MAGAZINE OF THE UNITED STATES AIR FORCE

Airman

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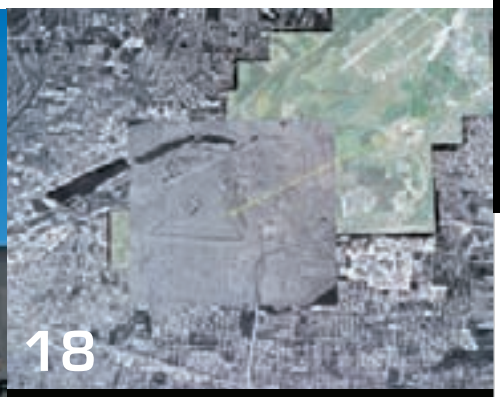
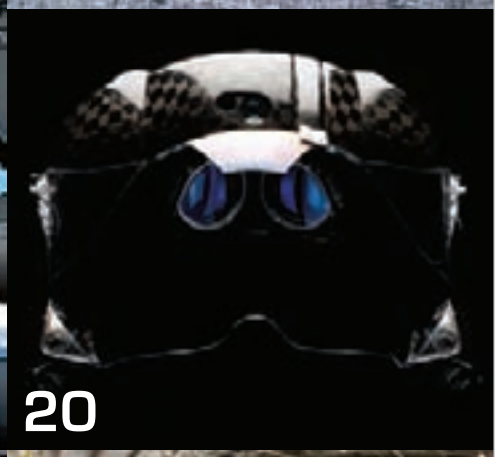
JANUARY-FEBRUARY 2010

IMAGINATION TO REALITY

THE FUTURE IN PLAIN SIGHT

Airman





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On the Cover

The new F-35 Lightning II helmet literally plugs the pilot straight into the aircraft. The direct connection puts flight information directly in front and lets the pilot see through the hull of the aircraft.

photo support by Lance Cheung
illustration and design by G. Patrick Harris

COMMENTS

Got something to say about Airman? Write us at **airman@dma.mil,** or visit **www.AIRMANonline.af.mil,** to share views with fellow readers.

INSPIRATION OF OTHERS

I just wanted to comment about the article on page 24, [Her Body is a Battlefield, November-December 2009] issue of Airman magazine. It brought tears to my eyes, as we know the Mulumba family all too well. This is one remarkable family!

Despite the "monster" they dealt with, this family was such an inspiration as we struggled with our own "monster" when my son was diagnosed with leukemia.

Captain Mulumba's professionalism, dedication, strength, courage, faith, spirit, love and kindness she shared with not only Carol but all of her patients. The pediatric hematology-oncology family is a very close knit group. When one struggles we all do; it affects us all.

So, I give thanks for being blessed by this wonderful family, to the Air Force and the doctors, nurses and medical staff at Wilford Hall Medical Center.

Thank you for this feature story.

Respectfully,
Kristina Estopier
San Antonio, Texas

What an inspirational story. It is a miracle and breathtaking. I kept on reading it over and over. It is amazing to ponder what this little girl went through with her family and how the Air Force took them the way they are 100 percent. I have so much respect for the military. I have also learned to appreciate what I take for granted. Well written.

Suzan Williams
Michigan

TOOLS OF THE TRADE

I've got a lot of Aeromedical Evacuation stories. [Tools of the Trade, November-December 2009] I was at one of the first KC-135 bases to start running the missions when the C-9 retired. From our war wounded to heart patients. It was an incredible mission and I was proud to be part of it.

Kevin Taggerty
Reprinted from the Airman magazine fan page on Facebook

I knew a lot of the Aeromedical Evacuation guys at Ramstein Air Base, Germany back in the mid-90s. I miss those days, had too much fun and not enough time.

Billy Howard
Reprinted from the Airman magazine fan page on Facebook

CALENDAR CONGRATS

"My AFJROTC cadets love the magazine and calendar in this month's issue [AIRMAN 2010 Planner]. Keep up the good work and thanks."

Robert Gilliam
Reprinted from the Airman magazine fan page on Facebook

AIRMAN CONTRIBUTORS

The story on page 35 [Combat Stress, November-December 2009] did not have a byline. It was written by Staff Sgt. Stacia Zachary while deployed. I'm happy to say she arrived home safely and is back to work in our office. Keep up the great work Airman Magazine!

Leslie Brown
Team Eglin Public Affairs

Editor's Note: *Thank-you Staff Sgt. Stacia Zachary. Your byline should have been included with the story.*

Photo Contest

Staff Sgt. Sharner Smith, a knowledge operator with the U.S. Air Force Aerial Demonstration Squadron reads the latest issue of Airman in the Thunderbirds hangar. The photo was taken and submitted by Staff Sgt. Kristi Machado. Sergeants Smith and Machado teamed up to win the most recent fan photo contest on the Airman fan page on Facebook. Fans are asked to send in a photo of themselves reading Airman in their work or off-duty environment. All Airman fans are eligible to enter. Full details and rules are posted on the Airman fan page at www.facebook.com/Airmanmagazine. If there is enough support, Airman will run the best fan photo here in the Airmail section of each issue. Both the photographer and the subject will receive credit.

Airman

Official magazine of the U.S. Air Force
January-February 2010, Volume LIV, Number 1

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Airman is published bimonthly by the Defense Media Activity for the Secretary of the Air Force Office of Public Affairs. As the official magazine of the U.S. Air Force, it is a medium of information for Air Force personnel. Readers may submit articles, photographs and artwork. Suggestions and criticisms are welcome. All pictures are U.S. Air Force photos unless otherwise identified. The opinions of contributors are not necessarily those of the Air Force.

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DISTRIBUTION

One copy for every three Airmen and civilian workers.

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Frontline Duty

TAKING CARE OF DETAILS DAY AND NIGHT

Sometimes the most important part of any mission lies behind the scenes. It isn't found in front of the camera and often no one sees the many steps and hard work it takes to get to a single, visible objective.

The glory may be in the afterburners and at the end of every successful mission, but it's born in the details well behind the scenes. Things like making sure training gear is clean and ready for the next exercise or munitions are built to specifications are the real bits of glory. Sometimes it's all about waiting and at other times it takes speed.

You may find the ingredients for success all along the way and never see them for what they are. From up close, the signs of success are just another exercise, one more maintenance check or another day of training. Every now and then, the glory of serving is on the sidelines of the biggest football game of a season or on the ice.

From around the service, this month's Front Line Duty takes a look at some of those moments. Enjoy and know that every task is important to the success of today's Air Force.

—Airman staff

CLEAN AIR DRY Dozens of chemical protective masks lie in a basin after a wash and turn in at the 35th Logistics Readiness Squadron supply warehouse at Misawa Air Base, Japan. The masks were redistributed to Defense Department organizations that still use this type of mask.

photo by STAFF SGT. SAMUEL MORSE

COLD STEEL Ellsworth Air Force Base, S.D. got its first big snowfall of the winter season. The snow turned the B-1B Lancers white. The B-1 serves as the supersonic component of the Air Force's conventional bomber force, along with the subsonic B-52 and B-2 Spirit.

photo by AIRMAN 1ST CLASS COREY HOOK

READY SET Staff Sgt. Crystal Thompson, Tech. Sgt. Afton Meeks and Senior Airman Anna Steinfeldt of the 419th Medical Squadron look over the "injuries" of Airman 1st Class George Couington at Hill Air Force Base, Utah, during a base operational readiness exercise. Airman Couington is from the 75th Force Support Squadron.

photo by STAFF SGT. KYLE BRASIER

SWITCH OUT Staff Sgt. Nick Frazier configures a maintenance stand in preparation to change the No. 2 engine on a KC-10 Extender aircraft at a base in Southwest Asia. Sergeant Frazier is a 380th Expeditionary Aircraft Maintenance Squadron jet propulsion systems mechanic deployed from Travis Air Force Base, Calif. He is a native of Buffalo, N.Y.

photo by TECH. SGT. CHARLES LARKIN SR.

COBRA CARGO Loadmaster Senior Airman Wesley Springs prepares to guide in another Egyptian vehicle on board a C-17 Globemaster III in Cairo, Egypt for the Iron Cobra exercise. Senior Airman Springs is assigned to the 15th Airlift Squadron, Charleston AFB, S.C. Iron Cobra is a multi-national exercise in which Airmen teach Egyptian forces how to weigh and load vehicles onto Air Force aircraft.

photo by STAFF SGT. QUINTON RUSS

FALCON LOAD Technical Sergeant Chris Hickman with the 169th Maintenance Squadron, McEntire Joint National Guard Base, S.C., is building bombs to use during the 2009 Eager Tiger 10, Falcon Air Meet. The FAM took place at Mwaffaq Salti Air Base in Al Azraq, Jordan. The goal of the FAM is to train and work through friendly competition between the air forces of the U.S., Middle East and other F-16 users from around the world. In this year's meet, F-16 units from Belgium, Jordan and the U.S. competed in maintenance and operations events.

photo by TECH SGT. CAYCEE COOK

BIG SPLASH Staff Sgt. Brian Peters practices using a travel stroke to swim with his full equipment on during water survival training at the Soto Cano Air Base, Honduras, swimming pool. Sergeant Peters and his team members trained in several water-based tactics to prepare them to operate safely in rescue and recovery missions.

photo by TECH. SGT. MIKE HAMMOND

WAY IN THE BLUE U.S. Air Force Academy Cadet Cobb Brandon shows his team spirit and game face during ESPN's "College GameDay" broadcast from the U.S. Air Force Academy for the Air Force vs. Army football game. College GameDay's latest Academy visit is part of ESPN's salute to veterans of the U.S. Armed Forces, which included a week of programming — "America's Heroes: A Salute to Our Veterans" — culminating in a special "SportsCenter" edition from West Point on Veterans Day. This was "College GameDay's" third visit to the Academy.

photo by STAFF SGT. BENNIE J. DAVIS III

RESPONDER REST Senior Airman Steve Forlong, 532nd Expeditionary Security Forces Squadron desk controller, waits in the driver seat of a Humvee to conduct a patrol mission. He is a member of the instant response force which conducts patrols around Joint Base Balad, Iraq.

photo by SENIOR AIRMAN CHRISTOPHER HUBENTHAL

DELIVERY DISCOVERY Master Sgt. Michael Lang inspects the cargo area of the newest C-17 Globemaster III delivered to Charleston Air Force Base, S.C. Accompanied by a Reserve crew, Lt. Gen. Charles Stenner Jr., commander of Air Force Reserve Command, flew it to Charleston.

photo by DEBRA BALDWIN

CHECK THIS U.S. Air Force Academy Cadet Brandon Johnson checks a Bentley University player during a hockey game at the academy's Cadet Ice Arena in Colorado Springs, Colo.

photo by JOHNNY WILSON

TURN, TURN, TURN Senior Airman Ricky Lose, a 19th Logistics Readiness Squadron refueling maintenance journeyman at Little Rock Air Force Base, Ark., prepares to check the Y strainer on an R-11 refueling truck during a six-month scheduled service inspection. The large trucks can hold up to 6,000 gallons of fuel and are used primarily to refuel the C-130 Hercules fleet at the base.

photo by STAFF SGT. CHAD CHISHOLM

WAITING IT OUT Senior Airman Jedidiah Wallace, a 28th Maintenance Squadron weapons load crew member, watches for the all-clear signal before towing damaged parts to a repair shop after finishing maintenance on a B-1B Lancer aircraft at Ellsworth Air Force Base, S.D. Weapons load crew members work to ensure bomb bays are working properly and are mission ready.

photo by AIRMAN 1ST CLASS JOSHUA J. SEYBERT

HIS BITE IS WORSE Staff Sgt. John Coddington restrains Gizmo, a 12-year-old Belgian Malinois. Sergeant Coddington and Gizmo are deployed to the 380th Expeditionary Security Forces Squadron in Southwest Asia from Vandenberg Air Force Base, Calif. The two continually train together, cementing their association.

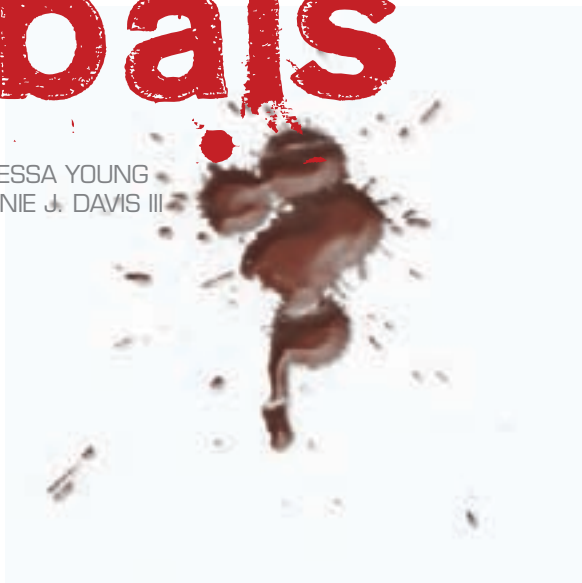
photo by SENIOR AIRMAN STEPHEN LINCH

SPIKING THE PUNCH Tech. Sgt. Michael O'Toole loads a burn box with training ammunition in preparation for a controlled detonation. Explosive Ordnance Disposal members from the 386th Expeditionary Civil Engineer Squadron are responsible for the destruction of expired or unusable ammunition. The flight also disposes of expired aircraft flares.

photo by STAFF SGT. SHAUN EMERY

Aircraft Cannibals

STORY BY STAFF SGT. VANESSA YOUNG
PHOTOS BY STAFF SGT. BENNIE J. DAVIS III



A nose-less C-5A with its 13.5-feet high open cargo area appears poised to take a bite of it's sister ships while sitting in Davis-Monthan Air Force Base's Boneyard. Although these aircraft are retired from flying, they continue to give of themselves in parts to the service of the nation.

As a young boy Bill Amparano thought working at a place where thousands of old aircraft are stored sounded like a dream job. After his first childhood visit, he said he knew this was where he wanted to work someday. About 30 years later, he started living out his dream under the hot sun near Tucson, Ariz.

The number of retired and excess aircraft stored on the 309th Aerospace Maintenance and Regeneration Group's 2,600 acre desert facility rivals the number of aircraft in the active Air Force inventory, including more than 4,000 aircraft from different services, agencies and countries. Among them are planes flown by World War II aces and 9/11 first responders.

While some aircraft are stored here until they can be returned to service, others will never be flown again, but are still useful as parts for today's Air Force. Aircraft mechanics like Amparano are assigned to reclamation teams that pull these parts to help sustain today's active fleet. In fiscal 2009, 309th AMARG reclamation teams at Davis-Monthan Air Force Base, Ariz., pulled more than 18,000 parts, saving the Air Force about $633 million compared with the cost of purchasing new ones.

In December, Amparano celebrates his 21st anniversary as a structural and aircraft mechanic with the 309th AMARG. He said each day working with the priority removal team still brings a new adventure.

His latest priority removal task is to pull a section of cargo floor from a C-5 Galaxy. This floor section will be used for corrosion testing at the Air Logistics Center at Robins Air Force Base, Ga. The results will provide information to benefit the entire C-5 fleet. But it hasn't been an easy task. For the past two days, he's been crouched in a hole under the cargo floor, tediously grinding and hammering rivets. Each one takes two to three minutes to punch through the floor and there are thousands of them. The section is 48 feet long and he'll need to spend another day under the floor to finish the job. And, though he wasn't working out in the merciless Arizona sun, two days packed in the stifling space under the floor, where temperatures can reach more than 105 degrees, weren't much better. He and other aircraft mechanics on the 577th Commodities Reclamation Squadron team have been working on this project for a week. Sometimes they called in additional help and some days they worked after hours to get it done.

Inside the aircraft, Amparano removes rivets he can't reach from below. Amparano said he hopes to have this floor rolled out in another day. With about half of the job complete, his partner, Virgil Richardson, another mechanic and priority part puller, stopped hammering long enough to laugh at that estimate.

Looking down the long row of rivets, Amparano reconsidered his optimistic forecast. "Well, maybe by the end of the week then," he amends. Amparano returned to kneeling on the steel floor and set his grinding tool to the next rivet.

Bill Amparano, a structural mechanic, takes a moment to discuss the removal process of a section of C-5A Galaxy cargo flooring while his partner, Virgil Richardson, grinds down the rivets holding the floor section together. Both mechanics have been working tirelessly to punch out thousands of rivets in order to remove the requested part.

During a typical workday, mechanics on the priority team, like Amparano and Richardson, could pull parts from any of more than 70 different airframes. And even after 20 years, he said he still learns something new each day.

"No matter how many years you have here, you're always going to come up against something new that you've never done before," Amparano said.

When these aircraft parts aren't being used to keep operational aircraft in flight, they can be used as training mockups or, as in the case of the C-5 cargo floor, for research and development.

There are two types of reclamation: programmed reclamation and priority reclamation. With programmed reclamation, the aircraft's owners create a save list of items to be removed when the airframe arrives. Those parts will be refurbished and stored until needed.

Priority reclamation is used when someone needs an aircraft part right away. Once the request is sent to the AMARG, aircraft

Sal West, a preservation technician, straddles an F-4 Phantom while applying sealing tape to the canopy before spraying it with a rubberized coating to protect the aircraft from environmental damage.

Virgil Richardson, an aircraft mechanic, reviews a work-order in the rear door frame of a C-5A Galaxy. Richardson has been working for two weeks inside the dark belly of the aircraft, pulling parts to replenish the fleet. During the summer temperatures inside the aircraft can reach 105 degrees or higher.

mechanics pull the part. Once pulled, it will be cleaned, inspected to ensure it meets the user's specifications and shipped. Depending on the size of the part, it can be shipped the same day. If a request comes from a maintainer downrange with a grounded aircraft, it's because there's no other place in the supply chain to get it.

In that instance, a planning team's work order will classify the pull as a "hot item." In most cases, if a part is needed for an aircraft downrange, it will be pulled, inspected and shipped immediately.

For Jim Blayda, an aircraft mechanic on the priority removal team, pulling "hot" parts that contribute directly to the warfighter is a fulfilling experience.

"Anytime we are available to make it happen, even if it's after hours, that's what we do. We're in it; one team, one fight," he said.

Though Blayda, a native of Tucson, never served on active duty, working for the 309th AMARG is a tradition in his family. His father, father-in-law and brother have all worked here.

After seven years of pulling parts, he said each day, each job and each aircraft still offer different challenges.

"Even if I have a list of 30 parts from 30 different aircraft, none of them will be the same," he said. "No two aircraft are ever the same. You never know what to expect. You learn a lot out here."

Part of the learning experience includes becoming acclimated to working in 100-degree or hotter temperatures, constantly moving to avoid Desert Harvester Ant bites and watching out for coyotes or rattlesnakes.

> "No two aircraft are ever the same. You never know what to expect. You learn a lot out here." - Jim Blayda, aircraft mechanic

To help the planes withstand the desert climate and wildlife, they are put through a vigorous preservation process. When aircraft arrive, their storage category is determined and they are preserved based on their category. Any parts that may corrode are removed, the fuel is drained, a preserving fuel is run through the engines and they are drained again. Then the aircraft is washed, any egress systems or other explosive materiel is removed and finally, it's towed to a designated location.

Once it's parked, a team applies a light sealant tape and two layers of a spray-on black, rubbery coating, to seal the doors and hatches. A white layer of the coating covers over the black layer and keeps the temperature inside the aircraft within 10 to 15 degrees of the temperature outside. The amount of coating used and where it is used on the aircraft depends on the storage category.

There are three main storage categories: 1,000, 2,000 and 4,000. The 1,000 category is the war reserve. Since these aircraft may be regenerated, they have more parts to preserve and will be covered in the most rubberized coating. Every four years, they are reprocessed just as they were when they first arrived.

The 1,000-category signifier means the parts pullers aren't allowed to remove anything unless there's no other source. Even if there's an aircraft grounded that needs the part desperately. Air Staff officials have to approve requests before anything is pulled. If the pull is approved, and once there's a spare available again, the user is required to return a serviceable part to put back on the stored aircraft.

Aircraft mechanic Matthew Rinaldi searches for a priority one part inside a Navy MH-53 Sea Dragon at the "Boneyard," at Davis-Monthan Air Force Base, Ariz.

Fred Vega, an aircraft mechanic, removes a piece of the trailing edge from a flap on a C-5 Galaxy at Davis-Monthan Air Force Base, Arizona's "Boneyard." The part will be used for structural testing with the Boeing Company.

Aircraft mechanics, Fred Vega, left, and Matthew Rinaldi, right, remove an aircrew seat from a KC-135 Stratotanker at the 309th Aerospace Maintenance and Regeneration Group, more commonly known as the "Boneyard."

Aircraft in the 2,000-storage category can be used for parts as long as the owner or the system program manager approves the pull.

The 4,000-category is considered the free-for-all category. Anything that can be reused will be removed.

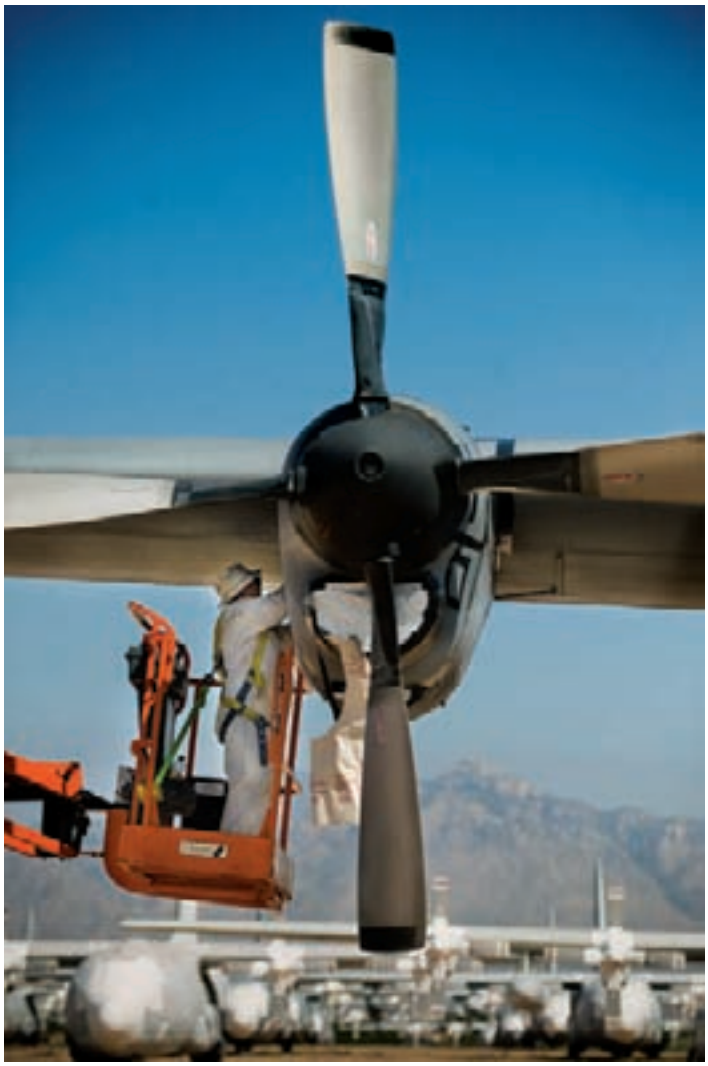
While the 1,000 category aircraft are sleek and white, masked in the rubber coating, those in the 4,000 category are usually just miscellaneous pieces surrounding what's left of the airframe.

Jerry Ferguson has been pulling parts here for more than a year. He served 21 years in the Air Force, from the Vietnam War through Operation Desert Storm. He's a self-proclaimed fighter-plane guy who maintained F-111D Aardvarks, all four models of the F-16 Fighting Falcon and knows the F-4D Phantom inside and out. During his time here, he's been reacquainted with some of the same aircraft he maintained during his uniformed service.

"There are some F-4s out here that I know . . . quite personally," he said. "That one over there — 815 — every time one of the vari-ramps opened up, it would bust the hinge pins and we could never figure out why.

Ferguson laughed a little and said, "I figure for my age, I fit in really well with these airplanes."

Many of the mechanics pulling parts from these aircraft are former Air Force maintainers and seeing the disassembled aircraft brings nostalgic feelings to some.



Gerardo Llamas, a preservation technician, covers the intakes and seams of a newly retired C-130 Hercules. For preservation, the aircraft must be sealed and then covered with a spray-on coating to protect it from the Arizona desert.

Aircraft mechanic Virgil Richardson grinds rivets holding together a 48-foot section of cargo flooring in a C-5A Galaxy. Each rivet takes two to three minutes to grind and punch through the floor. The part is being removed for use in corrosion testing.

Jim Blayda, a priority parts mechanic, works under the wing of an F-4 Phantom removing a check valve from the landing gear. The valve was requested to support the QF-4 drone program.

"That's the hardest part; seeing an aircraft that you used to maintain sitting here being torn apart for pieces when your whole life was based on making it fly," said Dave Jordan, the 309th AMARG lead planner for reclamation and a retired Air Force helicopter crew chief.

According to Jack Kruger, the 578th Storage and Disposal Squadron storage flight chief and a retired Air Force crew chief for many of the airframes, some components on these aircraft are interchangeable. Maintainers can switch some parts between F-15 Eagles and F-16 Fighting Falcons and between C-130 Hercules aircraft and KC-135 Stratotankers. Also, since many military aircraft are made by the same manufacturers, parts are useful across the services. The Air Force F-111 Aardvark's landing gear fits the Navy A-7 Corsair II. The Navy ES-3 Shadow has the same engine as the A-10 Thunderbolt II and the C-130 Hercules engine is the same in a Navy P-3 Orion.

"You'd be amazed about how many parts are interchangeable like that," Kruger said.

The 309th AMARG leaders are focused on finding ways to save money for their organization and their customers.

Bob Foley, the chief of plans and programs for the 309th AMARG, supervised the group's Air Force Smart Operations for the 21st Century efforts. Foley started working at the 309th AMARG 35 years ago as an aircraft mechanic, pulling parts from aircraft. Today, he's working with organization leaders to build a strategy to make better use of 309th AMARG's capabilities.

Foley said one of the goals 309th AMARG officials, Air Force Materiel Command, A4 and Global Logistics Support Center officials are working toward is re-establishing the programmed reclamation effort.

In the past few years, AMARG officials received a large number of aircraft for storage, including C-130s, F-15s and F-16s. "These aircraft have a level of continued support and sustainment needed in the field, which calls for parts requirements," he said.

Foley predicts AMARG officials will continue to receive a large number of current-model aircraft and they are working on improving how they recover parts and making the parts available quickly so they can be used to sustain the fleet.

"We want to see the best use for these parts," he said.

Foley is well past retirement eligibility, but said before he hangs up his hat he wants to see some of the dramatic improvements his team's been working on come to fruition.

"The quality of workmanship . . . is of exceptional value to the Air Force and to the taxpayer," Foley said.

"I think overall that's what I'm most proud of . . . what we contribute," said Foley. "It's very valuable, but it's very hard to put a price on it. What we produce is much more valuable than what the dollars reflect."

Foley said contributing factors like weather, equipment, variety of work all contribute to the value of the work at the AMARG. The less tangible contributions include history and memories as the team pops out a few thousand more rivets to make today's aircraft fleet better.

Following an aircraft part

At 11 a.m., Pete Paganini, the supervisor of the priority parts removal team, and Steve Noel, a work lead manager, receive a priority removal work order from the Naval Air Systems Command in Philadelphia.

A Navy P-3A Orion in Point Mugu, Calif., is on the ground in need of an attitude interface assembly. It's the part of the attitude direction indicator and flight directional system that makes sure both pilot and co-pilot have accurate information about the aircraft's flight angle.

People in the Navy supply chain contacted the 309th Aerospace Maintenance and Regeneration Group as a last resort for supply support.

Paganini and Noel are managers in the priority removal chain, but since this part is needed right away, they set out to remove it themselves.

According to their inventory list, this avionics part is available in two P-3s in storage. Once they arrive at one of the P-3s listed, they verify the tail number and review a diagram that identifies where the part is on the aircraft, the part number and how to remove it.

This part is located at the back of the flight deck in an electronics bay inside the aircraft wall. Because of where it is located, Noel has to climb into a crawlspace in the bay wall to pull the part out. None of the sunlight from the open door reaches this far into the aircraft, so Noel's only light source is a flashlight held by his partner.

After the part is detached, the part number is matched to the paperwork and both are immediately taken to the reclamation building.

Once parts are brought to the reclamation building, they are placed into different colored bins depending on their precedence. Priority parts are put into red bins, which are processed quicker and shipped out the same day. Save-list parts, which are taken from the aircraft upon its arrival, are put into blue bins. Routine reclamation parts are put into gray bins.

The attitude interface assembly is placed in a red bin. Since the part has spent some time in the desert, the first step is cleaning. Most electronic parts, like this one, are just wiped down to remove dust.

Once the part is cleaned, it is sent on a conveyor belt to an inspection station. Here the part number is verified again and matched to the work order. Since this part needs to be sent out right away, this is the only inspection the team will conduct before pushing it along to shipping. If requested, inspectors can perform more thorough examinations in back shops or with non-destructive inspection equipment.

Once the item is inspected, it continues down the conveyor belt to the shipping section. By 3 p.m., the part is packed and ready to be shipped to the customer.

On Oct. 5, the part was received by Point Mugu logisticians. On Oct. 6, the part was installed, and four days after 309th AMARG officials received the request, the aircraft was fully mission capable.

by Staff Sgt. Vanessa Young

INTELLIGENCE · SURVEILLANCE · RECONNAISSANCE

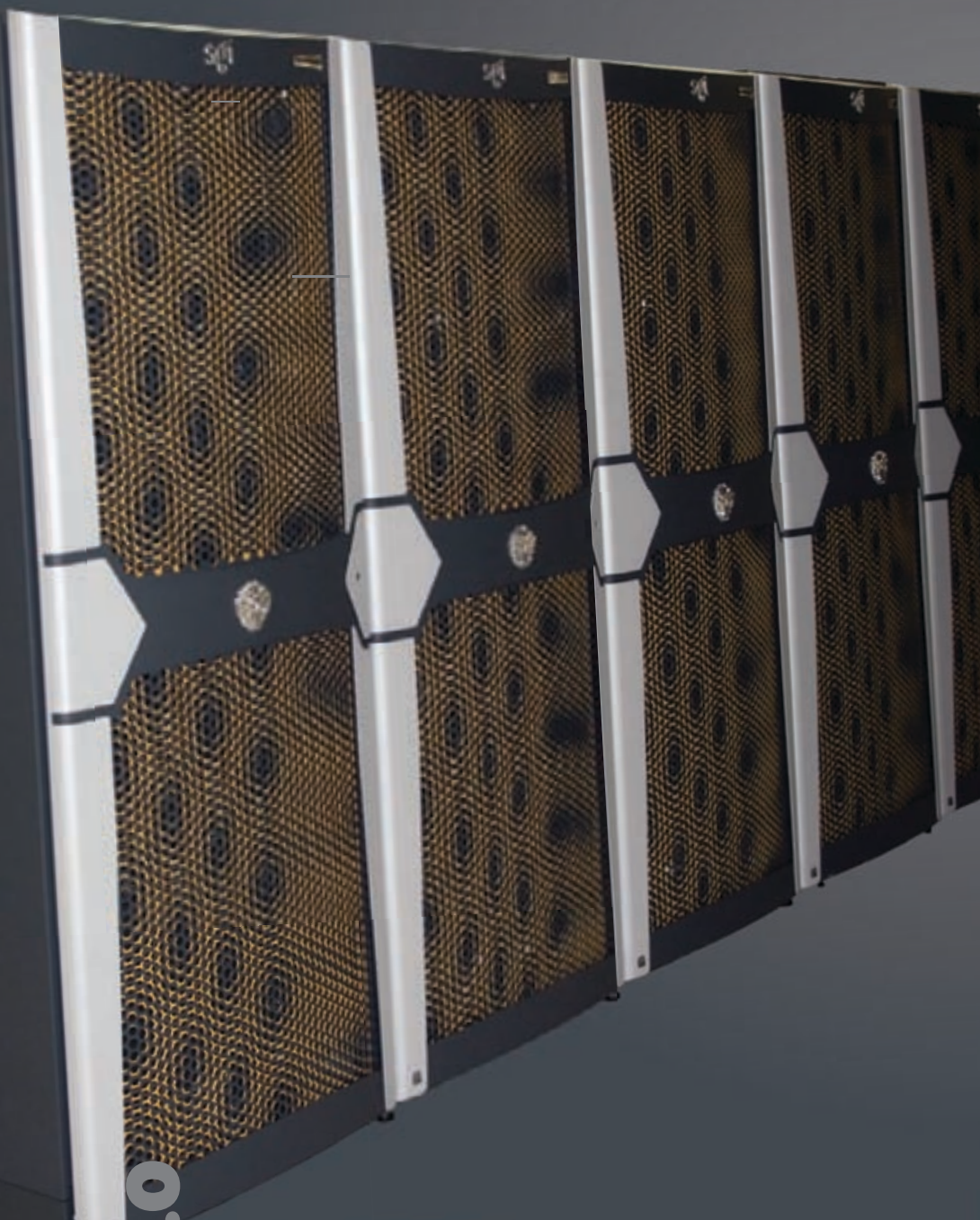
SUPERCOMPUTER 3 GIGABITS PER SECOND

no.5

no.4

courtesy photo

The supercomputer combines images from several sources into one composite, three-dimensional view.



MORE THAN ON THE RADAR

AIR FORCE RESEARCHERS TURN RADAR IMAGES INTO REAL-TIME AWARENESS

STORY BY STAFF SGT. J. PAUL CROXON

A convoy rolls down a dirt road in a rugged and hostile environment. Airmen sweat in the afternoon sun as they travel mile after dusty mile. They know they are a target, perhaps the only target for miles around. The convoy rounds a bend and, as if to validate their hunch, a disabled vehicle sits on the side of the road. The question is, should they choose plan "A" and drive on by, or plan "B" and call in explosive ordnance disposal technicians?

This scenario could happen any day in any war zone. It also could be played out in a computer game where players experience and see the battlefield in strikingly realistic ways, thanks to powerful computer processors and graphics cards. Computer gamers drive the technology that renders this vivid imagery and realistic graphics. What they might not know is that the same technology used to build the most recent virtual battlefield may one day be used to protect Airmen in the real world.

Engineers at the Air Force Research Lab Sensors Directorate have put a supercomputer to work, listed as one of the fastest computers in the world when it was built, translating vast amounts of raw data from airborne synthetic aperture radars into detailed pictures of an area roughly five kilometers square.

The computer isn't super in size. It shares a room with two other supercomputers and is about the size of a small refrigerator. It's the smallest and most powerful of the three.

Known as Gotcha, the computer and associated systems are being used as a virtual lens that focuses a radar beam to produce near real-time pictures of an area. Those images can be layered on each other and, using complex algorithms, the computer can automatically tell what has changed from one picture to the next. For instance, it can detect a new vehicle outside a building and, like a high definition DVD player, rewind the images to see when the vehicle left and what direction it came from. It can even detect human activities.

"This elliptical path was made by human footprints on grass," said Dr. Michael Minardi, Gotcha's program manager, as he points out a running track shape highlighted in red on the proof-of-concept display. "This is actually detecting the compacted grass on the ground."

Now that the proof-of-concept is done, the next step is making the system transportable and usable by the warfighter. Numerous hurdles must be overcome before that can happen. Perhaps the most difficult hurdle has been experienced by anyone who has taken a shower with other faucets running at the same time. Just as water pressure is limited by the diameter of the pipes in a house, the data going into the computer and out from the computer is limited by bandwidth.

"The radar data stream is about 3 gigabits per second," said Capt. Matthew Judge, an electrical engineer and the radar exploitation team lead. According to Captain Judge, the data collected amounts to terabytes of each day. To put it into perspective, one terabyte is nearly 1,500 compact discs worth of data. "We need to find ways to increase bandwidth from the radar to the computer and back out, as well as ways to store the data," he added.

A computer able to crunch that much data is indeed super by nature. The next step is making it deployable. Yet, researchers say the unique mission of the computer, to analyze and render detailed images, creates a unique set of problems, but the solutions could produce a field-ready system sooner than expected.

"The algorithms we use are uniquely applicable to [graphics processing units] like the ones used to render video games," said Captain Judge. "We've determined that a system made up of about a dozen high-end GPUs would have the necessary processing power to render the images."

Though the average gamer might wince at spending hundreds of dollars on the latest video card, the solution hypothesized by AFRL researchers is very inexpensive in terms of the potential lives saved.

"Imagine being able to monitor an entire city with this system," said Dr. Minardi. "The computer would alert you to changes in the battlefield; red-fled, blue-new. We're even looking at bringing the capability to a handheld device so the individual warrior on the ground is in control of his own ISR (intelligence, surveillance and reconnaissance) picture."

So, what does this mean for the Airmen on the ground? With this system they could choose option "C" and see that it was the enemy who left the vehicle loaded with explosives. They also could see if the enemy is still there. Gotcha!

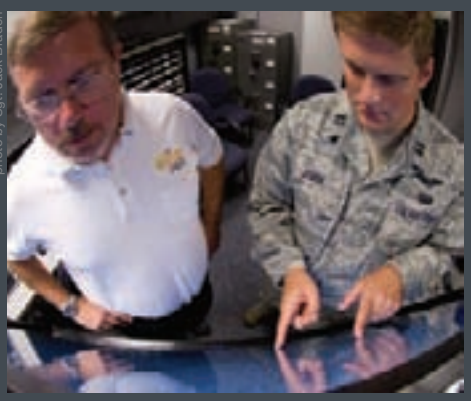


photo by Sgt. Jack Braden

Dr. Michael Minardi and Capt. Matthew Judge, researchers on the Gotcha supercomputer program use a touch screen to interact with a composite image created by several sources of airborne radar.

BLURRING THE MAN AND

STORY BY STAFF SGT. J. PAUL CROXON ✪ PHOTOS BY LANCE CHEUNG
DESIGN BY G. PATRICK HARRIS

photo illustration by G. Patrick Harris

LINES BETWEEN MACHINE

Like a prop from a science fiction movie, the F-35 Lightning II's high-tech helmet looks like something from the flight deck of a flying saucer rather than the cockpit of one of the largest defense programs in history. If the bulbous shape and carbon fiber construction didn't already set it apart from other helmets, the cord running down the back to connect the helmeted pilot directly into the aircraft makes it completely unique.

It's this aircraft/pilot connection that sets the F-35 apart from other aircraft. According to Jon Beesley, Lockheed Martin's chief F-35 test pilot, the helmet eliminates the need for a separate, traditional-style heads-up display by projecting the information directly onto the visor.

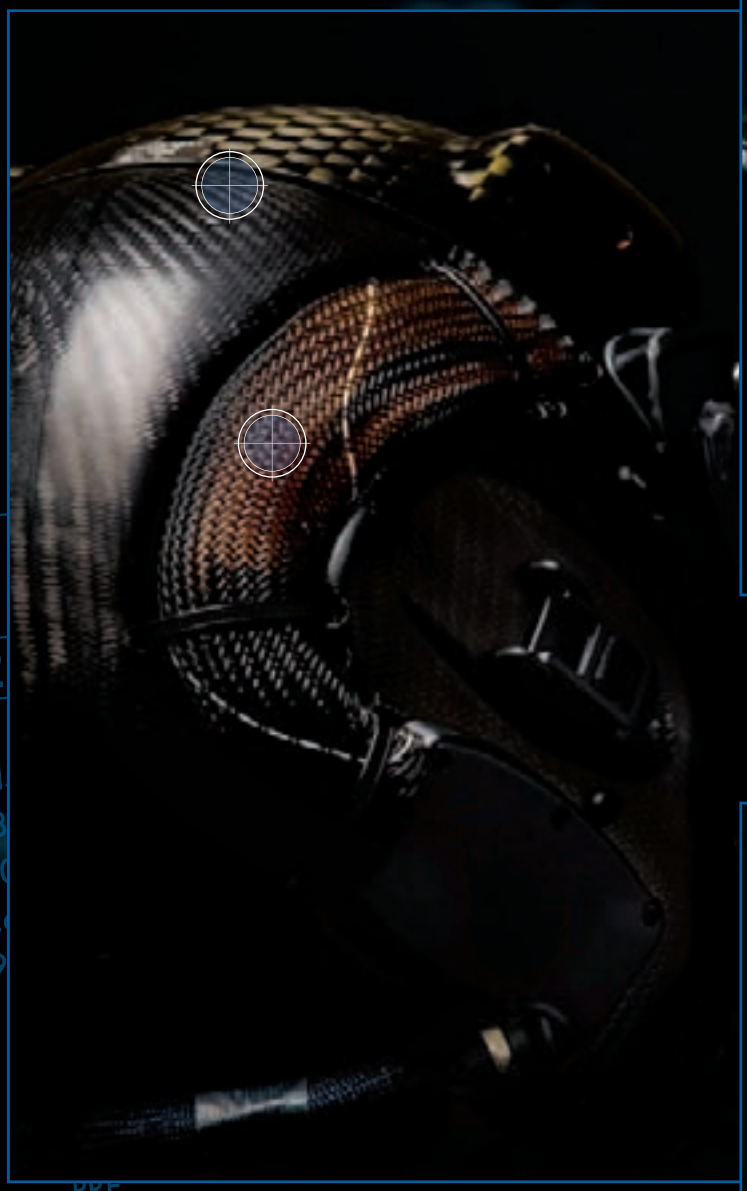
"I've flown with a lot of helmets in the past 27 years," he said. "After flying with this helmet, you eventually forget that it is a display. It becomes natural."

He added that eventually the cockpit integration will include voice commands for basic tasks.

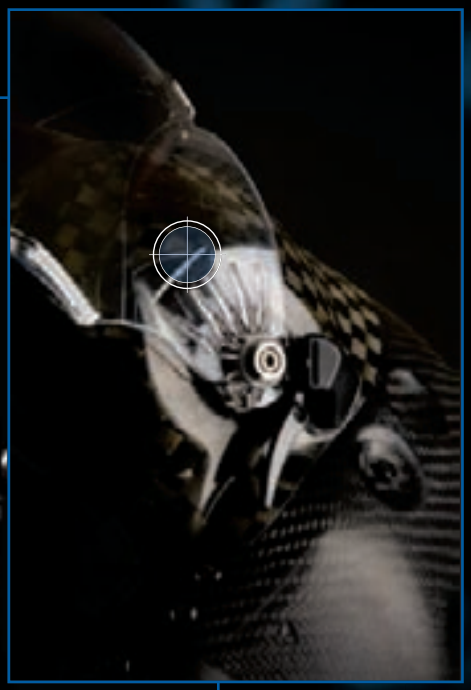
The helmet-mounted display system, or HMDS, shows content tailored to the pilot's view. When the pilot looks left or right, the information displayed on the visor changes based on pilot preference.

During a normal flight, the pilot can see flight information like altitude and air speed. Now, add some other air traffic. Even before the pilot sees the other aircraft, the HMDS system marks the object on his visor to locate, identify and track the potential threat. If the aircraft is hostile, the pilot can cue weapons without looking down at the instruments in the cockpit, because that information is also available on his visor. This works even for threats that are not in the air. If the connected pilot flies a ground support mission, the helmet allows the pilot to target ground-based threats like it does enemy aircraft.

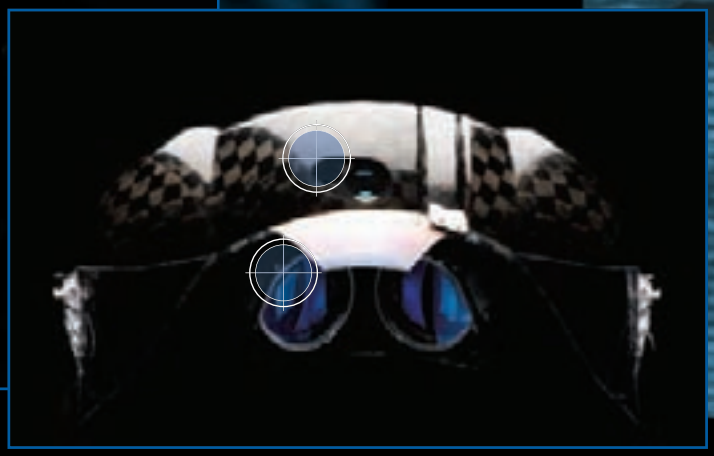
What's more, even after a pilot has spent his entire weapons load, he and the aircraft remain a viable weapon through sharing



The shell of the new F-35 Lightning II helmet is made of a lightweight composite of carbon fiber. The woven mesh material houses the wiring harness that links the pilot to the aircraft through cameras, projectors and night vision equipment.



About 8,000 Air Force pilots will be custom fitted for the helmet and each visor will be custom cut.



The helmet features binocular-wide field-of-view and an integrated day/night vision capability.

targeting capability. According to Dave Perkins, lead engineer of HMDS integration, pilots can mark new targets by simply looking, pointing and clicking a designator as they fly by. That precise targeting information can then be relayed via the aircraft's data-link system to other combat aircraft in the area.

Projecting information on the visor isn't the only trick this helmet possesses. Mix a little technology with some external cameras, then plug that into the HMDS and the pilot is now able to "look through" the hull of his own aircraft.

"You could imagine it like putting cameras all over your car, on the roof and undercarriage, and looking through those cameras to see what's happening below and above you," said Mr. Beesley. "The F-35 is able to do this seamlessly."

In the dark, a night vision camera mounted near the front of the helmet enhances this feature by overlaying targeting and flight information on the night vision images.

Blending all this technology, a heads-up display, night vision, and a helmet-mounted cueing system into a lightweight flight helmet that still protects a pilot's skull took two major prototype revisions. By the time production and fielding are finished, more than 8,000 F-35 pilots will each wear a custom fitted HMDS that will make quick decision making easier.

"I started flying in an F-4 Phantom," said Mr. Beesley. "In the F-4, a large part of my effort was spent flying it. If your attention wasn't on flight, bad things happened. The F-35 is developed so the pilot can spend more time making tactical decisions. He's not given data but rather answers to make better decisions."

With it's advanced stealth characteristics, cutting-edge weapons and ability to communicate with other aircraft in the battlespace; the F-35 maintains U.S. air superiority. Equipping the pilot with the HMDS and connecting man to machine just makes it an unfair fight.

Lockheed-Martin courtesy photo

The F-35 Lightning II will integrate with the pilot through the new helmet, providing increased reaction speed and targeting capability.

Lockheed-Martin courtesy photo

Bill Gigliotti, an F-35 Lightning II test pilot for Lockheed Martin, is one of the first few to use the new helmet in flight.

Lockheed-Martin courtesy photo

The helmet is made of carbon fiber and Kevlar. The lens on the visor is made of a strong polycarbonate for impact protection.

EXPERIMENTAL EXPLOSIVES

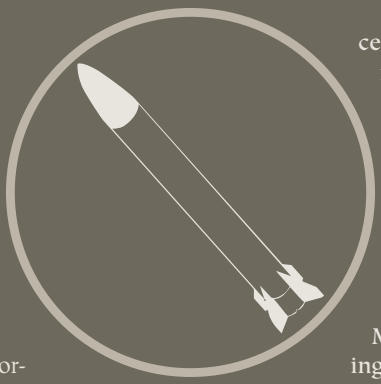
AIRMEN TURN LEGACY BOMBS INTO PRECISION MUNITIONS

BY STAFF SGT. J. PAUL CROXON ✪ PHOTOS BY STAFF SGT. DESIREE N. PALACIOS

Staff Sgt. Allison Kline lines up a guided bomb unit, or GBU-38, to the wing of an F-16 Fighting Falcon at Eglin Air Force Base, Fla. Sergeant Kline is a load crew member assigned to the 46th Test Wing.

Senior Airman Jimmy Mills observes Airman Joseph Goodus lining up a guided bomb unit to the mounting brackets under the wing of an F-16 Fighting Falcon. This particular bomb will test an experimental height-of-burst sensor.

During World War II and the Vietnam War, bombs weren't technological marvels. They were little more than metal tubes with explosives inside and a fuse designed to set them off on impact. It took hundreds of bombs to destroy a target, with a good measure of luck thrown in. Today's bombs are much more precise. Guided by lasers or Global Positioning Systems, they still use many of the leftover bomb casings from previous wars, but are able to hit a target with accuracy measured in inches. However, it's the bombs of tomorrow that promise true smarts.



Eglin Air Force Base, Fla., is home to the Air Armament Center. Among other things, engineers at the center develop new munitions technologies and possess the ability to design, build and test those experimental munitions. In terms of bombs, the center's latest innovation is making bombs flexible enough to give pilots more options than ever before.

According to Tech. Sgt. Wayne Beauchamp, a munitions Airman assigned to the 46th Test Wing, current bomb technology allows for precision delivery of munitions. But these smart bombs can be tailored, creating a specific bomb for a specific mission. For instance, the GBU-38 is a GPS-guided bomb built on the Mk-82 bomb casing, the same casings used during the Vietnam War. The guidance system allows the pilot to give the bomb a set of coordinates, drop it and leave the area while the bomb steers itself to the target. It works great for stationary targets, but what if the pilot is on a mission to destroy a weapons cache only to find that the weapons are now on a moving convoy or that the cache is split and the

Airman Joseph Goodus inspects a tool kit used to arm an F-16 Fighting Falcon during a training evaluation. Airman Goodus is assigned to the 46th Test Wing.

Tech. Sgt. Eric Bowlin, Senior Airman Kevin Matthews and Senior Airman Scott Hutchinson strap two guided bomb units, modified with experimental height-of-burst senors, to a trailer. Airmen Matthews and Hutchinson are assigned to the Air Armament Center. Sergeant Bowlin is assigned to the 46th Maintenance Squadron.

Airman Joseph Goodus, a load crew member with the 46th Test Wing, knows each step must be done with precision when attaching munitions to the aircaft. Precision is essential for accurate test results with the new, smarter bombs.

"We work with the engineers to build bombs never before tested"

— Tech. Sgt. Wayne Beauchamp

pilot now needs to take out more than a single target? That's a problem being researched by AAC specialists.

Engineers at AAC have developed a bomb that incorporates laser and GPS guidance systems with a height-of-burst capability. This would give the pilot the option to change bombs as the mission changes, eliminating the need to return to base, change munitions and re-engage, a costly process in time and dollars. The height-of-burst capability, or HOB, would enable the pilot to set the altitude of the bomb's detonation. Current bombs can be set to explode above the ground, causing significantly more damage, but at the cost of increased collateral damage. Allowing the pilot to determine the exact parameters would give tremendous flexibility to the pre-loaded arsenal.

Once the engineers develop the technology and the parts are built, the next task falls on munitions Airmen who build the bomb to order.

"We work with the engineers to build bombs never before tested," Sergeant Beauchamp said, pointing to a finished pair of GBU-54s fitted with the new HOB sensor. The sensor, like all experimental parts, is painted orange. "In this case it's an inert bomb with holes drilled in it so we will be able to see if the fuse goes off at the right time."

These bombs eventually will be fitted with the fuse, loaded on to one of the 46th Training Wing's fighters and dropped.

"Seeing the one-of-a-kind bombs we make dropped is definitely the best part of the job," Sergeant Beauchamp said grinning.

Once the munitions Airmen build the bomb, it's delivered to weapons loading personnel at an awaiting aircraft and loaded by armament specialists. On this day, the bomb was fitted to an F-16 Fighting Falcon.

According to Master Sgt. Greg Young, NCOIC of weapons standardization for the 46th TW's weapons flight, experimental weapons undergo a unique set of tests long before they hit the earth for the first time.

"One of the first things we do is a ground mount of the weapon onto an aircraft to make sure it fits properly," he said. "Since we use existing bomb casings for many of the weapons, we know ahead of time that a bomb should fit, but we need to physically check it to make sure."

Sergeant Young said the fit test is followed by an electromagnetic interference test to make sure the bomb is able to "talk" to the aircraft properly. The EMI test is followed by a flutter test.

"A flutter test is where we attach the munition to the aircraft and the pilot flies it through certain maneuvers to ensure it can handle the forces from the flight without falling apart or damaging pieces," said Sergeant Young.

After the flutter test, the weapons Airmen take the bomb through a series of separation tests. During these, the bomb is fitted to a special rack that replicates those on the aircraft. They release the inert bomb from the rack using the same systems found on the aircraft. This allows them to see whether the new bomb releases properly and whether it would arm at the right time.

Only after these tests are done does the bomb get dropped. Most of the time, AAC researchers use bombs filled with concrete instead of live munitions, but they do possess the capability to design, build and test live munitions, sometimes remarkably fast.

"We've tested and fielded bombs in a matter of months," said Sergeant Beauchamp. He uses the new small diameter bomb as an example. "It all depends on the needs of the warfighters on the ground. If they have an urgent need for a particular weapon we can prioritize it."

Though the AAC engineers are capable of developing munitions on completely new platforms, like the SDB that uses a special mounting rack and bomb casings, much of the work brings new life to old bombs, sometimes very old bombs.

"I've seen bomb casings come in that are brand new," said Sergeant Beauchamp. "I've also seen casings from the 1940s that become some of the most sophisticated bombs yet."

Thanks to bomb builders and armament Airmen, old, dumb bombs are getting smart.

The business end of a GBU-38. The orange tag at the bottom designates an experimental feature. In this case, it is a height-of-burst sensor that would allow the pilot to set the distance from the ground the bomb will detonate.

BOMB BUILDER

TOOLS OF THE TRADE

STAFF SGT. **ERIC BOWLIN**

PHOTO ILLUSTRATION BY LUKE BORLAND ✪ IMAGERY SUPPORT BY STAFF SGT. DESIREE N. PALACIOS

Airman

1 AN/GYQ-79A: tests tails kits software **2 Large Crescent Wrench:** fastens/unfastens bolts used on bomb nose plugs **3 Bomb Sling:** lifts munitions weighing up to 1 ton **4 Work Gloves 5 Component of strakes (nose collar):** Strakes help keep munitions headed toward the target by acting as stabilizers while the bomb is dropping **6 Component of strakes (another types of nose collar) 7 Speed Handle:** tightens the bolts on the strakes quickly **8 JDAM - Joint Direct Attack Munition:** tail kit

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FLIGHT PHYSICALS FOR C-130S ARE HERCULEAN TASK

BY RANDY ROUGHTON ✪ PHOTOS BY LANCE CHEUNG

A C-130 Hercules just left the maintenance hangar with a fresh coat of paint. Marlo Foreman isn't thinking about lunch or the work he has to do before going home for the day. His thoughts are on the aircrew members who will fly this plane. Corrosion control specialists like Foreman are among the first to see an aircraft when it arrives at Robins Air Force Base, Ga., for maintenance and the last to see it before it returns to its home unit.

"When a plane leaves, I'm always very happy because I know we did our job for the warfighters so they can do their jobs for our country," said Foreman, a painter in the 402nd Aircraft Maintenance Support Squadron's corrosion control flight. "It's our job to get these planes back to the warfighters as quickly as possible because they need their planes to survive. I feel the quicker we do that, the better off the Air Force will be."

Other mechanics have a different perspective. Some C-130 maintenance specialists aren't thinking about the airplane they've just completed or even where the plane is headed once it leaves their hangar after its six-year periodic depot maintenance. They've already turned their attention to the next airplane in line.

"Believe it or not, by the time the aircraft flies out, we're already so heavily involved with the airplanes we have now that we don't have time to really think about the last one," said Gary Rutledge, 560th Aircraft Maintenance Squadron's C-130 production flight chief.

Whatever their perspective on the job, mechanics in the Warner Robins Air Logistics Center at Robins AFB help keep Air Force aircraft in flying condition. The WR-ALC is the major maintenance depot for all avionics systems and for C-5 Galaxy, C-17 Globemaster III, C-130 Hercules, F-15 Eagle, U-2 reconnaissance aircraft and Air Force helicopters.

Maintainers in the 402nd Maintenance Wing manage depot-level maintenance with a team approach that encompasses every aspect of the airplane. It's a job that involves much more than inspecting and making repairs. Think of it as a flight physical for airplanes.

The physical begins from the outside when the aircraft arrives in the corrosion control flight hangar. Painters, like Foreman, remove the exterior coatings from the aircraft. Last year this process changed and, since August, they've stripped paint with plastic beads instead of sand. Blasting with beads is proving to be more efficient and safer than the old method. Plastic media blasting still uses air and water pressure to get down to the bare surface of the aircraft.

The corrosion control team also has a new instrument to get them to those hard to reach places. The new air multi-axis platform, more commonly called an AMP, was used on an F-16 Fighting Falcon from the Museum of Aviation at Robins AFB, but corrosion control specialists used the platform recently to strip and re-paint a C-130.

The AMP provides a stable base for elevations up to 52 feet, enabling Foreman to reach the tip of the tail and upper parts of the wings. The platform was designed for easy access to aircraft for dry media blasting, inspections, washing, repairs, masking and replacing parts. The platform eliminates the need for a crane and is equipped

Marlo Foreman, an aircraft painter with the 402nd Maintenance Support Squadron, operates one of four Area Multi-access Platforms to remove old paint from a North Carolina Air National Guard C-130 Hercules. Paint removal is one of the first steps in the Robbins Air Force Base, Ga., depot maintenance program.

What appears to be sand is really little plastic beads that are shot through four air hoses controlled by the Area Multi-axis Platforms. The beads are blasted through the AMP's laser aimed nozzles to remove the paint from a C-130 Hercules at the 402nd Maintenance Support Sq., Corrosion Control Flight at Robins Air Force Base, Ga. This environmentally friendly system presents a low hazard to the operators and the environment, while making the process faster.

Clarence Thrower applies specialized fiberglass tape to the outside of an F-15 Eagle's radome at precise locations while Larry Manion operates the Precision Radome Integrated System of Measurement at the 566th Electronics Maintenance Squadron's Antenna and Radome Range, Robins Air Force Base, Ga. The inspections and tests of the radome are part of the F-15's programmed depot maintenance process.

with a joystick and four nozzles, which can strip paint at a rate of 10 to 20 square feet per minute. Foreman and another painter usually work two AMPs at once, with a total of eight nozzles that can do the work of 16 to 20 people.

"In the aerial platform, everything is operated from the control panel and the joystick," said William Walker, a 402nd Aircraft Maintenance Squadron corrosion control supervisor. "He's operating four nozzles at a time from the platform, so it's like having 10 people working in the AMP."

Aircraft coating removal is the most labor-intensive effort in aircraft maintenance depots. Large aircraft are stripped every five or six years. It takes an estimated 2,000 days and 22,000 man-hours annually to strip the tops and sides of some of the aircraft. Specialists with Air Force ManTech and air logistics centers adapted technology developed by Air Force Research Laboratory's Materials and Manufacturing Directorate researchers for depot maintenance on large aircraft.

While the plastic media blasting process has proven to be an effective method of removing paint, it can sometimes make signal-altering changes in the shape of the radomes that must be corrected before the airplane can be sent back in the field. The radome is a weatherproof enclosure that protects the airplane's radar antenna. Maintainers in shops, like the 566th Electronics Maintenance Squadron Antenna and Radome Testing Range, test and tune radome antennas, correcting as many of the alterations as possible.

"We are really like your eye doctor," said Charlie O'Malley, a 566th EMXS Antenna and Radome Range supervisor. "The radome is like eyeglasses and what we do with electrical tape is like a prescription for your glasses.

"We are tuning the fiberglass material so that it does not devalue the radome signal. We test the radomes to make sure they're back to the original shape they had when they came from the factory. So when the pilot looks through the radome, we want to make it invisible, so he can pick up the airplane with no duplicates, fake images or shadows," he said.

Andres Orta, an antenna and radome testing range mechanic, might test and tune about 30 radomes a month with the help of specialized fiberglass tape and a Precision Radome Integrated System of Measurement anechoic chamber. PRISM testing provides a shielded environment for radio and microwave signals and lets the electronics mechanics know how much tape to use. One or two layers of tape work best for the radome.

"The tape we use has the same dielectric properties as the material used to construct the radome," Orta said. "Once we figure out what tape to use, we take it off the tester, put the tape in the radome and then hang it in the anechoic chamber and let it go through all of the tests."

Depot-level maintenance on a C-130 Hercules is as close to a flight physical as these aircraft can get. The entire aircraft is inspected about every six years and remains at Robins AFB for eight months at time. A new process will change the schedule to inspections every 18 months on different sections of the aircraft each time. The goal is to reduce the time each C-130 is not flying missions from 205 consecutive days to about 52 days.

The job of placing the tape can be difficult because of the shape of the enclosure, especially when it's time to tape the inside of the radome. However, the range's electronics mechanics thought of a creative way to handle the problem. All it took was placing a magnetic BB in the right spot.

"When we have the radome mounted, we can't put the patch on the inside," Orta said. "We place a BB inside the radome to mark the corners so we know where to transfer the tape from the outside to the inside."

Previously, the radomes were sent to an anechoic chamber in another building, but a 75-foot-by-40-foot chamber was built inside the range about a year ago and has helped the electronics mechanics increase production to about one radome a day. Before they had their own anechoic chamber, bad weather could halt production because they weren't able to take a radome outside for testing.

The chamber is 30 feet high with dozens of small prisms that allow the staff to see every dimension and any ridges that might affect radar transmission, O'Malley said.

"In the old days, we'd have to put a whole layer of tape around a zone of the radome," O'Malley said. "Now with our new technology, we can just put patches of tape instead of taping the whole radome, so that it kind of looks like a jigsaw puzzle. This helps the radome get a better transmission, and it's safer for the airplane and the pilot."

Part of a complete aircraft physical might be thought of as preventative care. Those installing the preventative measures also are looking to prevent problems in their shop.

The specialists who install the Large Aircraft Infrared Countermeasures Modifications system came up with ideas to make their workplace safe. Many of them are simple things, like a tent to protect themselves from cold, rain and wind while they worked and a removable platform and steps. Not only did those ideas make the work safer, it made it faster. In 2006, installing the LAICRM on a C-17 took more than 7,700 work hours and 45 days. Three years later, that number was cut almost in half, to less than 4,000 hours in 24 days, said Greg Horton, 562nd AMXS aircraft overhaul supervisor.

The real reward, for those giving the aircraft its preventative medicine, is in knowing lives are guarded by those countermeasures.

Aircraft electrician Guy Couey gains satisfaction from knowing that the work he does could save lives. "We're adding something to the aircraft that's going to make the aircrew safer, especially in a time like this when we have troops deployed in dangerous locations around the world. It's nice to be a part of something that's going to bring them home safely."

While Couey installs laser countermeasures systems, Keith Brand spends a good part of his day in the 573rd Commodities Manufacturing Squadron's sheet metal manufacturing shop on the 250-ton stretch press working with aircraft-grade aluminum that will become the leading edge of a C-130 wing.

"When I was hired at the shop, they were just putting in the overhead screen for this machine and I was impressed just by the size of it," said Brand. "I told myself I was going to be running that machine one day."

And just like people and airplanes, the press has to move the way it's supposed too, or something could strain or break.

"I like to describe the stretch press as a song and dance," said Brand. "If it moves wrong, it will tear up the part, so everything has to move just right. When it does, you'll have a good part."

Like a lot of health care facility workers, who try to treat as many patients as possible, people in the 402nd AMXSS, along with the entire Warner Robins ALC team, are in the middle of a transition in the way they maintain and repair aircraft. The transition to high-velocity maintenance, which aims to reduce aircraft downtime, began with a C-130 last summer. The Air Mobility Command C-130 was the first to go through the process.

The new maintenance method is expected to increase aircraft availability for in-theater use by 14 percent, said Maj. Gen. Polly A. Peyer, Warner Robins ALC commander, in a recent center publication. Instead of C-130s receiving depot-level maintenance every five or six years, and being out of action for up to eight months, the aircraft would be maintained every 18 months, one section at a time. Aircraft are on a six-year maintenance cycle now and are typically out of action for about 205 days. Under HVM, aircraft are grounded for only 52 days.

Sheet metal mechanic, Kevin Dobbins, was a Navy aircraft mechanic for 11 years and then worked as a licensed mechanic in the commercial airline industry. He now works at the Robins Air Force Base maintenance depot's Large Aircraft Infrared Countermeasures system section.

But the people who work in heavy aircraft maintenance don't have much time to think about the changes in maintenance philosophy. They are too busy keeping up with the workload. In the 560th AMXS C-130 Flight Periodic Depot Maintenance area, mechanics in critical skills are working 10 hours a day, six days a week to finish about 20 C-130s a year.

Though the mechanics perform complete physicals on several aircraft each year, they still marvel at the C-130's capabilities.

"The whole C-130 is unique," said sheet metal supervisor Mike Smith. "It's such a workhorse that every part of the C-130 is used to the max. There are a lot of flying hours and a lot of defects and corrosion when it gets to us."

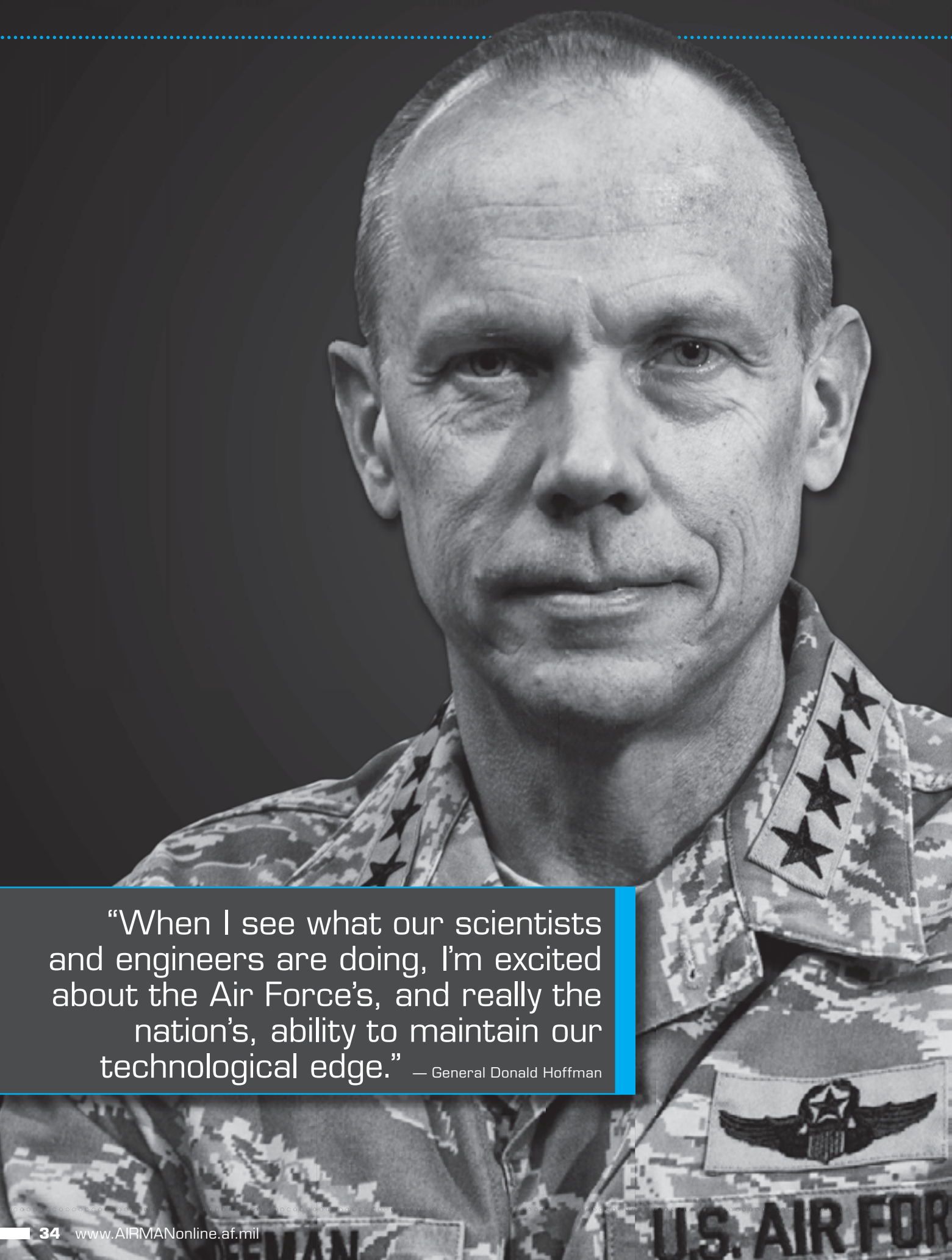
Much like doctors and nurses enjoy hearing former patients say thank you, the people who work on the C-130s feel somewhat rejuvenated when they hear positive feedback from the pilots flying them. Good news via e-mail or an official award travels fast among the 200 specialists who work heavy maintenance.

"When we produce an airplane early, with no problems, and then we get the good feedback from the home station, we feel a sense of pride because you know you're supplying it back to the force," said Jason Davidson another depot mechanic.

Every specialist in every department does his or her part to make sure the aircraft passes its "flight physical" before sending it back to work. They all know the impact aircraft maintenance has on lives and the Air Force mission.

"It's amazing how all of the cogs fit together, and we end up putting out an aircraft that's safe and reliable," said Capt. Justin Fortinberry, from the 402nd AMXSS said. "Aircraft maintenance isn't like an assembly line, although we try to get as close to that schedule as possible. Every one of these aircraft is different. It takes every one of the professionals we have out here to identify the individual issues."

And as the next patient is towed into the hangar, every one of the mechanics at the center is ready to perform the next flight physical.



"When I see what our scientists and engineers are doing, I'm excited about the Air Force's, and really the nation's, ability to maintain our technological edge." — General Donald Hoffman

AIR FORCE MATERIEL COMMAND:

READYING TODAY'S WARFIGHTER

BY MONICA D. MORALES
AIR FORCE MATERIEL COMMAND PUBLIC AFFAIRS

photo by Benjamin Paske

For Gen. Donald Hoffman commander of Air Force Materiel Command, at Wright-Patterson Air Force Base, Ohio, the goal of equipping the warfighter with the right tools, both on time and on cost, is achieved by focusing on five command priorities.

"Being located here in the birthplace of aviation keeps us acutely aware of the historical challenges and the current challenges that face our Air Force," said General Hoffman. "To ensure our Air Force is ready for any mission, AFMC must remain committed to these priorities."

The command's priorities are:

- Reinvigorating AFMC's role in the nuclear enterprise;
- Implementing effective and efficient integrated life cycle management to support the warfighter;
- Supporting the Air Force by recruiting, training and retaining a high-performing work force;
- Nurturing and protecting our people and families; and,
- Being good stewards of government resources.

General Hoffman and other AFMC senior leaders established the five priorities to tackle the Air Force's challenges of conducting daily wartime missions and standing ready for global contingencies. While each command priority is important, General Hoffman said the one at the forefront is recapturing excellence in the Air Force nuclear enterprise.

"No mission is more important than safeguarding our country's vital nuclear capabilities and maintaining nuclear deterrence," he said.

Air Force senior leaders established the Air Force Nuclear Weapons Center in March 2006 at Kirtland Air Force Base, N.M. That center is implementing more stringent tracking and control for nuclear weapons-related materials and improving the supply chain management process across the board. During the last half of 2009, center officials activated five new munitions maintenance units: one group, three squadrons and one detachment.

"Acquisition and sustainment, which includes maintenance, are the AFMC pieces of the nuclear enterprise," General Hoffman said. "But we didn't have unity of command for those responsibilities until recently. Everyone in these organizations has a personal and professional stake in making sure the work is done right the first time, every time."

AFMC includes a workforce of about 74,000 people. About two-thirds of them are Air Force civilians at locations across the country including three product centers, two test centers, three air logistics centers, research labs and other specialized units.

The AFMC priority of reinvigorating the nuclear enterprise includes stringent tracking and control systems for nuclear weapons-related materials. The Air Force Nuclear Weapons Center is the AFMC unit that manages and maintains these nuclear assets.

courtesy photo

Workers at AFMC's Arnold Engineering Development Center contributed to the successful unmanned, flight test of the NASA Ares 1-X flight vehicle. The ARES 1-X is scheduled to replace the space shuttle in 2017.

Air Force Materiel Command's mission is to engage in research, development, test and evaluation, acquisition management services and logistics support for the Air Force.

Command leaders are enacting organizational changes to establish clear lines of authority and accountability.

In May 2009, a joint memorandum from Secretary of the Air Force Michael Donley and Air Force Chief of Staff Gen. Norton Schwartz outlined the Air Force's framework for improving the acquisition process. This Acquisition Improvement Plan calls for streamlining acquisitions and increasing the size and improving the training of the acquisition corps.

General Hoffman said AFMC must ensure the workforce is always ready to support the acquisition mission.

"As part of the Air Force commitment to improving the acquisition system, we're working to recapitalize the acquisition workforce itself," he said. "I'm personally committed to filling existing vacancies and creating additional positions as necessary."

In addition to recruiting, training and retaining, the command is finding ways to nurture and protect people and families; and being good stewards of government resources.

General Hoffman said focusing on these areas will translate into successes for AFMC and the Air Force.

"I've charged our senior leaders with focusing on those priorities every single day," he said.

On the horizon, AFMC engineers are developing even more technologies for the warfighter. Air Force Research Laboratory scientists are investigating carbon fiber use in airframe construction. The hope is that it might result in stronger, lighter and less-costly aircraft with greater range and endurance.

Another example is collaborating with NASA on test data from the X-43A aircraft to enhance the Air Force's understanding of hypersonic flight dynamics used in a similar Air Force flight program, the X-51.

"Our collaborative research with NASA on high-altitude, long-endurance technology will result in a lighter-weight, gust-tolerant wind design," General Hoffman said. "These are all technologies that hold future promise."

The command's work of developing new technology, from designing uniforms to flying and maintaining combat systems and subsystems, shapes how the warfighter fights now and in the future.

"When I see what our scientists and engineers are doing, I'm excited about the Air Force's, and really the nation's, ability to maintain our technological edge," General Hoffman said.

photo by Atiba S. Copeland

HOW TO BUILD THE FUTURE: AIR FORCE ACQUISITIONS

STORY BY COLLEN MCGEE

The word acquisition means to gain or take possession of. It usually refers to things that are. Air Force acquisitions are about gaining things that aren't yet; using technology that is. It isn't science fiction. It's about finding the right technologies to blend into a new weapon system that can get the job done and provide a finished product; delivered on time and within cost.

According to Lt. Col. Douglas Pentecost, an 18-year acquisition officer, few Air Force acquisitions have problems. The ones that run into snags are usually big projects where even a small percentage of the cost represents a large amount of money.

"Less than 1 percent of all Air Force contracts are protested and of those, less than a third have voluntary corrective actions or sustained GAO (Government Accountability Office) decisions," said Colonel Pentecost. "Unfortunately, the few that do go wrong are high profile and have such a high level of technology that any cost overrun adds up to big dollars."

The acquisition process covers a lot of ground, including some highly technical areas. An error in any part of the process can lead to delays, an increase in costs or both. To prevent this, the Air Force is implementing an aggressive acquisition improvement plan.

Colonel Pentecost explained that the Air Force is committed to recapturing acquisition excellence by rebuilding an Air Force acquisition culture that delivers products and services as promised, on time, within budget and in compliance with all laws, policies and regulations.

Lt. Gen. Mark Shackelford, the Military Deputy from the Office of the Assistant Secretary of the Air Force for Acquisitions, said there are five areas the plan addresses including; workforce, requirements, budget stability, source selection and organization. Improvements to all five focus areas are being implemented at the same time.

The workforce initiative includes, "…filling the vacant positions, getting more positions and making sure the people are competent to do their jobs," said the general. "Our workforce does an incredibly great job given the pressure we put on them to perform."

General Shackelford admits that the mentality of doing more with less, beginning in 1989, created problems by spreading people too thin.

"We decreased the acquisition workforce by 23 percent; at the same time increasing the dollars we managed by 50 percent," he said. "The result was not enough people to do the work we've got."

Secretary of Defense Robert Gates recently announced that the services would get more help by adding 20,000 workers to the acquisition workforce, Department of Defense wide.

"The Air Force share of that is 4,865," said General Shackelford.

He broke down the numbers by specialty areas. The new Air Force positions include converting about 3,400 contractors to civilian positions, and hiring 1,200 new contracting specialists, 200 cost estimators and 65 attorneys. To get those people into position quickly, General Shackelford said the Air Force is using a congressionally-authorized expedited hiring authority.

"The civilian positions have been hard to fill because of the length of time it takes," said General Shackelford. "That's what the expedited authority will help with, taking the hiring process from an average of 150 or so days down to as short as maybe 30 days."

"Our goal, through October 2009 was 630 people interns and journeymen. We exceeded that," said General Shackelford. He said the new hires are coming in with a broad balance of experience levels, from fresh college grads to highly experienced people recruited from industry.

After people comes the ability to meet the need of the warfighter. This is the requirements area of the acquisitions process. The acquisition

improvement plan includes what is called "trade space." That space is the difference between need and want. To make sure the requirements are met, the warfighter and the acquisition experts get together earlier in the process and continue to collaborate until the product is delivered, ensuring a "closed loop" way of gaining a new weapons system.

"Closing the loop is important," said Robert Pollock, the director of the acquisition chief process office. "When we're buying combat capability, we want to make sure that it's a collaborative effort between the people who are establishing the capability that we need and the people who are going to go out and provide those capabilities."

There is more to the process than the needs and the technology available. Most items, like the quest for the new KC-X refueling tanker, will have to be compatible with the other services and our allies.

"They're going to get what they need, tempered with the ability to deliver, based on technological readiness, manufacturability, integration ability and cost," said General Shackelford.

"We know what industry is producing and are familiar with what they can and can't produce at this moment," said Pollock. "As we work with the warfighter, we are able to describe what's available right now, what's going to be available five years from now and 10 years from now."

"We ask, 'what is it that they need to be able to do right now and in the future?'" said Pollock, "Sometimes it's very difficult when you are describing what the needs will be in the future. We know what the trends are and what types of technologies are in development."

Pollock explained that warfighters know what capability they need and that acquisition professionals then get down into the details to meet the safety and legal requirements. Once that is done, the major commands get another look to make sure mission needs are still met. Once project requirements are built on paper, Air Force cost estimators figure out a price range of the new weapon system. This is where budgeting for the improvement plan comes in. According to Pollock, the Air Force already has a head start in this phase.

"Air Force cost estimators are some of the best in DoD," said Pollock. He said they know industry costs and can price estimate correctly.

Once the price is estimated, the requirements are frozen. General Shackelford explained that each major command commander formally acknowledges and signs off that the requirements are accurate before they are locked in and the process heads on to the next step. Source selection is the fourth piece of the plan and probably the one area that made the most headlines. The Air Force learned from previous problems and challenges. In fact, Pollock said it was the source selection issues with the tanker search, and the results of the GAO review that put the improvement plan in motion.

"We've proliferated the lessons learned from the tanker source selection last year," said General Shackelford. "We've increased the number of independent reviews to make sure we have the source selection package properly constructed."

General Shackelford explained that when all the pieces are in place and correct, making the final choices will be easier. Before the current search for a new tanker began Air Force Chief of Staff General Norton Schwartz said, in answer to a reporter's question after a speech at the annual Air Force Association Conference, that the requirements, when it came to the next bid for an Air Force tanker, needed to be transparent and air tight. Using the improved process, future quests for weapon systems will be less open to interpretation.

"We're learning from business practices that have succeeded in the past and from the current state of the world," said Pollock. "We need to say what we need and articulate it clearly."

Pollock explained that if a draft for proposal, listing the requirements for contractors to bid on, is unclear, then costs are going to rise because the contractor spends more time developing proposals to meet every possibility represented by the draft.

"That contractor has no choice but to give us different options and it takes up hours of manpower," said Pollock. "If we have a really tight request for proposal, that helps the vendor come back with a precise bid."

Part of ensuring the improvements within the acquisitions process are working, and that the legal, ethical and mission requirements are met, includes reviewing each step to make sure every block is covered.

"We're bringing in experts, multifunctional independent review teams, to make sure we're documenting," said Pollock. "The object is that if a vendor decides it's in his best interest to complain to the Government Accountability Office, then GAO, after looking at our process says 'Air Force, you did OK,' and allows us to start producing. It's all about getting needed capabilities to the Airmen."

The last piece of the plan calls for clear chains of command that allow for authority accountability in organizations. General Shackelford explained that the changes include shifting away from traditional Air Force organizational structures.

"We're going to turn from the wing, group and squadron structure in Air Force Materiel Command to a directorate, division, branch structure that will give us a better ability to manage people for improved acquisition outcomes and our programs," said the general.

Not only will that give a clearer line for the process and better authority oversight on the people, it will also allow the best in the acquisitions world to be placed where they are most needed.

"That will help us use our most experienced acquisition officers in the highest priority acquisition programs; give us the flexibility to move people within product centers," said General Shackelford. "It will recover the care and feeding role of the functional in financial management, contracting and engineering. And specifically, the contracting officers will be pulled out of the wing, group and squadron organizations and be placed in their own functional chain of command under the center's head of contracting authority."

Oversight of each project is also important and Colonel Pentecost said that there will be an increase from three to 13 program executive officers. The increase will ensure there are experienced senior leaders in positions of oversight who can address any concerns faster.

Though the plan has five major focus areas, they translate to a large variety of change areas. Much of it has already been implemented or is in progress.

"The plan has 33 specific actions," said Lt. Col. Edward Masterson, the chief of acquisition improvement plan operations. "As of today, nine are closed out, four more done and awaiting close-out and 20 are three quarters of the way through and expected to close in early 2010. The process changes are happening today and we are beginning to see program changes."

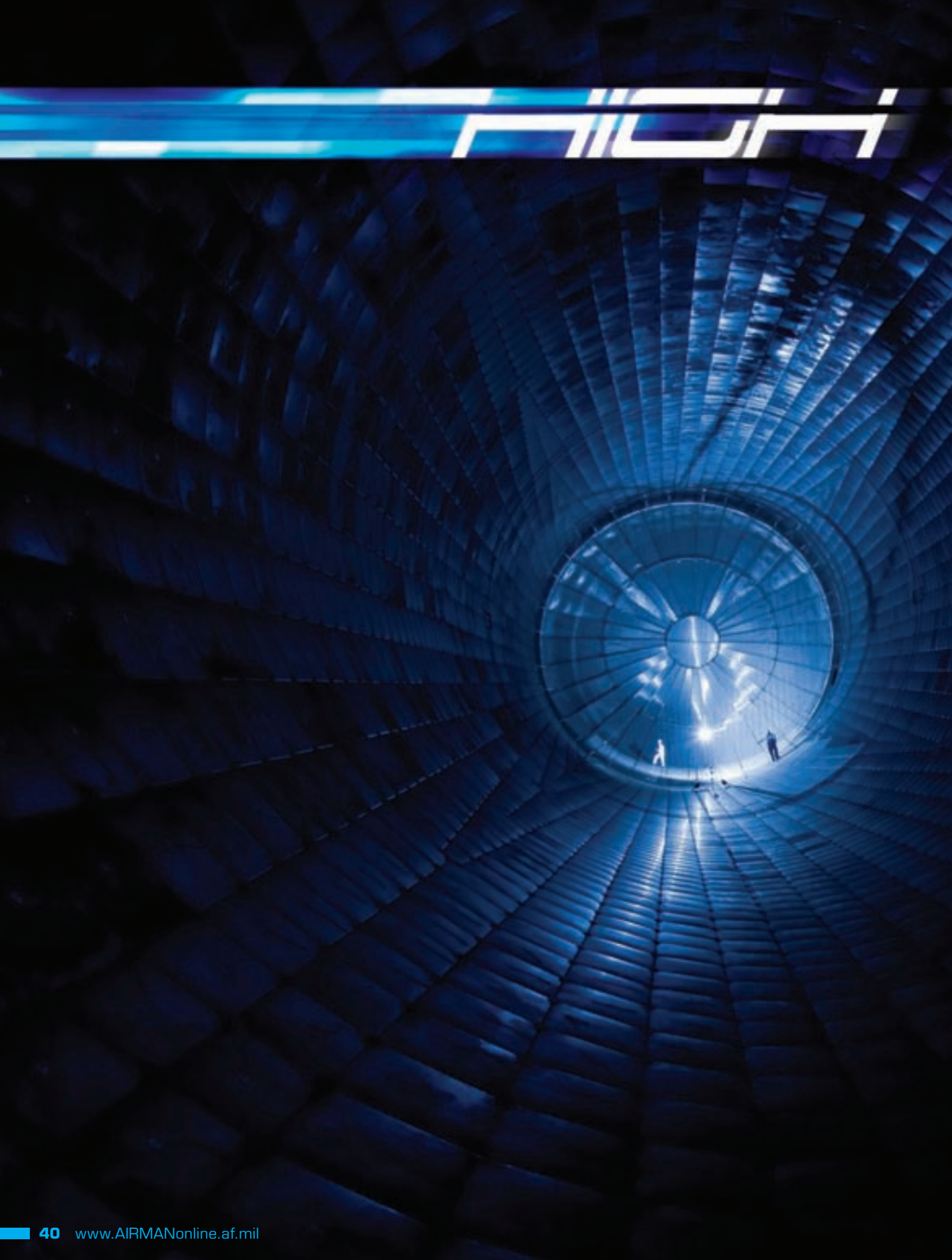
Colonel Masterson said this improvement plan has to be an entire culture change and basically be a pandemic of improvement that spreads from the top down. The processes needed improvement and the plan is being implemented rapidly. The support from all levels is what Pollock and Colonel Masterson say will be the key to success.

"We are committed to making this work," said Pollock. "There is not a single member of the acquisitions corps who doesn't want this to work."

"The Secretary of the Air Force and the Air Force Chief of Staff want this to happen too," said Colonel Masterson. "I've never seen everything come into alignment like this."

General Shackelford, Pollock and Colonel Masterson can see how the steps in the improvement plan are already taking effect in the process. They also know it will take time, time to build the culture of constant improvement and time to get the steps in the improvement plan completed.

Though many of the 33 initiatives are already being implemented, a total shift in culture is likely three to five years away. In the meantime, the next big weapon system to go through the updated acquisition process is the KC-X tanker, an aircraft that doesn't yet exist, but will be built from the most effective existing technology needed to get the mission done.


HIGH

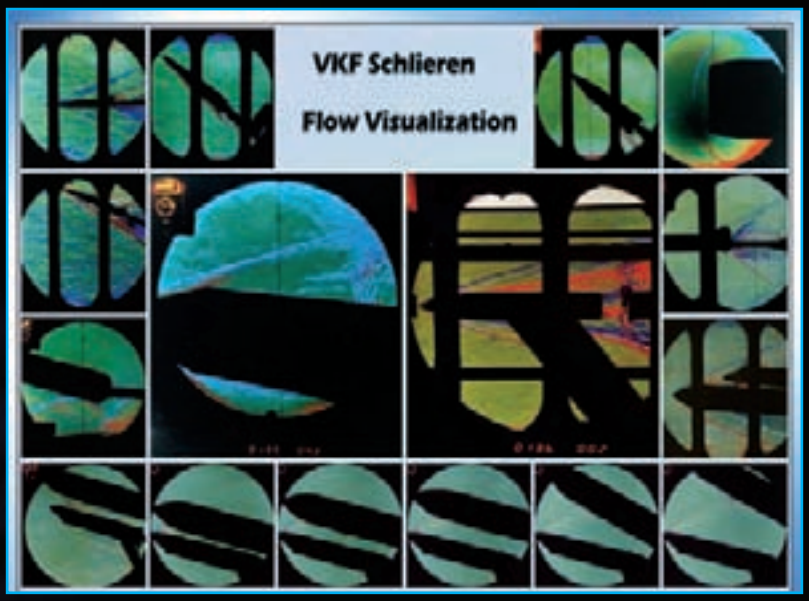
VELOCITY

WIND TUNNELS TEST THE PACE OF TECHNOLOGY

STORY BY RANDY ROUGHTON ✪ PHOTOS BY LANCE CHEUNG

Outside the Arnold Engineering Development Center's cavernous wind tunnels during testing, you can hear the engine rumbling like a large air conditioning unit. But inside the control room all is quiet, except for the humming of computers.

For more than four decades, AEDC's wind tunnels have tested aircraft like the F-15 Eagle, F-16 Fighting Falcon, F-35 Lightning II Joint Strike Fighter and the B-1 Lancer. Wind tunnel testing led to the development of the nation's top aerospace programs, including the Atlas, Titan, Minuteman and Peacekeeper ICBMs, and the space shuttle, the Global Positioning System and GOES-M weather satellites. While the testing pace has slowed in recent years, the focus behind the transonic and continuous flow wind tunnels in the Von Karman Gas Dynamics Facility is the same — to make air and space travel more effective, reliable and safe.



This thermal imaging technique was invented by a German physicist in 1864 to study supersonic motion. Modern uses of this method use digital imagery to photograph the flow of air around objects being tested at the Arnold Engineering Development Center.

"Everything we do here makes the lives of flyers safer — the lives of military and commercial pilots, commercial passengers and our astronauts," said Capt. Brandon P. Herndon, a test project manager with the 716th Test Squadron. "We accomplish this through the testing we do in our wind tunnels — predicting and evaluating aerodynamic effects before they are actually flown," he said.

"Although I've only been assigned at AEDC for about nine months, one can realize quickly how the wind tunnel data helps us design and modify aircraft, spacecraft . . . before we make costly design mistakes on a larger scale," Captain Herndon said.

The center is the nation's largest aerospace ground test complex and supports propulsion, aerodynamic, re-entry and space flight systems testing. This is the home of 58 aerodynamic and propulsion wind tunnels. Fourteen of them are the only tunnels of their kind, and 27 are unique to the United States. Although most of the wind tunnels are at Arnold Air Force Base, Tenn., AEDC has other facilities, such as Hypersonic Wind Tunnel 9 in White Oak, Md.

When the PWF was built, the electric drive motors were the largest in the world. The facility has two 16 feet by 40 feet transonic and supersonic tunnels, which are still among the largest in the world. An aerodynamic transonic tunnel, 4 feet by 16 feet, is also used to test most of the modern Air Force flight assets. The 16T transonic tunnel began operating in 1956, with the 16S supersonic following in 1960 and the 4T transonic tunnel opened in 1967. Transonic tunnels test aircraft that fly at speeds near the speed of sound, while the supersonic version is for aircraft that can fly faster than Mach 1, or about 717 mph.

Small-scale models are usually used in wind tunnel testing because full-scale versions would require tunnels substantially larger than any tunnel currently in existence, except for those that are limited to low speeds. Building large high-speed wind tunnels would result in high construction costs and takes considerably more electricity.

The 16T uses about 120 million watts of power for a typical test. "A full-scale tunnel would need an 80 feet x 80 feet test section and 3,000 million watts to operate," said Mike Mills, an AEDC aerospace engineer.

While the 16S hasn't been used for testing since 1997, the 16T remains what Captain Herndon calls "the workhorse of the facility," with testing continuing year-round. Its size can accommodate large-scale models for testing conventional aerodynamic and combined aerodynamic/propulsion systems.

Testing in the 16T supported almost every Department of Defense and government flight vehicle program in the last half-century, including the B-2 Spirit stealth bomber, RQ-4 Global Hawk remotely piloted aircraft, space shuttle and X-33 reusable launch vehicle.

The 4T transonic tunnel is used mostly for small-scale aerodynamic testing and can simulate altitudes from sea level to 98,000 feet. This continuous flow tunnel tested almost every major national flight vehicle developed.

Most higher speed air and spacecraft are tested in the smaller A, B and C tunnels of the Von Karman Facility across the street. Here, everything from space capsules to winged planes and the most sensitive of experimental craft, or X-planes, are tested. The facility is named for Dr. Theodore von Karman who led a scientific advisory group that began this long-range research and development method.

Several models of the space shuttle were tested in the VKF tunnels to determine the aerodynamic relationship between the main

components. In recent years, improved foam insulation, replacing the version blamed for the Space Shuttle Columbia disaster, was tested repeatedly for its ability to handle the heat during launch and re-entry.

With each safe, successful launch and return of a shuttle crew, outside machinists Scott Pogue and Jimmie Sanders can't help but feel proud of their work. They know how important it is.

"When I saw the last shuttle launch on TV, I was nervous, but I felt really good about having a part in helping the crew come back safely," said Sanders, who spent six of his 30 years at AEDC on active duty in the Air Force.

Mills arrived in 1978 and said wind tunnel testing solved many operational problems, made pilot ejection safer and helped the Air Force field the F-22 and the F-35 Lightning II.

One of the first test programs Mills worked on was a wind tunnel fly-off competition between air-launched cruise missiles before selecting the contractor.

"During these tests, full-scale cruise missiles were in the tunnel," Mills said. "The sequence of events, just after release from a B-52, was tested. The wings and tail fins were deployed and the engine started to demonstrate that the missiles were ready for flight."

About a month before testing begins, scale models are built and installed in the test section on support struts that can be moved through a range of angles to simulate those in flight. In the 16S and 16T, the models are installed in a removable test section and moved to the tunnel on railroad tracks. The trip usually takes about an hour because the combined weight of the test section and transfer car is about 1 million pounds. The test section is brought in through a large clamshell door and wind tunnel workers spend the next few hours making utility hook-ups and checking out the data systems.

Next, the pressure in the tunnel is dropped to about one-half that of the earth's atmosphere, the equivalent of an altitude of 20,000 feet. Then it's time to start the large electric motors that drive the main compressor. The 16T's main compressor is more than 30 feet wide and rotates at 600 rpm. This compressor moves air at a rate that could fill a 2,500 square foot house in 0.1 seconds said Mills. Once the motors are at full power, the test conditions are set including the speed, pressure and temperature.

Inside the tunnel, air is propelled around by another compressor and can be cooled if needed. The 16T's cooler flows water at a rate that could fill an Olympic-sized swimming pool in seven minutes, Mills said.

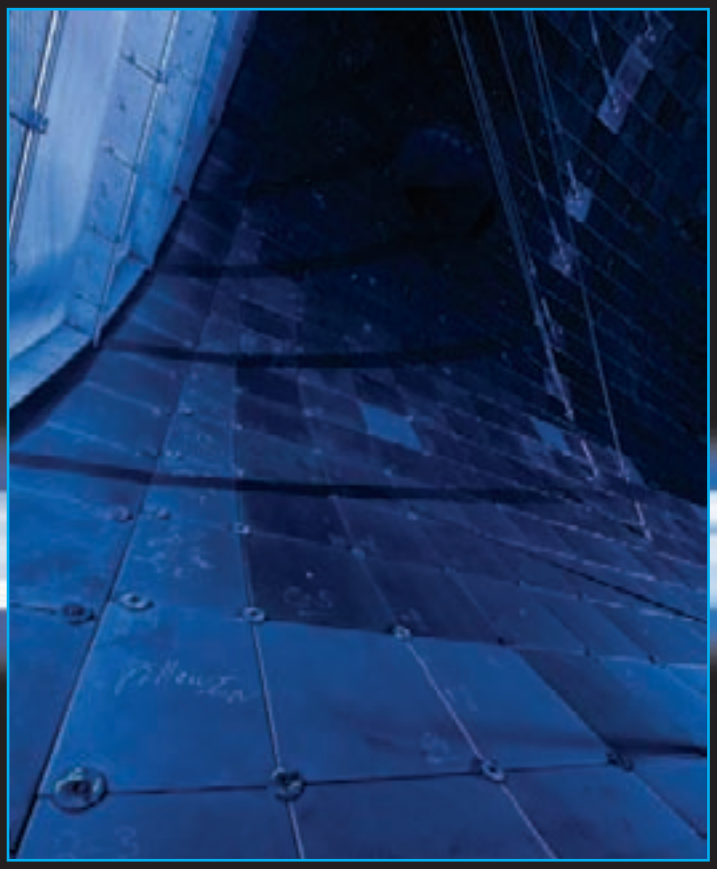
A typical series of tests take from one to four weeks. Individual tests can be completed in a few hours. The time depends on how much data is needed.

Testing in the VKF tunnels is much the same, except for a different process of installing the models and making configuration changes. The continuous flow tunnels can work for hours at a time with air that is supplied by a nine-stage compressor system. The entire system is an eighth of a mile long and driven by electric motors that provide up to 92,500 horsepower.

"The basic process is the same for all of our tunnels, whether running in the subsonic, supersonic or hypersonic regimes," said Dr. Richard A. Roberts, 716th Test Squadron project manager.

AEDC's wind tunnels also provide testing for store separation, pressure-sensitive paint capability and captive trajectory support testing. Store separation testing ensures that bombs and missiles separate cleanly from the aircraft when released. If this doesn't happen, the object could veer upward and hit the aircraft.

"We can simulate store separation by positioning a missile, bomb or fuel tank next to the flight vehicle in the test section," Roberts said. "Using feedback from the data acquisition system,



Metal tiles line the interior of the diffuser section of the 16-foot supersonic wind tunnel. The diffuser is a tunnel that widens from the compressor and then narrows sharply to increase air speed just before leading to the test section.

Jimmie Sanders, machinist mechanic, torques one of the many flange bolts that hold the 5,100-pound Mach 6 throat of a 50-inch closed–circuit, hypersonic wind tunnel at the Von Karman Gas Dynamics Facility, Arnold Air Force Base, Tenn.

Dr. Richard Roberts, the project manager of the von Karman Gas Dynamics Facility and the Propulsion Wind Tunnel Facility, is dwarfed by the 16-foot supersonic wind tunnel pressure section to his right during a recent site visit to the Engineering Development Center at Arnold Air Force Base, Tenn.

the path of the store can be simulated as it leaves the aircraft."

AEDC is also the home of the Mark 1 Space Facility, a 42-feet-by-82-feet space environment test chamber. Built in 1966 for the Air Force's Dyna-Soar developmental space program, it is now used for testing satellites and other space systems.

"The Air Force had a program called the Manned Orbital Laboratory Program back when we wanted astronauts to do our own missions in space," said Capt. Catercia Isaac, a physicist with the 718th Test Squadron. "So, they built this. But, later on NASA decided to use this chamber to test satellites. We've tested the GPS and weather satellites, which are still in orbit. We put them through all of the rigors in space in this chamber. If it can survive here, it can survive in space."

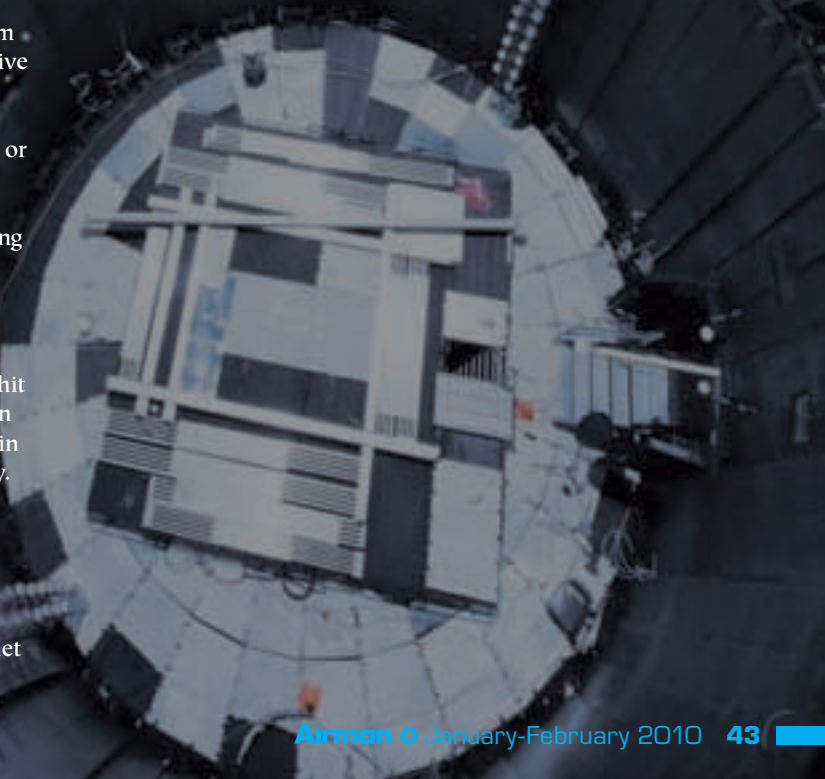
Through the years, testing activity slowed as fewer new craft were built. Though still an essential part of fielding any new air or space asset, demand is down at the tunnels.

"There were many more project engineers then, because there were many more projects," said Dr. Stan Powell, an Aerospace Testing Alliance engineering scientist. "We probably had 25 to 30 project engineers, and each engineer would have two or three projects.

"At that time, all of the problems of re-entry had not been worked out," he said. "Apollo, Gemini and Mercury had flown and the intercontinental ballistic missiles were good enough to hit a [target], but there were still a lot of problems that had not been worked out yet. As a community, we are smarter than we were in 1978. We know how to make airplanes that fly pretty efficiently. The things we are testing now are more in terms of getting the next 1 to 2 percent of performance, rather than merely demonstrating whether the thing will work or not."

"As good as we may be, we are not to the point where the work that AEDC does can be done any other way," said Powell. "Aerospace systems are too complicated to just build them and let them fly."

"When the warfighter is doing his job, he's got enough to worry about without worrying about whether his equipment will perform," Powell said. "When he punches a button, he has an expectation of what is going to happen, and he deserves for that expectation to be correct. We need to provide him with dependable, reliable systems."



WIND TUNNEL TEST PROJECT MANAGER

Richard A. Roberts, Ph.D.

photo by Lance Cheung

"Working with so many different customers allows for great networking opportunities and friendships across the country. The challenges and responsibilities are always new and different. I get great satisfaction knowing what I do contributes directly to many air and space programs, and ultimately to the security of our nation."

HOME UNIT/BASE:
716TH TEST SQUADRON
ARNOLD AFB, TENN.

HOMETOWN:
HILLSBORO, TENN.

MILITARY EXPERIENCE:
3 1/2 YEARS CIVIL SERVICE

EDUCATION:
DOCTORATE OF ENGINEERING,
TENNESSEE TECHNOLOGICAL UNIVERSITY

PRIORITY PARTS PULLER, AIRCRAFT MECHANIC

Richard Buchler

photo by Staff Sgt. Bennie J. Davis III

"Out here, we are nonstop all day long. From the time we receive our work orders to finding our jets; always moving. It is not a glamorous job, but I like not being stuck in one location all day."

HOME UNIT/BASE:
309TH AEROSPACE MAINTENANCE AND REGENERATION GROUP
DAVIS-MONTHAN AIR FORCE BASE, ARIZ.

HOMETOWN:
MERRILL, WISC.

AT 309TH AMARG SINCE:
FEBRUARY 2004

MILITARY EXPERIENCE:
U.S. AIR FORCE, 1987-1991, AIRCRAFT ELECTRICAL AND ENVIRONMENTAL SYSTEMS.

STORY BY STAFF SGT. J. PAUL CROXON ✪ PHOTOS BY MASTER SGT. JACK BRADEN

CELEBRITY AIRCRAFT

AIR FORCE MUSEUM BRINGS FAMOUS AIRCRAFT BACK TO LIFE

Among aircraft, like people, there are a few that stand out from the rest. Some are the first to do something, some are the last to do something, and some, well, some are just celebrities.

The Memphis Belle, a B-17F Flying Fortress, is just such an aircraft. Gaining fame for being the first American heavy bomber to complete 25 combat missions, she went on to fly across the country on a 31-city war bond tour. She was even portrayed in at least two motion pictures before being retired.

In 1945 the Belle was purchased by the city of Memphis for $350 and she was put on display in the city. Eventually the city donated the plane back to the Air Force, but it remained in Memphis where the elements, vandals and souvenir hunters damaged the plane beyond the repair capabilities of the city. That's when the National Museum of the United States Air Force stepped in.

In 2005 the Belle was delicately transported to the museum where she became a top priority. But she isn't just undergoing a cosmetic application of new paint. She's being reborn.

"We're taking our time with these aircraft," said retired Maj. Gen. Charles Metcalf the museum's director. "They aren't just display items, they are the historical record for that particular aircraft."

Being part of the historical record means the Belle will be restored to the way she was back in the 1940s. Hydraulics will be replaced, electrical wires will be re-run, and even the instruments will need to be found or fabricated. In all, General Metcalf anticipates the entire project to take the crew of museum craftsmen and volunteers more than a decade to complete. But for the general it's one more piece to the story.

Of the more than 450 display aircraft at the museum, the Belle has the company of about 26 others undergoing, or slated for, restoration. Among them is the only surviving B-17D, known as The Swoose, originally named Ole Betsy, a MiG-25, and even the Boeing X-32A, which competed in the Joint Strike Fighter contest. Some aircraft come nearly ready for display, but others need special attention and talented craftsmen. One crew specializes in fabric and wood, another specializes in composites, while another team works sheet metal. However, many of the aircraft restored at the museum don't come with restoration kits.

"The restoration crews use all the drawings; they use all the tech orders from that period [to restore the airframe]," said General Metcalf. "The equipment, well you have to look long and hard for it. Radios come with model numbers and sub model numbers and you may find kind of the right radio, but you have to look long and hard to find the right radio."

In the case of the Belle and The Swoose, craftsmen custom-make panels using the same kind of sheet aluminum used in factories in the 1940s to replace damaged parts, but often they need only remove the aged paint and grime to reveal the soul of the aircraft.

"This is 1930s aluminum," said General Metcalf holding a piece from The Swoose. "Back in the days before the war, the cladding was heavier than it is now so this hasn't been a beer can 10,000 times over. The Smithsonian looked at this aluminum and said it would have to be painted. They said it wasn't restorable. Hardly, you can see spots where we've buffed it out revealing the original metal."

Retired Maj. Gen. Charles Metcalf stands in front of a reproduction of the Wright Flyer at the National Museum of the United States Air Force. In addition to reproductions, the museum fully restores vintage aircraft.

Duane Jones, left, and Robert Anderson, restoration technicians with the Air Force Museum, remove a bomb bay door actuator from the Memphis Belle. The B-17 Flying Fortress is in the second year of a 10-year restoration program.

The museum has a collection of vintage and active aircraft and maintains a wish list for aircraft in the active inventory that have a particularly unique story to tell.

Very little of the original B-17D known as The Swoose remains. Years of neglect deteriorated the plane. Museum restoration technicians will spend the next 10 years painstakingly restoring it.

Robert Anderson, a restoration technician with the Air Force Museum in Dayton, Ohio, prepares a label for the bomb bay door actuator of the Memphis Belle.

Chris Williams, right, and Roger Brigner, exhibits restoration specialists with the Air Force Museum, replaces sheet metal on The Swoose.

The museum collection consists of about 450 aircraft on display. There are about a dozen more in various states of refurbishment.

In the case of battle damage, decisions are made as to whether to keep it or repair it.

"We make every effort to preserve the aircraft's story," said General Metcalf. "If the damage to an aircraft is an important part of the story we preserve it. It's a very deliberate process. A hundred years from now this aircraft will be preserved long after every other B-17 has turned to aluminum oxide. We don't overlook a thing."

The museum is always looking for celebrity aircraft, the first and last to do something, and aircraft with stories. In the case of modern airplanes where many aircraft are available, the museum looks for the ones with the best stories to tell.

"When it comes to modern aircraft we get the pick of the litter," said General Metcalf with a chuckle. "You may notice we don't have a tanker yet; we're waiting for one of three specific tail numbers. When an aircraft is retired, we are the last stop before the junkyard."

General Metcalf isn't a stranger to junkyards. He knows his way around the museum's restoration hangar; he knows all the stories; and he knows how to get those stories.

"It's a product of misspent youth, I suppose," he said. "I used to prowl automobile junkyards; now I prowl aircraft junkyards. There are places where we know there are aircraft, such as New Guinea, but it's hard to get to.

"I've long since stopped saying that you can't find these things or that it doesn't exist, because as soon as I say that something appears. They're still in barns and places that you would not expect them to be."

Once they are found, they are given all the care and time needed to bring them back to life so one day the grandchildren of the pilots who flew the aircraft can hear the story. And sometimes, it might even be a celebrity.

In addition to the more than 2,500 aircraft in the museum's inventory and on loan around the world, there is also a collection of more than 130,000 other items such as uniforms and medals.

STORY BY RANDY ROUGHTON ✪ PHOTO BY LANCE CHEUNG

LIVING MY STORYTELLING DREAM

While looking at the clouds through the window on my flight from San Antonio, my thoughts weren't where they normally are on the way to an assignment. I usually spend this time preparing for interviews or mulling over research.

This flight was different because this assignment was special. This was the first assignment for my dream job. I was reflecting on my first flight to San Antonio almost two decades ago for basic military training at Lackland Air Force Base, Texas.

I've always enjoyed a good story. I've also love to tell stories, whether they are to readers of a daily newspaper in Alabama or to the first grade children I taught in Florida. That first flight was 20 years ago. Then, I traveled with a copy of Airman magazine in my hands, as my dream was to become a storyteller for Airman.

My dream didn't come true during my first active-duty enlistment, or during a second that sent me from Alabama to the frigid climate of Grand Forks Air Force Base, N.D. However, when I left the 319th Air Refueling Wing, everyone knew my dream and I was given a mock cover of Airman with a photo of a prairie dog. It has a prominent spot on my desk to this day.

After several other public affairs jobs, in and out of uniform, I was finally given my chance in September. Two weeks after joining the Airman staff, I was on my way to my first assignments — Arnold Air Force Base, Tenn. and Robins Air Force Base, Ga.

Of course, I had to get there first. The trip northeast with veteran photojournalist Lance Cheung and broadcaster Tech. Sgt. Steve German began in a stormy fashion — literally. A severe thunderstorm knocked out electricity in my neighborhood, so my trusty alarm clock, which I counted on to awaken me in time for the 7:30 a.m. flight, let me down. Instead, I awoke at 6 a.m. I panicked because the drive to the airport takes 45 minutes in good weather. As it turns out, the same storm knocked out electricity at the airport, delaying our flight for more than two hours.

Lance Cheung, with camera, administers a little bonding, Airman style, during Randy Roughton's first trip as a staff writer for the magazine. The first stop of the assignment was the Arnold Engineering Development Center. The AEDC is the world's most advanced and largest complex of flight simulation test facilities. The center operates 58 aerodynamic and propulsion wind tunnels, rocket and turbine engine test cells, space environmental chambers, arc heaters, ballistic ranges and other specialized units. Twenty-seven of the center's test units have capabilities unmatched elsewhere in the United States; 14 are unique in the world.

Fortunately, the stories we found at Arnold and Robins made the adventurous trip worth it. At the Arnold Engineering Development Center, located in a remote area in the middle of southern Tennessee, we got an extensive tour of the largest aerospace ground test facility in the nation.

As a shameless history buff, I enjoyed hearing the stories behind the Propulsion Wind Tunnel Facility and the von Karman Gas Dynamics Facility, not to mention the Mark 1 Test Facility. This 82-foot, state-of-the-art space environment simulation test chamber was originally built for the Air Force space program, but its purpose changed with the creation of NASA in 1958.

The chamber is now used for full-scale space systems testing.

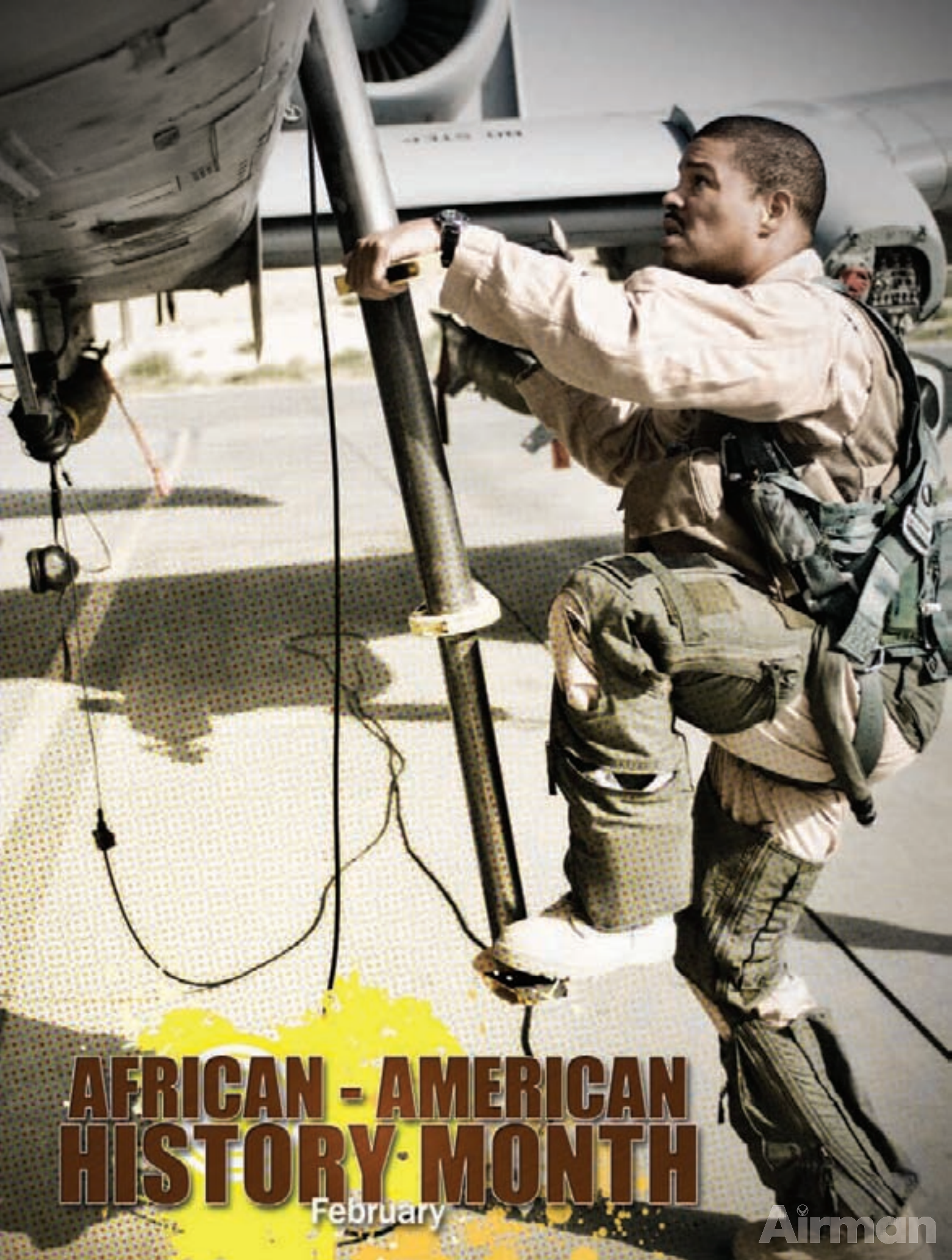
I was especially interested in the building of the von Karman facility, which was named after Dr. Theodore von Karman, a leading aeronautical scientist who is known as the father of supersonic flight. Von Karman's findings led to the building of the facilities in 1957, and it was renamed for him two years later.

After the wind tunnels, it was off to Robins for a visit with the people at the maintenance depot. Our hosts at the 402nd Maintenance Wing introduced us to some pretty amazing technology such as the Aerial Multi-Axis Platform, commonly called an AMP.

However, what are most interesting at both installations are the perspectives of the people there. I enjoyed hearing how they view their work and its impact on the mission. These are the people who, in some cases, work 10 hours a day, six days a week, to make sure our warfighters are getting safe aircraft as soon as possible. Of course, there are many people just like them all over the Air Force and we need to hear their stories.

On the way back to San Antonio, my mind was back on the things it normally is after a story assignment. I was reflecting on how to best tell the stories of the people I met. I hope my effort will do them justice because all the people I interviewed had wonderful stories to tell. I am very happy to be the outlet that allows them to tell them to you.

Randy Roughton



AFRICAN - AMERICAN HISTORY MONTH

February

Airman

THE FINAL FRAME

SURGE PROTECTORS | *photo by* SENIOR AIRMAN KENNY HOLSTON

WHITEMAN AIR FORCE BASE, Mo. — Lighting strikes over the 442nd Fighter Wing's A-10 Thunderbolt II parking ramp during an early morning thunderstorm. The 442nd FW maintains a fleet of 27 A-10's.