installation will receive at least one RIV with larger bases receiving two. Tyndall AFB Fire Emergency Services Flight has received the first unit.

"The P-34 RIV was developed with direct involvement and input from experienced Air Force firefighters," said Mr. Warner. "I think it will be well-received by our community."

Mr. Burt provides contract support as a communications coordinator at HQ AFCESA, Tyndall AFB, Fla.

Ultra High Pressure turret with twin LED spotlights

Ultra High Pressure Direct Injection Foam System

- **7.5 gpm foam tank fill capability**
- **3 to 6 percent foam injection rate**
- **Ability to draft and fill tank**
- **UHP Foam acts as compressed air foam when injected into atmosphere because of large differential pressure between discharge and atmosphere**
- **Potential for low flow rates with high energy knock down**

INTRODUCING

THE

P-34

RAPID INTERVENTION VEHICLE

Ford F550 (4x4) chassis
19,500 lb GVW

7,000 lb front axle upgrade

LED scene floodlights on extendable poles

Utilizes LED technology for all emergency and warning lights

300 lb storage capacity per side

Hose Reel Compartment

200 ft of 1" high pressure hose line on driver and passenger side of vehicle
Electric and manual rewind

Deutz™ – Pump Engine

2,300 governed RPM 6 cylinder, 174 hp, mechanical air cooled engine powers a

Waterous™ 4-stage, high pressure centrifugal pump

Firefighting controls accessible from both sides of vehicle

Changing the Light Bulb

Capt Jacob M. Gilman
Capt Kevin S. Ochs
Dr. Michael E. Miller
AFIT/GEM

How many engineers does it take to change a light bulb? All joking aside, the answer is not as simple as you might think; in fact, the correct answer is "many!"

The incandescent light bulb has changed very little since its inception. Essentially a resistor in a vacuum tube, only 10 to 15 percent of the electrical energy consumed by the bulb is converted to visible light; the remainder is emitted as heat. Even with its proven history of reliability, we cannot ignore the lack of efficacy (see sidebar) as we face ever-challenging energy initiatives and fiscal constraints.

Other common lighting technologies (such as fluorescent, high intensity discharge [HID], and halogen) can have efficacy on the order of four times that of a standard light bulb and over the last six decades have attempted to combat incandescent inefficiencies (see Figure). Within the last decade, however, the light emitting diode (LED), around since the early 1960s, has emerged as the most promising challenger. In fact, LED technology likely represents the future of lighting.

LEDs are solid-state devices that have recently matured to the point of producing bright (white) light and are already competing with existing technologies in efficacy. While they still have room for improvement, as solid-state devices, LEDs possess several unique qualities which make them ideal for lighting applications: rapidly improving efficacy; wide range of available color temperatures; long lifespan; instant-on; no mercury content; cool operating temperature; and the capability to be dimmed, which increases efficacy and lifespan.

The Air Force Institute of Technology has teamed with AFCESA and Dr. Daryl Hammond, the Air Force's Electrical Subject Matter Expert at Tyndall AFB, Fla., to coordinate research efforts surrounding LED lighting technology relative to the Air Force. Currently, two projects are underway, with more planned for the future.

The first focuses on reducing the economic impact of existing and future streetlight fixtures. An earlier AFIT investigation identified nearly 29,000 250-watt streetlight fixtures on 64 Air Force installations. This project combines Asset Management principles with the application of Haitz's Law to develop a location-dependent, time-phased adoption strategy for LED street lighting across the Air Force.

Haitz's Law, based on the systematic observations of Dr. Roland Haitz, predicts that as LED functionality, quality, and efficiency increase, the cost of producing and purchasing them will decrease. It states that "every decade, the cost per lumen (unit of useful light emitted) falls by a factor of 10, the amount of light generated per LED package increases by a factor of 20, for a given wavelength (color) of light."

The financial metrics typically used by Air Force organizations only determine if it is cost effective today to replace the existing technology with a current competing technology. These metrics ignore the fact that advanced technology products, such as LEDs, are rapidly evolving and might yield greater savings if purchased at a later date rather than today. This project will predict the year LED streetlamps will be an attractive investment option for replacing existing

For light, it's all about efficacy, not efficiency

Efficiency is a common term, often given as a percentage and defined as $\left(\frac{\text{Units Out}}{\text{Units In}}\right) \times 100$. For example, an electrical device that consumes 100 watts, but delivers only 90 watts, is 90 percent efficient.

When dealing with sources of light, things get a little more complicated because of the human eye. With lamps, we are not as concerned with the power output, but rather the brightness of the light we see. Since the eye perceives certain wavelengths of light as being brighter than others (for example, the eye is more sensitive to green light than it is to red light, so one watt of green light appears brighter than one watt of red light), a standard unit of measure, the lumen (lm), is used. When light output is measured in lumens, perceptually everything is equal; one lumen of red light will appear as bright as one lumen of green light. Luminous efficacy is therefore a ratio defined as $\left(\frac{\text{Perceived Light Out [lumens]}}{\text{Power In [watts]}}\right)$ or lm/W and this quantity is often found on bulb packaging and data sheets. What does this mean practically? Lamps that emit light at wavelengths you can't see well have a lower efficacy, even if they are nearly perfect (efficient) at converting electrical energy to light. Therefore, lamps of differing technologies should be compared based on the amount of light they deliver as seen by the human eye.

streetlamps and represent the greatest cost benefit to the Air Force. Initial results indicate greater benefit might be derived by purchasing in future years rather than prematurely adopting this rapidly evolving, cutting edge technology.

A second research project focuses on developing a novel LED lamp to deliver improved illumination in mixed and multi-light source workspaces. With the increased focus on daylighting facility interiors, the mixing of light from both natural and artificial sources with multiple correlated color temperatures (CCTs), or white points, should be considered. Although not fully understood, the type of light and mixed-light environments do have a physiological impact on occupants.

CCT values available from artificial light sources typically vary from what is considered "warm" (2,700 Kelvins; incandescent bulb) to "cool" (6,500 Kelvins; linear fluorescent). This research capitalizes on the unique dimming abilities of LEDs to create a lamp that can produce light with a wide range of CCTs and spectrums approximating natural daylight at any particular time of the day. A prototype has been designed to demonstrate the concept and will be used to validate computer modeling results.

Future projects will leverage this and other prototypes to better understand the requirements for LED lamp designs in the Air Force. Other topics may explore compatibility with night vision goggles or dynamic control to provide even greater system efficacy.

Through our ongoing research, we seek to "change" the light bulb.

Capt Gilman and Capt Ochs are students in the Graduate Engineering Management Program and Dr. Miller is an assistant professor in the Department of Systems and Engineering Management, AFIT, Wright-Patterson AFB, Ohio.

Editor's Note: AFCESA has issued Engineering Technical Letter (ETL) 12-4, Light-Emitting Diode (LED) Fixture Design and Installation Criteria for Interior and Exterior Lighting Applications. The new ETL updates guidance in ETL 10-18 regarding required calculations for LED investment decisions, retrofit design requirements, applicable prohibitions, and environmental considerations. ETL 12-4 is available on the Whole Building Design Guide website (http://www.wbdg.org) and Dr. Daryl Hammond, P.E., HQ AFCESA/CEOA, is available to interpret.

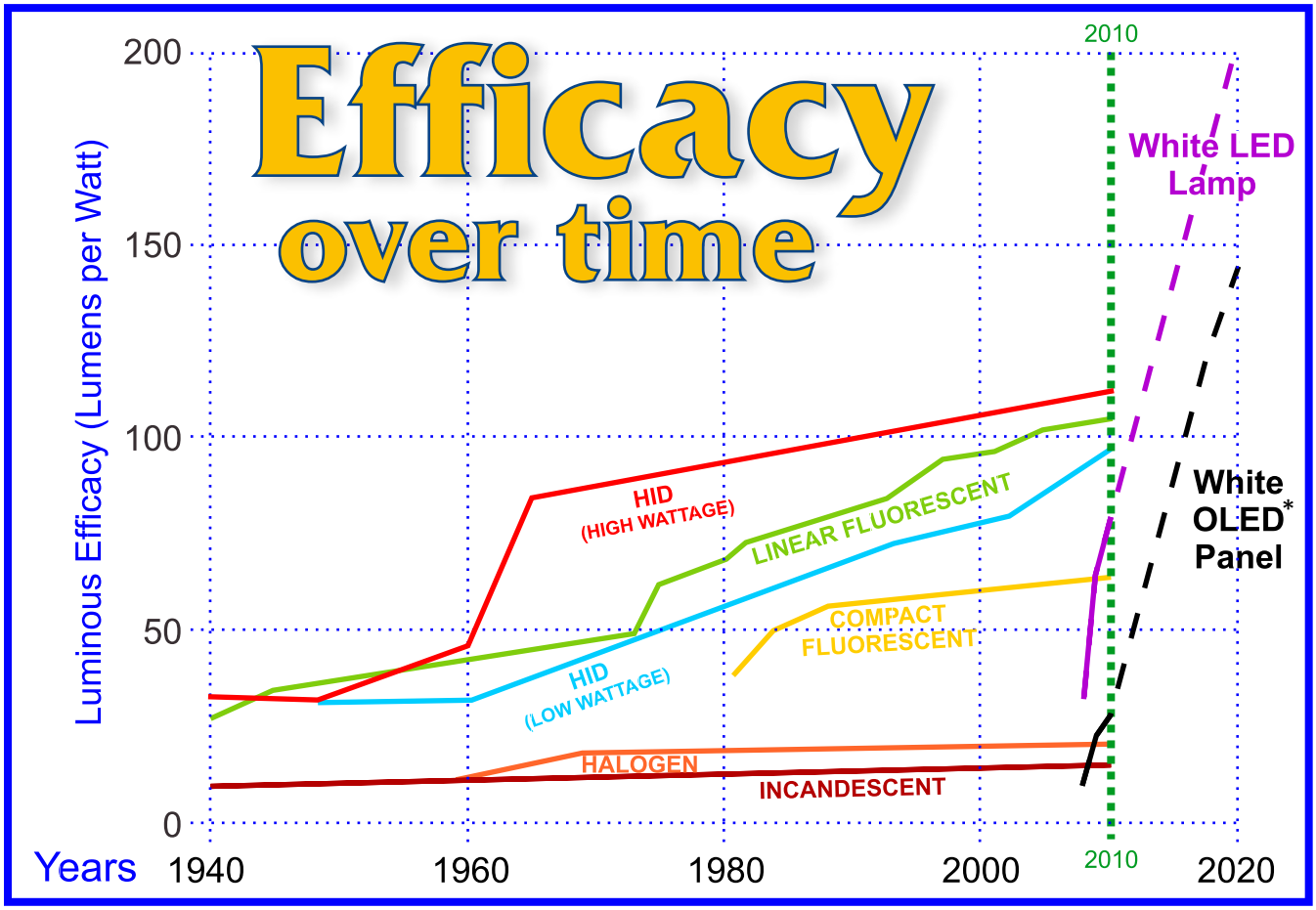


Figure. Commercially available lighting product efficacies over time (DOE 2011). White LED lamp efficacy is projected to continue steeply climbing to surpass legacy technologies. * Organic LED (organic compounds form emissive electroluminescent layer)

Diffusion in Clay Layers & Groundwater Remediation

Capt Jeremy M. Miniter
USAFSAM/OED
Dr. Mark N. Goltz
AFIT/ENV
Dr. Avery H. Demond
University of Michigan
Dr. Junqi Huang
U.S. EPA

The DOD's Strategic Environmental Research and Development Program (SERDP) estimates that over 3,000 DOD sites have groundwater contaminated with some type of chlorinated aliphatic hydrocarbon (CAH). Commonly used by the DOD as solvents, nonpolar CAHs such as tetrachloroethylene, trichloroethylene, and carbon tetrachloride are of particular concern to the DOD. Past use and disposal of these CAHs have led to extensive subsurface soil and groundwater contamination. CAHs persist in the groundwater environment and are difficult to remove with current remediation technologies.

Undissolved CAHs are sometimes referred to as dense non-aqueous phase liquids (DNAPLs) — hydrocarbons or hydrocarbon mixtures that are heavier than and only slightly soluble in water. When released to the subsurface, DNAPLs migrate downward until they encounter low-permeability clay layers where they may pool (see Figure 1).

Based upon research sponsored by AFCEE, it is believed that pooled DNAPL sitting atop the low-permeability clay layers dissolves into the surrounding groundwater, and the dissolved CAH molecules diffuse into the clay layers. Upon removal of the DNAPL pool, the dissolved CAHs in the low-permeability clay layers remain and serve as a long-term source of contamination through "back diffusion" into the relatively clean groundwater flowing past.

The current paradigm is that CAHs move into and out of the low-permeability clay layers primarily through diffusion. However, based upon reports of CAH concentrations greater than that expected from simple diffusion, there is evidence other transport processes are important. "Enhanced" diffusion may result from cracks in the clay layers, perhaps pre-existing or formed by the interaction between the DNAPL and clay. It has been shown that clay particles flocculate in contact with nonpolar organic solvents, resulting in the formation of cracks. Not accounting for this enhanced diffusion could lead to significantly erroneous predictions of the amount of CAHs in low permeability zones and their release rates from these zones.

In a collaborative SERDP-funded study, researchers from the Air Force Institute of Technology, the U.S. Environmental Protection Agency, and the University of Michigan developed a numerical model that simulates the enhanced transport of CAHs into and out of low permeability clay layers due to the presence of cracks. Using DOD's Groundwater Modeling System (GMS), three different groundwater contamination scenarios using trichloroethylene (TCE) are modeled:

Scenario 1 is a sand aquifer (with no clay layer present) that initially contains a constant 110 mg/L TCE source for 10 years, after which the aquifer is flushed with clean uncontaminated water for 20 years.

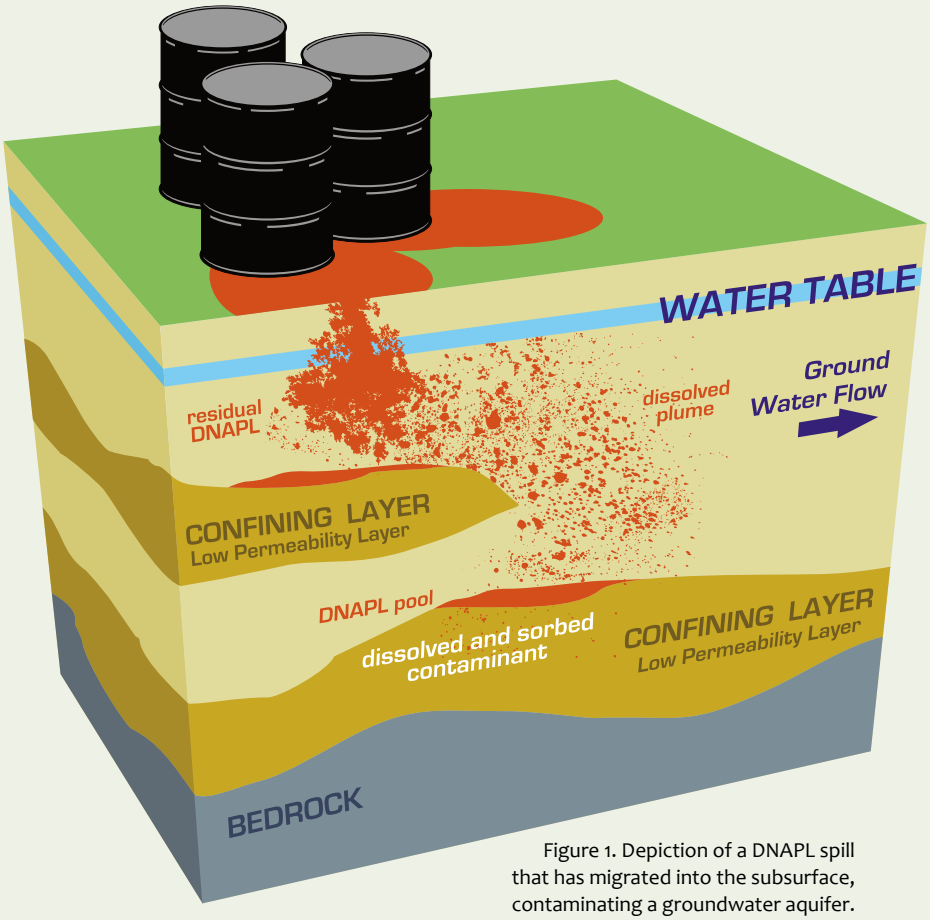


Figure 1. Depiction of a DNAPL spill that has migrated into the subsurface, contaminating a groundwater aquifer. The DNAPL pools atop low permeability lenses and layers.

Scenario 2 is the same sand aquifer with a constant 110 mg/L TCE source, but the TCE source now sits atop a non-cracked low-permeability clay layer.

Scenario 3 is the same as Scenario 2 except the low-permeability clay layer now contains cracks.

In the model, the cracked clay is represented using a dual-domain submodel; the cracks are represented as a domain of mobile water, while the clay matrix is represented as a domain of immobile water. (Figure 2)

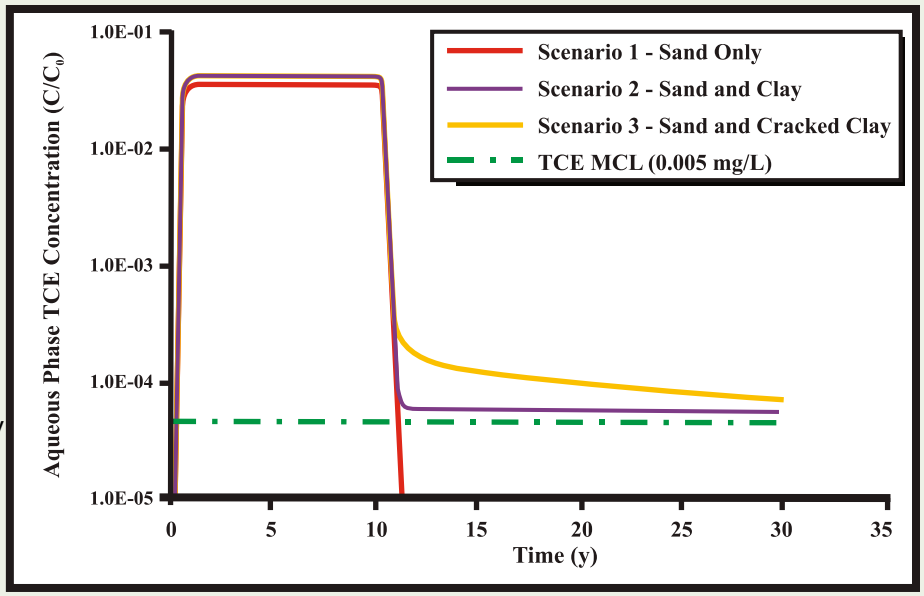


Figure 3. Concentration versus time breakthrough curves obtained from GMS for an observation point downgradient from a TCE source for three scenarios. The breakthrough curves suggest that enhanced diffusion and storage of groundwater contaminants in cracked low permeability clay layers lead to persistent downgradient contaminant concentrations even after the contaminant source is removed.

The GMS model output is the concentration calculated at an observation point 56 meters downgradient from the contaminant source as a function of time (Figure 3). For Scenario 1, after the TCE is removed, the concentration remaining is insignificant because there is no low-permeability clay layer that can act as a long-term contaminant source. For Scenarios 2 and 3, the downgradient concentration 20 years after the TCE source is removed is still above the maximum contaminant level for TCE of 0.005 mg/L. Higher downgradient concentrations are predicted in Scenario 3 than in Scenario 2 because the cracks in the low-permeability clay layer allow for more contaminant mass to enter the layer.

This research project is currently ongoing, as investigators attempt to determine the following: 1) how the interaction of DNAPLs and clay may lead to cracking, and 2) how the cracking might impact aquifer cleanup and downgradient risks.

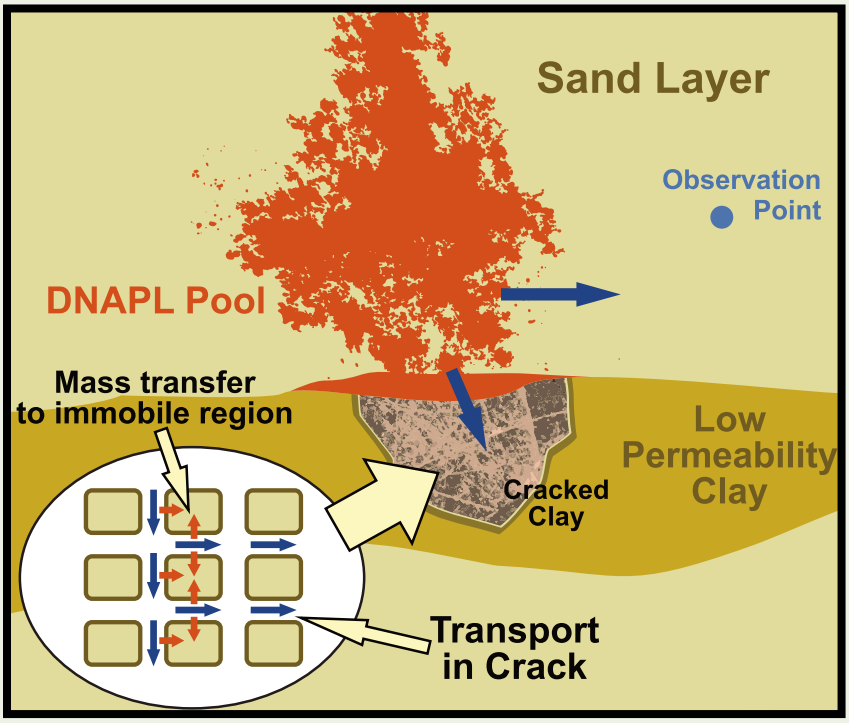


Figure 2. Conceptual depiction of a DNAPL pool atop a low permeability clay layer in a sand aquifer. Cracks in the clay, either naturally occurring or caused by the presence of the DNAPL pool, may allow for enhanced transport and storage of the DNAPL in the clay layer.

Based on the model simulations performed to date, it appears enhanced diffusion due to cracks in low permeability clay layers may be an important transport process that should be taken into account by DOD site managers considering remediation strategies for groundwater contaminated with DNAPLs.

Capt Miniter is a graduate of the Air Force Institute of Technology (AFIT), currently assigned to the School of Aerospace Medicine at Wright-Patterson AFB, Ohio; Dr. Goltz is a professor of Engineering and Environmental Management at AFIT, Wright-Patterson AFB, Ohio; Dr. Demond is an associate professor in the Department of Civil and Environmental Engineering at the University of Michigan, Ann Arbor, Mich.; and Dr. Huang is a hydrologist at the Ground Water and Ecosystems Restoration Division, National Risk Management Research Laboratory, ORD, U.S. Environmental Protection Agency, Ada, Okla.

Evangelist for Readiness

Dr. Ronald B. Hartzer
HQ AFCESA/CEBH

Although he retired more than 22 years ago, Maj Gen George E. "Jud" Ellis was a leader who helped transform the Air Force and Civil Engineering in ways that should be remembered by today's engineers.

Maj Gen Ellis was born in Millinocket, Maine, and graduated from the U.S. Military Academy at West Point in 1958. He originally wanted to become a pilot and went to Webb AFB, Texas, for basic flying training. But, as he explained, "I didn't fly the T-33 very well, so for my sake — and the Air Force's — they asked me to fly an engineering desk."

Following base-level assignments at Randolph AFB, Texas, and at various sites in Alaska, he landed at Chanute AFB, Ill., to build Minuteman training facilities.

Maj Gen Ellis served an 18-month tour in Vietnam as an adviser to the Vietnamese Air Force base commander at Tan Son Nhut. "I learned patience in an environment that was full of frustrations," he said. His reward was a tour in the Pentagon as project officer and executive officer for the Director of Civil Engineering, Maj Gen Guy H. Goddard.

Following a year at the National War College, he became the BCE at Maxwell AFB, Ala. That was where Maj Gen Robert C. Thompson, Director of Engineering and Services (E&S), selected him to be the first team chief for the new Air Force Civil Engineering and Services Management Evaluation Team or CESMET. This team included a team chief, two civil engineers, and representatives from Budget, Procurement, Supply, Transportation, and Services. CESMET traveled throughout the Air Force to provide a fresh look at how the E&S business was being conducted. They were not inspectors but evaluated management results. Their visits ended with a lengthy out-briefing from a deck of 5x8-inch cards, which they left in lieu of a formal report.

His follow-on assignment was as the Operations and Maintenance Division chief at the Air Staff, where he planned the move of part of the staff to Tyndall AFB, Fla. Then-Col Ellis had a stake in the outcome because he was also moving to Tyndall to become commander of the Air Force Civil Engineering Center and interim commander of the new Air Force Engineering and Services Center. He later became the center's vice commander when Brig Gen Clifton D. "Duke" Wright, Jr. became commander.

In 1979 he became the deputy chief of staff for E&S at HQ Tactical Air Command, Langley AFB, Va. He established a working relationship with TAC commander Gen Wilbur L. "Bill" Creech, and they began to revolutionize the command and literally change the look of Air Force bases.

Their base improvement program grew out of a larger program to improve TAC's sortie generation rate. Maj Gen Ellis helped his boss understand that professional-looking facilities were an important part of sortie generation. He said that "TAC had too many 'Ozark garages.' We had skilled technicians working in maintenance areas configured for P-51s….We made a relatively expensive bet that if we gave the maintenance folks an appropriate place to work and quality tools to work with, we would have gone a long way in establishing the right aircraft maintenance attitude."

In 1979, TAC had $8M for its O&M contract programs. By 1982 it was $99M, MILCON went from $60M to $200M, and the command had a 50 percent increase in sorties within five years. The changed working and living environment created a "pride in belonging." In the process, they introduced a set of earth-tone colors that soon spread throughout the Air Force and became known as "Creech Brown."

Maj Gen Ellis also brought the world of Wang to TAC Civil Engineering. Not satisfied with the existing automation system, BEAMS, and aware that folks at the bases needed help with managing their 3,000 job orders each month, he chose Wang, the only IT system on the GSA lease schedule that met the requirements. It eventually became a powerful management tool for the command.

In 1984, he was selected as the deputy director of HQ USAF E&S, serving once again with Maj Gen Wright, the director, who described him as "a very outgoing, personable, gregarious person. He was also an outstanding leader with good ideas and vision….He could probably build a team as well as anybody I've ever seen." The two began several initiatives to improve both the readiness of E&S personnel and their efficiency in accomplishing day-to-day business.

In 1986, when Maj Gen Ellis became the new director he continued the initiatives. When he laid out his philosophy and priorities in a now famous presentation to the new civil engineer officers at AFIT in January 1986, he listed his "Four Keys to Excellence":

1) Organizing our readiness resources to train and deploy the way we fight
2) Decentralizing responsibility and authority
3) Modernizing and expanding our information management systems throughout Engineering and Services
4) Listening to our customers

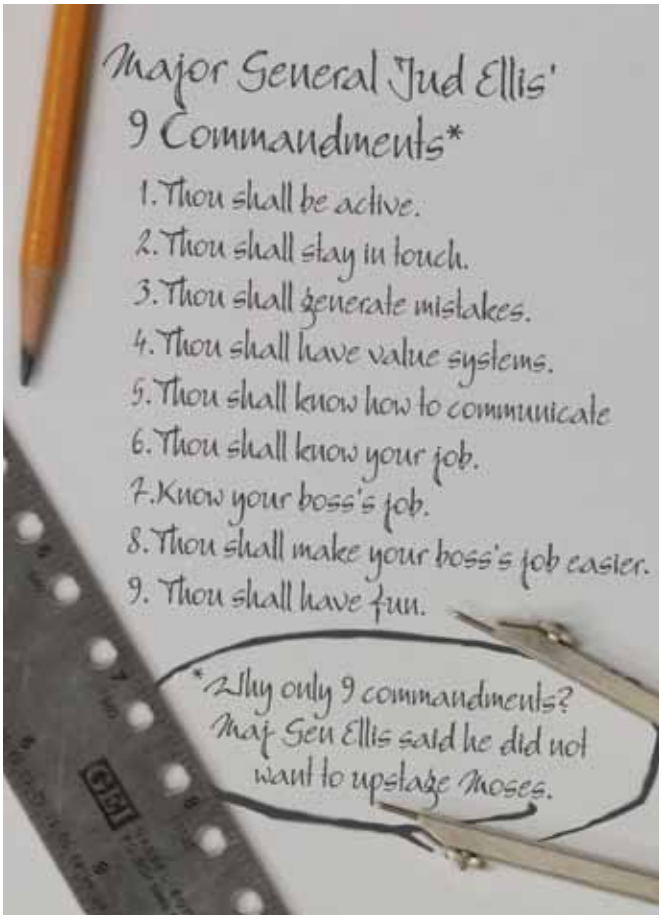
Readiness was always job one for Maj Gen Ellis. "We must prepare to go to war. That's why we're in business; it's our number one priority! Right now, I don't feel that we can get to Europe and do the job we are trained to do." He kept up this theme throughout his time as director, earning himself the moniker "The Evangelist for Readiness."

It bothered him that "no flying squadron commander today knows who his base civil engineer will be when he has to go to war." He wanted flying squadron commanders to know who their BCE would be and for them to train together before deploying. During a time when the Air Force was rediscovering the importance of "Air Base Operability," Maj Gen Ellis made sure that his forces would be ready, increasing the quality and intensity of E&S contingency training. The results of his work were demonstrated in the successful E&S support during the Gulf War.

As E&S director, he continued his effort to implement the Wang Work Information Management System, or WIMS, across the Air Force, institutionalizing the automation revolution he began at TAC. "It will permit us to be able to innovate, to both control and decentralize, and communicate," he predicted. He hoped it would improve job order tracking by using visibility and automation to reduce the number of old work orders, which he said were usually found on visits to base shops, "in the second drawer, left side....I've won more bets by picking the second drawer, left side." By 1986, Wang computers were adopted by the Air Force and began appearing at all E&S units.

When he retired in 1989, Maj Gen Ellis had helped transform Engineering and Services. Pilots now appreciated the role of engineers, who became key players in the Air Force readiness business. He helped break down barriers so that E&S units could easily transition from peacetime to war. He brought effective automation to E&S units.

Following his retirement, Maj Gen Ellis worked for private companies doing engineering work and stayed in close contact with his former colleagues. When he passed away in January 2001, a group of steadfast Air Force friends and colleagues from all over the country traveled in below zero weather to Riverton, Wyo., to pay their last respects to the "Evangelist for Readiness."



Author note: For a complete transcript of Maj Gen Ellis' January 1986 AFIT presentation and a full description of his Nine Commandments, see the online version of this article at www.AFCESA.af.mil.

Power Pro # Dirt Boyz = Fast AAS Reset

TSgt Brinn Jackson
48 CES/CEOFP

One day this past summer, I picked up the crash phone in RAF Lakenheath's Power Production shop and listened for the bad news — the in flight emergency, or IFE. An F-15E aircraft was already in the overrun and had engaged one of the aircraft arresting systems, an E-5 system.

The good news was that it was a successful save of the aircraft; the E-5 system worked as designed. The E-5 is a 1950s vintage system that consists of nothing more than a series of ship anchor chains laid out in the runway overrun. It's designed to stop an aircraft inadvertently departing the runway surface due to an in-flight emergency or aborted takeoff in which the aircraft is unable to stop using its braking systems.

Even better news was the time it took us to respond and reset the system. I immediately hung up the crash phone and dialed the 48 CES Heavy Equipment shop and asked the "Dirt Boyz" to put a couple of loaders on retainer for the reset efforts. The barrier crew, SSgt James Jancewicz (the current NCOIC of Barrier Maintenance), SSgt Mike Ellis, SSgt James Hicks, and A1C Randall Griebel, rolled out to the runway and I called our superintendent to update him.

As the fire department and recovery towed out the aircraft, the crew started planning how to move tons of chain back to the side of the runway. It's quite an effort to return the chains to their normal position, reposition and reset the hook cable and rubber cable supports, and clean up the overrun.

An E-5 aircraft arresting system, such as this one at Eglin AFB, Fla., consists primarily of ship's anchor chains. (U.S. Air Force photo)

But, once equipment operators SSgt Andrew Klodt and A1C Kyler Gardipee arrived with the loaders everyone kicked into action like it was a routine occurrence. The AAS crew told them what they needed and it happened. They did a phenomenal job of resetting the anchor chains. As they removed the twists in the double row of chain, their skill was pretty apparent. They were able to grab whatever link the crew wanted with the forks and roll the chain over itself.

Each link in an E-5 chain is approximately a foot in length. (photo by Mr. Eddie Green)

At the same time the chains were being reset, Mr. Christopher Gunn and Mr. Lee Endean circled the overrun with a sweeper and a kick-broom to remove all of the FOD. Surprisingly, there was no real damage to the system and the AAS crew was able to string the cable, space the donuts, and call the system back into service without any delays. Because of the Dirt Boyz, the Power Pro team accomplished a full E-5 system reset and certification in less than 1.5 hours.

TSgt Jackson is the NCOIC for Power Production, 48 CES, RAF Lakenheath, United Kingdom.

Nellis CEs Clean Up F-15 Crash Site

SMSgt Richard Buchalski
820 RHS/CA

Airmen from the 820th RED HORSE (RHS) Airborne Flight, Nellis AFB, Nev., conducted the flight's first real-world sling load operation Nov. 9, 2011 as part of the recovery and clean-up efforts at the remote site of an F-15C Eagle aircraft crash that occurred October 24, northwest of Alamo, Nev. The team of civil engineers worked alongside Guardsmen from the Army National Guard Aviation unit stationed in Stockton, Calif.

After the Safety Investigation Board (SIB) concluded its initial stage of gathering information from the site, Airmen from the 820 RHS, 99 CES, 99th Logistics Readiness Squadron (LRS), and the 99th Security Forces Squadron (SFS) were permitted to begin cleaning up the crash site. Civil engineering AFSCs participating included fire protection, emergency management, engineering, pavements and equipment, electrical, power production, and plumbing. (EOD had already safed the site and wreckage.)

In addition to gathering and boxing up the aircraft debris, the 820 RHS Airmen led by TSgt James Ward tore down the on-scene base camp, which had been erected by the flight the day after the crash for the SIB members and security forces personnel to use in day-to-day operations.

With the assistance of the Guardsmen and their CH-47 helicopter, the Airmen were able to safely sling load a total of six, 20-foot CONEX boxes containing 44,000 pounds of aircraft parts from the crash site to the staging area at Alamo airport five miles away.

After redistributing four of the CONEX boxes containing wreckage materials onto four tractor trailers at the Alamo airport, the 820 RHS Airmen transported the last two boxes and the tractor trailers back to Nellis AFB for the SIB to continue examining.

Despite the austere environment, remote location, and challenging logistics, Team Nellis was able to utilize the special sling load capability and beddown provided by the 820 RHS Airborne Flight, along with the expertise of the 99 CES, 99 LRS and 99 SFS, to recover an F-15 in just four days," said SMSgt Lee Smith, Nellis Emergency Manager. "[Four days is] half the time of a normal aircraft recovery operation in perfect conditions. This is a true testament of the efficiencies, attitude and expertise of our Airmen today."

SMSgt Buchalski is the superintendent for the Airborne Flight, 820 RHS, Nellis AFB, Nev.

During cleanup of an F-15C crash site in southern Nevada, SSgt Ian Zerby, 820 RHS Airborne Flight, prepares to rig a CONEX box for sling load by a NG CH-47 Chinook and (inset) Airmen from the 820 RHS Airborne Flight take a knee as the Chinook recovers an aircraft part. (photos by A1C Daniel Hughes)

Miracle Monday at Little Rock AFB

Ms. Peggy Eason
19 CES/CEA

Monday, April 25, 2011, is a day that many people at Little Rock AFB will never forget, especially those whose homes took a direct hit from the tornado that passed through our Arkansas base that day.

Fifty-three families found themselves homeless and 273 homes were damaged. Although some damage was as minor as a gutter blown off, 19 homes were so badly damaged that the only thing to be done was to demolish what little was left.

Even with all the destruction inflicted by the tornado, many at Little Rock refer to April 25 as "Miracle Monday" because no one on base that night sustained any serious injuries, and most importantly, no lives were lost.

First responders were on site within minutes after the tornado hit and with volunteers, they fanned out through the housing area to ensure no one was seriously injured. Our privatized housing partner, Hunt Pinnacle Communities (HPC) was in action almost before the tornado had exited the area. The response to the calls for help was amazing: Everyone from the staffs of HPC and the base's housing office to friends, co-workers (both military and civilian), and neighbors pitched in to help find belongings, move furniture, remove tree limbs, and pass out water and cookies.

Within five days, HPC was able to relocate 43 of the 53 displaced families to other homes on base. Four of the remaining 10 families chose to stay in temporary lodging until the "right" unit opened up and six chose to move off base. Within four days an insurance claims adjuster was on site taking claims from affected families whose policies were provided through Housing Privatization. In all, 88 claims were filed and settled within 30 days, many within 2 weeks.

There were two important lessons learned. HPC's maintenance office did not have enough supplies on hand to immediately deal with a disaster of this magnitude, but quickly rectified the situation and also purchased backup supplies for the remainder of the Arkansas tornado season. A positive lesson learned was the value of HPC's Facebook page, which was monitored by both HPC and the base's housing office. Residents would use their smart phones to ask for updates on power outages; updates and responses to questions from civil engineer operations were posted almost immediately, as was information from other base agencies providing tornado relief.

The healing process for our residents began almost immediately. Demolition on the uninhabitable homes began on June 20 and finished on July 8. Work on the homes with minor damage started the last week of June and included some much needed window repair work. Contracts for other more unique repairs were finished by the end of July. Soon, people driving through the housing area will not be able to see any outward evidence of the day we call "Miracle Monday."

Ms. Eason is the Compliance Manager for Housing at Little Rock AFB, Ark.

(above) Airmen and family members work to clear debris from Little Rock AFB, Ark., housing after a tornado struck the base April 25, 2011. (photo by A1C Ellora Stewart)
(left) A resident of base housing and her son go for a stroll through an area of base housing damaged by the tornado. Nineteen homes on base were destroyed and 273 damaged. (photo by TSgt Chad Chisholm)

Altus CEs Aid Little Rock AFB after Tornado

A1C Kenneth W. Norman
97 AW/PA

A four-person team from the 97 CES structure shop at Altus AFB, Okla., traveled to Arkansas to assist the 19 CES at Little Rock AFB after the base was devastated by a tornado April 25.

The team consisted of TSgt Robert O. Findley, SSgt Paul C. Northrup, A1C Dustyne K. Timm, and A1C Jonathan T. Daniel. They spent seven days at Little Rock AFB working 12-to-14 hour shifts, helping clean up debris and fixing structural damage to base facilities.

The tornado damaged 273 on-base housing units, three C-130 Hercules aircraft, and many base facilities.

"The overall damage that was done to the base is just shy of $90 million at the latest estimate," said Lt Col Lance D. Clark, 19 CES commander, Little Rock AFB. "It was incredibly helpful [to have this team]. Because of their efforts, they were able to help us speed up the recovery. We were able to get temporary fixes for facilities done within 10 days of the tornado."

Arriving at Little Rock, TSgt Findley found out he would be working for one of his former supervisors.

"We hit the ground running," he said. "Working for my old boss, I wasn't there to play games; we took care of business and got out."

During their time at Little Rock AFB, the 97 CES structural team showed the true character of the "Mighty 97th" by working hard and getting the job done.

"We had a lot to do and they jumped in and helped us do it all," said Mr. Michael Duhon, 19 CES deputy operations chief. According to him, the team from Altus helped repair 42 roofs, boarded up 73 windows on 12 facilities, cut and removed metal roofing and siding that was blown across the flightline, collected engineering and contracting data for $4M worth of emergency roof repair for 55 roof facilities, helped repair four hangar doors, worked with emergency responders on facility damage by identifying almost $50M in facility repairs, and helped drain 12 facilities heavily damaged from 10 inches of torrential rainfall.

"It was rewarding," A1C Daniel said. "I am from Arkansas. It is two hours from my house and I actually went to [my supervisor] and asked if I could go help."

In Memoriam

On Jan. 5, 2012, three Air Force civil engineers were killed while supporting Operation Enduring Freedom. SrA Bryan R. Bell, TSgt Matthew S. Schwartz, and A1C Matthew R. Seidler, the Explosive Ordnance Disposal technicians who made up Team Tripwire, died when an improvised explosive device struck their vehicle in Afghanistan's Helmand Province during a combat patrol.

SrA Bryan Bell, 23, a native of Erie, Pa., deployed to Afghanistan from the 2 CES, Barksdale AFB, La., in October 2011. It was his second deployment since joining the Air Force in 2007; he previously served in Iraq. SrA Bell's sister, A1C Candice Bell, Wright-Patterson AFB, Ohio, escorted her brother home to Harborcreek Township, Pa., where they grew up. At his funeral on January 16, SrA Bell was posthumously awarded the Bronze Star Medal with Valor, Purple Heart, Air Force Commendation Medal, and Air Force Combat Action Medal. He was laid to rest in Wintergreen Gorge Cemetery, Erie County, Pa., with full military honors. A memorial service was held at Barksdale on January 20. At his funeral, A1C Bell acknowledged the bond and loss of her brother's fellow EOD Airmen: "We are not Bryan's only brothers and sisters." In a letter from Afghanistan, SMSgt Christopher Schott, 466 EOD flight chief, echoed this special bond, writing "As you gather there at Barksdale to remember and honor my fallen comrade, I stand in remembrance with my family, 13,000 kilometers away, wishing nothing more than to be there."

TSgt Matthew Schwartz, 34, was the non-commissioned officer in charge of EOD training and operations, 90 CES, F.E. Warren AFB, Wyo. He was on his sixth deployment when he was killed. He joined the Air Force in 1999, a few years after graduating high school in his hometown of Traverse City, Mich. TSgt Schwartz earned several awards and distinctions including multiple Bronze Stars, (one with Valor); a Purple Heart; a Meritorious Service Medal; a Joint Service Commendation Medal; three Air Force Commendation Medals; an Air Force Achievement Medal; an Air Force Combat Action Medal; four Air Force Good Conduct Medals; and a National Defense Service Medal. Following his funeral on January 14, TSgt Schwartz was laid to rest in Traverse City with full military honors. "Matt was, and is, a remarkable example of a fine American who paid the ultimate price for the freedoms our great nation has to offer," said CMSgt Thomas Pachniak, 90 CES Superintendent. "I have lost a good friend," said TSgt David Csizmar, 90th CES EOD team member. "His loss has, and will continue to reverberate throughout the base and EOD community. [We have] lost a great Airman."

A1C Matthew Seidler, 24, a native of Westminster, Md., entered the Air Force in 2009 and was deployed from the 21 CES at Peterson AFB, Colo., where he'd been stationed since 2011. At A1C Seidler's funeral on Jan. 17 in Pikesville, Md., he was presented the Bronze Star, the Purple Heart, the Air Force Commendation Medal, and the Air Force Combat Action Medal. He was laid to rest in Arlington National Cemetery in Virginia. On January 20, hundreds of military and civilians from across the region attended a memorial service for A1C Seidler at Peterson AFB. To many at the memorial service, A1C Seidler was a brother, not by blood but by craft. Fellow EOD technician A1C Terry Smith, said, "We would talk to each other about how proud we were to be part of such a close-knit, small community. The look in his eyes, you could tell it was a big deal for him. What he did and what he gave is more than I think I'll ever be able to give, but I still hope that sometime in my life I can look back and say that I did all I could to do right by him and say that I never quit, that I didn't stop, that I kept on going."

Compiled with information from Air Force News articles by SrA La'Shanette V. Garrett, SrA Mike Tryon, and Ms. Lea Johnson, published local obituaries, and sources within the EOD community.

Col Davey wins National Writing Competiton

Col Justin C. Davey recently won first place in the Secretary of Defense National Security Essay Competition for his paper, "Enduring Attraction: America's Dependence On and Need to Secure its Supply of Permanent Magnets."

Col Davey, 628 MSG Commander at JB Charleston, S.C., wrote the essay while a student at Air War College, Maxwell AFB, Ala. It marks the first time the college has been honored with a first place winner.

Now in its fifth year, the annual Secretary of Defense essay competition is intended to stimulate new approaches to coordinated civilian and military action from a broad spectrum of civilian and military students. Col Davey's research and paper addressed the indispensability of rare earth magnets to the defense industry and the threat to the United States' lead in the technological innovation of military applications that use permanent magnets. The paper appears in the October 2011 edition of Joint Forces Quarterly at http://www.ndu.edu/press/jfq-63.html.

Ms. Michele Flournoy, Under Secretary of Defense for Policy, presents Col Justin Davey with the first place certificate for the 2011 Secretary of Defense National Security Essay Competition.

WHERE THERE ARE ENGINEERS THERE IS A WAY

Engineers with the 467 EPBS added force protection (FP) to dining facilities at Contingency Operating Base Adder, Iraq, using what they dubbed the "Egyptian" method, because it relied on roller pipes, fulcrums, levers, and occasionally a hand winch, to compartmentalize the facilities with precast concrete panels.

The panels offered the fastest, cheapest, and cleanest solution to meet FP requirements in the existing facilities. A crew of 10 engineers used levers as large as 75 pounds and 10 feet long to move and position the 8,000-pound panels.

An article on the project, written by Capt Timothy Pach, appears in the November-December 2011 issue of The Military Engineer available at http://themilitaryengineer.com.

Standing Down

Electric power production Airmen from the 332nd Expeditionary Civil Engineer Squadron disassemble the anchor plates of a mobile aircraft arresting system on the flight line of Joint Base Balad, Iraq, Oct. 15, 2011. JB Balad disassembled units, turned in equipment and shut down services to transition the base to the Iraqi government. (photo by MSgt Cecilio Ricardo)

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