Air Force
Civil Engineer
By Engineers. For Engineers.
Vol. 25 No. 3 Fall 2017

DEVELOPING OUR TOTAL FORCE

Commitment to training ensures mission success

For the past 70 years, the U.S. Air Force has been breaking barriers and boldly leading, defending our country in air, space and cyberspace through innovation, technical mastery and courage. Needless to say, it has been a total force effort, one in which we are proud to celebrate this year, our Air Force's 70th birthday.

Civil engineers have been part of the Air Force journey each step of the way, utilizing every component of our force — from active duty to reserve, officer to enlisted, GS-civilian to wage grade, the National Guard and partners from sister services, allies and coalitions as well as contracted support — to provide advanced fighting platforms and ready engineers prepared for duty. This history and effort has allowed CE to "lead the way" and become the service provider of choice for our capabilities in combat settings.

As we move forward into the future, however, we cannot rest. It is imperative that we remain committed to total force human capital development to enable our CE teams to meet the evolving and pressing challenges that confront us in garrison and deployed.

Thankfully, this commitment is shared by leaders across the Air Force and CE. Gen. David L. Goldfein, our Air Force chief of staff, repeatedly emphasizes the importance of molding, training and developing our young men and women. As engineers, we continually review our education and training courses to ensure classes are timely and relevant. Readiness is about both technical competence to provide a capability, such as air conditioning for space control facilities, and the ability to deliver the capability under demanding and often unplanned circumstances.

Examples of unplanned circumstances surrounded us this summer. Even as we performed our daily missions and trained for expeditionary AF missions, total force Airmen engineers quickly responded to calls for help following devastating natural disasters in Florida, the U.S. Virgin Islands, Puerto Rico and other affected areas. You have provided clean drinking water, disaster assistance bed-down support, pavement evaluations and firefighter support most prominently. Airmen engineers were successful because they were prepared.

Each of us needs to consider how we can become better prepared for our professional future and our Air Force missions, providing individual and organizational readiness that allow us to embody the adage: "Victory goes to those who are prepared." In this vein, know that officers and enlisted can still use Career Field Education and Training Plans to identify professional development appropriate for their career path, while wage-grade and GS civilians have various career-planning resources at their disposal. Of course, I encourage all members of the CE community to seek mentors and be mentors via the MyVECTOR tool, which now allows you to personalize individual development.

In closing, I urge you, our most important resource, to invest in your future via the many opportunities provided by the Air Force for your education, training and growth. In doing so, I have full confidence that you will meaningfully lead the way into our shared future. Remember, together, engineers lead the way!

Timothy S. Green
Major General, USAF
Director of Civil Engineers

Features

Vol. 25 No. 3 Fall 2017

On the Cover

Alaska Air Guardsmen from the 176th Civil Engineer Squadron and support units repair a children's rehabilitation center at Riga, Latvia, during their two-week annual training as part of a humanitarian assistance project. The Alaska Airmen were the third rotation of Air National Guardsmen on the project, working alongside Latvian military and contractors to upgrade the aging building. (U.S. Air National Guard photo by Tech. Sgt. N. Alicia Halla)

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Goodbye, CFM Johnson

By Gerald Johnson
Civil Engineer Civilian Career Field Manager

Gerald Johnson (U.S. Air Force photo)

It has been about two years since I was fortunate enough to become your civil engineer civilian career field manager. It has been a tremendous honor! Many accomplishments occurred over the last couple of years and I hope you have benefited from them.

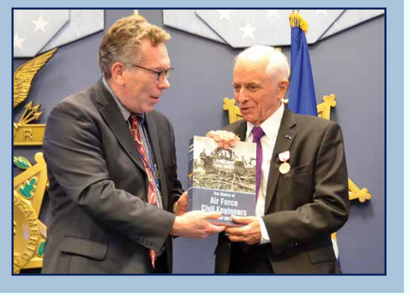
For me, there are five events I am particularly proud to have been a part of: I-LEAD, or leaders encouraging Airman development program; government schedule 12 vectoring; resurrecting career field team roadshows; wage-grade training opportunities; and science, mathematics and research for transformation, or SMART, opportunities. I would like to take a little credit, but I can't and won't.

If you remember the scene in "The Bellboy" where Jerry Lewis conducts an orchestra and you get to the drum sequence, think Jeff Wagner, well, then you know where I stood. Waving a stick in the air was for show and was really meant to highlight the real talent on the career field team and the CFM team. Many people came up with great ideas and worked enormous amounts of volunteer hours to make them reality.

While I was your CFM only for a short time, I've also served on the civilian developmental team for many years. In all my travels, I've met many impressive folks in the field, all hard-working, dedicated civilians who are the core of our success.

But as they say, all great things must end. It is now time to pass the baton to a new CFM, Carol Gaudette.

A tremendous team of individuals accomplished a lot in the last couple of years, and I'm confident they will do even greater things with Ms. Gaudete. With all the extraordinary talent I met in my travels over the years, I have no doubt the CE career field is in good hands and will continue to lead the way. Thank you.



Gerald Johnson, who previously supervised Anthony Duno while both were with U.S. Air Force's in Europe, honors Duno for his 70 years of service during a retirement ceremony in July 2016 at the Pentagon. (U.S. Air Force photo by Steve Warns)

Carol Gaudette (U.S. Air Force photo)

Hello, CFM Gaudette

By Carol Gaudette
Civil Engineer
Civilian Career Field Manager

My name is Carol Gaudette, and I am the new civil engineer civilian career field manager. I am excited to have been passed the torch from Gerald Johnson. It almost goes without saying, Gerald launched many great initiatives during his time as CFM. Armed with Gerald's insight, as well as the support from the civil engineering career field team, I look forward to continuing the momentum.

During his time as CFM, Gerald championed getting the word out to our civilian career field about opportunities and initiatives. As a result, we have seen a vast increase in not only participation, but also awareness of career development opportunities. Participation increased by 236 percent in civilian developmental education applicants alone between academic year 2017 and 2018. I hope to see those numbers continue to rise.

Under Gerald's tenure, the CE career field conducted the first-ever vectoring of GS-12s, with 20 percent electing to apply for CDE opportunities this past spring. I also hope to launch the first GS-11 vectoring initiative within the next year. I'm excited about our ability to reach employees earlier in their careers and provide valuable feedback and advice to help them meet career goals. I encourage all of you to take advantage of this opportunity to have senior members of the CECFT review your career goals and experience and make recommendations to help you get there.

From left, Randy E. Brown, Air Force Civil Engineer Center director, speaks to Carol Gaudette, then AFCEC section chief, and Lonnie Duke, installation restoration program manager, during a tour of Travis AFB, California, in August 2016. (U.S. Air Force photo by Heide Couch)

Additionally, in my first full month on the job, I attended our civilian development team meeting. The team consists of GS-15 or colonel from each major command as well as a National Guard and reserve members. The team reviews and scores every civilian development application and every vector request.

I now have a tremendous appreciation for the level of effort and dedication each team member invests in this process. What you should know is your senior leaders care a great deal about you and your career. The advice they provide in the form of a vector or CDE recommendation is carefully deliberated. I know many of you don't seek a vector or apply for CDE for various personal reasons or beliefs, but I strongly encourage you to take advantage of the upcoming opportunities and get valuable feedback. Supervisors, I hope you will support and encourage employee participation.

I'm also thrilled to be working on solving barriers to diversity. You may imagine that CE is uniquely challenged in the engineering career field. Our existing workforce is less than 12 percent female and less than 9.3 percent Hispanic, to give you a couple of examples. Additionally, the largest portion of our workforce, 38 percent is older than 50. So, along with the CECFT, I will continue to look at ways to increase recruiting of a diverse workforce through the palace acquire program, the science, mathematics and research for transformation, or SMART, program, and through acquisition coding.

I am also enthusiastic about the newly available options for wage-grade employee development. These include access to the tuition assistance program, an opportunity to apply for an associate's degree and the SMART scholarship program for undergraduate and advanced degrees. Additionally, we are very close to launching our wage-grade training plans, so be on the lookout for those within the next couple of months.

After working in a wide variety of positions, locations and functions throughout my Air Force career, I am excited to take on the role of being your CFM and help you navigate through your civil engineering career. I look forward to hearing from you. If you have questions or concerns, please reach out to me or the CE Career Field Team at: 210-565-2666 (DSN: 665-2666) or afpc.ce.cft@us.af.mil.

BECOMING CIVIL ENGINEERS

By Maj. Ryan J. Barry
285th Civil Engineer Squadron
Virgin Islands Air National Guard

The 285th Civil Engineer Squadron was a combat communications unit from its founding in 1980 until 2012, when it began mission conversion to a prime base engineer emergency force, or Prime BEEF. Located in St. Croix, U.S. Virgin Islands, the squadron is unique. It doesn't reside at a wing like most other CE units.

The squadron is part of the Virgin Islands Air National Guard with 70 Airmen authorized, incorporating a small Joint Force headquarters air element and the 285th CES. Additionally, it's a geographically separated unit to the Puerto Rico Air National Guard's 156th Airlift Wing.

The squadron and its Airmen emerged from mission conversion in 2014. As we received our Airmen back from their various specialty CE technical schools, we were hesitant and doubted ourselves. We did not have the benefit of previous construction experience, which helps enrich the technical knowledge gleaned in tech school. At the time, our unit's Prime BEEF bull was timid and lean.

The unit's second and current CE commander, Lt. Col. Mike Hinrichsen, applied his unique solution set as we collectively shaped the unit's future. He started physically presenting a multipurpose tool when Airmen passed the academic portion of their five-level upgrade training. Each time he handed one out, Hinrichsen reminded the Airmen it was time to get their hands dirty as they moved into the hands-on portion of their training. The tools became quite the commodity, inspiring each Airman to compete to earn his or her own tool.

For the next five years we trained, hard. We went on multiple exercises and deployments to do hands-on training for each shop. We spent training days and dollars almost faster than the 156th AW could issue us resources. The effort was dizzying, and the results were not immediately apparent because we became victims of our own incredible operations tempo.

We gritted our teeth through the seemingly ceaseless computer based training modules, or CBTs, and cheered audibly when they became less painful group lectures. Between writing the after-action report for yesterday's training event while preparing for the next exercise, we trained. Our Prime BEEF logo grew from a calf to a bull. We gained wisdom, built CE-centric muscle memory and developed our warrior ethos.

In June 2017, we deployed for training to Riga, Latvia. Were we ready? Had the training paid dividends? Had we become Air Force engineers? As we boarded a KC-135 from St. Croix to Riga, a nervous energy filled the fuselage. It would be our first real test as engineers. Those who would follow us in later rotations expected us to perform. The time had come to be CE.

Above, Staff Sgt. Steven Fergus cuts all-thread anchored into the roof from the Mēs esam līdzās Children's Rehabilitation Center in Riga, Latvia. (U.S. Air Force photo by Staff Sgt. Nicholas Goldman)

We deployed 26 Airmen alongside six engineers from Alaska ANG's 168th CES to rehabilitate part of a special-needs children's school. Our Airmen overcame adversity in several aspects. First, the project was an excellent multi-trade laboratory to cultivate the burgeoning talents of our engineers. Starting on day one, the team members learned how to work together, to step out of their personal comfort zones and, in several cases, to move out of their given specialty in order to complete the mission. We pushed through significant material delays, tool shortages and a maddening cycle of initial approval and subsequent rejections of our work by local Latvian contractors. Second, this was the first trip outside of the United States for most of our young Airmen. As our engineers worked side-by-side with Latvian National Defense Force engineers, they traded stories and shared laughs. Something clicked; the 285th CES bull charged!

By the end of our rotation, we helped remodel 4,300 square feet of the school, installed several thousand feet of electrical and water lines, hung new windows and installed ceilings. But the project was not just about the standard CE metrics. It became a capstone on the previous several years of efforts. Less than a week after our return, NGB asked for short-notice help on another deployment for training; this one in California. Volunteers raised their hands from most of our shops and we sent four engineers. Several engineers asked for out-of-cycle deployments, despite our own mobility window being on the not-so-distant horizon.

From left, Staff Sgt. Anthony Harley, Staff Sgt. Jamale Griffin and Senior Airman Vanessa Ayala of the 285th Civil Engineer Squadron structural team install a drop ceiling. (U.S. Air Force photo by Staff Sgt. Nicholas Goldman)

The old hesitation was gone. Our self-confidence swelled. The "can do, will do" attitude that defines our total force engineers around the globe replaced our timidity. Alongside its brethren, the bull now lowers its head, paws the ground, snorts fire and asks to be part of the fight.

We have become CE! We are CE! It is a distinct honor to serve with the men and women of the Virgin Islands ANG and the 285th CES!

Engineers ... Lead the way!

To learn more about the 285th CES go to: https://www.facebook.com/285CES/

Editor's Note: *Barry is the operations officer at the 285th Civil Engineer Squadron, Virgin Islands ANG. He is a professional engineer licensed in California.*

Airman 1st Class Angeles Cruz-Morales cuts to fit a section of wall in preparation for new drywall installation. (U.S. Air Force photo by Staff Sgt. Nicholas Goldman)

The 285th CES team pauses for a photo with faculty and children of the Mēs esam līdzās Children's Rehabilitation Center in Riga, Latvia, at the renovation initiation ceremony. (U.S. Air Force photo by Tech. Sgt. Akil McFarlande)

Yes, we go to tech school for that!

By Master Sgt. Erich Schmidt
9th Civil Engineer Squadron
Beale Air Force Base, California

Africanized bees swarm an F-16 fighter jet at Luke AFB, Arizona. Pest management technicians are trained to deal with all kinds of insects and other animals that may endanger Airmen and their families. (Courtesy photo)

I work in the 3E4X3, pest management, career field, and although I have spent my entire 14 years of military service in civil engineering, my career path wasn't so clear at first. I was supposed to work in aerospace ground equipment, but was re-classed into CE after not applying myself in technical school. In CE, I had to commit to accomplishing what was expected of me as a student and developing as an Airman.

I spent my first few years at F.E. Warren Air Force Base, Wyoming, where I got to see firsthand the importance of our nuclear mission. Although being in pest management may not be the most glamorous job, it allowed me the rare and eye-opening experience of going behind the scenes and seeing the rest of our Air Force at work. From missile launch facility capsules to command posts and aircraft maintenance, being in CE lets me see different aspects of our nation's military that most jobs wouldn't. I was part of the readiness support team, or RST, which was responsible for emergency response and decontamination in the event of a nuclear weapons incident.

In 2006, our team was part of an effort to brief Russian and NATO delegates on these procedures and give unique insight into our emergency response programs. After completing Airman Leadership School, I spent a year at Osan Air Base, South Korea, where I continued to be a part of an RST, in addition to my primary duties as a pest management technician. In place of a nuclear mission, our role was focused on post-attack procedures during a chemical weapons attack.

In 2008, I moved to Nellis AFB, Nevada, where I was temporarily assigned to the engineering programming section. This allowed me to step out of my career field for the first time and broaden my knowledge of CE in terms of base infrastructure development and mission expansion rather than responding to work requests. Our section was responsible for expediting over $122 million in Air Combat Command maintenance and construction projects needed to support the mission.

After leaving Nellis and finishing my second tour at Osan, I spent three years at Aviano AB, Italy. Back in my career field, I was part of a two-person shop and found myself having to handle all pest management business alone while my coworker was deployed for eight months. He endured the same when I deployed to Al Udeid AB, United Arab Emirates, in 2014. This was a challenging assignment, as not only did we have to adhere to strict European environmental standards, but we had to modernize our practices to comply with the new global harmonizing system, or GHS which allows nations to share a common language when it comes to chemical usage,

Camel spiders are a common encounter for pest management technicians in Southwest Asia. The spiders average 6 inches in length but are not venomous. (Courtesy photo)

transportation and storage. During my time in Italy, I completed my Community College of the Air Force degree and had the fortunate experience of being able to attend the legacy course at the Non-Commissioned Officer Academy in Germany. Being able to attend an in-residence course provided me with insight and experience from classmates who had been stationed all over the world.

In 2015, I arrived at Beale AFB, California, where I originally served as NCO in charge of the pest management section, and began to focus more on preparing myself for becoming a senior NCO by attending seminars and receiving continued mentorship from people in leadership roles. These teachings were invaluable as they helped me understand the transition of entering leadership and advisory roles compared to the operational aspect of my job. Additionally, I attended an alternate first sergeant course and have filled in as first sergeant on several occasions.

Today, I am filling a GS-12 position as space manager for the CE real property office, assisting with record keeping and managing space allocation requests to support an ever-changing intelligence, surveillance and reconnaissance mission at Beale.

OSD SMART scholarship program

Science, Mathematics, & Research for Transformation

The smart way to earn your college degree

By Erica Becvar
Career Field Management Analyst

Do you or someone you know want or need a college or graduate degree? Want to know how to earn one free and get paid while getting it? The civil engineer career field is in its second full year of spreading the word among the civilian workforce on getting your degree through SMART.

Managed by the office of the assistant secretary of defense for research and engineering, the science, mathematics and research for transformation or SMART program is a highly competitive scholarship program that funds undergraduate and graduate students in 19 academic science, technology, engineering and math disciplines and moves graduates directly into the Department of Defense workforce after graduation. Internships engage SMART scholars in hands-on work experiences at DOD facilities, thereby enhancing their educational experience and building a public service commitment to DOD's mission. SMART ensures DOD has a steady infusion of high-quality U.S. technical talent in areas of critical importance. These new graduates are ready to apply their technical knowledge, skills and abilities to fulfill our military's mission.

Organizations can use SMART to recruit students into the DOD or advance the education of current civil service employees, both general and wage-grade schedule. In exchange for SMART funding, students commit to working one year for each academic year funded by SMART. Students funded for more than one academic year complete internships during the summers between academic years. Participation in the SMART program is completed in three phases: degree pursuit, service commitment and monitoring of program graduates. Since 2007, annual funding for the program has ranged from $8.2 million to $45 million, with the number of students graduating ranging from 26 to more than 100 per year.

The SMART program places special emphasis on STEM areas. These include: biosciences; physics; chemistry; cognitive, neural and behavioral sciences; computer and computational sciences; geosciences; information sciences; mathematics; oceanography; and operations research. Engineering fields include: aeronautical and astronautical; chemical; civil; electrical; industrial and systems; mechanical; materials; ocean; and nuclear.

Organizations participating in the SMART program receive many benefits. They can hand-pick SMART applicants or support current employees to fill personnel needs now and in the future. The nationwide SMART applicant pool includes very competitive students. For example, in 2016, the average GPA was 3.7. Participating organizations can groom participants over time through the SMART mentoring program and yearly summer internships. Internships allow organizations to orient participants with the organization, and the SMART program facilitates a positive transition into full-time employment. There is no cost to the organizations during the first phase of the program.

Organizations identify requirements by degree level (bachelor's, master's or Ph.D.), discipline and whether the requirement is for a recruit or retention student. Each requirement includes a commitment to provide a summer internship assignment and mentor, and to place SMART participants in a permanent position upon graduation. Organizations must participate in the review and selection of SMART applicants as well as an online SMART orientation for selected students.

SMART students enjoy many program benefits. They are not limited in college choices, and full tuition is provided at any accredited college or university in the U.S. Recruitment students are given an annual living allowance of $25,000 to $38,000 along with paid summer internships. Students also receive health insurance and a book allowance of $1,000 per academic year. The organization provides mentoring upon participant selection and graduates are placed as full-time employees at the sponsoring organization.

Retention students benefit by staying in their current position and receive their full salary and benefits while going to school full time in residence. Their employers receive $25,000 to $38,000 based on degree level the employee is pursuing, which can be used to help defray the salary of the employee or obtain temporary or contract support while the employee is pursuing his or her degree. Graduating retention students either return to their duty stations or are outplaced according to the agreement with their employer.

A SMART start

The SMART program seeks individuals with the appropriate drive and technical background combined with a desire to serve their country. Program participants must meet the following eligibility requirements with no waivers permitted.

- Currently enrolled in an accredited university or college.
- Must be 18 years or older and be a U.S. citizen.
- Must be eligible to obtain and maintain at least a secret or top secret clearance if required by the sponsoring organization.
- Recruitment students must be geographically mobile (usually this means within any of the 50 states) for placement in DOD within relevant career fields after graduation.
- Must have at least a 3.0 out of a 4.0 GPA at time of enrollment and must maintain at least a 3.0 cumulative GPA for the degree funded.

The overall application for the SMART program takes approximately one year to complete, from the application phase to the time the student begins the scholarship. The call for applications is in early August and closes in early December. Candidates can submit applications online at: https://smart.asee.org/.

The evaluation of candidates is based on a review of academic records, personal statements, recommendation letters and examination scores. Selections are made in January, with award notification in April, and selectees have one week to accept or reject a SMART scholarship offer after official notification. The number of SMART participants is subject to the availability of funds.

The online orientation of selectees occurs in July before school begins. Internships occur during the summer and last eight to 12 weeks. Graduation can be in the summer or fall, with hiring of recruitment students occurring within 60 days of graduation.

Rooting for STEM

U.S. employment projections show a shortage of STEM professionals is likely in the future. And, with approximately 40 percent of Air Force STEM civilians being older than 50, recent studies show the personnel system might not provide a sufficient inventory of STEM-degreed personnel.

The Air Force civil engineering community itself will face a new host of complex engineering and installation support problems. Collectively, a perfect storm of workforce challenges is brewing. It includes the impending retirement of much of the Air Force STEM workforce; low college-readiness rates and interest in STEM majors; and challenges that the Air Force, like its sister services, faces in recruiting and retaining high-quality STEM talent in a competitive environment.

In a 2012 posture statement, the Air Force set out to carefully and proactively manage its STEM workforce and improve methods to attract and recruit future innovators. The next year, the 2013 Air Force diversity strategic roadmap set forth a mission to attract high-quality, talented, diverse individuals. The roadmap established a priority to position the Air Force as an employer of choice and attract top talent, (competent, qualified and diverse) … people consistent with Air Force requirements such as STEM."

This was reinforced in 2014 by a RAND Corp. report that recommended the Air Force continue to promote and increase programs to encourage STEM recruiting and retention for civil service positions. A diversified STEM talent pool would help keep up with technology advancements and enable the Air Force to avoid technological surprises. Innovative and technically savvy Airmen are essential to continued mission success since STEM is a part of every mission.

Full STEM Ahead

To build the strength and talent of the CE career field needs and prepare to meet STEM challenges, CE is focusing on recruitment. Examples of existing tools employed by the CE career field are the pathways recent graduate and Palace Acquire intern programs, which recruit recent college graduates into the CE workforce. The career field also supports its civilian members through tuition assistance for current CE civilian employees.

Regarding SMART, Edwin Oshiba, deputy director of civil engineers, deputy chief of staff for logistics, engineering and force protection, recently said, "It is one of the best programs we have with regard to both recruitment and retention for continued civilian development."

SMART's initial investment in CE was $400,000 in fiscal year 2016 as a pilot project, $1.6 million in fiscal year 2017, and fiscal 2018's investment is projected at $2.7 million. The program is well on its way to being an additional and exciting new recruitment and retention tool in the force development toolbox with 20 installations now participating and eight SMART students scheduled for CE employment upon graduation.

Getting Smart About SMART

For more information on the SMART program visit: https://smart.asee.org/, or the CE career field team SharePoint site at: https://cs.eis.af.mil/sites/10016/default.aspx. As the CE point of contact for SMART, feel free to email me or call: 210-565-0738 or DSN: 665-0738. Questions specific to the CE career field can be directed to: afpc.ce.cft@us.af.mil.

To learn more about the program, watch a SMART webinar at: https://www.youtube.com/watch?v=5chWNLapQ-o&t=2218s&list=PL_Lt8vbVLfk_pzt-TWzfk_GNAKp-ePXc1&index=25

Editor's Note: *Becvar is the SMART point of contact for the CE career field and serves on the CE team as the career field management analyst.*

Embracing trying times as a military spouse, mother, career broadener

By Ashley Sadorra
Air Force Office of Energy Assurance

My journey is a bit unusual. I am not an engineer. However, I have found myself immersed in the Air Force civil engineer community where my business and planning background is graciously accepted and integrated in our innovative career field. In addition to being the atypical engineer, I have been a military spouse for seven years and a mother for two years. My three takeaways from the last 10 years are set strong career goals, surround yourself with great people and adapt quickly. These three simple actions can be extremely challenging at times, but can ultimately lead you down a rewarding professional path.

Personally, 2006 was a good year, but, professionally, it was extremely hard to find a job as a recent graduate. Upon graduation, I immediately started working on my master's degree in business and finding a civil service job. During this time of transition, I was seeking adventure and found myself in Minot, North Dakota. It was quite a change in climate from College Station, Texas. On a freezing cold morning in February 2007, I took my first oath as a GS-04 employee working a temporary position in separations and assignments. Working alongside military members, I quickly learned the level of impact made in any rank or grade was extremely important to the mission. The Air Force culture and camaraderie are unlike any other. This is truly when and where my career as a civil servant began, which motivated me to seek other opportunities within civil service.

With a powerful drive and positive mind, I applied to all of the internship opportunities available. In July 2008, I received an offer for the palace acquire internship program with the civil engineer career field as a community planner at Langley Air Force Base, Virginia, now Joint Base Langley-Eustis.

The internship was full of great educational opportunities and experiences. It all started with the basic course, CE 101, at the Air Force Institute of Technology. The training and development plan required 110 weeks of training courses, rotations through the different CE Air Force specialty codes, other base-level mission organizations and on-the-job training. I am sure the syllabus has changed since then, but it was intense at the time. All of it was necessary to obtain the knowledge and skills to become a proficient community planner, while simultaneously preparing me for other developmental roles in environmental compliance. The internship was a fundamental building block to where I am in my career today.

The move from Minot to Langley was also the best decision of my life because it put me where I needed to be to meet my husband, Jet, who is an active-duty civil engineer officer. While at Langley, he knocked out two deployments and a short tour to Osan Air Base, South Korea. It was hard being away from one another, but I stayed busy at work until we received our next assignment to Royal Air Force Mildenhall, England. The second I knew where he was going, I applied for a supervisory position at RAF Lakenheath.

England was a dream. I was fortunate to have the opportunity to support the 48th Civil Engineer Squadron as the environmental element chief. This was, by far, the best experience of my service. We were a hop away to beautiful European destinations. I led an awesome team of 14 civilians and two military members and worked with the most amazing people Great Britain had to offer. We went through numerous challenges together, but one that will forever be embedded in my mind was responding to a helicopter crash off the coast of Norfolk. Neither training nor exercise will ever prepare you for the emotional strength needed to do your job when you lose military members you know, but the incident brought U.S. and British contingency personnel together. Our merged team was able to restore the nature reserve within the following months to its natural state. Even today, both emergency response teams exercise and train together. I will never forget those we lost and the selfless efforts of the men and women during those 11 days.

After three years at Lakenheath, my son came along. Ian became the light of my life and the No. 1 reason I give 150 percent in everything I do. While my newborn slept, I took time to get through the first half of Air Command and Staff College via correspondence until I went back to work. Only a short couple of months had passed and we received orders for our next assignment. San Antonio, Texas, would be our new home and, of course, I started applying for jobs. We moved from England to Texas when Ian was 8 months old. He started to stand on his own and was saying his first word, "dadda." We left England with a huge blessing and so many wonderful memories.

My next role was in the Air Force Civil Engineer Center's Installations Directorate, working the readiness and environmental integration program. It was an adjustment to go from supervisor to project manager, but I was excited. Where else can you work with multiple partners, leverage alternative resources to protect our most valuable missions and conserve land? I was also trusted to facilitate the development of the directorate's goals, objectives and stakeholder report. Doing this enhanced my understanding of the Air Force strategic vectors and intent and long-range plan, and gauged my interest in other initiatives that support the Air Force future vision and mission assurance, such as career broadening programs and Air Force legislative fellowship program.

Jet and I found out about his short tour to Al Dhafra Air Base, United Arab Emirates, in February 2017. I assumed this was the perfect time to quickly finish ACSC and look for other opportunities until he returned. Coincidentally, the career broadening program position with the Air Force office of energy assurance was advertised in the CE career field newsletter and on USAJOBs that week.

What interested me about this program was its joint nature, and I could continue to work with federal, state, local and private partners to help implement cost-effective solutions to our installations, sustain our current missions and defend against unforeseen threats. Though it would take me out of my comfort zone, the challenge could give me experience I need to identify gaps, develop solutions and advocate smart investments to support strategic interests, support defense communities and prepare me to lead breakthrough initiatives in future roles. After applying, I was interviewed by the career broadening program board and was offered the job in April. Off to a new adventure.

I have learned in the last decade to embrace trying times. Family has and will always be in the forefront, but to stay competitive, I have to continuously better myself. Part of that is knowing where I want to be and what juncture of my life is the right time to take the next step, like when Jet has to make a permanent change of station move. Yes, boxes need to be checked -- civilian developmental education, credentialing and supervisory experience -- but these are all great opportunities. These are perfect moments to interact with military leaders, counterparts and peers, all the while expanding on your professional competencies as you develop your personal leadership philosophy.

Networking in the Sadorra household is growing the military family. We were lucky to have met so many great people across the globe. In fact, one of our closest friends from RAF Lakenheath, now in San Antonio, has opened their home to Ian and me while we transition to Alexandria, Virginia. Embrace those who care about you and help you along the way. Always pay it forward. Luckily we have a small Air Force and the odds of being stationed together again are in our favor.

Ashley Sadorra receives the 48th Mission Support Group Civilian of the Year award in 2015 while stationed at Royal Air Force Mildenhall, England. Here she was presented the Liberty Wing award by former 48th Fighter Wing leadership. (U.S. Air Force photo by Airman 1st Class Erin R. Babis)

Total force development in challenging times:

A look to the past for inspiration

By Maj. Josh R. Aldred
Air Force Civil Engineer Center

In 1963, then Air Force Chief of Staff Gen. Curtis LeMay awards Maj. Gen. Augustus Minton with the U.S. Army Distinguished Service Medal. Minton was leaving the Pentagon for his new position as the Pacific Air Forces deputy chief of staff for administration and logistics. (U.S. Air Force photo)

It's no secret the Air Force civil engineer community has been through a constant cycle of churn over the last 10 years. We've restructured our squadrons, our staffs and our processes while enduring significant reductions in manpower, resources and capabilities. The signature theme during my 14-year Air Force career has always been "do more with less." However, we press on, the grit and determination we've embodied in our community prevents us from accepting failure despite all the limitations in manpower and resources. Failure, especially mission failure, is not within our DNA.

Despite the challenging times we face now, we can find comfort in the fact this is not the first time our career field has endured similar circumstances. Maj. Gen. Augustus Minton led the AFCE career field as the longest serving Air Force civil engineer from 1957-1963 and he is the father of this magazine. During this time, the Air Force plant replacement value increased by nearly 300 percent with virtually no increase in human capital. In fact, Minton reduced the air staff by 35 percent during his tenure. Overall officer manning was less than 100 percent and nearly 50 percent for captains.

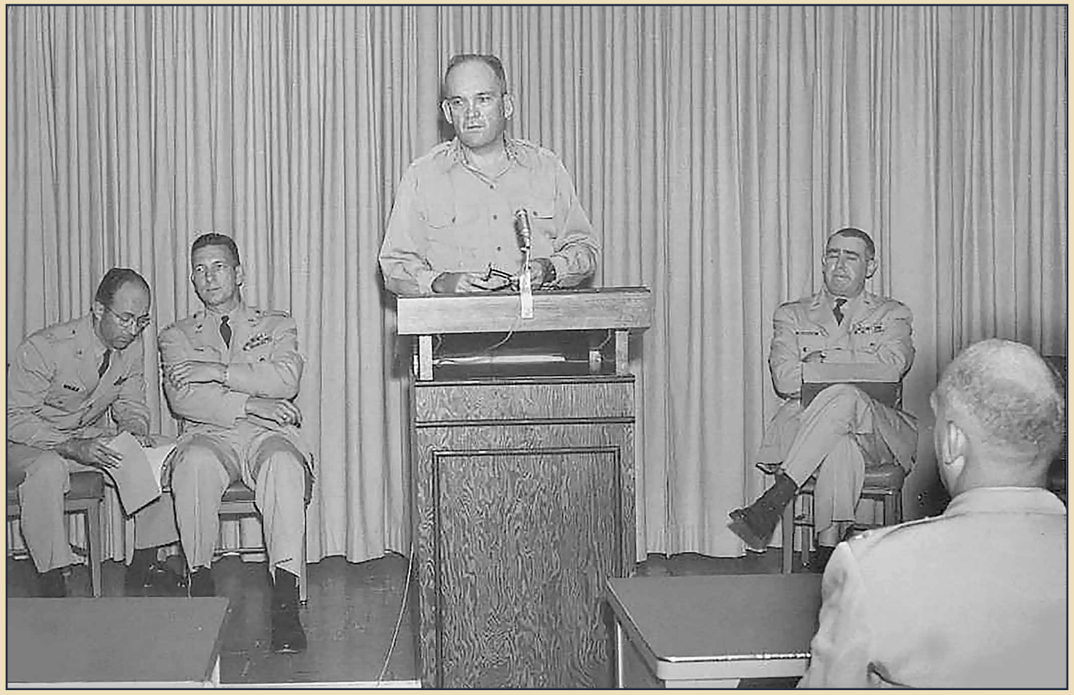
If we look back into our history, we would see many of Minton's leadership qualities and philosophies can be summarized in three words: pride, professionalism and performance. We should leverage these qualities today to develop our engineering team and grow new leaders of character who will lead the force of the future.

Pride

Minton took great pride in the professionalism of the AFCE career field and initiated a name change from air installation officer to base civil engineer because he felt "the type of construction we had to be familiar with, and the importance of building confidence on the part of our people and the pride in the job they were doing. I had always had the feeling that the base engineering people were considered kind of the base handyman…that was the feeling that I think most people had about the installation officer on the field at that time."

Minton also said, "To the average person, the term civil engineer denoted a professional with a background of experience, education and so forth. I think an engineer with the education and experience has specialized knowledge and experience just like a doctor or lawyer."

These lessons apply today in how we conduct our business with limited resources. We must seek excellence in all



In 1960, Minton delivers a speech to servicemembers at the Air Force Institute of Technology, or AFIT, at Wright-Patterson Air Force Base, Ohio. The general shaped the civil engineer career field into what it is today, to include civil engineers working with AFIT and industry to field ideas. (U.S. Air Force photo)

we do, despite our challenges and in a manner worthy of a civil engineer. As Minton eloquently stated, "It's inherent that we will have problems in accomplishing these things. But to continue to do our job in a commendable manner as we have done in the past, we must meet and resolve these problems head on."

Professionalism

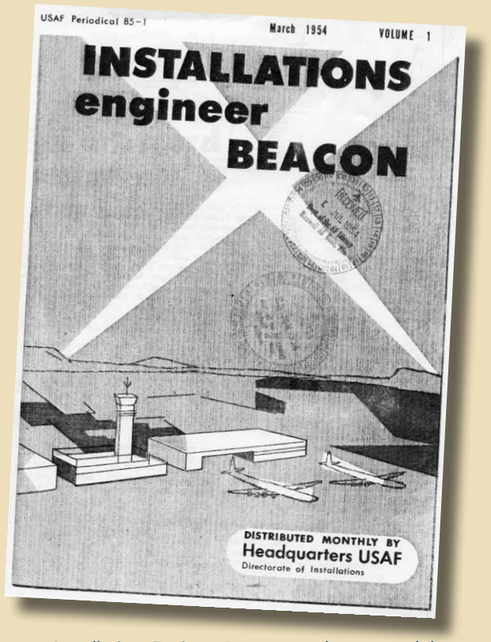
Minton strongly believed in professional registration and advocated for all Air Force engineers to put their engineering licenses, "right there behind your desk, so when somebody is sitting there talking to you, they will see that certificate and any others you have." The drive for professionalism was rooted in an exponential increase in technical expertise across the career field.

For example, in March 1959, Air Force civil engineering had a worldwide real property inventory in excess of $9.5 billion. AFCEs were responsible for an annual $1 billion new construction program, family housing programs in excess of $1 billion, and had an operation and maintenance budget of $600 million. Engineers called to work in the career field were highly qualified in modern management practices and up to speed with cutting-edge technical developments in all areas of the rapidly developing engineering field. Unfortunately, they were handling a workload of ever-increasing volume and complexity with no equivalent change in quality or quantity of manpower to perform the mission.

Statistics showed CEs in 1958 were being called upon to do four times the amount of work they did in 1950, with virtually the same manpower. Minton decided existing personnel had to be developed professionally to increase individual productive capabilities. Headquarters Air Force directed a stringent program of professional development. On Nov. 20, 1958, Minton began a professional development program within civil engineering. In a letter to major commands, he asked each command civil engineer, "to undertake and pursue an active plan to have our eligible engineers become registered as professional engineers and affiliated with professional societies."

Minton also initiated a plan to, "Develop the existing Installations Engineer Beacon newsletter published by the directorate of installations and develop it into a professional journal that would serve as a medium of communication between engineers;" today's Civil Engineer magazine.

The Beacon, established in March 1954, was a monthly periodical dedicated to such issues as design, construction, planning, programming and maintenance. In March 1959, it changed its name to the Civil Engineering Beacon, in keeping with the name change from installations engineering, and published its final edition in November 1959. The first issue of CE magazine was published in February 1960. Five thousand copies of the 32-page journal were



The 1954 Installations Engineer Beacon newsletter paved the way for the development of the the Air Force Civil Engineer. Today the magazine offers all civil engineers the opportunity to share their experiences and learn from others. (U.S. Air Force photo)

distributed for the first time to more than 100,000 people assigned to civil engineering activities within the Air Force.

Due to the increasing technical requirements and complexities of Air Force projects, Minton also advocated for stronger partnerships with academia and industry. A prominent example was Operation COOL SCHOOL, which was started when Minton and Col. Clarence A. Eckert, Civil Engineering Center director said, "Few in the professional engineering world understood or appreciated the magnitude and complexity of the engineering work being done in the Arctic. To help get the word out and to foster a closer relationship with engineering educators, General Minton decided to invite a number of engineers with him on an inspection trip to several of the sites. The classroom extended from Greenland across the Arctic to Alaska; the faculty consisted of senior military engineers and Arctic experts; and the students were distinguished university presidents and engineering educators."

The result was a strong partnership with academia that could be leveraged when the Air Force reached the limit of its technical expertise.

Finally, Minton aimed to increase the level of professionalism across the career field through graduate education and education with industry. He worked closely with Eckert

to obtain more graduate opportunities for civil engineers through the Air Force Institute of Technology's civilian institution program.

"In those days, hardening of a missile silos was a very sophisticated science. From the nuclear testing program, we were developing engineering standards and designs for the Atlas, Titan and Minutemen," Eckert said. "Almost all of our experts in the field were educators. Among the leaders in the field was Dr. Nathan Newmark. One of his protégés was a young Air Force officer named John Peters. General Minton had to go to the Chief of Staff to get approval, but John Peters was our first Ph.D. In later years, he rose to the grade of brigadier general. But it showed the Air Force and the world that we were creating a body of highly qualified professionals."

Because of these efforts, the career field set a new standard for professionalism, and hundreds of Air Force engineers have graduated with advanced degrees from civilian institutions over the last six decades. Air Force infrastructure will continue to become more complex, and we must continue to promote advanced education for our civil engineer team to meet the technical challenges of tomorrow.

Performance

Minton was an advocate of utilizing industrial processes and lessons learned to improve the performance of complex Air Force construction projects. One example was the construction of missile systems. In Minton's words missile engineering, "was so very, very complex, and we just had a checklist. That's when the system of the critical path was developed. Put it on a chart and a computer and find out the elements that were holding the project up. Concentrate on the critical path. That critical path construction was a real breakthrough in construction. That came out of the Air Force that came from our people."

The general was not a fan of claiming lack of resources as a limiting factor. He said, "Too often we are inclined to prepare a reasonable course of action to solve an engineering problem, then present it to those in authority on a take-it-or-leave-it basis. Too often we are inclined to hide behind a mythical shortage of resources when we should convince those in authority that good engineering practice and Air Force policy dictates a certain course of action. Too often we are content to be known as the base 'handy man' rather than make the effort to establish a reputation as a base civil engineer, a reputation that is basically professional and based on solid performance should be the real goal. To me, this type of salesmanship, if it can be called that, is necessary if one is to be a 'complete' Air Force Civil Engineer."

It's difficult to summarize all the achievements of Minton in a short article, but his legacy includes establishing the professionalism of the civil engineer career field, sponsoring the establishment of this periodical, initiating the critical path method in complex construction projects, and partnering with academia and industry to hone our technical edge. Notable projects completed during his tenure include the design and construction of the Air Force Academy, Cheyenne Mountain, the ballistic missile early warning system and a large bomber and missile beddown effort for Strategic Air Command.

These major efforts were accomplished despite almost no growth in human capital across the career field and by instilling pride and excellence; rewarding professionalism and advanced education; and demanding a high level of performance. What is old is new again and we can learn from Minton's leadership to succeed through the total force development challenges we face now and in the near future.

Editor's Note: *Aldred is deputy director of AFCEC's Energy Directorate. He is a professional engineer licensed in Arizona and a certified project management professional. He would like to thank former Air Force civil engineer historian Dr. Ron Hartzer for assisting with this article.*

Then a brigadier general, Minton poses for an official photo. The general is considered by many to be the father of Air Force Civil Engineer magazine. (U.S. Air Force photo)

CE transformation prioritizes assets through evolving ops management mindset

By James A. Martin
Headquarters Air Force Materiel Command

Under civil engineer transformation, the installation-level operations flight maintains responsibility for management, prioritization, execution, and closeout of facilities and infrastructure systems maintenance and repair, i.e. work. At the core of this effort are operations managers. Using asset management principles, they classify and prioritize work in accordance with the work prioritization framework in Air Force Instruction 32-1001, Operations Management. This allows the Air Force to apply scarce resources to the highest mission priorities from a life-cycle management perspective. Teaming with the requirements and optimization branch within the operations flight, our operations managers ensure we're effectively investing scarce dollars and man-hours based on proactive facility and infrastructure system analysis and life-cycle requirements planning.

This is a huge paradigm shift from the legacy customer service unit, or CSU, functions where 80 percent of CE work was a result of facility managers calling the CSU to put in a direct scheduled work request. Instead, an estimated 20 percent of the work will be called in and the remaining 80 percent will be a result of proactive systems performance analysis and life-cycle planning efforts. Although we will always be reactive to our customers, we are shifting to be more proactive and bring data analysis and management, requirements identification and life-cycle planning back to the forefront.

"We have said asset management is the foundation for all we do to effectively and efficiently operate and sustain our installations. Institutionalizing that mindset in our Airmen engineers starts with giving our operations managers the knowledge they need to apply those principles in the field. We are doing that at our operations management schoolhouse," said Edwin H. Oshiba, deputy director of civil engineers, deputy chief of staff for logistics, engineering and force protection.

This shift started in February 2016 with an integrated process team workshop. The effort was two-fold: develop an interim course that sundowned our legacy interim work management system or IWIMS training and build a curriculum that turned asset management principles and transformational initiatives into reality. A team of subject matter experts ranging from operations managers, training managers and CE transformation experts assembled and, in the ensuing weeks, produced a new course training standard that laid out all 3-level training requirements.

"This was truly revolutionary," said Steve Schade, 3E6 operations management training manager. "We initially thought we only needed to build a provisional course to get us to NexGen, but we quickly realized this material transcended anything we had ever done in the past. There is nothing provisional about this. It is the foundation for the direction this course is to evolve in the future."

The new course enables a core operations engineering capability with the ability to analyze built and natural infrastructure asset data to support work management and prioritization decisions. Data, when properly leveraged, is a critical asset for mission success as it enables informed, actionable decisions. Operations managers serve as data stewards and gatekeepers to ensure we collect only data we need. Accurate and sustained data allows us to get the most value from our new information technology tools, such as NexGen and the sustainment management system, BUILDER.

Paul Rollins, 366th Training Squadron, Sheppard Air Force Base, Texas, teaches asset management principles and BUILDER condition indexes during an 3E6 operations management apprentice course. (U.S. Air Force photo)

The 26-day course is broken into four blocks of instruction, with three of them dealing with the 29 main objectives under the asset management umbrella. It is easy to think of asset management as an independent process or program that defines what we do. In all actuality, however, all of the operations manager's roles and responsibilities are underpinned by asset management principles and practices and defines how we optimize our built infrastructure assets to get the maximum value from our resources (time, money, manpower, etc.) Because of this, it made perfect sense that asset management be the nucleus of the entire course of instruction.

Orientation/Air Force specialty code concepts/CE organizational functions: These objectives provide basic schoolhouse orientation and the CE core concepts associated with various CE career fields. They also provide basic terms and facts dealing with operations management-related publications and references as well as basic customer courtesies. They also provide the general principles and structure of the operations flight since this is where Airmen will be predominantly working.

Real property: The real property objective is the first introduction into asset management principles. It identifies the basic facts and terms concerning what is a base or installation and what is a facility, for example. It then breaks down the basic facts surrounding real property management. Terminology like category code, mission dependency index and real property asset database are introduced as a way to define assets by location, category, criticality, etc. – all essential elements to asset visibility.

Civil engineer work: With a firm understanding of what built infrastructure assets are, the effort starts with understanding the relationship, basic facts and principles behind different CE work classification and priorities, levels of approval authority and even scenario-driven work prioritization practicums. This is where maintenance, repair and construction are introduced. What does the primary workload of CE operations entail? How is work handled and prioritized? The basic asset management principle is if you

(U.S. Air Force graphic)

don't have the means to do all the work, there must be a systematic process in how work is planned and prioritized for execution to minimize risk to mission and Airmen.

Asset management: The asset management objective breaks down basic facts and principles behind asset and activity management planning. The basic understanding and importance of life-cycle management and the concepts and capabilities behind our sustainment management systems, or SMS. SMS is an element of CE transformation and asset management philosophy that represents a shift toward a proactive versus reactive strategy. Assets are not just kept operational by relying primarily on corrective repairs, but through predictive condition-based repairs we call life-cycle maintenance. This enables work to be planned prior to failure, with the support of SMS, and results in higher performing assets at lower life-cycle costs which takes us back to the 80 percent/20 percent paradigm shift mentioned earlier.

Preventive maintenance: The preventive maintenance, or PM, objective identifies basic terms and concepts and the importance behind PM in life-cycle management. From a programmatic perspective: understanding general facts and concepts behind the PM task list; measuring PM effectiveness, and building a balanced PM program or schedule. Understanding PM is highly craft-centric; operations managers are looking at it programmatically to ensure the entire program is prioritized, executable and successful to keep good assets good.

CE workflow: The workflow objective identifies basic facts and concepts associated with work scheduling and how CE tasks flow through the system, to include project-level work. The final part of this objective identifies roles and responsibilities surrounding the warranty program.

Facility manager program: This objective stays consistent with the legacy course and identifies facility manager responsibilities and CE roles and responsibilities in executing a facility manager training program.

Financial management: For the first time, this objective introduces the basic facts and terms associated with "funds of the civil engineer" work. It entails job cost accounting, program element codes and element of expense identification codes, definitions and fundamentals, as well as the different appropriations associated with doing CE work to

Tech. Sgt. Tracy Hayward, 366th Training Squadron, Sheppard Air Force Base, Texas, teaches the importance of tracking data in a unit. (U.S. Air Force photo)

DEVELOPING OUR TOTAL FORCE

"The major difference is that we are teaching operations managers how to think."

- Tech. Sgt. Tracy Hayward

include reimbursable program and support agreements. The pioneering effort not only shows the relationship and importance of understanding the assets CE manages and maintains, but the different monies used to perform the work and manage the assets.

Materiel acquisitions: This objective stays consistent with the legacy course and identifies materiel acquisitions roles and responsibilities, workflow, warehouse operations and avenues of requisition associated with its operations function.

NexGen: According to Master Sgt. Amy Dare, operations management force develop manager, "We have already come so far and are not going to stop there. The apprentice course will be expanded in the near future to include TRIRIGA, its capabilities and the 3E6 roles and duties associated with the operation and sustainment of this IT system."

This will be fundamentally different than the legacy IT system. It is a paradigm shift away from 3E6s being the IT SMEs like they were with IWIMS. Instead, we are teaching operations managers the key information needed to manage CE work using asset management principles and practices using any and all IT platforms. It also focuses on detailed descriptions and explanation of work, going more in-depth on data and data analysis, and optimizing how we expend resources to include money and manpower. Operations managers won't be the ones making the final decision on what work is going to be done by an operations flight but this objective prepares them to present options and recommendations to leadership based on reliable data and information from various IT systems. Operations managers will be at the cusp of this discussion.

The course, launched in January 2017, underwent five validation classes. To date, 62 students have graduated for a 98 percent pass rate. While on the surface not much has changed with this legacy course that could not be further from the truth.

"The major difference is that we are teaching operations managers how to think," said Tech. Sgt. Tracy Hayward, operations management instructor supervisor. "We started by defining the value of data and stressing the importance of accuracy. We use examples the students can relate to, like a car or house, then apply the principles and processes to an Air Force installation. They leave the schoolhouse better prepared for CE transformation with an understanding of how the data they track and validate affects not only their unit but also the Air Force as a whole."

"Today's force is one of change and with change comes opportunities," said Chief Master Sgt. John Wilde, civil engineer chief of enlisted matters. "This change to the operations management career field is truly inspiring and will only continue to flourish as we evolve the career field. This will yield endless opportunities as we advance in our CE transformation efforts. I was asked once when do we stop transforming? The answer is never. We need to continue transforming to stay relevant and this schoolhouse effort is testimony."

The effort does not start and stop with the 3E6 apprentice course. There are plans to continue the 3E6 evolution by enhancing 5- and 7-level skills development through career development courses, specialty training standard advancements and various asset management courses offered at the Air Force Institute of Technology, such as WMSS 301, WMGT 417 and WMGT 436. The CE education and training review committee recently approved the development of an asset management computer-based training module to be used as part of the common core skills and infused in all CE Air Force specialty codes. This is all part of the CE transformation journey that began in 2007 with program action directive 07-02; the Air Force CEs effort to implement a multi-pronged asset management approach.

Operations managers are now arriving at installations more equipped with knowledge and abilities than ever before. I urge you employ them, challenge them to think and embed them into your day-to-day asset management processes. This will only enable their evolution. As we look to the future and consider the multitude of CE transformation efforts, asset management and the role of our operations managers will be at the forefront … Leading the way!

Editor's Note: *Martin, a retired CE chief master sergeant, was a member of the 3E6 apprentice course development team. He serves as an asset management program analyst at headquarters Air Force Materiel Command, Wright-Patterson AFB, Ohio.*

Continued service through the Air Force Reserve

By Capt. Lindsey R. Burelison
U.S. Air Force Academy
Department of Civil and Environmental Engineering

My decision to separate from active duty was bittersweet. I was excited about starting a new chapter, putting down roots, spending more time with family and really important things like no more computer-based training and physical training tests!

However, I was also sad. For nine years, Air Force civil engineering was more than my job — it was my family. From my first assignment at Minot Air Force Base, North Dakota, followed by Kunsan Air Base, South Korea, and two deployments, I made great friends, grew personally and professionally, worked with extremely talented Airmen and was able to support outstanding missions across the globe. In taking off the uniform, I was leaving a tightknit community of friends and colleagues. I was leaving my second family.

Clearly, I was not ready to shut the door on Air Force civil engineering. As soon as my separation was official and I had secured civilian employment, I began searching for vacancies in the Air Force Reserve. Now two years later, I have learned that as a reserve civil engineer, I am able to realize the benefits of both a civilian and military career and continue serving with a degree of flexibility that complements my personal and professional goals.

The transition to becoming a reservist was a little confusing. OK, it was a lot confusing! I fumbled a bit as I coordinated with my local recruiter, unit reserve coordinators and the detachments managing reserve positions. However, I quickly learned that our reserve CE network is strong. A fellow CE officer who had recently transitioned guided me through applying for my first position and taught me the basics of inactive duty training, annual tours and "good years." Within a few months I was hired as an individual mobilization augmentee, or IMA, supporting the Air Force Civil Engineer Center.

The position with AFCEC served as a great introduction to the reserve, particularly since I was a new civilian employee in the planning and integration directorate. Scheduling my annual reserve duties at times that were advantageous for all parties was easy given my proximity, and I gained invaluable insight into the organization that benefited both my military and civilian roles. During my two-week annual tour, I served as the executive officer to the director. In doing so, I broadened my depth of knowledge regarding each directorate, its mission and role within the organization, and was able to support key initiatives including mission bed downs and the development of AFCEC performance metrics.

After a year supporting AFCEC, I learned of a vacancy at the U.S. Air Force Academy supporting the Academy's Department of Civil and Environmental Engineering and the Field Engineering and Readiness Laboratory. As a graduate and former faculty member, the opportunity to return to teaching and mentoring future engineers was one I couldn't pass up. I applied and am now in a career-broadening position as an IMA to USAFA/DFCE. This summer I was fortunate enough to spend two weeks with more than 20 enlisted mentors from across the Air Force, teaching 70 cadets about heavy equipment and the vital work performed by Airmen in the operations flight. My annual tour didn't feel like work, it was fun. In the past, I always enjoyed sharing active-duty experiences with students, and I still do. However, this year I was also able to show cadets that there are opportunities to continue serving, even if they decide not to complete a 20-year active duty career.

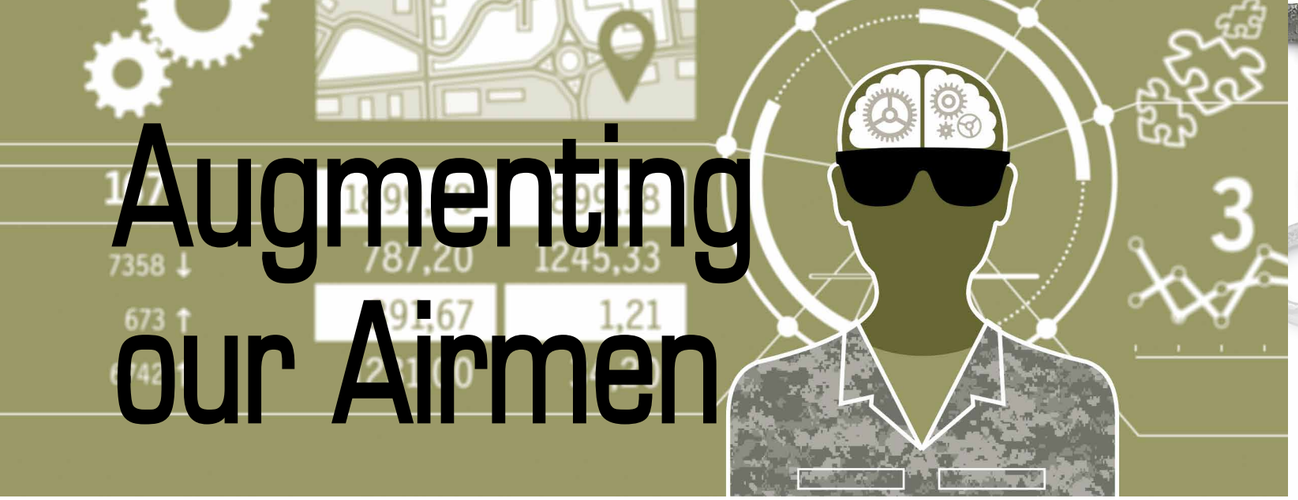
After my assignment with USAFA, it will be time to consider what's next, but I won't have to do that alone. Air Force Reserve Command facilitates development teams, or DTs, to help individual officers navigate career progression and assignment selection. I participated in the January 2017 DT as an action officer and was both comforted and impressed. Twenty five reserve engineers came together at Buckley Air Reserve Base, Colorado, and devoted a week to the career development of reserve CE officers. Over 300 records were scrubbed and scored, with personal vectors assigned to each member. In general, the DT looked for items that mirror what active-duty DTs and promotion boards review: performance reports, decorations, advanced academic degrees, PME and developmental plan input. With respect to career progression, officers should show both depth and breadth of assignments: Wing and base, headquarters and staff, National Capital Region, joint assignments and a variety of locations or commands. In other words, a successful career in the reserves looks a lot like our active duty counterparts and draws on the same skills, attitude and achievements.

One of the big questions I wrestled with while separating dealt with regret: Would I regret not staying in to become an operations flight chief or squadron commander? I now know that the opportunity to be a part of a squadron and lead Airmen still exists for me. The reserves offer a multitude of opportunities ranging from full-time (air reserve technician and activated guard or reserve) to traditional reserve unit programs (serving in reserve squadrons, groups, wings and staff positions) to IMAs backfilling critical positions in active-duty units and staffs. Plus, there are opportunities such as the civil engineer staff augmentation teams, or S-Teams, only available in the guard and reserve, where units focus engineering skills on command staff augmentation and planning, design and construction missions.

Having been a reservist for only two years, I am confident that there is still a lot that I don't know. However, I have a supportive community and amazing mentors to help me learn the ropes. Whether active duty or reserve, CE takes care of its own!

For information on joining the Air Force Reserve, visit www.afreserve.com.

Facing page, Air Force Academy cadets pose for a picture after learning to use heavy equipment this summer. Burelison trained and mentored cadets as part of her annual reserve two-week tour at the Academy. Above, Burelison gathers with members of the Buckley Air Reserve Base, Colorado, development team following her participation on a personnel board. She assisted officers on navigating career progression and assignment selection for the Air Force Reserve Command in January 2017. (Courtesy photos)



Augmenting our Airmen

By Capt. Patrick Grandsaert
Air Force ROTC Det. 045

Whether in preventive maintenance, upgrade training or routine Prime Base Engineer Force, or Prime BEEF, training requirements, everyone needs to reference a manual from time to time. Long-time veterans may be able to service a deployed water purification unit or a generator without having to refresh themselves, but most people do not remember the steps required on something they trained on at Silver Flag three years ago. Current innovations may be able to mitigate that knowledge gap between training opportunities, as well as speed up training for new Airmen.

Many may recall how in 2013 a product called Google Glass promised a heads-up display, known as augmented reality, or AR, while you lived your life. While there was initial excitement, people wearing these glasses in public were widely ostracized as violating privacy and unspoken social norms. Bars and nightclubs, concerned about patrons being secretly recorded by these futuristic glasses, banned such devices on their premises. This led to the ending of the product line in 2015. However, many businesses saw great potential in offering hands free, step-by-step instruction by using these glasses. Corporations such as the Boeing Co. saw productivity increases as high as 25 percent in construction of wiring harnesses and General Electric saw task completion time reduced by 46 percent, according to a 2017 report. These are unheard of gains in processes where second or minute task reductions are considered breakthroughs. AR technology can be applied across many other domains for similar gains, including applying it to Air Force civil engineering.

How can we apply these types of gains to the Air Force? Perhaps we could use Silver flag as a test bed. Have one student maintain our deployed assets after classroom instruction, referencing the manual. Then, allow another student to maintain a unit armed only with AR glasses that provide access to step-by-step instruction and access to how-to videos. As long as a varied number of students with different experience levels take part, this could be a perfect experiment to show the capabilities of this new technology in our Air Force.

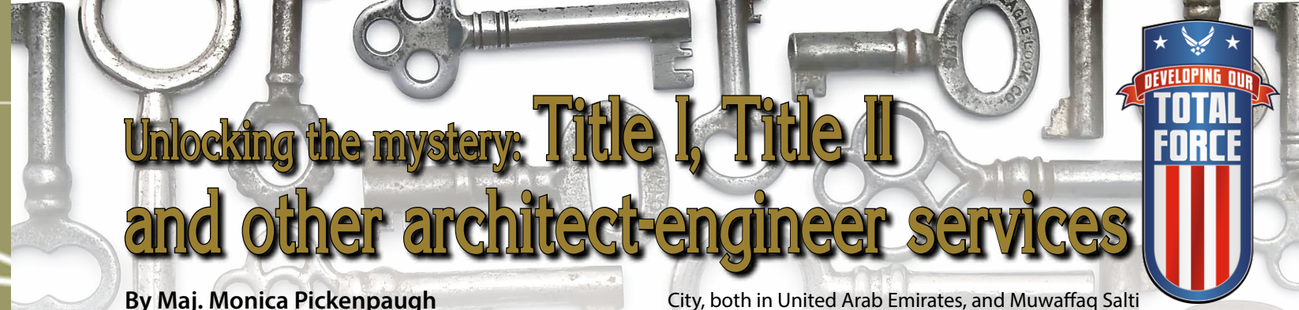
Though research has shown this will greatly improve task completion time, there are many other potential benefits Students are spending less time in the classroom and more time hands on, while reducing overall temporary duty lengths across the enterprise. If this technology were given to deployed units, downrange engineers could feed live video of what they have questions on to the Air Force Civil Engineer Center, rather than waiting to get back to the office to fill out an email or attempting to describe the issue over the phone.

In a wartime environment, giving a civil engineer or CE augmentee a pair of AR glasses with various resources at their command would greatly bridge the gap between the time they were trained, or mitigate a lack of training when extreme needs arise.

At Kunsan Air Base, South Korea, the readiness flight took two days every month to train new augmentees for CE operations due to a high turnover rate. AR glasses would mitigate much of those man hours for both CE and sister unit personnel. This is not even mentioning our asset management data gathering process or allowing immediate references to help determine the condition of our assets.

There is much potential in AR, and through new procurement methods, such as defense innovation unit experimental, there is a quick contracting process for developing and fielding them in as fast as six months. One of the end-state goals for CEs is to rapidly adapt in changing environments to maintain effective and efficient installation support operations by fiscal year 2020. AR today, to support our technicians and augmentees, is a step in the right direction.

Editor's Note: *Grandsaert is the commander of the operations flight at Air Force ROTC Det. 045 at San Jose State University, California.*



DEVELOPING OUR TOTAL FORCE

Unlocking the mystery: Title I, Title II and other architect-engineer services

By Maj. Monica Pickenpaugh
Air Force Civil Engineer Center

One of the first things I learned when I was assigned to the Air Force Civil Engineer Center's contingency construction branch was what Title I services, Title II services and other architect-engineer, or A-E, services are.

Although I had been an Air Force engineer for eight years, I had no idea what these services or terms meant. But during my time at AFCEC, I have served as the project manager, or PM, on several A-E services projects and become familiar with these terms. Let me demystify them for you.

Title I services are used for project designs, including site investigations, design plans, studies and technical calculations. Title II services are for inspection and supervision of construction operations. Other A-E services, outside the scope of Title I or Title II services, include feasibility studies, technical investigations, reports, mapping, surveys and environmental impact studies.

I was AFCEC's Title I services contract PM in Afghanistan and completed site investigations around the country to document assets, current conditions and compiled the investigations in a computer-based system. I use this mnemonic device to remember the term Title I services: ***Knowing what assets you have is step one to any project***.

My experience with Title II type contracts has been on construction projects, such as the Ministry of Defense Headquarters in Afghanistan and the Dover AFB, Delaware, runway repair project, where our onsite contractor officer representative and Title II inspector worked closely to supervise construction operations. Both projects had construction or repair elements that needed supervision, oversight and inspections. This led me to my Title II mnemonic device: ***In construction you need a second opinion***.

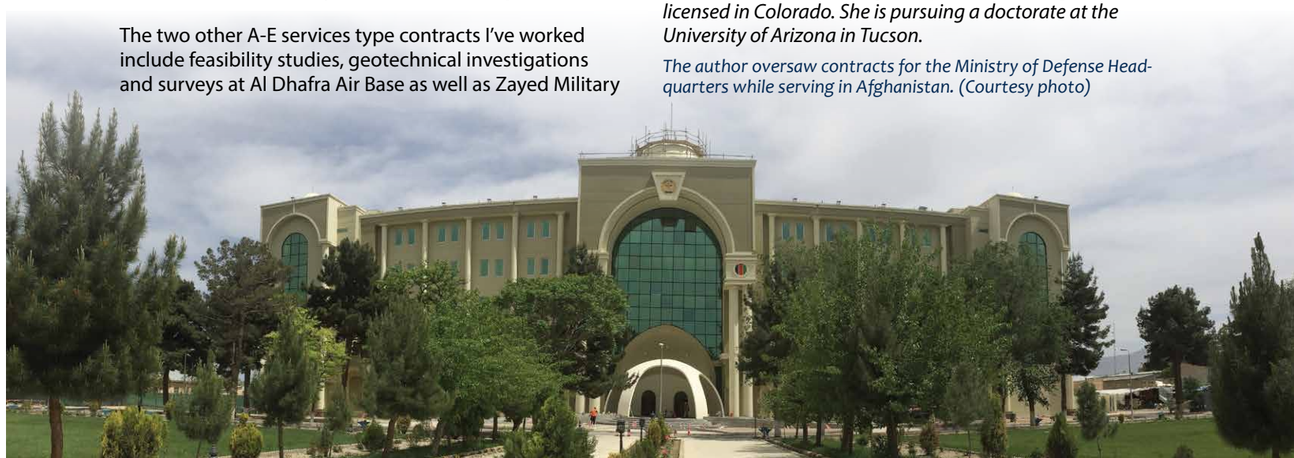
The two other A-E services type contracts I've worked include feasibility studies, geotechnical investigations and surveys at Al Dhafra Air Base as well as Zayed Military City, both in United Arab Emirates, and Muwaffaq Salti Air Base, Jordan. These other A-E services type contracts help finalize the framework for construction. Now we have an idea of what these types of A-E services are and how to remember them. Why the seemingly arbitrary designations?

The terms Title I, Title II and Other A-E services are arbitrary, and they come from the 1941 U. S. Army General Construction manual. The Federal Acquisition Regulations do not define A-E services with the Title I, Title II or Other A-E services, but the Defense Federal Acquisition Regulation defines A-E services by Title I Planning and Design, Title II Supervision and Inspection of Construction, and Other A-E services. Over time, Title II services have been accepted to mean construction inspection services by an A-E firm. Is there anything else to know?

The Brooks Act of 1972 states: "The Congress hereby declares it to be the policy of the Federal Government to publicly announce all requirements for architectural and engineering services, and to negotiate contracts for architectural and engineering services on the basis of demonstrated competence and qualification for the type of professional services required and at fair and reasonable prices." The statement means the A-E must be selected by technical competition before price is negotiated. This is different than a construction project, where price can be a factor in award.

I have learned a lot by working contracts to gain A-E services throughout the world and I hope this short article has helped clarify these terms. If you are in need of any of these services AFCEC holds the decentralized A-E contract available for use by your agency for Title I, Title II and Other A-E services requirements.

Editor's Note: *Pickenpaugh is a professional engineer licensed in Colorado. She is pursuing a doctorate at the University of Arizona in Tucson.*



The author oversaw contracts for the Ministry of Defense Headquarters while serving in Afghanistan. (Courtesy photo)

CETSC provides expertise to 90 ANG bases

By Robert T. Bossert, Jr.
Air National Guard Civil Engineering
Technical Services Center

The Air National Guard Civil Engineering Technical Services Center is a great asset to the ANG civil engineering community. As a headquarters ANG organization, it provides subject matter expert technical and energy support to approximately 90 bases of the ANG as well as the headquarters staff.

The CETSC, located in an Armed Forces Reserve Center on the north side of Minot, North Dakota, comprises 38 highly skilled craftsmen, technicians and engineers and is supported by 11 contract employees. These employees conduct consultation visits to ANG bases, support programming and execution of facilities projects, review project designs to provide quality assurance and subject-matter expertise on all aspects of facilities construction and sustainment, restoration and modernization. They also support construction, providing pre-acceptance inspections, technical support for contract dispute issues, and product and equipment evaluation and recommendations. The SMEs at the CETSC interact with their respective Air Force SMEs on a regular basis.

Services provided include engineering technical support, base operations support, day-to-day facility operations and maintenance support, and training in many facility and infrastructure areas. It also represents the ANG in meetings with other agencies and Department of Defense components.

Some of focus areas of the technical support provided include fire protection and suppression systems; pavement and roof systems; aircraft arresting systems; petroleum, oil, lubricants systems and technical design reviews. CETSC performs technical design reviews of all major projects being designed in the ANG. This is approximately 300 submittals per year.

In recent years, hangar high expansion foam fire suppression systems have been of particular interest in the Air Force and ANG. CETSC established a nationwide contract for detailed inspections of the hangar fire suppression and foam detection systems in the ANG. Following these inspections, the CETSC is working with installations to establish some quick fixes to increase the reliability of the existing fire suppression systems and implement a program to bring all existing fire suppression systems up to new Unified Facilities Criteria standards.

A team at the CETSC inspects roof and pavements systems at ANG installations. The team develops maintenance and management plans as well as system condition assessments for "BUILDER" incorporation. Large roof and pavement projects are prioritized and shared with the National Guard Bureau for incorporation into the ANG asset management program.

CETSC is the program management office for Aircraft Arresting Systems, or AAS, in the ANG. Support provided to installations with a fighter aircraft mission includes 10-year overhauls of BAK-12 and Mobile Aircraft Arresting Systems, cable retraction systems and their radio controls installations, assistance with troubleshooting and replacement of wiring harnesses. As with all other areas of support, the team will travel to an installation to help barrier technicians troubleshoot, identify and fix any problems on an existing system.

Because these systems provide critical support to the flying mission, an expert from the CETSC will be present during construction at critical times and for final acceptance to ensure a new install is done properly.

For many years, the ANG was the main user of airfield AAS cable retraction systems. Because of the experience of the workforce, CETSC has provided technical and onsite support to other DOD agencies.

The ANG energy program is also managed and executed by the members of the CETSC. This includes development and execution of energy policy and guidance, coordinating installation-level energy projects and programs, managing design and execution of energy projects, managing contracted support for regional Resource Efficiency Managers, or REM support, a robust ANG-wide retrocommissioning program and assisting the installation with reporting energy statistics via the Air Force Energy Reporting System.

With limited staff at ANG installations and no permanent position for an installation energy manager, regionally deployed contract REM services supplement the ANG energy program in the field. The services are centrally managed, providing continuity in the ANG facility energy program. REM services enhance the energy program by completing energy audits, developing energy-related projects, promoting energy awareness and monitoring energy program metrics.

CETSC is working to enhance the strategic vision of "mission assurance through energy assurance." The ANG is a host site for several micro-grid demonstration projects and CETSC is tracking the lessons learned from these projects. CETSC will continue to evaluate ways to increase energy assurance through additional on-site renewable generation and potentially expanding microgrid capabilities. As control capabilities of facility-related control systems increase, so does the potential for cybersecurity treats. CETSC is working to develop strategies to enhance the cybersecurity posture for these control systems across the ANG.

CETSC also acts as the ANG engineering liaison with Air Force headquarters, Secretary of the Air Force for Installation Environment, Air Force Civil Engineer Center and other services and agencies. CETSC engineers review Air Force engineering policy documents, coordinate with AFCEC and represent the ANG at Air Force-level engineering meetings, provide engineering representation for the Next Generation Information Technology program and offer input for strategic sourcing.

For almost 30 years, the CETSC has supported ANG installations and been highly valued. As ANG civil engineering and installation leadership continue to turn over technical and energy services provided by CETSC to installations, its expertise will be needed more than ever.

***Note**: Bossert is chief of the National Guard Bureau Technical Services Branch and chief of the Air National Guard Civil Engineering Technical Services Center. He is a professional engineer licensed in North Dakota.*

High expansion foam is released in the fuel cell hangar at the 190th Air Refueling Wing in Topeka, Kansas. The release is part of a multiday pre-acceptance inspection conducted on every new HEF system installed in the Air National Guard. (U.S. Air National Guard photo by Steve Becker)

Members of the 167th Airlift Wing in Martinsburg, West Virginia, conduct a test of the new optical infrared flame detectors in a fuel cell. Starting a test fire just outside of the hangar and observing the operation of the flame detectors ensure the detectors do not recognize a flame signature outside of the hangar, such as a taxiing jet, and inadvertently discharge high expansion foam in the hangar. (U.S. Air National Guard photo by Steve Becker)

United Nations peacekeeping:
An engineer's perspective

By Capt. Stephen R. Bernero
Education With Industry student

This will be unlike any other deployment you've been on. These were the first words said to our group of U.S. Army, U.S. Air Force, U.S. Navy and U.S. Marine Corps officers sitting in the Winchester, Virginia, classroom, waiting to begin training with a U.S. military observer group.

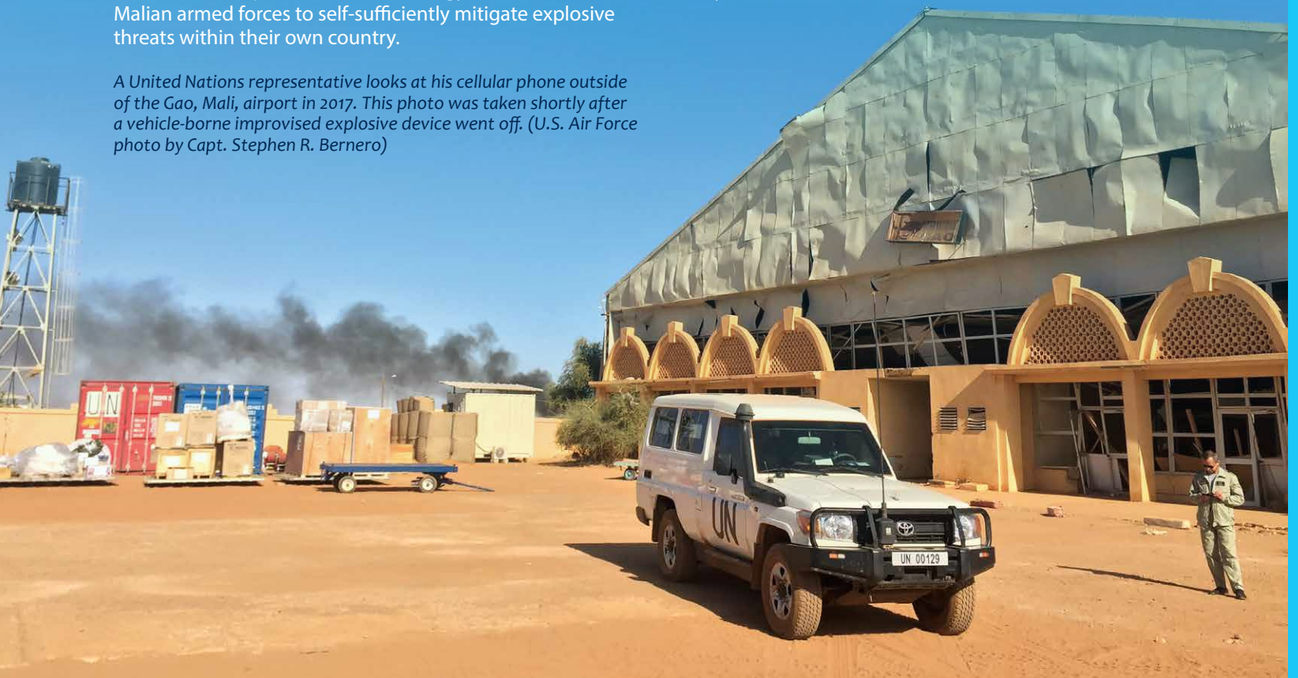
The training class, composed of officers ranging from captain to colonel, was to prepare us to serve as staff officers within one of 16 United Nations peacekeeping missions worldwide. Over a month later, I landed at a small airport in Bamako, Mali, to begin what would be the most formative year of my military career since entering the Air Force in May 2010.

As an explosive ordnance disposal-qualified civil engineer, I was tasked to serve as a counter improvised explosive device adviser within the U.N. mine action service, or UNMAS, mission in Mali, a former French colony that had faced two coups d'état since the 1990s. After the most recent coup in 2012, the U.N. responded to what could be summarized as a civil-unrest fueled insurgency and substantial governance deficits in the northern reaches of the country. Amid the conflict, improvised explosive devices, or IEDs, quickly emerged as weapons of choice as the country became home to the U.N.'s deadliest peacekeeping mission with over 117 casualties since 2013. Our job was straightforward: Develop and execute a strategy to enable the Malian armed forces to self-sufficiently mitigate explosive threats within their own country.

With a substantial workload ahead of us, I set forth integrating into the UNMAS and Mali staff. Overcoming a significant language barrier was not always easy when living on a local economy within a developing country. However, with the help of an amazing predominant French team, I was able to quickly acclimate myself and, with time, language became less of a barrier.

The EOD flight where I previously served heeded one mantra above all others for our Airmen: You are an EOD technician, first and foremost. This mindset, along with lessons learned from senior NCO mentors over the years, allowed me to find a common technical language regardless of whether I was speaking with a Malian army colonel or the French Embassy's defense attaché.

One of the pivotal moments from my tour came five months into the mission while strategizing how to best empower the Malian armed forces. A colleague and I arrived at a crucial realization: Despite the fact every international or bilateral organization in Mali was actively working to mitigate the IED threat, there was little to no coordination among offices. This meant one foreign government could deliver training to Malian combat engineers that may contradict what was delivered simultaneously to a different unit by another international organization. This disjointed approach toward security sector reform not only created discord among international partners, but also endangered the lives of Malian operators working to secure their country.



A United Nations representative looks at his cellular phone outside of the Gao, Mali, airport in 2017. This photo was taken shortly after a vehicle-borne improvised explosive device went off. (U.S. Air Force photo by Capt. Stephen R. Bernero)

The landscape surrounding the worksite was comprised of small farms overlooking the Niger River in Bamako, Mali. (U.S. Air Force photo by Capt. Stephen R. Bernero)

Over the course of the next few months, my team and I adopted a new external coordination strategy and began working outward. My colleague and I liaised directly with various foreign defense attachés working in Bamako, while our supervisor engaged with executive leadership within the U.N. Multidimensional Integrated Stabilization Mission to lay the foundation for what was to come. By February 2017, five international organizations and 12 foreign embassies attended the inaugural meeting of the mine action capacity development working group. This working group was specifically chartered to mitigate explosive hazards in Mali by eliminating contradictory training and doctrine development, identifying capability gaps and prioritizing critical shortfalls within the security sector for reform. While a great deal of work remained to be done, my team and I felt confident we had taken a step toward a self-sustaining Malian security sector capable of countering the IED threat in the country.

Prior to my departure, if I were asked what I anticipated my year in West Africa would be like, I would likely have given a much understated response. As I look back on the experience now, the value of living outside of my comfort zone and working with our joint and combined partners proved to be tremendously rewarding.

As engineers stand ready to support the warfighter, it is our flexibility, adaptability and problem-solving abilities that ultimately ensure we continually... Lead the way!

Editor's Note: *Bernero is an Education With Industry student currently assigned to General Motors in Warren, Michigan.*

The author discusses the demolition of expired Malian ordnance with fellow members of the U.N. mine action service in Ségou, Mali. (U.S. Air Force photo by Capt. Stephen R. Bernero)

Unique generator plant powers the mission

By Maj. Adam Burwinkle
386th Expeditionary Civil Engineer Squadron

Thanks to the 386th Expeditionary Civil Engineer Squadron power production shop and other Airmen around the squadron, more than 1,000 residents of Commando Village Tent City have air-conditioned spaces to sleep at night.

At an undisclosed location in Southwest Asia, 386th ECES Airmen labor every day to provide reliable power to the tent city, which provides housing required by the increase in rotational and transient forces supporting Operation Inherent Resolve. While the installation is primarily powered through host-nation utilities, the tent city and its War Reserve Material structures require standard U.S. power; 110 volts and 60 hertz, available only through the use of expeditionary assets.

Since March 2016, the 386th ECES power production shop has provided this power with the use of a set of generation assets called interim base expeditionary airfield resources, or IBEARs. These six IBEAR generators are unique to this area of responsibility and are intended to bridge the gap between the legacy mobile electric power, or MEP 12s, and the BEAR power unit.

This system required on-the-job training since applicable predeployment training wasn't available, increased rates of preventive maintenance and depot-level servicing, driving time and resource consuming contracted support.

Above, Airmen in Southwest Asia install two different generation assets side-by-side on the deployed site in May 2017, creating a unique power plant. Right, Civil engineer Airmen work in tight quarters on mechanical systems at an undisclosed location to accomplish the mission in March 2017. (U.S. Air Force photo by Tech. Sgt. Donald Jabaay)

Maintenance required included the replacement of multiple main oil seals, head gaskets, two fans and the overhaul of bearing assemblies. Due to these factors, the 386th Air Expeditionary Wing's tent city dropped down to a single IBEAR generator, despite the simultaneous efforts of Airmen working continuously to bring the others back on line. The near constant runs, the years of operation in an expeditionary environment, and the challenges of operating a system unknown to most power production craftsmen meant a very real risk to the AEW's operations.

These issues became an untenable situation that drove the Airmen of the 386th ECES to seek innovative, alternative solutions. With the timely support of the U.S. Air Forces Central Command WRM manager, five legacy MEP-12s were shipped (three by sea and two by air) and installed side by side with the IBEARs. This side-by-side generation plant required running new fuel lines, installing new

Engineers work in the heat of Southwest Asia to finish installation of much-needed fuel and control lines. (U.S. Air Force photo by Tech. Sgt. Donald Jabaay)

control cables and sensors, and designing a new fueling plan, all with the specter of the heat of the summer in the area of responsibility on the horizon.

The installation of these assets, and supporting infrastructure, was a heavy lift for multiple shops in addition to their already substantial load of preventive and corrective maintenance. The plant installation consumed nearly 1,000 labor hours across five shops. The install team also had to work around rising temperatures and a few surprise showers, always troubling when working on electrical equipment.

The result of these efforts and incredible work is the AOR's sole side-by-side IBEAR and MEP-12 power plant again providing reliable power, redundancy, the ability to maintain assets without outages and an extension to the lifespan of both sets of assets with reduced run times on each generator. These extraordinary Airmen turned a power plant nearing failure into a system the 386th AEW and all the partners who transit through tent city, can count on.

All credit for this effort goes to the outstanding and deserving Airmen of the 386th ECES. Engineers … Lead the way!

Editor's Note: *Burwinkle is now with the Air Force Installation and Mission Support Center's Detachment 8, Joint Base Langley-Eustis, Virginia. He is a professional engineer, licensed in Ohio and a project management professional.*

Different technologies were used on site to include the digital interim base expeditionary airfield resources and analog MEP-12. (U.S. Air Force photo by Tech. Sgt. Donald Jabaay)

Completing New Horizons during a national weather emergency

By Maj. Peter Sabatowski
823rd Expeditionary RED HORSE

This year's New Horizons exercise in the Dominican Republic was anything but a normal chance to provide construction, medical and other support.

New Horizons, sponsored by U.S. Southern Command and executed through Twelfth Air Force, is an annual training opportunity funded as a combatant commander's exercise engagement. Since the mid-1980s, the Air Force and her sister services have built schools and community centers while providing medical care and more to bolster partnerships among the U.S. and Central American, South American and Caribbean nations. This year's exercise focused on training readiness and providing tangible humanitarian and civic assistance benefiting the Dominican Republic in and around San Juan. Unique challenges tested the readiness and flexibility of the units involved.

The 823rd Rapid Engineer Deployable Heavy Operational Repair Squadron Engineer, or RED HORSE, from Shaw AFB, South Carolina; Marine Corps 8th Expeditionary Support Battalion from Camp Lejuene, North Carolina; Louisiana Army National Guard; and Air Force National Guard 231st civil engineering flight from Missouri teamed up to form the 823rd Expeditionary RED HORSE. The new unit constructed three clinics and a school between San Juan and Santo Domingo, Dominican Republic. The coordination across these joint entities was critical during the initial planning phases through execution. Additionally, the 635th Material Maintenance Squadron from Holloman AFB, New Mexico, deployed to initiate and maintain camp operations as part of the 346th Air Expeditionary Squadron.

In June 2016, planning efforts refined the facility designs from construction, developed bills of materials, and identified personnel and equipment requirements. The tasked units were responsible for determining their own equipment and personnel requirements and shipping them to the Dominican Republic in order to successfully complete construction with organic assets.

Construction of the facilities started in January 2017 with contracted services at the four sites due to military manpower and equipment availability. Quality assurance and control was completed by the 823rd ERHS to ensure utility systems and foundations were completed according to design specifications. During this period, leadership began mobilizing containers, vehicles and personnel to support vertical construction work beginning in April.

Personnel arrived at the beginning of the month and immediately started vertical construction. Within the first 30 days, all concrete blocks had been placed, but roof systems and concrete still needed to be completed on all facilities. On May 1, a massive rainstorm caused floodwaters to rise across a normally passable riverbed, essentially isolating the living compound. Until this point, construction was progressing at a rapid pace and it appeared that all projects would be completed ahead of schedule.

Above, U.S. Airmen and Soldiers build a vocational school in Arroyo Cano, Dominican Republic, in April 2017. The Airmen from Hurlburt Field's 823rd RED HORSE and Louisiana National Guard Soldiers with the 225th Engineer Brigade were part of Exercise New Horizons 2017. (U.S. Air Force photo by Staff Sgt. Timothy M. Young)

An assessment of rainstorm aftermath was accomplished the following morning and roadway passages were eroding because of the water flow. The alternate route, normally crossed by wading through a shallow river, had turned into raging rapids. With heavy rains expected to continue because of the start of the country's rainy season, engineers, support personnel and group leadership were essentially cut off from all construction sites and support. Crisis planning began with two focal efforts: how do we continue construction operations and what do we do with all the personnel and equipment in the compound.

Capt. Matthew Fecke, 823rd ERHS deputy commander, devised a small maintenance and repair team, consisting of the site project managers and craft leads, to traverse the damaged roadway and continue construction operations with a separated incoming Army team and legal officer. Although it was dangerous to cross the roadway, the risk was accepted to try to maintain construction progression. The team, composed of eight Air Force, 17 Army and two Navy personnel, was able to successfully core fill, with buckets, all facilities' walls with 28 cubic meters of concrete and place 19 roof trusses across all four buildings. The efforts of this small team resulted in no loss in the construction timeline.

Meanwhile, I led planning efforts to develop courses of action for all other personnel and equipment isolated from additional water, fuel and support. The planning committee considered all factors of costs for hotel fees, service contracts for base camp operations and fuel requirements necessary to complete construction and maintain support operations. Multiple site visits and key leader engagements with local leadership over the first 48 hours created the underlying assumption that the roadway would not be repaired in a timely manner due to competing priorities — a national weather emergency was declared May 3. Due to the tremendous risk of road failure and the timeline for applicable repairs, the decision was made to relocate construction operations to hotels.

The compound population was approximately 180 personnel. Over the next three days, 100 people redeployed to their home stations. Of those remaining, 63 were assigned to the 823rd ERHS and identified as the bare minimum needed to complete construction. Although billeting was now split between two regions, construction continued to progress and was completed in the next 30 days, making all troop construction work completed in just over 60 days.

The training exercise initially focused on mobilization, construction execution and demobilization, but this year was unique. Exercise New Horizons 2017 further tested crisis management and our ability to adapt and overcome significant challenges. The events that transpired relied heavily upon the planning team's experiences and backgrounds to be able to solve problems and develop a continuation of operations plan with no prior foresight.

In a matter of just 72 hours, we developed, decided and executed to ensure the mission was completed not only on time, but nearly three weeks ahead of schedule.

Various U.S. Armed Forces units support Exercise New Horizons 2017 in the Dominican Republic to assist in construction projects to build schools and community centers, and provide medical care for local residents. (U.S. Air Force courtesy photos)

Army CERL improves energy efficiency

By Brian Clark
U.S. Army Corps of Engineers
Construction Engineering Research Laboratory

The current design practice for most new heating, ventilation and air-conditioning, or HVAC, systems that serve multiple zones is to use variable air volume, or VAV, systems with boxes in each zone. The Department of Defense has a large inventory of energy-inefficient constant volume multizone air handling units, an older technology. As these multizone units continue to age, control systems associated with them are often upgraded due to obsolescence or replaced due to failure.

Because of the common need to perform a controls will retrofit on multizone units, researchers at U.S. Army Corps of Engineers' Construction Engineering Research Laboratory wanted to determine if it would make sense to convert the constant volume multizone units to variable volume multizone units as part of the controls retrofit. In other words, would the cost of bolstering the controls retrofit by adding variable frequency drives outside airflow stations and some additional programming effort pay for itself in energy savings?

CERL researched this question by retrofitting five multizone air handling units -- two at CERL in Champaign, Illinois, and three at Fort Bragg, North Carolina -- and evaluating a year's worth of operational data. The objective of the demonstration was to validate the effectiveness of the retrofit approach in reducing energy consumption, analyze the economics and comfort associated with the upgrade, and develop technical guidance to help installations perform successful retrofits.

Multizone units explained

In a traditional multizone system, the air handling unit contains a hot deck and a cold deck with associated heating and cooling coils. Constant volume multizone air handlers tend to be inefficient because they cannot reduce the supply fan speed when zones in the building do not need full heating or cooling. To deal with the lack of fan speed control, multizone systems blend conditioned air from the hot and cold decks to create a zone air supply temperature to meet the demands of the zone, which leads to simultaneous heating and cooling. Converting a constant volume multizone air handling unit to a variable air volume unit will reduce heating, cooling and fan energy.

Neutral deck units have a deck for unconditioned air to mix with either hot or cold deck supply air to maintain zone temperature set points. Though both traditional and neutral deck multizone units operate fan systems at a constant speed, neutral deck units are more energy efficient since they can take advantage of the neutral air both to avoid mixing heated and cooled air and provide free heating to zones with minimal heating requirements.

CERL retrofit approach

Converting a constant volume multizone system to a VAV system ordinarily requires re-ducting and re-zoning to accommodate VAV box terminal units and is a major renovation effort that can be very costly, time consuming and disruptive to the building occupants. This complete overhaul renovation approach is seldom considered attractive; therefore, multizone systems are usually operated as constant volume systems until they fail or otherwise warrant replacement, due to a building renovation, for example.

The retrofit technique developed and studied by CERL, which is intended to be applied as part of a planned HVAC controls upgrade, retains HVAC infrastructure and leverages simple controls changes to achieve variable airflow. The approach includes the installation of VFDs for system fans and a flow station for the outside air intake. Since air handlers can be operated based on a set schedule or on occupancy sensors, the CERL team implemented and tested both options. Because the approach avoids tampering with ductwork and terminal units, it can be accomplished for a lower first cost with less system downtime and less disturbance to building occupants than a full system retrofit.

Air Handler Unit #	Unit Type	Horse Power	Scheduled Ventilation Energy Reduction	Demand Controlled Ventilation Energy Reduction	Demand Controlled Ventilation Payback
1	2-Deck	8	28 percent/yr	42 percent/yr	7 yrs
2	2-Deck	3	60 percent/yr	64 percent/yr	3 yrs
3	3-Deck	3	63 percent/yr	57 percent/yr	10 yrs
4	3-Deck	3	30 percent/yr	26 percent/yr	never
5	3-Deck	3	40 percent/yr	39 percent/yr	13 yrs

CERL developed standard controls drawings that define the sequence of operation changes required for both traditional multizone air handlers, which were studied at CERL, and neutral deck multizone air handlers, which were studied at Fort Bragg. The CERL control drawings include sequences for modulating fan speed based on critical zone damper position and an optional sequence for demand controlled zone ventilation through room carbon dioxide or occupancy sensors. These control drawings can be used to help implement the CERL retrofit approach when multizone units are selected for controls upgrades.

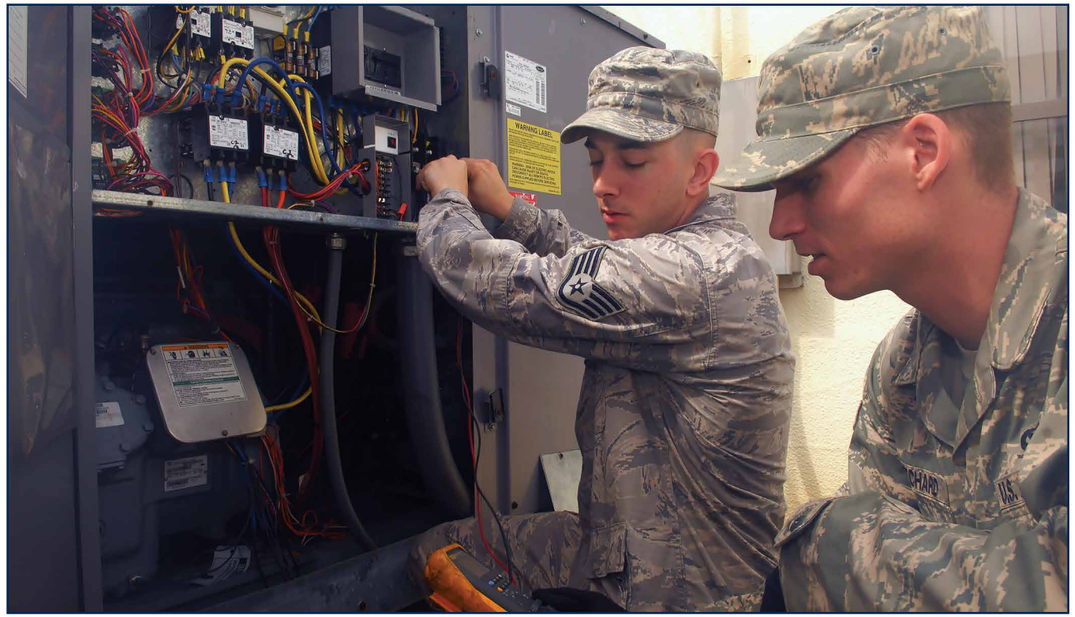
Results

Historical weather data and the performance of the system at various temperatures during the demonstration year were used to determine expected annual energy savings for each system. Our analysis showed that retrofitting traditional hot and cold deck units at CERL and neutral deck units at Fort Bragg resulted in a 26 to 64 percent reduction in energy consumption using either scheduled or demand controlled ventilation. Considering only the additional costs associated with implementing the variable volume conversion as part of an HVAC controls retrofit project, four of the five multizone units had a simple payback within the 15-year lifecycle period. The larger the unit, the faster the payback tended to be due to energy savings being proportional to multizone unit size but with only incremental implementation cost increases; however, retrofits for traditional multizone units as small as 3 horsepower were lifecycle cost-effective.

Along with all of the relevant energy usage data, such as fan, chilled water and hot water, researchers also collected zone temperature and relative humidity data to determine how effectively the retrofitted units were able to maintain occupant thermal comfort. This was important because the retrofit technique was judged on its ability to pay for itself in energy savings while maintaining occupant comfort. Researchers used American Society of Heating, Refrigeration and Air Conditioning Engineers standard 55 metrics to gauge and assess comfort.

The demonstration showed this retrofit technique is viable, readily implemented and in many circumstances will be cost-effective when added to a controls renovation. For more details about this study or to receive technical support in multizone retrofit projects call: 217-373-3338 or DSN: 314-524-9922.

Editor's Note: *Brian Clark, Sean Wallace and Joseph Bush contributed to this article.*



Staff Sgt. Warner Houston and Senior Airman Jace Pritchard, HVAC technicians with the 18th Civil Engineer Squadron, check a refrigerator system at Kadena Air Base, Japan. (U.S. Air Force photo by Tech. Sgt. Angelique Perez)

Celebrating 70 Years of Engineers *Leading the Way*

U.S. AIR FORCE
BREAKING BARRIERS
SINCE 1947

At top, aviation engineers during World War II laid pierced steel planking at a Pacific air base to provide an expedient runway. This new innovative material of its time allowed for rapid construction of temporary runways and landing strips. Today's Air Force engineers use AM2 matting to make a ramp while working with the U.S. Army in Afghanistan to beddown combat aviation units. We celebrate civil engineers providing support and leading the way as the Air Force turns 70 this year. Look for further coverage on: www.afcec.af.mil

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