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FEATURES

About the cover: The KC-46A Pegasus deploys the centerline boom for the first time. See "The Air Force's Tight-Budget Shopping List," p. 18. Boeing photo by John D. Parker.

AIR FORCE MAGAZINE
Journal of the Air Force Association

DEPARTMENTS

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Editorial

The 2016 Statement of Policy

The United States remains the world leader but the future holds uncertainty, aggression, and, in too many spots around the globe, conflict, and war. To protect American interests, our armed forces must be technologically advanced, lethal, and highly mobile.

Our Air Force is America's first-responder force for engagement: It possesses the skills, agility, responsiveness, and weapons systems to meet challenges on any spot on the globe, with little advance notice. However, the Air Force is at a crossroads, with very old weapon systems and the smallest fleet it has had since before World War II. Our national security interests require that this status be dramatically changed.

Funding pressures have pushed the Air Force into a classic "ready force today" versus "ready force tomorrow" conflict. It's a choice no armed service should ever have to make; either option creates unacceptable risks. AFA calls, in strongest terms, for an end to the funding caps imposed by the Budget Control Act of 2011, and for the Air Force to once again have the flexibility to make prudent decisions about investing the funds it does receive to produce a modernized, balanced, and capable fighting force for today and tomorrow.

If the Air Force is to prevail in the combat environments of today and tomorrow, recapitalizing its aging fleet with fifth generation fighter aircraft is crucial. America simply cannot afford or accept the inherent risk, to maintain older weapon systems while adversaries roll out new platforms.

A steadfast commitment to recapitalizing fighter, bomber, tanker, trainer, combat search and rescue, and intelligence, surveillance, and reconnaissance platforms is essential to fulfilling the Air Force role in the National Military Strategy.

We must also recapitalize the nuclear force to ensure we continue to successfully carry out the nuclear deterrence mission during a potential future of proliferation, and to maintain both Air Force bomber and missile components of the nuclear triad. We must invest in infrastructure, personnel development, weapons development, storage, and safety.

Space capabilities remain indispensable to the joint force commander's ability to deter aggression and to execute globally the entire range of military operations. However, our space capabilities are facing evolving competition from both Russia and China in anti-satellite systems. It is imperative to invest smartly to enhance space domain mission assurance, including resilience, defense operations, and reconstitution of space systems.

The Air Force Association 2016 Statement of Policy was adopted by the delegates to the AFA National Convention Sept. 13, 2015.

We must also establish and maintain a robust capability in the cyber domain, to defend our networks against cyberattack and to attack and exploit the networks of our potential adversaries when necessary.

AFA believes the Air Force must play a leadership role in ensuring US military superiority within the cyberspace domain.

Our essential technological edge is strongly connected to advancements in science and technology. As systems become increasingly complex, the links between capability, innovation, and research and development become critical for affordable future system architectures.

AFA believes the Air Force needs to continue to invest in research and development to maintain its technological edge, and must ensure that our defense industrial base has the capability and capacity to reliably and affordably meet our defense needs now and in the future.

AFA will also continue to strongly advocate for aerospace education and the development of science, technology, engineering, and mathematics as the foundational skills and our distinctive advantage needed to insure US airpower dominance, national security, and free economic vitality.

Finally, the effectiveness of today's Air Force hinges more than ever on the quality, training, and dedication of its airmen. Through 25 continuous years of combat operations, our airmen and their families have steadfastly served our nation. We must honor our commitments to them, and to all veterans and retirees who served honorably. The Air Force must also continue the fight against sexual assault and hold those responsible accountable. This should not be open to debate.

The Air Force Association unequivocally declares that America deserves a dominant United States Air Force and a strong national defense. It's time the Air Force became the force America needs it to be, not the Air Force it used to be, or the Air Force it is forced to be by arbitrary budget decisions.

We stand for and respect our airmen, their families, our veterans, and our Air Force heritage. We pledge that we will do all that we can to guarantee that the Air Force can provide for the common defense of the nation we love today and tomorrow. ✪

For more on AFA's policy positions, see "Top Issues," on page 66.

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Tell It Like It Was

John Correll's excellent disclosure *["Opposing AWACS," September, p.88]* of the intense, unenlightened warfare against AWACS development was amazingly introspective and accurate. As a Boeing Washington representative, I was assigned the program just as it had failed its first DSARC review. A select technical task force was created to re-evaluate all the classified requirements and operational risks for the system, and it was approved for development. AWACS was viewed as a threat both to Air Force and Navy fighter autonomy in the battlespace—taking direction from a battle manager and requiring fighter protection. Plus, the range and fidelity of the new Doppler radar was doubted. Air Force Chief of Staff Gen. David C. Jones, having just come from his USAFE command, appreciated the game-changing potential in a continental conflict, so he "approved" of a "white-paper" movie we made of a Soviet command post anguishing over their fighters lost to AWACS-directed battles. When shown to congressional staffers, aerospace writers, the GAO, etc., a positive image began to replace the doubters. Senator [Thomas] Eagleton's opposition was based on possible reduced F-15 buys. Senator [William] Proxmire and Representative [Patricia] Schroeder were just looking for anti-defense budget targets. The other negativists did not appreciate the tactical force-multiplier effect of airborne C3.

When we were negotiating the NATO and Saudi AWACS buys, Grumman and the Navy insisted that the E-2C could do the over-land surveillance and air control mission, but of course it had neither the range, altitude, onboard electronics, or ground clutter radar discrimination capability.

Westinghouse proved the advanced radar capability, Boeing proved its system integration chops, and the Air Force proved its anti-jam and survivability claims. The naysayers gradually faded as AWACS met its targets, and theater commanders asked for more and more air surveillance assets. AWACS became the must-have for Red Flag and crisis management airborne C3, worldwide. Thanks, Mr. Correll, for telling it like it was.

Theodore Smith
Fairfax, Va.

I just finished reading Correll's article and was stunned that he never mentioned either Gen. David C. Jones, commander in chief of USAFE, USAF chief of staff, and Chairman of the Joint Chiefs of Staff, or Gen. Wilbur L. Creech, USAFE deputy chief of staff for operations and intelligence, commander, Electronic Systems Division, and, ultimately, commander, Tactical Air Command for some six years.

I spent over two years as Major General Creech's administrative assistant and much of that period was spent refining briefings to sell AWACS, which we accomplished. General Creech was then promoted to lieutenant general and sent to Hanscom. The program went forward despite the opposition of Congress. General Jones went on to be the CSAF and, in spite of great opposition, the CJCS. General Creech went on to be the commander of TAC.

Do you have a comment about a current article in the magazine? Write to "Letters," *Air Force Magazine,* 1501 Lee Highway, Arlington, VA 22209-1198. (Email: letters@afa.org.) Letters should be concise and timely. We cannot acknowledge receipt of letters. We reserve the right to condense letters. Letters without name and city/base and state are not acceptable. Photographs cannot be used or returned.—THE EDITORS

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AFA's Mission

Our mission is to promote a dominant United States Air Force and a strong national defense and to honor airmen and our Air Force heritage. To accomplish this, we:

Educate the public on the critical need for unmatched aerospace power and a technically superior workforce to ensure US national security.

Advocate for aerospace power and STEM education.

Support the Total Air Force family and promote aerospace education.

Interestingly enough, I spent some five years, prior to my assignment to USAFE, flying EC-121s out of McClellan AFB, Calif., and in Vietnam.

AWACS survival happened only because of General Jones' and General Creech's efforts and, by the way, it has been one of the best systems our military has ever developed.

Col. William R. Phillips,
USAF (Ret.)
Houston

Not For Nothing, But I Invented It

Thank you for your fine article on Seek Eagle *["Eglin's Middle Men," September, p. 94].* It may sound like bragging (well, it is, a little), but I claim that I created Seek Eagle way back when.

It was 1965. I was a colonel on the Air Staff running a small staff section called Requirements Plans Group. The group was the catch-all and odd-ball team for Gen. (then Maj. Gen.) Jack Catton and his directorate of Operational Requirements and Development Plans, DCS/R&D.

General Catton received two major complaints (from Tactical Air Command and Air Materiel Command) that people were fastening things on the outsides of operational aircraft without knowing whether the things would fall off or shake the aircraft to pieces. Something had to be done.

It appeared that discipline and mandatory procedures would be required, so with the help of representatives of the two commands, my group put together a master directive establishing a compatibility office, with enough clout to work and enough details to get it launched.

I was about to send out an almajcom message inaugurating the process, when an older and wiser colonel told me that a program like that had to be given a code name in order that it might be referred to unambiguously in the future. So I went to the Pentagon code namers. They issued me the words Seek Eagle. We could then issue a directive, and we tasked the Air Proving Ground Command at Eglin to make it happen and keep it going.

They did and they have. And since then, the number and variety of things we have hung on innocent aircraft beggar comprehension. Without Seek Eagle it could not have worked.

All that sounds self-serving, but I must say that Seek Eagle was an idea whose time came, and the implementing directive almost wrote itself.

My thanks to Seek Eagle for its years of service, and thanks to AFA for publicizing their good work. God bless you all.

Brig. Gen. Geoffrey Cheadle,
USAF (Ret.)
Washington, D.C.

Guns, Schmuns

Amazing! In "Aperture" on p. 12 *[September],* it is finally recognized that the gun is no longer the primary weapon for air-to-air battle. Interceptor pilots from the late '50s were not recognized as "fighter pilots" because they didn't carry a gun. All the years since then the "true fighter pilots" fought with a gun. They were the "knights of the air" even though Eddie Rickenbacker, whom I met several times when I flew with the 94th Fighter-Interceptor Squadron, agreed that if you needed to use a gun in an air battle you were losing. We've been fighting wars for years and the last use of a gun was in 1988. That's 26 years ago! How about an article about us fighter pilots flying using sensors, missiles, and rocket who were the future of the air battle, for once.

Ray Janes
Denton, Texas

Close Call

Thank you for publishing the article, "The Year of the Kamikaze" *[p. 54]* in the August issue of *Air Force Magazine.* In September 1945, I was on the crew of an empty Liberty cargo ship moored at a downtown pier in San Francisco. We did not know the war plan, but since then, we have learned that the invasion of Japan would have begun on Nov.1. I am certain that my ship would have loaded military cargo and been a part of the invasion fleet. Reading your article brought back strong memories and the reality that my ship would probably have been destroyed.

Col. Paul A. Stagg,
USAF (Ret.)
Cambridge, Md.

Join Us, CAP

Just finished Issue 5 *[Wingman Magazine].* It takes awhile to arrive here in Bangkok. Anyway, as usual, a very enjoyable read.

Re: membership decline. Yes, it is certainly dismal looking at the membership numbers. I believe the reason the association had such great numbers in the past was due to the command support of membership. In the ANG back then, we were told to belong to AFA and the National Guard Association. They sent around a computer printout with all the officers listed and whether or not they paid their dues. Demands followed and promotions would be affected. It was expected and you were criticized by command for noncompliance. Needless to say, it worked. I understand that is difficult to do nowadays.

As to an idea for today, might I suggest hitting the CAP up for members. They just became full-fledged airmen and should be willing to join. The few occasions I had to deal with these folks they were always gung ho and really Air Force. A letter similar to Jimmy Doolittle's might do the trick. Besides the benefits you might emphasize the clout of more members with Congress and so forth.

Keep trying. Thank you for your efforts in everything.

Lt. Col. C. J. Clemens,
ANG/USAF (Ret.)
Bangkok

The More Info the Better

I have been an avid reader of *Air Force Magazine* for many years and enjoyed your July piece, the "Russian Airpower Almanac" *[p. 48].* That information is important for the public to see. Providing so much information in such a limited space is a difficult task and it was done well.

Additionally, I believe there are a few categories that would serve readers well if they were listed uniformly:

- Unit and R&D cost
- Combat radius—some platforms listed range and ferry range, others listed combat radius
- Gun rate of fire
- Total number of aircraft produced

I will be starting Air Force Euro-NATO joint jet pilot training this year, so research of this nature is quite useful and interesting to me.

Randy Carey
Wichita Falls, Texas

B-1 Longevity

Your article about the B-1 *["Airpower Classics," September, p. 116]* is incorrect. The longest B-1 combat mission was 23 hours long on 3 May 2004. A/C Mark Bennett, Copilot Mark Johnson, WSOs Mathew Farley and Mathe Clapp, C/S SLAM 53 out of Diego Garcia.

Lt. Col. Mark D. Johnson,
USAF
Deputy Director of Operations
8th Air Force
Colorado Springs, Colo.

Assumptions About Tankers

Thank you for the editorial on the KC-46 *["Editorial: The Tanker Imperative," September, p. 4].* I've followed the acquisition of this asset in my retirement. As former study director of the Tanker Requirements Study FY-05 (TRS-05), I cannot re-emphasize enough the need for tanker modernization. Hopefully we've seen an end to war plans simply assuming tanker support will be there, and instead continue to develop a robust tanker programming plan for the outyears. I wouldn't mind seeing a separation in deployment versus employment requirements, but at least seeing tankers become a priority is a step in the right direction.

Lt. Col. Scott Wilhelm,
USAF (Ret.)
Kansas City, Mo.

By Megan Scully

The Dems on Defense

In an interesting twist, the most liberal candidate in the 2016 presidential field may be among the biggest backers—albeit a reluctant one—of the Pentagon's most expensive weapons program.

Vermont Independent Sen. Bernie Sanders, whose efforts to claim the Democratic presidential nomination have gained considerable traction in recent months thanks to an energized grassroots campaign, has made no bones about his reluctance to take military action, should he become the next President.

Despite Sanders' pledge to move the United States away from a policy of "unilateral military action" and his desire to trim what he deems to be unnecessary defense spending, Sanders has supported the massive F-35 strike fighter program during his time on Capitol Hill.

The fighter, after all, has home-state implications for the two-term senator, with 18 of the stealth fighters headed to the Vermont Air National Guard beginning in 2020. Like other lawmakers whose states stand to gain from the procurement program, Sanders has expressed reservations about the F-35's history of cost hikes, calling the program wasteful. But as long as the military is buying the airplanes—something he considers a foregone conclusion at this point—he wants to see them put to use in Vermont.

"For better or worse, that is the plane of record right now and it's not going to be discarded," Sanders said at a town hall in New Hampshire in June 2014. "That's the reality."

But defense spending in general—and individual programs like the F-35, in particular—have taken a back seat to domestic issues at this stage of the contest for the Democratic nomination.

When Sanders, who considers his vote against the Iraq War in 1991 one of the most important of his congressional career, has discussed these matters, he has tended to focus on diplomacy and foreign policy rather than bread-and-butter defense issues. As the former chairman of the Senate Veterans Affairs Committee, he has also been particularly vocal about veterans issues, from suicide prevention to support for families.

Screenshot from CNN video

Defense policy will heat up as election time grows near.

"Sanders believes that just as planes and tanks and guns are a cost of war, so is taking care of the men and women who we sent off to fight the war," he states on his site.

Meanwhile, Hillary Clinton has the pedigree, both as former Secretary of State and a former member of the Senate Armed Services Committee, to argue she has a unique set of national security bonafides to be the next President.

But her campaign has been mired in scandal. Her handling of the deadly attack on the US consulate in Benghazi, Libya, during her tenure as Secretary of State has been a hot-button issue for many conservatives—and lingering security questions about her use of personal email to conduct official business have more broadly hurt her ability to assert herself in the security arena.

"I have tried to the best of my ability to be able to respond and if people are uncertain, if they have concerns about these questions about the emails, it's their choice to say, 'That's going to influence, you know, how I think about the election.' I understand that, I get it," Clinton said Sept. 27 on NBC's "Meet the Press."

Clinton's platform includes critical defense and security issues, including defeating ISIS, stopping Iran from acquiring a nuclear weapon, and standing up to Russian President Vladimir Putin. But in her "Meet the Press" interview, Clinton quickly, and tellingly, pivoted to domestic issues, which have been her focus on the campaign trail.

"I also hope people will look at my lifelong advocacy for kids and families and women and look at what I'm proposing, the vision I have for the country to move forward on everything from raising incomes to equal pay for equal work to getting the cost of college down to dealing with high prescription drug costs," she said. "That's what I hope people focus on and people get to make their minds up," she said.

Those are the issues that have dominated the campaign season so far and have resonated with voters anxious about their own futures.

While defense issues have been largely on the backburner at this stage of the campaign, policy battles over the United States' role in the world, and how the country should pay for it, will likely play out as the primaries get closer and the candidates attempt to differentiate themselves on security matters.

They are, after all, vying to be the next Commander in Chief. ✪

Megan Scully is a reporter for CQ Roll Call.

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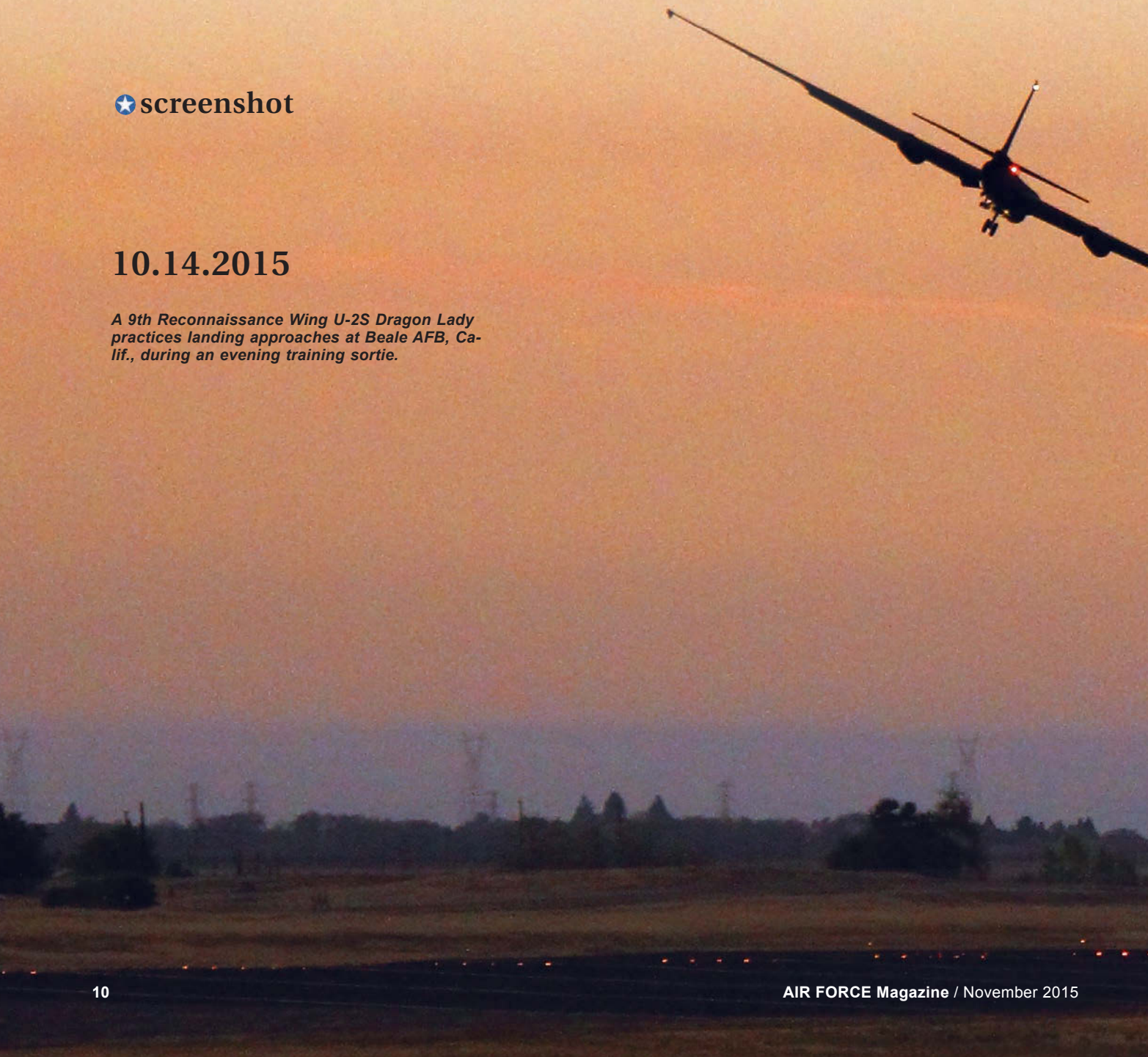
F-35 "Myth Busting"

The program executive officer for the F-35 joint program office shot down some "myths" about the fighter program Sept. 9 during a speech in Washington, D.C.

While most news reports about the program mention cost overruns, the last time the office added money to the development program was in 2010, said Lt. Gen. Christopher C. Bogdan, who said he hasn't asked for "a single penny" since then—and doesn't intend to. Additionally, he said, while estimating the costs for everything related to the F-35 program for the next 50 years is "a mighty sketchy endeavor," the program has seen a decrease in the estimated operations and sustainment costs of about 13 percent in the last three years and expects that trend to continue.

Bogdan also addressed reports that the F-35 lost in a dogfight to an F-16, saying that while the F-16 and A-10 are "awesome, … they will not survive in the future battlespace." Those aircraft can't do some of the missions the F-35 has been designed to do, or what the services want the aircraft to do, he said, using the analogy of an Olympic decathlete racing an Olympic sprinter in the 100-meter dash. "That's not what we should measure the F-35 on," Bogdan said.



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10.14.2015

A 9th Reconnaissance Wing U-2S Dragon Lady practices landing approaches at Beale AFB, Calif., during an evening training sortie.

By Brian W. Everstine, Pentagon Editor

Spatial Disorientation Led to Fatal F-16 Crash

An F-16C pilot lost visual contact with the lead aircraft in his formation and suffered from spatial disorientation during maneuvers, leading to a fatal crash into the Gulf of Mexico on Nov. 6, 2014, according to an Air Combat Command accident investigation board report released Sept. 8.

The pilot, Matthew J. LaCourse, performed a series of dynamic maneuvers during intercept training with another fighter that stimulated fluid in his inner ear canals, states a release summarizing the report. These fluids are crucial to human perception of direction, movement, and gravity—and the fluid stimulation led him to misperceive his angle of bank, pitch, and position, leading to spatial disorientation. The AIB also determined there was evidence to show the loss of visual contact with his flight lead contributed "substantially" to the crash.

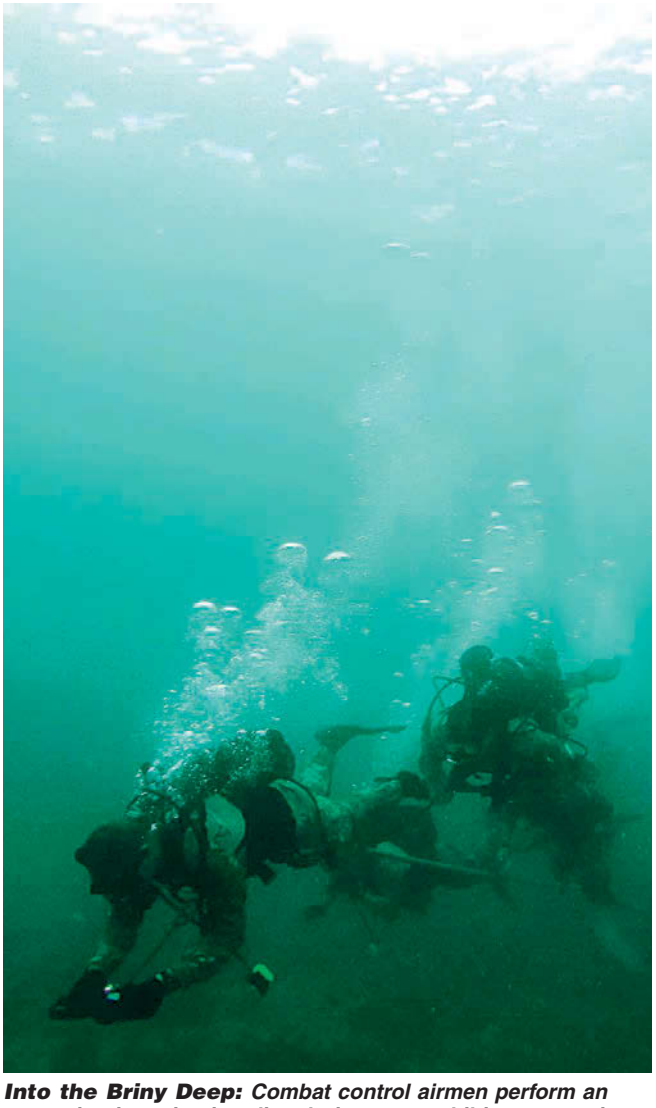
LaCourse was a civilian pilot assigned to the 82nd Aerial Targets Squadron at Tyndall AFB, Fla., at the time of the crash.

Gulfstream, Northrop Want Action on JSTARS Recap

The Air Force plans to award a contract for engineering, manufacturing, and development of its next generation

Staff photo by Aaron M. U. Church

USAF photo



Into the Briny Deep: ***Combat control airmen perform an open-circuit navigation dive during an amphibious operations exercise off the west coast of Okinawa, Japan, on Sept. 22. The airmen were refreshing qualifications and honing infiltration proficiency.***

JSTARS in 2017, but some contractors are pressing the service to move faster.

One group, led by Gulfstream and Northrop Grumman, said it is to going to move forward with a proposal now. The team, one of three vying for a contract to recapitalize the JSTARS fleet, has been testing a prototype for years, and flew a team of reporters to the Gulfstream production facility in Savannah, Ga., in early September, to display the maturity of the program.

Northrop Grumman has a prototype Gulfstream 550 aircraft, outfitted with a radar canoe and several sensors and radars, which has been in testing, and company officials say their version—with a range of more than 8,000 miles and cruising altitude of 51,000 feet—is ready for the Air Force.

The prototype can fit 10 operators, down from the current E-8C requirement of 18, and though Gulfstream has never produced an aircraft with in-flight refueling capability, officials say they can engineer that into an aircraft. The team is competing against Boeing's planned modified 737 and a joint effort by Bombardier and Lockheed Martin centered on a Bombardier Global 6000 bizjet.

USAF Advocates for Allied Capabilities

The Air Force wants allied countries to pick up the slack to increase capabilities in intelligence, surveillance, and reconnaissance, air mobility, and command and control as USAF downsizes to its smallest size in history, the service's top international affairs official said Sept 9.

Although allies often are quick to show up to contingencies with equipment, many lack communication links and command and control capability to effectively operate with other countries, including USAF, said Heidi H. Grant, the deputy undersecretary of the Air Force for international affairs, during the ComDef conference in Washington, D.C.

There's a shortfall of air mobility such as tanker refueling if the US isn't available, she said. As the US military shrinks, it's working to get in front of dropping capabilities by working with allies to improve capabilities.

Rethinking the Space Ground Enterprise

As the Air Force retools its space ground enterprise, it must remain focused on agility, automation, security, and resiliency, the new commander of 14th Air Force (Air Forces Strategic) said Sept. 11 in Washington, D.C.

The current space ground architecture was "designed in a different era for a different time," said Lt. Gen. David J. Buck. However, he said, "like every other environment, space is contested, degraded, and operationally limited."

Maintaining separate ground stations for every satellite system requires individualized operating systems, each operated by proprietary software the government does not own, Buck said. That's why the Air Force is moving toward one system where the government would own the mission data and technical baseline, he said.

The Air Force is also transforming its space training so that after a "Space 101"-type course at Vandenberg AFB, Calif., new space operators will go to a different location for unit mission-specific training.

KC-46A First Flight

Boeing flew the first all-up KC-46A Pegasus aerial tanker Sept. 25. The jet took off from Paine Field, Everett, Wash., at 1:24 p.m. local time on a checkout flight ending at Boeing Field in Seattle.

During the flight, the company said, technicians checked out basic aircraft integrity and fundamental systems, such as the engines, flight controls, and environmental systems. After the flight, a Boeing spokeswoman said plans call for calibrating instrumentation before the next series of flights, when the refueling boom and probe-and-drogue wing aerial refueling pods (WARPs) will be tried out.

Previous flights have been made with the jet's stablemate, a "provisioned freighter" 767-2C with all the plumbing of the all-up KC-46 but without the fitted military gear and air refueling probe. The test fleet will comprise two 767-2Cs—which will clear all the FAA requirements for the type—and two all-up KC-46s. The 2Cs will be fitted with refueling gear later to join the test program, to be flown out of Edwards AFB, Calif., and Boeing Field. All four of the test aircraft are expected to eventually join the operational force.

Boeing is under contract to build 17 jets, to be delivered by 2017 for initial operational capability, and ultimately will deliver 179 KC-46s under the KC-X program.

USAF plans a follow-on KC-Y and KC-Z program to finish replacing the KC-135 and KC-10 fleets, respectively.

Beale's Final MC-12 Sortie

The 9th Reconnaissance Wing flew its final MC-12W Liberty sortie from Beale AFB, Calif., ending Air Combat Command's operation of the aircraft on Sept. 16.

"The MC-12 is a great story because it linked those people in the aircraft with people on the ground and it allowed them to carry out a critically important mission," Col. Douglas Lee, the 9th RW commander, said in a news release.

Beale's 427th Reconnaissance Squadron has flown the aircraft since June 2011, following the Air Force's decision to normalize the MC-12 as a permanent fleet. Air Force MC-12s clocked some 400,000 combat flying hours and more than 79,000 sorties over Iraq and Afghanistan since they were first deployed in June 2009, according to officials.

The Air Force is retaining 13 of the 41 aircraft to stand up a special operations-tasked unit with the Oklahoma Air National Guard, while eight MC-12s are transferring to the Army.

USAF's Extended Range Reaper Operational

General Atomics Aeronautical Systems recently announced its Predator B/MQ-9 Reaper-Extended Range remotely piloted aircraft has entered initial operational service with the US Air Force.

The Air Force asked the company to produce 38 MQ-9 Reaper-ER variants, a quick reaction capability requirement, in 13 months and declare them operational 18 months after receiving the contract. The MQ-9s deployed operationally last month.

The MQ-9 airframe is made into an ER variant through a modification package featuring wing-mounted fuel tanks—extending the aircraft's range—an improved propeller, a heavyweight trailing arm landing gear system, and an alcohol/water injection system, among other modifications. The ER variant allows the aircraft to mix configurations of both fuel and weapons as well.

The quick reaction contract calls for all 38 MQ-9s to be delivered by July 2016.

Chinese Fighter Conducts "Unsafe" RC-135 Intercept

A Chinese fighter jet reportedly intercepted an Air Force RC-135 reconnaissance plane in an "unsafe fashion" on Sept. 15 over the Yellow Sea, according to Pentagon officials.

The Chinese crossed in front of the Rivet Joint, prompting concerns from the Air Force crew. While the intercept was deemed unsafe, there was no threat of a collision, Pentagon Press Secretary Peter Cook said.

The Defense Department is investigating the incident.

Chinese aircraft have intercepted US aircraft in a similar way before. Last summer, a Chinese J-11 flew within 20 feet of a Navy P-8 Poseidon in the South China Sea.

Breedlove: NATO and Russia Need to "Engage"

The US and NATO need to find a way to engage Russia and press that country to "rejoin a community of norms

New Digs: *Crews at the National Museum of the United States Air Force at Wright-Patterson AFB, Ohio, move a North American X-15A-2 into the museum's new, fourth building Oct. 2. The 224,000-square-foot structure, slated to open to the public in June 2016, will house aircraft galleries dedicated to research and development, space, global reach, and presidential aircraft. The new exhibit space will also host four STEM learning nodes. In all, the museum—the largest military aviation museum in the world—will showcase 360 aerospace vehicles and missiles and thousands of artifacts amid 17 acres of indoor exhibit space.*

USAF photo by Ken LaRock

that does not believe in changing international boundaries by force," said Gen. Philip M. Breedlove, commander of US European Command and NATO Supreme Allied Commander Europe.

Russia has vast energy reserves and a sprawling transportation infrastructure that Europe uses to help its economy grow. However, NATO countries and Russia need to talk at a high level to find common ground so they can work toward a peaceful and prosperous Europe, Breedlove said at the German Marshall Fund of the United States in Washington, D.C., on Sept. 28.

Breedlove's comments came the same day President Obama met face-to-face with Russian President Vladimir Putin at the United Nations in New York. "We recognize the deep and complex history between Russia and Ukraine, but we cannot stand by when the sovereignty and territorial integrity of a nation is flagrantly violated," Obama told the UN General Assembly. "If that happens without consequence in Ukraine, it could happen to any nation gathered here today."

Space Fence Passes Critical Design Review

Lockheed Martin's Space Fence System has passed the Air Force's critical design review, marking the end of the design phase and the beginning of radar production and facility construction, the company announced Sept. 28.

The large-scale digital radar, turnkey facility, and other parts of the system passed the review after a demonstration of a small-scale system that detected and tracked objects orbiting in space.

The Space Fence will use S-band ground-based radar to detect and track objects and debris in space to prevent collisions, and will replace the existing Air Force Space Surveillance System.

B-1 Transitions to Global Strike

The 7th Bomb Wing at Dyess AFB, Texas, and the 28th BW at Ellsworth AFB, S.D., held a realignment ceremony Sept. 28, marking the transition of the B-1 fleet from Air Combat Command to Air Force Global Strike Command.

The move means the Air Force's entire bomber fleet—the B-1, B-2, and B-52—is consolidated under the command of 8th Air Force, but for the roughly 7,000 airmen involved, the transition should be relatively seamless, 8th Air Force (Air Forces Strategic) Commander Maj. Gen. Richard M. Clark told *Air Force Magazine*.

"They will wear a different patch, but aside from that it won't be a significant change" for the airmen, said Clark. However, "behind the scenes, we'll have more consolidated advocacy for long-range strike, and a consolidated center for strategic thought for long-range strike and standoff weapons."

Even though all three of the service's bombers are "unique weapon systems," Clark said, "the core competency of long-range strike is something common to all" and the B-1 transition will help "build some synergy" within the bomber community. "In general this is a really great move for the Air Force," one that brings 8th AF back to its heritage.

Hundreds of Pieces to This Puzzle: *SrA. Cody Bowman (l) and SSgt. Catalina Cornejo disassemble an F110-GE-100C turbofan engine from an F-16 at Eielson AFB, Alaska, Oct. 8. Airmen at the maintenance shop will carefully take apart the engine and examine each component for wear or damage. The preventive maintenance reduces the risk of an aging or damaged part compromising the safety and performance of the aircraft.*

USAF photo by SrA. Peter Reft

The War on Terrorism

US Central Command Operations: Freedom's Sentinel and Inherent Resolve

Casualties

By Oct. 19, 15 Americans had died in Operation Freedom's Sentinel in Afghanistan, and nine Americans had died in Operation Inherent Resolve in Iraq and Syria.

The total includes 23 troops and one Department of Defense civilian. Of these deaths, five were killed in action with the enemy while 19 died in noncombat incidents.

There have been 61 troops wounded in action during OFS/OIR.

Obama Convenes Anti-ISIS Summit in New York

President Obama convened a summit with representatives from more than 100 countries in New York on Sept. 29 to emphasize the formation of a "global movement that is united by the mission of degrading and ultimately destroying [ISIS]," he said in remarks at the United Nations headquarters during the annual General Assembly.

The summit comes just after the one-year anniversary of the formation of a global coalition to counter ISIS, and though the group marked successes in stabilizing and liberating portions of Iraq and Syria from terrorists, Obama conceded there is a great deal more effort needed. "This is not a conventional battle. This is a long-term campaign—not only against this particular network, but against its ideology," he said.

Obama praised the growth of the international coalition to some 60 nations, and the military contributions from nearly two dozen countries. In a nod to the recent increase in Russian activity in Syria, he declared the US is also "prepared to work with all countries, including Russia and Iran, to find a political mechanism in which it is possible to begin a transition process."

NATO Hands Off Control of Afghan Airspace

Afghanistan on Sept. 22 took control of its own airspace after 13 years of NATO support, the alliance announced.

Turkish Maj. Gen. Cahit Bakir, Resolute Support commander for Kabul International Airport, praised the occasion as a "historical milestone for Afghanistan."

Aviation is critical to both transportation and economic activity in the landlocked country, and the projected growth of aviation over the next two decades in Asia gives Afghanistan an opportunity to become a key partner in the region, said Mohammad Daud Sultanzoy, the chair of Afghanistan's airport development project.

Afghanistan's airspace control is not only critical to safe military and civilian traffic, it is tied to revenue from overflight of commercial traffic and is a vital part of training for Afghan air traffic controllers and airport workers, Bakir said.

Petraeus: US Not Where It Should Be in ISIS Fight

In his first testimony to an open session of Congress in three years, retired Army Gen. David H. Petraeus urged increased support to Iraqi security forces, Sunni tribal forces, and Kurdish Peshmerga.

"Some elements of the right strategy are in place" in the fight against ISIS, he told the Senate Armed Services Committee, but several elements are under-resourced or missing altogether. "We are not where we should be at this point," he said.

While he said he would not embed US personnel at the Iraqi battalion level, he would recommend embedding US advisors down to brigade headquarters level for the Iraqi security forces fighting ISIS. "The center of gravity of the sustainable defeat of ISIS in Iraq lies in Baghdad," Petraeus said, and the "key" is to strengthen "those in Baghdad who are prepared to pursue inclusive politics and better governance."

CSAR Airmen, Aircraft Deploy to Turkey

The Air Force will begin combat search and rescue operations from another base inside Turkey, Gen. Philip M. Breedlove, commander of US European Command and NATO Supreme Allied Commander, said Sept 29.

The Air Force has moved people and assets to Diyarbakir Airport in the southeast region of the country to expand Operation Inherent Resolve, Breedlove said at an American-Turkish Council conference in Washington, D.C.

Some 300 airmen, HH-60G Pave Hawks, and HC-130s "will be on station to provide rescue capabilities to coalition recovery efforts in the fight against [ISIS]," Defense Department spokeswoman Laura Seal told *Air Force Magazine*.

US troops "will be guests of the government of Turkey" and there is no plan for a permanent presence at the base. In addition to the new deployment, the US will increase the contingent of strike aircraft flying out of Incirlik Air Base to "step up the fight against [ISIS]," officials said.

Electrical Failure Caused Predator Crash

Complete electrical failure caused by a short circuit brought down an MQ-1B Predator on March 1 in the US Central Command area of responsibility, the Air Force announced. The Predator was flying a "combat support" mission in an undisclosed area when it crashed.

According to the Air Force investigation, a short circuit in the aircraft's onboard printed wiring board caused electrical generation to exceed the capacity of both the Predator's alternators, draining both batteries. Without power, the aircraft couldn't fly and crashed, according to an abbreviated accident investigation board report released Sept. 9.

The aircraft was assigned to the 432nd Wing at Creech AFB, Nev., and was operated by the 196th Reconnaissance Squadron at March ARB, Calif. The Predator was destroyed with losses estimated at $3.9 million. No injuries or damage to private property was reported, states the release. The Air Force did not disclose if the Predator was armed at the time of the crash.

Lockheed Martin in March began construction on a Space Fence site at Kwajalein Atoll in the Pacific Ocean. Initial operational capability is now scheduled for late 2018.

Senators Endorse Need for Bomber Recap

The Air Force Association's Mitchell Institute for Aerospace Studies on Sept. 10 rolled out a new study exploring the need for and capabilities of a next generation long-range strike aircraft.

A bipartisan group of senators and congressmen also offered remarks during the Capitol Hill event, saying the US must ensure the success of the Long-Range Strike Bomber.

Bombers bring enormous value to the United States and its ability to project power around the globe, including

Competing NSS Launches

The Air Force released the final request for proposals for GPS III services on Sept. 30, officially opening the door to competition for national security space launches.

Companies have until Nov. 16 to submit proposals, though California-based SpaceX and the United Launch Alliance are the only entities certified for military space launches, according to a Sept. 30 press release.

The Air Force will evaluate the proposals and award a "firm-fixed price contract" that will cover launch vehicle production, mission integration, and launch operations for a 2018 Global Positioning System III satellite launch, states the release.

"Through this competitive solicitation for GPS III launch services, we hope to reintroduce competition in order to promote innovation and reduce cost to the taxpayer while maintaining our steadfast laser focus on mission assurance and assured access to space," said Lt. Gen. Samuel A. Greaves, Space and Missile Systems Center commander and Air Force program executive officer for space.

This is the first of nine competitive launch services planned under the Phase 1A procurement strategy; previously United Launch Alliance was the only certified launch provider.

long-range strike and loiter capability, the ability to reassure and shape pre-conflict scenarios, unrivaled capacity, and limited vulnerability to adversary attack, said Sen. Marion M. Rounds (R-S.D.).

The bomber force and air superiority are key to maintaining the overmatch against potential adversaries around the world, and preserving this overmatch is vital to shaping potential global threats, he said.

Rounds praised the study, adding that it would inform the "doctrinal underpinnings" of how the LRS-B will be acquired and employed, helping to keep America's bomber force credible.

F-35 Ejection Seat Issue Grounds Lighter Pilots

The Defense Department has restricted pilots weighing less than 136 pounds from flying the F-35 because of an issue with the ejection seat, the F-35 program office told *Air Force Magazine.*

Lighter pilots are at greater risk of injury if they have to eject at low speed, so the services restricted such pilots from operating the jet beginning Aug. 27. At least one pilot is affected. All variants of the F-35 use the same Martin Baker US16E ejection seat system, said Joe DellaVedova, a spokesman for the F-35 program office.

He noted that the aircraft is still in the developmental phase, "where discoveries are expected to happen. That's why we test: to make things better for the warfighter." Still, he stressed, safety is critical. "The F-35 Joint Program Office, Lockheed Martin, and Martin Baker continue to work this issue with the US services and international partners to reach a solution as quickly as possible," he said. ✪

By the Numbers

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Active B-52Hs slated to be converted to carry only non-nuclear weapons in compliance with the New START arms reduction agreement with Russia. The first, serial No. 61-1021 of the Reserve's 307th Bomb Wing at Barksdale AFB, La., began conversion in September. An additional 12 B-52Hs in storage at Davis-Monthan AFB, Ariz., will also be converted to spare them from destruction.

Senior Staff Changes

RETIREMENTS: Maj. Gen. Terrence A. **Feehan,** Maj. Gen. Jim H. **Keffer,** Brig. Gen. Jeffrey R. **McDaniels,** Brig. Gen. David R. **Stilwell,** Brig. Gen. Kevin B. **Wooton.**

NOMINATION: To be ANG Major General: Stephen E. **Markovich.**

CHANGES: Lt. Gen. Anthony J. **Rock,** from Chief, Office of the Defense Representative-Pakistan (ODR-P), CENTCOM, US Embassy, Islamabad, to IG of the AF, OSAF, Pentagon.

COMMAND CHIEF MASTER SERGEANT RETIREMENTS: Walker H. **Cottingham Jr.,** Victoria V. **Gamble,** James A. **Laurent,** Peter B. **Stone.**

CCMS CHANGES: CMSgt. Troy L. **Eden,** from Command Chief, Natl. Air & Space Intel. Center, DCS, ISR, USAF, Wright-Patterson AFB, Ohio, to Chief, AF CMSgt. Mgmt. Office, DCS, Manpower, Personnel, & Svcs., USAF, Pentagon … CMSgt. Shelina E. **Frey,** from Command Chief, 7th AF, PACAF, Osan AB, Korea, to Command Chief, AMC, Scott AFB, Ill. … CMSgt. Terrence A. **Greene,** from Command Chief, 51st FW, PACAF, Osan AB, Korea, to Command Chief, 5th AF, PACAF, Yokota AB, Japan.

SENIOR EXECUTIVE SERVICE RETIREMENT: Edmundo A. **Gonzales.**

SES CHANGES: Charles D. **Ebersole,** to Exec. Dir., Air Force Research Lab, AFMC, Wright-Patterson AFB, Ohio … Stephen R. **Herrera,** to Exec. Dir., AFSOC, Hurlburt Field, Fla. … Charles W. **Perkins,** to Principal Dep. Dir., Emerging Capability & Prototyping, USD, Acq., Tech., & Log., Washington, D.C. … Douglas D. **Sanders,** to Dep. Gen. Counsel (Instl., Energy, & Env.), Office of the General Counsel, OSAF, Pentagon … Donna C. **Senft,** to Chief Scientist, AMC, Scott AFB, Ill. ✪

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The Air Force's Tight-Budget Shopping List

By **John A. Tirpak,** Editorial Director

With demand for capabilities up but dollars down, USAF still needs to pursue cutting-edge technology.

Test pilot Vincent Caterina takes an F-35 through a high-angle-of-attack mission profile during a test flight over Edwards AFB, Calif. A new pod system, Talon Hate, would allow fourth gen fighters, such as the F-15 and F-16, to communicate with fifth gen Raptors and F-35s.

Lockheed Martin photo by Matt Short

While Congress dithers over budgets, demands on the Air Force to fight the nation's wars, deter new ones, and respond to aggression and humanitarian crises continues to grow. At the same time, the long delay of modernization—sacrificed to pay for relentless operations—is pushing the service to seek a lengthening list of new hardware. Getting those needed new systems in time is anything but assured, top service and defense leaders said at the Air Force Association's Air & Space Conference held at National Harbor, Md., just outside of Washington, D.C., in September.

During the conference, senior leaders again made impassioned pleas for Congress to repeal the Budget Control Act, which has played havoc with modernization and readiness for four years, and to simply pass a Fiscal 2016 National Defense Authorization Act, instead of a continuing resolution. A lengthy CR, Air Force Secretary Deborah Lee James pointed out, would not even fund the Pentagon at the perilously low levels of a sequestered budget under the BCA.

"We really need our Congress to pass a full-up [appropriations] and authorization bill," she said, because a CR "is a really, really bad deal for our Air Force." A CR would halt about 50 "new start" programs, block USAF from "an ability to modestly upsize" the force by about a one percent increase in end strength, and it "would once again hit readiness" hard. She also told reporters that "our investment accounts—our [research and development] accounts, [science and technology accounts] ... would be impacted" as well. When sequester was applied in full force two years ago, it led to grounded squadrons, massive civilian furloughs, and a backlog of maintenance and training from which USAF still has not recovered.

The Air Force is doing its part to reduce costs. Service acquisition chief William A. LaPlante said the application of "should-cost" policies, as well as a determination to get program requirements right at the outset and not tinker with them afterward, has led to "real savings" totaling more than $2 billion in the last few years. These monies have been returned largely to the portfolios that generated the savings, and have made it possible to buy "thousands" more munitions than would have been possible without the solid progress in acquisition reform, he said. A new initiative—"should schedule"—is aimed at cutting the time it takes to get a new capability developed and fielded at lower cost, he said.

Defense Secretary Ashton B. Carter, answering questions after his keynote speech, apparently declined a proposal offered by James last year that the nuclear triad, being so fundamental to the nation's security, might be funded from a special, set-aside account that would not compete with other service modernization priorities.

"The nuclear deterrent is a must-have," Carter said. "It's the foundation, ... the bedrock, and it needs to remain healthy ... and we all know that we need to make additional investments in that, both in the Navy and, importantly, in the Air Force." However, "the money's got to come from somewhere and ... you don't get money by relabeling it, so the hard question remains where the money comes from in all the services." Carter said, "We ought to face that question and stick to the central commitment of having a nuclear deterrent."

CHANGING ODDS

As Russia and China flex their muscles in eastern Europe and the western Pacific, respectively, the pace of updating the Air Force's largely antiquarian fleet is behind the power curve. Service leaders said they can handle the fight against ISIS in Iraq and Syria largely with the old iron, but against a more formidable enemy, the odds are not changing in USAF's favor. Every leader pointed out that China, Russia, and other countries are rapidly advancing along many technology fronts, and James said USAF's technology edge is rapidly narrowing.

Two of the Air Force's top three "existential" conventional needs—the KC-46 tanker and F-35 fighter—are entering production phases that Capitol Hill's budget games could easily, expensively—and unnecessarily—unravel. The F-35 production rate is set to nearly triple next year, while the KC-46 needs to ramp up to achieve a needed 2017 capability.

The F-35 program has had to become less ambitious because of funding constraints, program director Lt. Gen. Christopher C. Bogdan reported in a panel discussion. Now transitioning from development to large-scale production, the emphasis has shifted to what improvements will be made beyond the basic F-35s, which all the services will be flying by 2018. "What we would consider to be an F-35 modernization program"—the so-called Block 4 phase—will have to be "skinnied down," Bogdan said.

"We have to make sure that we're doing the right things that are affordable and most relevant and useful" for combat forces of the future, he said.

Still, production is ramping up from "somewhere on the order of 40 to 42 airplanes a year ... to something over 120 airplanes a year" in the next three years. "That is a big deal," he said, and will put "a lot of pressure on the supply chain."

Senior USAF leaders all noted that cuts in production of the F-35 would be inevitable with a long-term CR or a return to sequester-level funding, though none would put a specific number on the penalty. Reduced numbers translate to lower efficiency and higher unit costs, which the Air Force can ill afford.

Air Combat Command chief Gen. Herbert J. "Hawk" Carlisle said it's imperative the F-35A buy be raised and sustained. It's now running about 35 a year.

"I think we have to get to 60," Carlisle told reporters in a press conference. "It won't happen as soon as we would like, ... but sometime after the turn of the decade ... we have got to get to a figure of 60 a year. I would love to get to 80 ... but no one knows what the fiscal environment's going to be in the 2021 POM," or program objective memoranda, the Pentagon's five-year spending plan.

The Air Force will follow a congressional mandate to look at how many F-35s it should buy, he said, but for the moment, Carlisle affirmed that the long-standing figure of 1,763 airplanes has not changed, even though the security picture has changed radically since that figure was established.

At 60 per year, the Air Force would complete its F-35 acquisition in about 2043. At 80 per year, the buy would close out in about 2036. In either case, "legacy" fighters, such as the F-15 and F-16, will need to continue serving for a long time, he said.

Bogdan noted that the US and its international partners on the F-35 are looking to further reduce costs by acquiring the fighters under a "block buy" approach sometime in the next few years. It would be similar to what is called a "multi-year" buy in the US, agreeing to buy a certain number of aircraft over a period longer than Congress' two-year budget cycle. The commitment allows a manufacturer to purchase materials and set labor rates more efficiently, lowering costs. Bogdan reiterated that if left unmolested, the F-35 program could be delivering jets at about $80 million apiece by 2018, which is lower than the cost of "new old" jets like the F-15 and F-18.

The KC-46 program has suffered some recent delays, using up the schedule margin, but James said she still expects Boeing, the contractor, to deliver 18 air-

Boeing photo by John D. Parker

The first KC-46 test aircraft flies with an aerial refueling boom installed. Tanker program executive officer Brig. Gen. Duke Richardson says the tanker program is making slow, steady progress.

craft by late 2017. Under the contract, the company will absorb any costs of delays or rework, James noted.

"The KC-46 strategy is strong. We are not going to change it," tanker program executive officer Brig. Gen. Duke Z. Richardson said in a panel discussion.

"We know of no technical showstoppers, here. It's taking longer than we want, there's no doubt about that, but we are making ... slow and steady progress." The Air Force still plans to buy 179 KC-46s, to be delivered by 2028. After that, USAF intends to pursue the KC-Y and KC-Z tanker programs to first replace the rest of the KC-135 fleet, which will be more than 80 years old by then, and the KC-10 fleet, which will be in its 60s.

In addition to the F-35 and KC-46, Chief of Staff Gen. Mark A. Welsh III labeled the Long-Range Strike Bomber as "existential" for the service, necessary to begin replacing the fleets of B-52 and B-1 bombers, now more than 50 and 30 years old, respectively.

"We need 100 LRS-Bs," Carlisle told reporters. The utility of modern, stealthy bombers has been proven beyond doubt in Libya, in deterring North Korea, and in the ongoing Pacific bomber presence. It's a capability USAF must invest in, he insisted.

Fourth on the priorities list remains a replacement for the E-8 JSTARS airborne ground-mapping radar. Welsh admitted it had been a mistake to host the JSTARS on already old and heavily used 707 aircraft when the fleet was built in the 1990s. Some of those airplanes had literally been used as "cattle cars" before being modified into JSTARS, and are now too expensive to keep flying.

"It costs a lot to operate," Welsh said in his conference speech. "It's been a phenomenal system for us, but it's time to recapitalize this airframe." He added, "Every combatant commander agrees with me" that the system is crucial and mandatory, and "we're going to push hard to keep it on track and get this thing done." Exhibitors at AFA's Tech Expo featured a series of proposed designs based on business aircraft that could potentially deliver new JSTARS capability by 2023. A fleet of about 25 airplanes is envisioned.

A replacement for the 55-year-old T-38 trainer is next on the list, and USAF is examining a number of brand-new and off-the-shelf aircraft to fill the "T-X" requirement, which calls for 250 airplanes. The service is also well underway in configuring a new Combat Rescue Helicopter, but deliveries are still years away. Carlisle has previously said that 112 CRHs is the "absolute minimum" needed to do the job.

SLEPING THE FOURTH GEN

New priorities have joined USAF's list of critical new programs, however. Carlisle told reporters that because USAF wasn't allowed to buy enough F-22s to fulfill its worldwide air superiority mission, it will have to retain its F-15C and F-15E fleets for "a long time to come," and this will require a hefty service life extension program, or SLEP, which he said would cost "billions of dollars." Stress tests on those airplanes—and on the F-16—show there are "issues ... with respect to the structural integrity" of the aircraft.

The F-15s, Carlisle said, need things like "longerons and wings," and that's just for starters. Such parts were built to specifications requiring that they be viable for the life of the airplane—anticipated at the time they were built to be about 20 years—but they have now been flying much longer than that. In 2008, a Missouri Air National Guard F-15 broke in half during air combat training because a longeron—a fundamental structural feature—snapped under the stress of a high-G turn.

Not only do the jets need to be refurbished to fly safely, there is a large package of capability upgrades needed to keep them credible in combat, Carlisle said.

"If I could find a way with the resources, I would do everything I could, when we put those airplanes in to do a [SLEP] ... to do a capability upgrade at the same time," Carlisle said in his press conference. Such needed improvements, he said, include a new active electronically scanned array (AESA) radar, "some of the passive detection capability, some of the link architecture," as well as "the radios, the communication/navigation equipment." While he didn't put a date on how long the F-15s will have to serve, "we have to get them as capable as we can" for however long that turns out to be. The E-models have a different flight profile and wing loading, but they, too, will need to be reinforced and improved, Carlisle said.

Lockheed Martin illustration

Erik Simonsen illustration

The Air Force had to give up its Combat Avionics Program Extension Suite, or CAPES upgrade, for its F-16 fleet in last year's budget, but Carlisle said the aircraft must still be upgraded, one way or another.

As for an AESA radar on the F-16, "we need it yesterday; we're behind," Carlisle asserted. The original plan to let Lockheed Martin choose a radar supplier as part of the omnibus package was overturned by Congress and now there must be a competition, which is underway. To pay for the radar, Carlisle said he is looking for "help" from Air National Guard state adjutants, who have a set-aside equipment account funded separately from the Active Duty Air Force budget.

"I'm looking for all the help I can get because I need [the F-16s] for my air defense ... of the continental United States." First to be equipped will be the District of Columbia Air National Guard F-16s, which sit alert at JB Andrews, Md., but the whole fleet will get the same radar, Carlisle said.

The effort to choose a new radar should take "no more than nine months, hopefully no more than a year. ... If I can find a way to do it quicker, I will," he added.

A brand-new combat airplane may even be in the mix for ACC. Welsh, in a press conference, told reporters, "I think eventually we need a new close air support airplane," notionally called the A-X,

Top: An artist's conception of a high speed strike weapon, a hypersonic missile suitable for future bombers and fighters. USAF is pursuing hypersonic weapons and longer-ranged air-to-air missiles. Above: An artist's conception of the Long-Range Strike Bomber. USAF needs 100 LRS-B aircraft, says ACC chief Gen. Hawk Carlisle.

which would replace the A-10, now more than 40 years old. He described the new aircraft as a "CAS platform that is cheaper to operate" than the A-10, "has better weapons capability, is more responsive, can operate in a low-threat environment, and operate extremely successfully." It would operate in a "high-low mix" with the F-35, which would perform CAS in

USAF photo by SrA. Sandra Welch

SrA. Lucas Brogdon and SrA. Cody Fischer on the line with HH-60G Pave Hawk helicopters at Bagram Airfield, Afghanistan.

contested airspace, where its stealth, speed, and electronic warfare would allow it to survive in ways the A-10 cannot.

Contingencies requiring an inexpensive CAS platform, such as the engagements "we have been in for the last 15 years," are not likely to go away, said Welsh. "We're going to be continuing in this vein for a while." The A-X would be a manned airplane, he added, rather than a remotely piloted aircraft.

Carlisle agreed on the need for a new manned CAS platform, explaining that the A-10 simply lacks the stealthiness, speed, or sensor systems to survive in contested airspace, and is getting too old to be maintained economically for the low-threat mission. He told reporters that the Air Force Research Laboratory is working on new weapons that would make delivering CAS more effective and precise from a new platform.

USAF leaders were remarkably upbeat about the prospects for new, game-changing technologies entering the inventory in just a few years. Carlisle insisted that laser weapons will be installed on fighters by 2020, with sufficient power to disable or misdirect surface-to-air missiles aimed at Air Force fighters.

"We're making significant progress" in onboard power generation, beam shaping, and beam control, Carlisle said. "I think we'll have ... capability that we can put on a fighter aircraft ... before the turn of the decade. I really do. ... And if I have a vote, I'll try to get it sooner." The system would be a podded capability, but further miniaturization of components could produce an internal system in the future.

Another directed-energy application will come in the form of an operationalized version of the Counter-electronics High-power microwave Advanced Missile Project, or CHAMP, Carlisle said. The CHAMP program, carried out in 2012 by AFRL, successfully demonstrated the ability to overfly a bunker or communications node and fry all the electronics—computers, servers, data systems, etc.—inside without causing any physical destruction. Carlisle suggested that USAF has, or soon will have, a limited operational capability with CHAMP, flown aboard an AGM-86B Conventional Air-Launched Cruise Missile. However, because the inventory of CALCMs is so low, ACC will be starting a program to put a CHAMP-like capability on the AGM-158 Joint Air-to-Surface Standoff Missile-Extended Range, or JASSM-ER. It's "an exceptionally high priority for me," Carlisle told reporters.

Yet another new podded system is being explored under the Talon Hate program, which will give a near-term, interim capability allowing "fifth generation" fighters, such as the F-22 and F-35, to communicate with fourth generation jets, such as the F-15 and F-16. USAF had originally planned for an all-fifth generation force of fighters—Welsh observed to reporters "those days are gone"—and so covert

Contractors remove the wings from an F-15 at Portland Arpt., Ore. When sequester was applied in full force two years ago it led to a backlog of maintenance from which USAF still has not recovered.

communications between those jets, but not the older ones, were developed. The eventual system will be the Multi-domain Adaptable Processing System, or MAPS, that will allow not only voice but data communications among all USAF fighters.

As for other new weapons, Carlisle said he "had to be careful" not to reveal anything classified, but allowed that USAF is diligently pursuing hypersonic missiles as well as longer-ranged air-to-air weapons to equip the fighter force. A Chinese air-to-air missile, the PL-15, he identified as one with exceptional range that the Air Force will have to out-reach. He did not say whether USAF is looking at further improvements to the AIM-120 AMRAAM, a new variant of that missile, or a wholly new weapon.

DREAMING OF THE RAPTOR

Asked by reporters if the Air Force might resolve some of its fighter capability and capacity shortfalls by reopening the F-22 production line, Carlisle said, "I dream about it every night," but he doesn't think budget will allow such a possibility.

ANG photo by TSgt. John Hughel

USAF photo by Danny Webb

SrA. Markus Beach gives a thumbs-up to the pilots of a T-38 trainer at Sheppard AFB, Texas. Replacing the 55-year-old aircraft fleet is high on USAF's priorities list.

The No. 1 new capability wanted by Air Force Special Operations Command is a way to see below the clouds in a combat situation, Lt. Gen. Bradley A. Heithold said. In the "Four-Star Forum" question-and-answer session of the conference, Heithold said he wants to "take the cover of weather away from the enemy" by deploying small unmanned aerial vehicles from gunships like the AC-130. He wants to put these "tactical, offboard" sensors "below the weather deck" to "tell me what's down there, and then shoot it and kill it." He described this as "not that daunting of a challenge. The technology is there," and he has invited industry to offer solutions to this requirement.

Heithold's second-highest priority is to install high-energy lasers on his gunships, both to defend against enemy missiles and "to use these things offensively to engage targets." In the offensive role, the lasers would be silent destroyers, "quick-working in the middle of the night, without anybody knowing it."

Air Force Global Strike Command, recently elevated to a four-star command, sees its top modernization projects as being in nuclear command and control, recapitalization of the Minuteman ICBM force, modifications to the existing bomber fleet, the LRS-B, and a replacement for the command's obsolete UH-1N helicopters, according to its chief, Gen. Robin Rand.

Speaking at the Four-Star Forum, Rand said USAF owns "about 75 percent" of the capabilities that make it possible for the national command authorities and the President to communicate with nuclear forces, but much of it is badly dated.

"That's a big priority," Rand said, noting that he would "work collaboratively" with the other USAF major commands to deliver improved capability. The ICBM fleet will be recapitalized "where we can" and he pledged to keep the LRS-B on track so that it delivers an initial capability "in the mid-2020s." Air Force Global Strike Command is also working on a new Long-Range Stand-Off missile, or LRSO, but USAF leaders have declined to discuss the weapon or its anticipated capabilities. They have suggested a capability in the late 2020s timeframe.

Mark J. Lewis, a former chief scientist of the Air Force and now with the Institute for Defense Analyses, said in a panel discussion USAF must also pay attention to maintaining its infrastructure for testing new capabilities; specifically, wind tunnels that will help develop and refine hypersonic systems. As good as modern computers and computational fluid dynamics programs are, he said, they cannot substitute for the hands-on value of trying designs out in the tunnel.

RAGGED EDGE OF READINESS

Carlisle said that beyond modernization, his forces are "on the ragged edge" and can't continue to maintain the operational tempo they have been on without an infusion of more money. But training and readiness won't matter much if USAF has second-rate—or even equal—equipment, versus potential enemies.

"If those budget pressures continue, and we continue to get cut, and between now and 2020 we don't get relief from the Budget Control Act," Carlisle told reporters, "our Air Force's capacity will be down to the point where we'll be able to do [only] one thing at a time. We won't be able to be everywhere because we just won't have enough capacity." ✪

STOPPING TERROR ON

By Jennifer Hlad, Senior Editor

Through quick actions, Spencer Stone and two childhood friends prevented a slaughter.

It was supposed to be the "ultimate Europe trip": three childhood friends meeting in Rome and traveling to Venice, Munich, Berlin, Amsterdam, and Paris before a grand finale week in Barcelona.

On the high-speed train from Amsterdam to Paris, though, A1C Spencer Stone was suddenly awoken by a railroad employee running by. Even bleary from his nap, Stone could tell the man was at "a full sprint and looked really scared."

He heard breaking glass and turned to his friends, Anthony Sadler, and Oregon Army National Guard Spc. Aleksander Skarlatos. Stone immediately knew something was wrong.

Then he saw a man with an AK-47.

There wasn't time for a plan. Stone and Skarlatos put their armrests up, Skarlatos said, "Go get 'em," and the three young men ran toward the terrorist holding the gun, not sure they would even reach him.

Their actions that day stopped a massacre, instantly turning the three into international celebrities who have been showered with gifts, awards, and praise.

Stone joined the Air Force in October 2012 hoping to become a pararescueman, but his depth perception was not good enough. He then went to SERE school to become an instructor, but was unable to complete the course. His third-choice career field worked out, though—Stone chose to become a medical technician.

He and Skarlatos became friends in elementary school; they met Sadler in middle school. In an interview with *Air Force Magazine,* Stone said the trio had planned the trip partly as a celebration of Sadler's college graduation in 2016.

Stone was stationed at Lajes Field, in Portugal's Azores, and thought it would make more sense to travel through Europe when he lived close, rather than to wait until next year, when he would be stationed at Nellis Air Force Base in Nevada.

The morning of Aug. 21, the three friends ate at Burger King and explored Amsterdam for a few hours before boarding the train. They had first-class tickets, but sat in a different section before deciding it was too crowded. They had settled into seats in the first-class section and Stone was napping with headphones on when the train employee ran past, waking him.

Seconds later, Stone and his friends were charging a man with a rifle, a pistol, 270 rounds of ammunition, a box cutter, and a bottle of gasoline. Authorities later charged Ayoub el Khazzani, a Moroccan, with multiple counts of attempted murder, possession of weapons, and conspiracy.

Stone said it wasn't even a choice—he had to act.

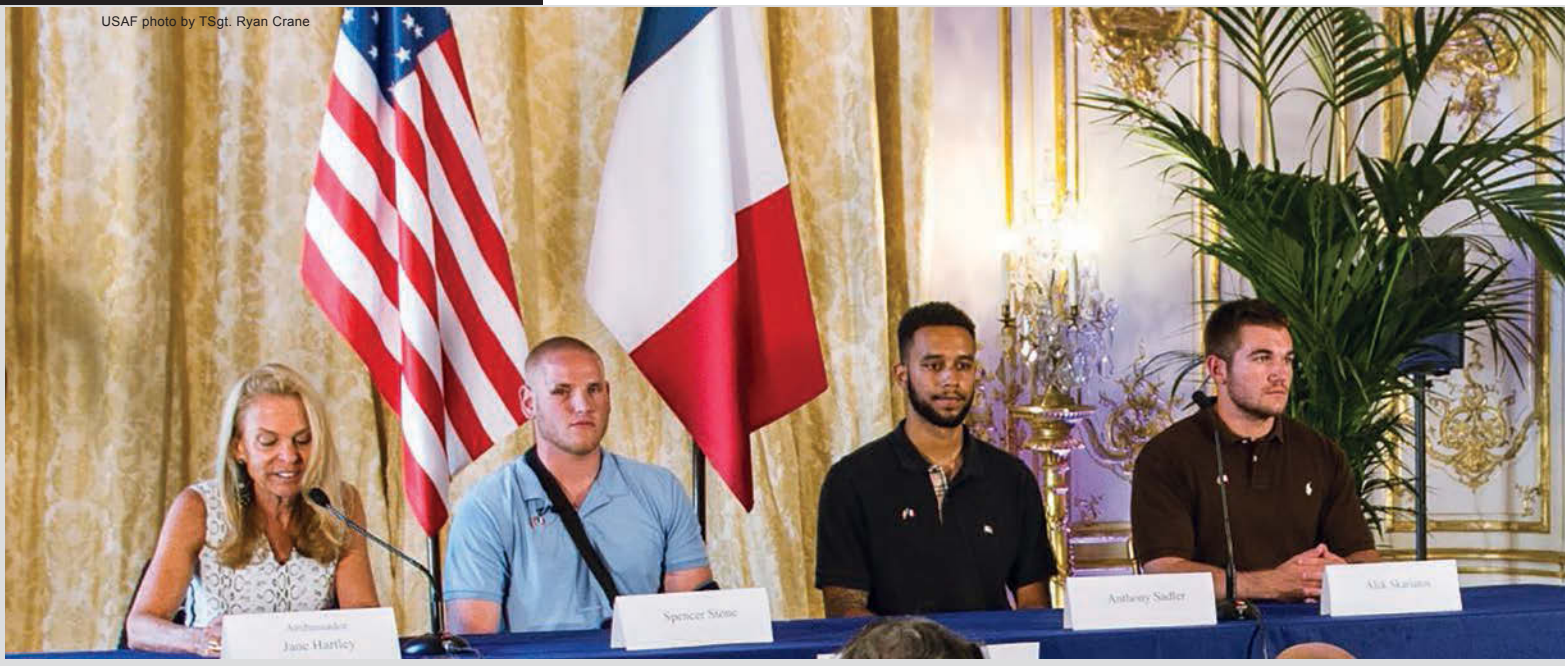
"I'm not going to run away. I'm not going to leave everyone to die," he said. "I'd rather die trying than sit back and watch everyone get slaughtered."

Still, Stone was convinced that he would be shot, and was shocked when he actually reached the gunman.

"I don't really remember running up to him. I either blacked out or closed my eyes, because I don't remember anything. … I just heard his footsteps and him trying to work the gun," Stone

"It seemed like he just kept pulling more weapons left and right," Stone said in an Air Force video. "Every time I heard a click, I was just like, 'Oh, I'm still alive. Oh, I'm still alive.'"

USAF photo by TSgt. Ryan Crane



L-r: US ambassador to France Jane Hartley, A1C Spencer Stone, Anthony Sadler, and Aleksander Skarlatos speak at a press conference in Paris two days after the terrorist attack on a high-speed train heading from Amsterdam to Paris.

said. "I probably closed my eyes, because I was like, 'I'm gonna get shot, I'm gonna get shot.'"

Stone, trained in Brazilian jujitsu, began wrestling with the man, trying to take away the gun. He put the man in a rear chokehold, while Skarlatos grabbed the AK-47 and told him to stop.

"It seemed like he just kept pulling more weapons left and right," Stone said in an Air Force video. "Every time I heard a click, I was just like, 'Oh, I'm still alive. Oh, I'm still alive.'"

Khazzani allegedly pulled a handgun and pointed it at Stone's head, but it jammed, so he pulled a six-inch box cutter blade and began slashing at the airman.

Stone looked down at his hand and saw that his thumb was hanging "halfway off," so he let go. He and his friends pummeled the man, then Stone choked him again until Khazzani was unconscious.

STOP THE BLEEDING

A British man, Chris Norman, and an off-duty conductor, Eric Tanty, helped them tie the man up.

Then, Stone and his friends noticed another passenger, French-American academic Mark Moogalian, was injured and spurting blood.

Stone went to him, stuck his finger in the man's neck, and pressed down to stop the blood that had already covered the entire front of his body.

"I felt like I was the only person who could help him," Stone said. "I didn't really care about my injuries at that point because of the adrenaline, I didn't feel them. ... I just thought that guy was gonna die, so I wanted to give him a fighting chance."

The man's wife, Isabelle Risacher-Moogalian, told CNN her husband was shot when he tried to get the gun away from the attacker, before Stone and his friends reached the terrorist. She had crouched under a seat to hide, and she saw her husband fall to the ground.

When Stone and the others ran to the attacker, Moogalian made eye contact with his wife and told her he was hit and it was "over."

She saw the blood gushing from his neck and ran to a different part of the train car to find help, but no one responded. She returned to find Stone, also bleeding, with his finger in the wound, talking to Moogalian to keep him conscious.

"I'm sure that saved his life," she said. "I would not have been able to do anything."

News of the attempted attack, and the heroes who stopped it, spread quickly. Two days later, the three friends had just finished lunch at the US ambassador's house in Paris when they were told they would receive the French Legion of Honor medal.

"We all just went crazy, started running around the ambassador's courtyard, hooting and hollering," Stone said. "It was fun."

During the ceremony, French President François Hollande said they showed that "faced with terror, we have the power to resist. You also gave a lesson in courage, in will, and thus in hope," according to the Associated Press.

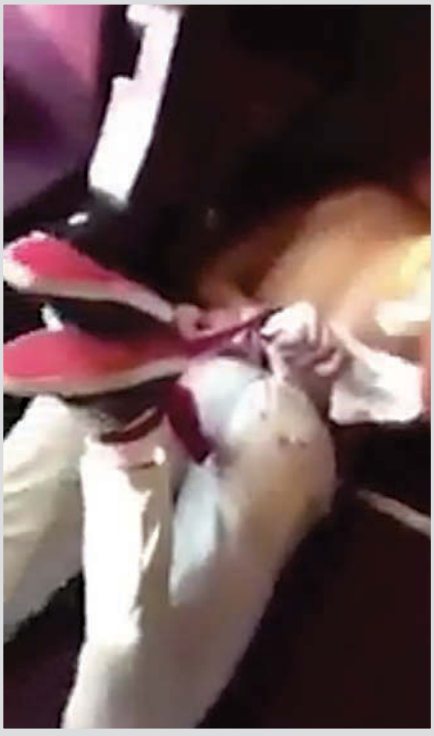
Lt. Col. Richard Smith, commander of Stone's unit, the 65th Medical Operations and Support Squadron at Lajes, said in a press conference that the friends' actions are "one of the purest examples of service before self that I have ever seen."

Stone's ability to go from being attacked to an attacker and then a lifesaver was "pretty impressive," Smith said.

The same day the group received the Legion of Honor, Secretary of the Air Force Deborah Lee James announced that Stone had been nominated for the Airman's Medal.

"My heart wanted to jump out of my chest, because that is just like, the biggest honor of all," Stone said.

He then flew to Ramstein Air Base in Germany, where he was greeted as a hero before going to Landstuhl hospital for medical treatment. He later flew with about 25 airmen redeploying from Southwest Asia on a KC-10 Extender to Travis AFB, Calif., just 45 minutes from his hometown of Carmichael, Calif., for more medical care and rest.



Twitter video by Ahmed Meguini

Top: Screenshots from a video in the immediate aftermath of the attack show A1C Spencer Stone subduing the terrorist (l) and Ayoub el Khazzani, the Moroccan attacker, tied up on the train waiting for authorities. Right: Criminal and forensic investigators in protective suits on the platform inside the the Arras train station in northern France.

He stepped off the plane to a crowd of hundreds of airmen and their families.

COMING HOME

"We're all very proud of A1C Stone," MSgt. Tanya Hubbard, the 60th Medical Operations Squadron family medicine residency and pediatric clinics superintendent, said at the homecoming. "He is humble and will tell you that he doesn't deserve all of the fuss, but that's what makes him special. He acted on survival instincts, but he is naturally a protector, and we're thankful that he was in that place at that time."

In September, still less than a month after Stone, Skarlatos, and Sadler disarmed the man on the train, Defense Secretary Ashton B. Carter presented each a medal: The Airman's Medal for Stone, the Soldier's Medal for Skarlatos, and the Secretary of Defense Medal of Valor for Sadler.

Stone also received the Purple Heart for injuries he suffered in the attack.

SIPA photo by Robert Alain

USAF photo by Ryan Crane

Stone is interviewed in Paris on Aug. 23. Stone suffered cuts to his head and neck, and his thumb was nearly severed while subduing the knife- and gun-wielding attacker.

Although his injuries occurred while he was off-duty, Stone was eligible to receive the Purple Heart because Congress just this year expanded eligibility for the award in response to the 2009 Fort Hood, Texas, shootings.

"I have lived my life and led my career with the abiding belief that when each of us who wear this uniform or choose to defend this nation are called, we will do the right thing," Gen. Paul J. Selva, vice chairman of the Joint Chiefs of Staff, said at the award ceremony in the Pentagon courtyard. "Gentlemen, thank you for acting, thank you for being people who care enough to make a difference."

President Barack Obama welcomed the three into the Oval Office, saying that their courage, quick thinking, and teamwork prevented "a real calamity."

"They represent the very best of America—American heritage—and it's these kinds of young people who make me extraordinarily optimistic about the future," Obama said.

Stone "lives to our core values, he holds himself to the highest standards," CMSAF James A. Cody told reporters at the Air Force Association's Air & Space Conference in September. "In the face of something that, where most people would freeze, you would hope somebody like Airman Stone would be there [to] act. And that's exactly what he did."

Being pushed into the limelight was initially a bit of a challenge for Stone, who said he used to be terrified of public speaking.

"My voice would shake and I'd forget to breathe," he said. "Before, they'd want me to talk for a promotion ceremony, and I'd try to push it off to anybody else, like, 'Please don't make me go up there and make a fool of myself."

Now, he said, it's easy for him.

"I feel like I've grown up more in these past three weeks than the past 23 years of my life," Stone said.

Though he said his values were instilled by his family growing up, "the Air Force … gave me the tools to be the person I've always wanted to be."

At press conferences in Paris, Stone wore a sling to support the cast around his surgically repaired thumb, and the cuts and bruises on his face and neck were still apparent. But less than a month later at AFA's conference, the cuts on his face had healed, he was no longer wearing the sling, and he said he is healing ahead of schedule.

"I should make a full recovery," Stone said, adding that he had been stabbed about an inch from his carotid artery but is "healing up fast."

He showcased how well he had healed at a Sept. 18 Nationals baseball game in Washington, D.C. Air Force Chief of Staff, Gen. Mark A. Welsh III took the mound to throw out the first pitch, but almost immediately signaled for relief. Stone trotted out on the field


USAF photo by T. C. Perkins Jr.


USAF photo by Scott Ash

Above left: Stone arrives at Travis AFB, Calif., on Sept. 3. He was greeted by hundreds of well-wishers. Above: Stone is thanked by Secretary of Defense Ashton Carter at a ceremony at the Pentagon, where he received the Airman's Medal and Purple Heart.

as the crowd cheered, and he threw out the ceremonial pitch with his uninjured hand.

Moogalian, the man Stone saved, is also doing well, he said. "I'm just glad he's alive. … I'm very grateful he's alive."

Welsh highlighted Stone's actions several times during the conference. "You made us proud. You made the service proud," Welsh said. "I don't think you get it yet, I don't think you know how this has affected people in our service."

Stone had been scheduled for a permanent change of station to Nellis in November, but got permission to instead move back to Travis—much closer to home—instead. He had previously served at the hospital at Travis for a year-and-a-half, he said, and will be close to his brother, friends, and family.

He also was slated for promotion to senior airman at the end of October, but Welsh decided to promote him again, to staff sergeant, on the first of November. Stone was surprised and ecstatic at this announcement, which came during Welsh's AFA speech, but Stone said he still hopes he can "live up to what I'm supposed to be."

Welsh said he wasn't worried.

"He has stayed very true to himself from the very beginning; he has not let the moment overwhelm him," Welsh said in a roundtable with reporters. "He has an instinct for saying and doing the right thing, which I think is going to be a very, very good attribute in a young NCO."

Before that fateful train ride, Stone was planning to leave the Air Force, go to paramedic school, and become a firefighter. Now, he said, he has a lot more doors open to him, so he has to decide what he wants to do.

"I haven't made a decision yet," he said in mid-September.

For now, Stone will go back to being a medical technician at the hospital at Travis. Still, he acknowledged that the choice that saved the lives of everyone on the train also altered the course of his own life.

"I'm under a microscope now. I can't, you know, go out and do everything everyone else does because I'm going to be nitpicked in every single way, but it's not a problem, because it's how I should be acting anyway," he said.

"There's definitely a lot of pressure to be or act a certain way, but I enjoy it," Stone said. "It's not going to be a negative on my life, it's going to be a positive. I'm going to grow into a stronger and smarter person."

People around the world—including Carter, Hollande, and Obama—have called Stone and his friends heroes. It feels good, Stone said, "but I don't consider myself a hero at all. I believe any other airman in the Air Force would have done the same thing. That's what they're supposed to do."

The options were clear, he said: "What would you rather do? Walk away and let everyone die, or would you want to die trying to save somebody? And there's no greater honor than saving someone else's life or giving your life for someone else." ✪

Danger Back Home

In the early morning of Oct. 8, Spencer Stone was with a group of friends in Sacramento, Calif., when they were involved in a fight that ended with Stone being stabbed four times. According to a website set up by his brother, Everett Stone, the airman was stabbed in the heart, left lung, liver, and back, and needed open heart surgery to save his life. As of Oct. 21, Sacramento police were still looking for two men and one woman they believe were involved in the stabbing. Stone was treated at the University of California Davis Medical Center and released Oct. 15. Police said the stabbing was not an act of terrorism and stressed that it "is in no way related to the incident that occurred in France."

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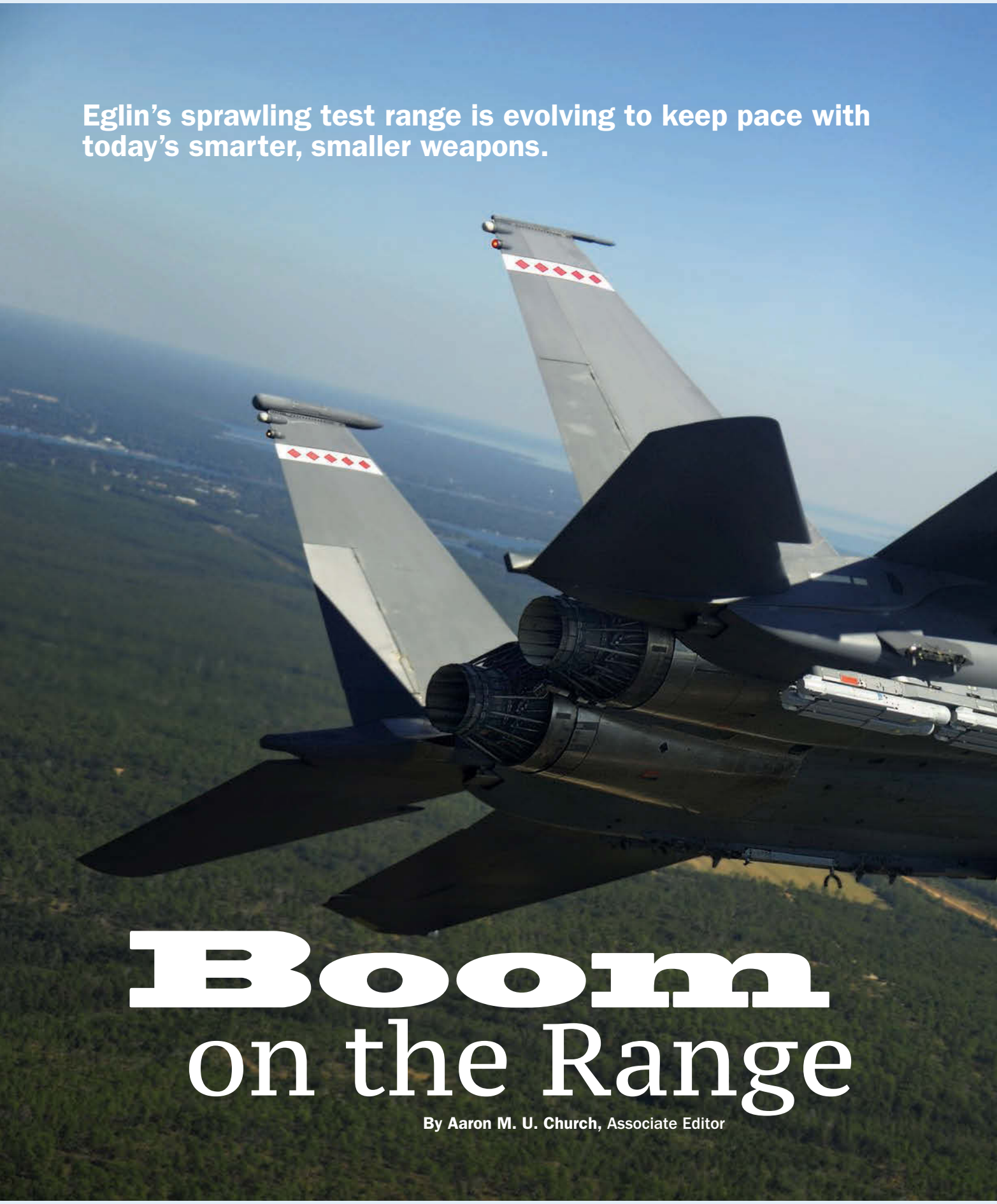
Eglin's sprawling test range is evolving to keep pace with today's smarter, smaller weapons.



Boom on the Range

By Aaron M. U. Church, Associate Editor

The Eglin Gulf Test and Training Range is considered one of the crown jewels of the Air Force. The enormous land-and-water range plays host to every phase of an aerial weapon's life, from development and testing through operational use, and the service is determined to preserve this unique capability for weapon evaluation.

Overseen by the 96th Test Wing at Eglin AFB, Fla., the range covers some 724 square miles of the Florida panhandle, and its overwater expanse stretches the length of Florida from Key West to Eglin, encompassing a mind-boggling 120,000 square miles of the Gulf of Mexico. It is the Defense Department's largest range.

"We truly believe this is ... one of the nation's treasures," 96th Range Group Director Richard Ulrich said in a recent interview. The Air Force wants to "protect this capability for our country," providing the means to test the next generation of cutting-edge weapons, he said. Longer ranged "standoff" and future hypersonic weapons demand more room for testing.

The Small Diameter Bomb II is one of the new wave of weapons pushing the range to advance and expand.

"This is one of our first adverse-weather weapons that's able to acquire, track, and defeat" moving targets, said James F. Carter, miniature-munitions engineering director of the Air Force Life Cycle Management Center's Armament Directorate. "We like to characterize it as our next generation in miniature munitions." SDB II was cleared for low-rate initial production in June, and it is wrapping up developmental testing at Eglin.

The Air Force plans to buy at least 17,000 of the 250-pound winged glide bombs, to arm the F-15E Strike Eagle by 2018, followed by the F-22 and F-35. SDB II is also the first "net-enabled weapon" that can be retargeted in flight by either aircrew or joint terminal attack controllers on the ground.

"If they decided that they don't want to hit that target, they can abort that weapon" and it will go off to some preplanned set of coordinates and self-destruct, he said. "It's a very powerful and flexible

Raytheon photo

An F-15E Strike Eagle carries a load of Small Diameter Bomb IIs on a test sortie over Eglin AFB, Fla. The F-15E will be the first aircraft cleared to employ SDB II operationally.

weapon" that must be very accurate to make its small warhead effective against a moving vehicle.

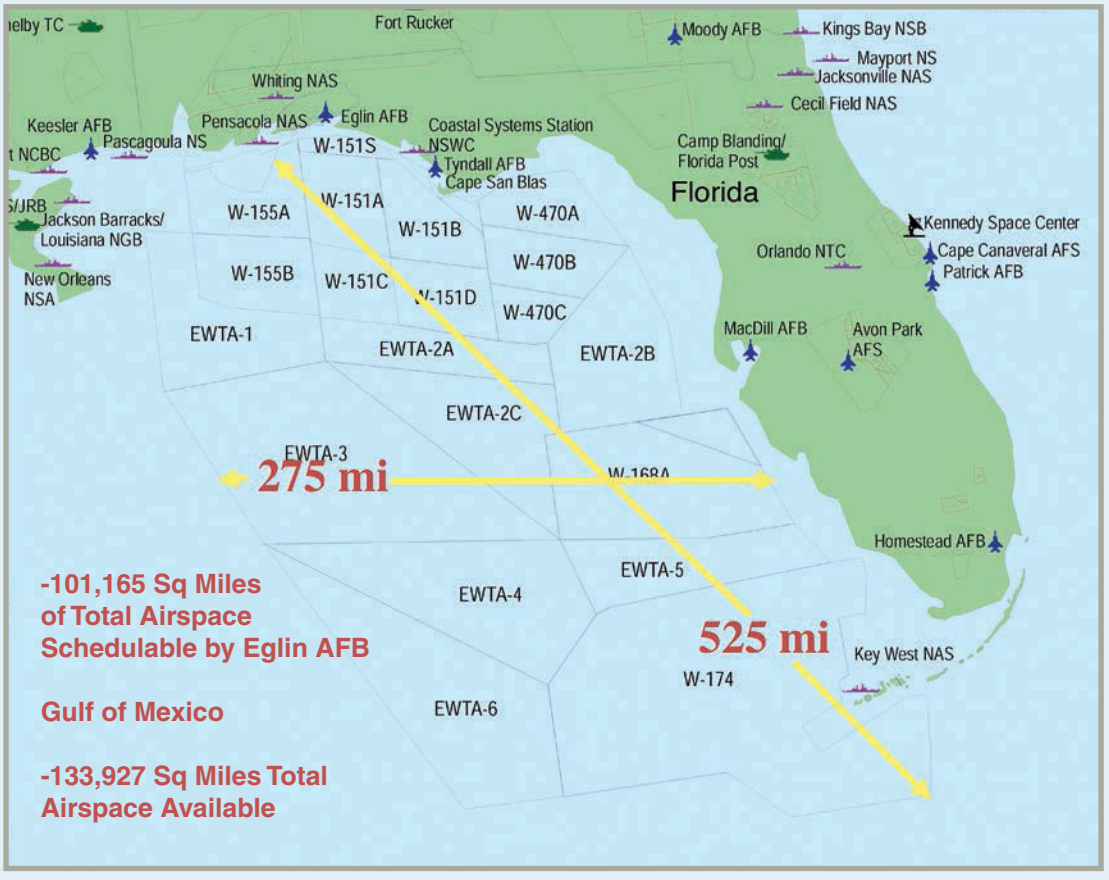
To develop and test a weapon like SDB II demands modern facilities, support, and expertise, all offered by Eglin's various tenants.

Eglin's resident 96th TW is the largest in the Air Force, and its tenant organizations encompass every facet of weapons development, testing, and support. The SDB II project "has used every bit" of those assets, said Carter.

The Air Force Research Laboratory explored concepts at Eglin that became the basis of SDB II almost 30 years ago. "They did a lot of work in the '90s on dual-mode seekers, the development of software to support those seekers, [and] research on explosives" that have all become part of today's SDB II, Carter explained. The weapons program office—also on base—is helping prime contractor Raytheon build a developmental test plan, while the test wing supplies everything to carry it out.

"They'll provide the aircrews, the maintainers, the range, the target, ... conduct the test, collect the data, and then we'll all jointly sit down and review," said Carter.

Across the street, the 46th Test Squadron maintains a dedicated test fleet of A-10s, F-15C/Ds, F-15Es, F-16s, and UH-1N helicopters. The range group furnishes everything from targets and sensor testing to range control, telemetry, and data collection. When the weapon moves to operational testing, the Air Force Operational Test and Evaluation Center Det. 2—also at Eglin—will determine its readiness for combat.



USAF map by 96th Test Wing

The Eglin Test and Training Range covers some 724 square miles of the Florida Panhandle and 120,000 square miles over the Gulf of Mexico.

SMALL DIAMETER BOMB II TEST UPDATE

The Small Diameter Bomb II took a big step forward on June 12, when Air Force officials cleared Raytheon to begin low-rate initial production, issuing a $31 million contract.

"Our first production lot—LRIP Lot 1—is for 144 weapons to support our initial fielding on the F-15E," James F. Carter, Air Force Armament Directorate miniature-munitions engineering director, told *Air Force Magazine*. Raytheon will start production next year, and plans call for 11 production lots spanning 17,000 weapons over the coming years, he said.

To date, manufacturer-led developmental testing has focused on honing the 250-pound weapon's "normal attack" mode, which pairs infrared and millimeter-wave radar to strike moving targets in all weather. "We still have to do our laser attack testing," Carter noted, and "we also have coordinated attack testing."

USAF is "anxious to get this weapon out in the field to be employed in the kind of situations that we're seeing today" against enemies such as ISIS in Iraq and Syria, he said.

After developmental testing, SDB II will undergo government confidence trials where "we're going to stretch the capability of the weapon [and] ... test the edges of the envelope," Carter added. This includes pitting the weapon against inclement weather, maritime conditions, and adversary countermeasures to "see how it performs" under stress.

The SDB II offers new challenges, but the 96th Range Group at Eglin is a test support veteran, epitomized by its mobile, unmanned target program.

"We've been doing unmanned ground vehicles [since] before unmanned ground vehicles were cool," said 96th RG engineer Maurice Bobbitt. SDB II is, however, driving a sharp uptick in demand. In 1987, "we started with 15 unmanned targets" a year, a level matched during a single one-week test in 2015. This year, for SDB II alone, "I'm building up 53 vehicles, ... so the growth has been significant," Bobbitt said.

Because SDB II is designed specifically for use against moving targets—both on land and at sea—it's "a little bit more complex" than its GPS guided predecessor, according to Carter.

To support this requirement, the range group has some 2,000 vehicle targets available—everything from pickup trucks to tanks. These vehicles provide SDB II "the moving target piece that we need when we go test," said Carter. When "customers" ask for the kinds of targets that are available to test against, Bobbitt answers, "pretty much anything you can think of on the domestic side," and "more than you think" would be available for foreign types of vehicles.

Lockheed Martin photo by David Henry

An F-22 releases four SDBs at Mach 1.6 in an earlier test. SDB II adds additional all-weather and moving-target capabilities and will eventually be integrated onto the F-22.

Bobbitt's team outfits each vehicle with instrumentation tailored to the specific data-gathering requirement of a given test shot. The target flight can also install "tele-operated" controls on anything from a Russian "T-72 tank, or a five-ton wheeled truck, or a Toyota Tacoma," Bobbitt said. The cheap, commercially available system allows operators to drive a target from the safety of a control room 20 miles away.

"It looks like a video game, so we make sure we train people heavily in Xbox," joked Bobbitt. "I haven't put it on a motorcycle or Segway yet, but I'm hoping to."

Human controllers often aren't predictable enough for scenarios that are tightly timed or require highly consistent performance. Humans also have trouble controlling remotely controlled targets at high speed. So in 2009, the group developed a semi-autonomous system that allows vehicles to run at preprogrammed routes and speeds.

"If I want it to be on time at any point within a second, it's there," said Bobbitt. The system can control vehicle targets driving up to 90 miles per hour—valuable for testing weapons like SDB II. Armed pickups—called "technicals"—of

SrA. Roderick Ponton, a 96th Aircraft Maintenance Squadron crew chief, launches an F-16 from Eglin. The 46th Flight Test Squadron operates a mixed fleet of F-16s, F-15s, A-10s, and UH-1Ns to support weapons testing on the range.

USAF photo by Samuel King Jr.

the type used by insurgents in Afghanistan, Libya, Iraq, and Syria "are becoming a big threat" and they travel much faster than average military vehicles, Bobbitt said.

Providing realism in target vehicles doesn't necessarily mean lavish spending if it's not necessary. The steering wheels and interface used to drive tele-operated targets are things "you can go to Walmart and buy," Bobbitt said. The cost of the control facility is "surprisingly low since we used existing capabilities instead of building specialized components."

The team won't destroy a hard-to-get Russian mobile air defense radar if it can be simulated instead, either. Often, the high-end equipment will provide convincing effects from a distance but "a much lower-cost target" can be the focus of the weapon, he said.

outboard engines, capable of moving at 45 knots in moderate sea conditions.

"We put this out in the Gulf of Mexico and they target it and shoot it," Bobbitt said, giving testers "a maritime presence that we simply didn't have before." The SDB II program alone will drop an estimated six live and 12 inert weapons against maritime targets this year, according to the range's 2014 environmental assessment.

Tracking multiple boats speeding in circles off the Florida coast—or damaged and drifting in Gulf currents—was another challenge overcome with a cheap, sensible solution. Unlike the tele-operated vehicles, the HSMSTs lack cameras for situational awareness, so "what we did is develop a satellite tracking system that we put on the target," Bobbitt

USAF photo by SSgt. Stacia Zachary

MSgt. Brian Mosier adjusts an SDB II pneumatic carriage system used to mount the weapon on the aircraft.

USAF photo by Samuel King Jr.

Maj. Joe McGill preflights an A-10C at Eglin. The 40th Flight Test Squadron provides in-house test support to weapon development and test programs.

With the advent of weapons like SDB II and the Joint Air-to-Surface Standoff Missile (JASSM), "maritime seems to be our biggest growth" area, driving the development of "smart" maneuverable surface targets as well, Bobbitt said. Eglin turned to the Navy to avoid developing a custom system from scratch. "We're very much into trying to save customer money, because we're blowing stuff up," he pointed out.

Eglin's Navy-developed High-Speed Maneuverable Surface Targets (HSMSTs) are 27-foot speedboats with a pair of 250 horsepower

said. "It's commercially available. ... It feeds back through the Internet" and uses Google Earth to display each target's position in real time. The total cost of the system was less than $5,000 and provides "situational awareness of what's out there at any point," he said.

The range's long, narrow sound along Santa Rosa Island is one of the only places that both land and sea targets can be engaged simultaneously. SDB II testers can "have vehicles that are running up and down the road and then boats that are running in the bay" at the same time. This lets testers evaluate the seeker's ability to discriminate between the targets and "be able to track both," explained Carter.

USAF photo

A munition impacts a barrier in a sled-track test at Eglin. The 96th Range Group develops, maintains, and operates a wide variety of specialized targets, infrastructure, test facilities, and instrumentation.

Some of the group's most advanced test capabilities aren't on the range but in the lab. Facilities like the McKinley Climatic Laboratory, where jets can run their engines in temperatures from -65 degrees Fahrenheit to 165 degrees Fahrenheit, are "unique in the world," said Jerry Griffin, technical director with the group's 782nd Test Squadron.

SDB II, with its complex seeker that bundles millimeter wave radar, infrared, and laser guidance, makes intensive use of the group's Guided Weapons Evaluation Facility (GWEF).

"What we do is take the smart end of a weapon, ... bring it into our facility and wrap a virtual world around it to fool it into thinking it's flying," Griffin said. This reduces the need to waste expensive seekers in multiple live-drop tests just to "make sure that system can work in all the targeting and engagement scenarios that it's going to encounter." The facility runs approximately 45,000 simulated weapons engagements each year at a cost of about $100 per run.

"Doing that in a flight test would be hundreds of thousands of dollars for a single engagement," Griffin said. The facility evaluates the effectiveness of US seekers and countermeasures, as well as how to thwart adversary systems.

"Every few months some new threat system will come out and we need to worry about our survivability against those systems. That's what generates that large number of runs," he noted.

Given Eglin's proximity to inhabited areas, the one thing SDB II testers can't do is over-land testing of a full-up live weapon. That work is done at White Sands Missile Range in New Mexico.

SDB II "has a 40 nautical mile range, so if something went wrong, it has a lot of area that it could cover," Carter pointed out. "We do very few all-up round live tests here at Eglin, strictly because of the kinematic footprint."

To cut down on the number of live shots at White Sands, Eglin conducts "hybrid shots" instead. A guided test vehicle—essentially an SDB II with a self-destruct system instead of a warhead—is dropped against a moving vehicle while being filmed by high-speed cameras. The cameras capture the weapon's exact orientation at the point of impact. This lets technicians "set up a static arena test" in a safer place. The weapon is placed in exactly the same position relative to an identical target, then detonated.

"Between the two, you have a very similar test to what you would've gotten out at White Sands," without as much cost or risk, Carter said.

Eglin is looking to make greater use of its overwater range space, to permit the testing of future long-range strike weapons. The range can already test long-range weapons like the Tomahawk cruise missile. Two were launched from Key West, over the Gulf to Eglin during an *Air Force Magazine* visit in June.

"What we're looking to do is to expand our testing out into the Gulf" with longer range instrumentation and telemetry, range director Ulrich explained. By networking several dispersed instrumentation sites, the range group is able to track tests across a wider area. Over the Gulf, though, even with tower-mounted instrumentation on Santa Rosa Island, testers can only gather full test data up to 26 miles offshore.

A lineup of aerial target drones await launch over the Gulf of Mexico from Eglin.

"When you look at long-range strike, with ... hypersonics and those type of things, you need a lot of area, and you need to be able to capture that" data over the entire flight path, he said. "Capturing something that flies by at very high speed is going to be challenging in the future."

Like Edwards Air Force Base in California, Eglin is struggling with an FCC decision to auction off some of the telemetry frequency bands to the telecom industry. Controllers can track chase airplanes and test articles like the Tomahawk from the southern tip of Florida, but some of the frequencies used to do that "we've lost, so we've got to replace that capability," said Chris Nixon, director of the 96th RG support squadron. This means retrofitting the wing's test aircraft with new transmitters and updating the range's telemetry receiver stations by 2023 "to make sure we can capture that data on the new frequencies."

Eglin's test mission is also suffering from physical encroachment—less from the surrounding community than from military training on the range itself.

Range crowding has been a problem since the 2005 Base Relocation and Closure (BRAC) round consolidated several units and training functions to Eglin.

Big as the land is, "we have both limited airspace and limited land ranges," Ulrich said. In addition to the 96th TW, Eglin now hosts the joint service F-35 schoolhouse and the 7th Special Forces Group that moved from Fort Bragg, N.C. "They've come here and changed the mission set on the ground ... so that is always a challenge," he said. ✪

Breathing Free?

By Brian W. Everstine, Pentagon Editor

The Air Force completed modifying the F-22 fleet this year, hopefully solving a vexing oxygen-supply problem.

A Raptor takes off from JB Elmendorf-Richardson, Alaska, in September 2011 after a four-month stand down while investigators studied reports of pilots experiencing hypoxia-like symptoms.

USAF photo by SSgt. Brian Ferguson

As the Air Force's F-22 force passed eight months of first-ever combat operations in April, Air Force Materiel Command completed a fix for oxygen system problems that had plagued Raptor pilots for years.

The Defense Department tasked the Air Force, on a short deadline, to respond to high-profile oxygen problems in the crown jewel of the military's fighter fleet in 2012. In several hypoxic incidents, Raptor pilots experienced oxygen deficiency that caused them to lose cockpit motor skills and, in some cases, black out at the controls.

The Air Force launched a large-scale investigation to find the cause, enlisting help from the Navy, NASA, and researchers and engineers across the service. The 2012 investigation identified a faulty valve in the pilot's life support system and a filter blamed for causing "Raptor cough" among pilots. In addition to replacing the valve, AFMC was given 180 days to design and install a backup oxygen system in a Raptor to prevent pilots from falling unconscious and losing control of the aircraft in the event of a failure in the primary oxygen system.

The first developmental system was installed and flown on a Raptor at Edwards AFB, Calif., 179 days later. By April 2015, every F-22 in the fleet had been retrofit with the system.

"This project is a great example of a great success for the pilots," said Matt Dansereau, systems engineer with the F-22 programs office's backup oxygen system development team at Wright-Patterson AFB, Ohio. "It was delivered on time, under budget, and had a direct impact on how we fly and the confidence the pilots have in the aircraft."

The F-22 team at the Air Force Life Cycle Management Center at Wright-Patterson worked alongside Lockheed Martin and Boeing to develop the current system from the ground up, Dansereau said.

Installation began in 2012, fostered by more than $30 million through multiple contracts awarded to Lockheed Martin. Each Raptor required approximately 20 days for system installation, which was scheduled alongside other maintenance to limit the downtime, according to ACC.

"Aircraft were scheduled down, modified, operationally checked, and returned to service," ACC spokesman Ben Newell said. "However, no aircraft were grounded" for the retrofits.

Installation started in Alaska, where the F-22s assigned to the 3rd Wing at Joint Base Elmendorf-Richardson were the first to receive the system. The Raptors needed the systems to return to NORAD aerospace alert there because they are tasked with covering more airspace than anywhere else, 3rd Wing commander, then-Col. David Nahom, said in a release at the time. Nahom is now ACC's one-star deputy requirements director.

Jets without the system were altitude- and distance-limited and restricted to within 30-minutes' flight time of a divert airfield, and while there wasn't a large-scale grounding, the restrictions affected the training and deployment of the aircraft.

The new system was designed to be transparent to the pilot, and automatically activates on rapid decompression, a shutdown of the environmental control system, or when manually engaged by the pilot. The system has a control panel in the cockpit within reach of the pilot. It is left in the automatic position and will provide 100 percent oxygen when activated.

"The system is now a background feature of normal operations, providing an extra layer of safety for our pilots," Newell said. The new system means a few new routine checks for maintainers, and a new checklist for pilots to make sure it is functioning, but does not entail large-scale changes to the jet or how it operates, Dansereau said.

The joint Air Force and contractor team at Wright-Patterson has now moved into a sustainment role and integrating the system into regular maintenance cycle of the aircraft. It is included in the overall cost of keeping the jet flying, said Michael Connolly, the original program manager for the automatic backup oxygen system in the F-22 system program office.

READY FOR ACTION

Since the backup system was installed, the F-22s have entered a new era of global operations. The Raptors saw their first combat operations in September 2014 as part of Operation Inherent Resolve in combat strikes in Syria, and saw their first deployment to Europe in August 2015. The jet's mission capable rates have risen to 67.4 percent in Fiscal 2015 up from 60.9 percent in 2010, before the oxygen issues came to the fore.

One of the jet's main bases, JB Langley-Eustis, Va., has deployed the 27th and 94th Fighter Squadrons to fight in Inherent Resolve and made history in the theater, said Col. Peter M. Fesler, commander of the 1st Fighter Wing at Langley. The jet has performed "better than we imagined it would" both in strike packages and by using its sensor suite as a smaller-scale command and control aircraft.

"The rest of the strike package takes a lot less time wondering where the threats are," Fesler said. The F-22 helps identify targets on the ground so other jets can focus on the mission instead of on possible air-to-ground threats.

The first Raptor to drop a bomb in combat last year was a Langley F-22, and the base's most recent deployment earlier this year was the first time F-22s deployed to combat with the software upgrade allowing it to employ Small Diameter Bombs, Fesler said.

Langley F-22 crews stand down for two weeks after they return from deployment before returning to flight for training. In August, the base had its highest sortie generation rate since the jets first arrived, Fesler said.

While the backup system and changes to the life-support system have been implemented, the lingering issues of hypoxia-like incidents have not completely gone away. There were four such incidents in 2013, in jets without the backup system, and one each in 2014 and 2015 in jets with it. The number of recent hypoxia incidents are in line with historical rates of other aircraft, Fesler said.

While the new system is an example of "extra capacity" for jets, it hasn't changed how the pilots think about flying, Fesler said. There's a little more work for maintainers and one more switch in the cockpit, but other than that pilots are flying like they always have been.

A VEXING PROBLEM

Possible issues with the F-22's oxygen systems came under public scrutiny in late 2010, more than two years after Air Combat Command's safety section reported two hypoxia-related incidents.

On Nov. 16, 2010, F-22 pilot Capt. Jeffrey Haney was returning to JB Elmendorf-Richardson following a training flight when his aircraft experienced a bleed air leak malfunction. His oxygen cut off 20 seconds later, according to the accident investigation report. He rolled inverted, descending rapidly until, three seconds after apparently attempting to recover, he crashed into a mountainside and died instantly.

The Air Force investigation concluded that Haney was unable to recognize and respond to the emergency due to spatial

A Raptor pilot guides an F-22 over the Baltic Sea in September. USAF deployed Raptors and supporting airmen to Spangdahlem AB, Germany, to train in Europe.

USAF photo by TSgt. Jason Robertson

disorientation, channelized attention, and a breakdown of visual scan, according to ACC's accident investigation board report.

Some in Congress responded with derision to the Air Force's blaming a "complex emergency" for the crash, and some legislators accused the Air Force of covering a deficiency in their newest fighter by blaming the pilot instead of faulty equipment.

The Air Force found that Haney's focus on restoring oxygen flow by manually pulling the O-ring attached to his ejection seat distracted him from recovering the jet, but asserted that he suffered no lack of oxygen. A DOD Inspector General report reviewing the Air Force crash investigation found the service presented no evidence to support that presumption.

The 2013 report alleged that the service inadequately analyzed Haney's possible attempts to activate the jet's backup oxygen system or the physiological symptoms of a lack of oxygen.

Haney's family filed a wrongful death lawsuit against main contractors Lockheed Martin, Boeing, Honeywell, and Pratt & Whitney in 2011. The suit alleged that the F-22 was designed and manufactured "with a dangerous and defective oxygen backup system that did not automatically provide life support or breathable oxygen to the pilot in the event of a malfunction." Despite the fact that most legacy fighters require pilots to manually activate the emergency oxygen system, the contractors later settled the lawsuit for an undisclosed amount.

In 2011, the entire F-22 fleet was grounded for four months due to unexplained oxygen-related incidents. Pilots reported 14 hypoxia-like incidents that year and another 10 in 2012.

While the Air Force stressed physiological incidents were extremely rare, occurring approximately once every 9,000 sorties, public confidence took another hit in May 2012. Two Virginia Air National Guard F-22 pilots—Maj. Jeremy Gordon and Capt. Joshua Wilson—openly refused to fly the jet.

PILOTS FEEL UNSAFE

Gordon and Wilson told the television press they had experienced hypoxic inflight incidents and felt unsafe flying the Raptor. "There's a mechanical risk or even an enemy threat where I'm trained to deal with that threat," Gordon told the CBS newsmagazine "60 Minutes." "But this is something strapped to my face under which I have no control what's coming through that tube, which means there may be a point when I don't have control over myself when I'm flying."

During the 2011 grounding, the Air Force convened a Scientific Advisory Board to investigate the cause of the incidents and find ways to avoid similar issues in the future. The board, including several retired Air Force general officers, spent seven months investigating the issue before releasing a 238-page report in February 2012.

The board did not identify a single "smoking gun" causing pilots' reported oxygen problems but pinpointed several contributing factors, most notably a flaw in the pilot's life support vest. The Combat Edge vest was designed to inflate during high-G maneuvers to maintain blood flow to the pilot's body. However, a quirk with a valve occasionally kept the vest inflated when it shouldn't be, restricting pilot's breathing and causing lightheadedness and dizziness. The vest, and other issues with filters and tubes in the life support system, created a "mosaic" of problems that fed hypoxic incidents, ACC Operations Director Maj. Gen. Charles W. Lyon, said when briefing the board's findings in August 2012.

"When we start to affect a human's breathing cycle, physiologically they will start to get some symptoms," Lyon said. "It may be lightheadedness. It may be tingling. It may be a bit of numbness. That's what we found, ... that the pressurization schedule with the F-22 inflates this prematurely. So we've removed this," he explained.

The move to install an automatic backup oxygen system on the F-22 undid a decision made early in the jet's development. The original life support system on the F-22 had a self-regenerating standby oxygen system, but engineers decided to remove it during development to save weight.

"The logic behind the decision was that the [manual emergency system] provided adequate backup in the event of an OBOGS shut down," the advisory board's report stated, referring to the on-board oxygen generation system. "That decision saved approximately 15 pounds and was approved by the F-22 Life Support System Integrated Product Team in 1992."

Engineers at the time made the decision based on the availability of the

A1C Emmanuel Marioni, a technician of low observable materials, inspects the skin of an F-22.

USAF photo by SrA. Joan King

A brand-new F-22 takes off from Lockheed Martin's Marietta, Ga., facility on its way to its new home at JB Langley-Eustis, Va.

Lockheed Martin photo by Damien A. Guarnieri

emergency system and the assumption that an oxygen system failure "would be an unlikely occurrence."

Instead, "shutdowns have occurred more frequently than was anticipated," the SAB wrote. Designers at the time also worked on a modification that would have released stored, 95 percent oxygen into the life support system if a failure occurred, but that feature was not adopted in the final design.

The SAB, in its report, observed the F-22 was the only jet in the Air Force's entire inventory whose pilots experienced a high rate of hypoxia. Although the fighter's existing, manually activated emergency oxygen system was deemed adequate, the F-22 was also the only aircraft outfitted with an on-board oxygen generation system that did not have either a backup oxygen system or a plenum-reservoir to provide breathable air in case the pilot is unable to activate the emergency system.

"A review of safety incident data showed that the F-22 aircraft was the only aircraft with an abnormally high rate of hypoxia-like incidents whose cause could not be determined," the board report stated. "All aircraft experienced low rates of incidents caused by a hardware failure, a hose obstruction, or mask failures; however, the F-22 was the only mission design series with a high rate of unknown cause incidents."

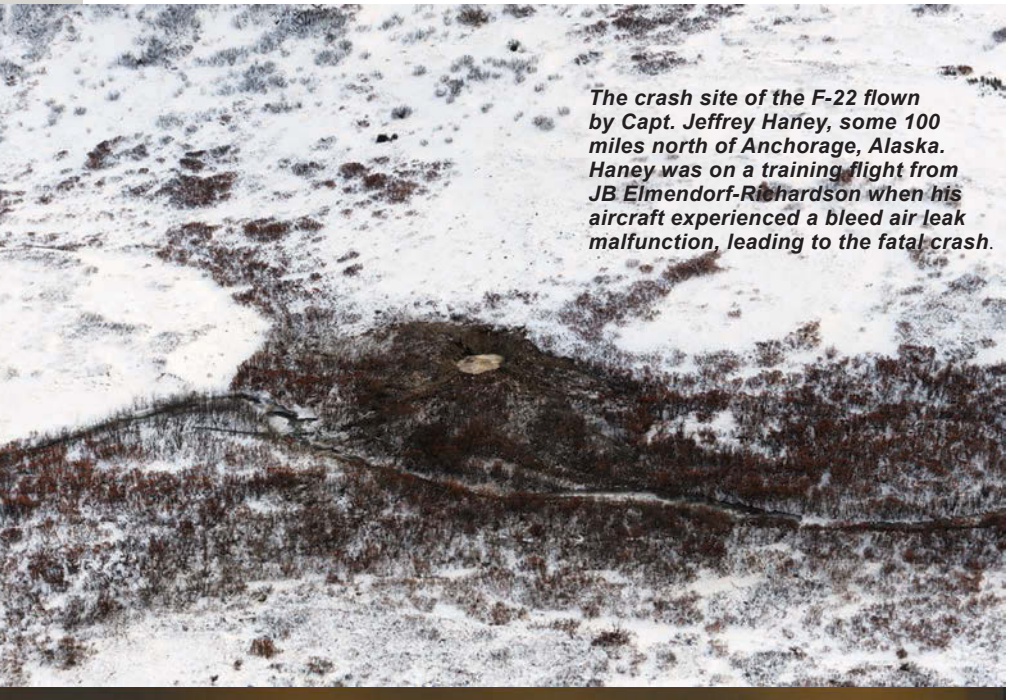
The F-22's original emergency system required the pilot to manually pull a ring on the ejection seat and descend to altitudes where he could breathe unassisted as soon as possible. In addition, the ring could be difficult to pull under certain conditions and if not activated in time, the pilot could lose consciousness and likely crash, since the jet lacked automatic ground avoidance.

The service's top priority going forward needed to be the installation of the backup system, according to the SAB. When the report was released, then-Defense Secretary Leon E. Panetta gave the service the 180-day deadline to develop and install the system, beginning in May 2012.

The Air Force hopes its newest stealth fighter, the F-35, will avoid these early issues when it hits initial operational capability in August 2016.

Unlike the F-22, the F-35's on-board oxygen generation system is complemented by an automatic, seat-mounted backup source, according to the advisory board's report. Like the F-22 and other fighters, the F-35's emergency oxygen system also automatically activates if the pilot ejects.

With the F-35 fleet already equipped with automatic systems, the Air Force's entire fifth generation fighter fleet now flies with automatic backup oxygen sources.



The crash site of the F-22 flown by Capt. Jeffrey Haney, some 100 miles north of Anchorage, Alaska. Haney was on a training flight from JB Elmendorf-Richardson when his aircraft experienced a bleed air leak malfunction, leading to the fatal crash.

USAF photo by MSgt. Jeremiah Erickson

"60 Minutes" photo

In 2012, two Virginia ANG F-22 pilots—Capt. Joshua Wilson (l) and Maj. Jeremy Gordon—publicly refused to fly the F-22. They told a "60 Minutes" interviewer they had experienced hypoxic inflight incidents and felt unsafe flying the Raptor.

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The Signal in the Noise

By Marc V. Schanz, Senior Editor

Air Force leaders say the service needs to better analyze and exploit the data coursing through its global ISR and C2 networks.

The Air Force wants to make the most of its hard-built intelligence, surveillance, reconnaissance, and command and control capabilities. To do so, it has to analyze, exploit, and disseminate the information more effectively and faster, senior leaders noted at the Air Force Association's Air & Space Conference in September.

USAF's ability to project both power and global reach around the globe has grown more potent due to advances made to its networks and ISR nodes, in particular the Distributed Common Ground System (DCGS) and the service's combined air and space operations centers (CAOCs). Now composed of 27 geographically separated and networked sites, the DCGS collects and processes information from a vast array of sensors on aircraft such as the U-2, the RQ-4 Global Hawk, and the MQ-9 Reaper.

But as USAF adapts its ISR architecture from one that supported low-intensity fights to one better equipped for contested and anti-access challenges, senior leaders are emphasizing that the service must get a handle on its information management and exploitation practices. Modernizing the DCGS and the CAOC architecture are critical to the future success of the combat air force, Air Combat Command's Gen. Herbert J. "Hawk" Carlisle noted.

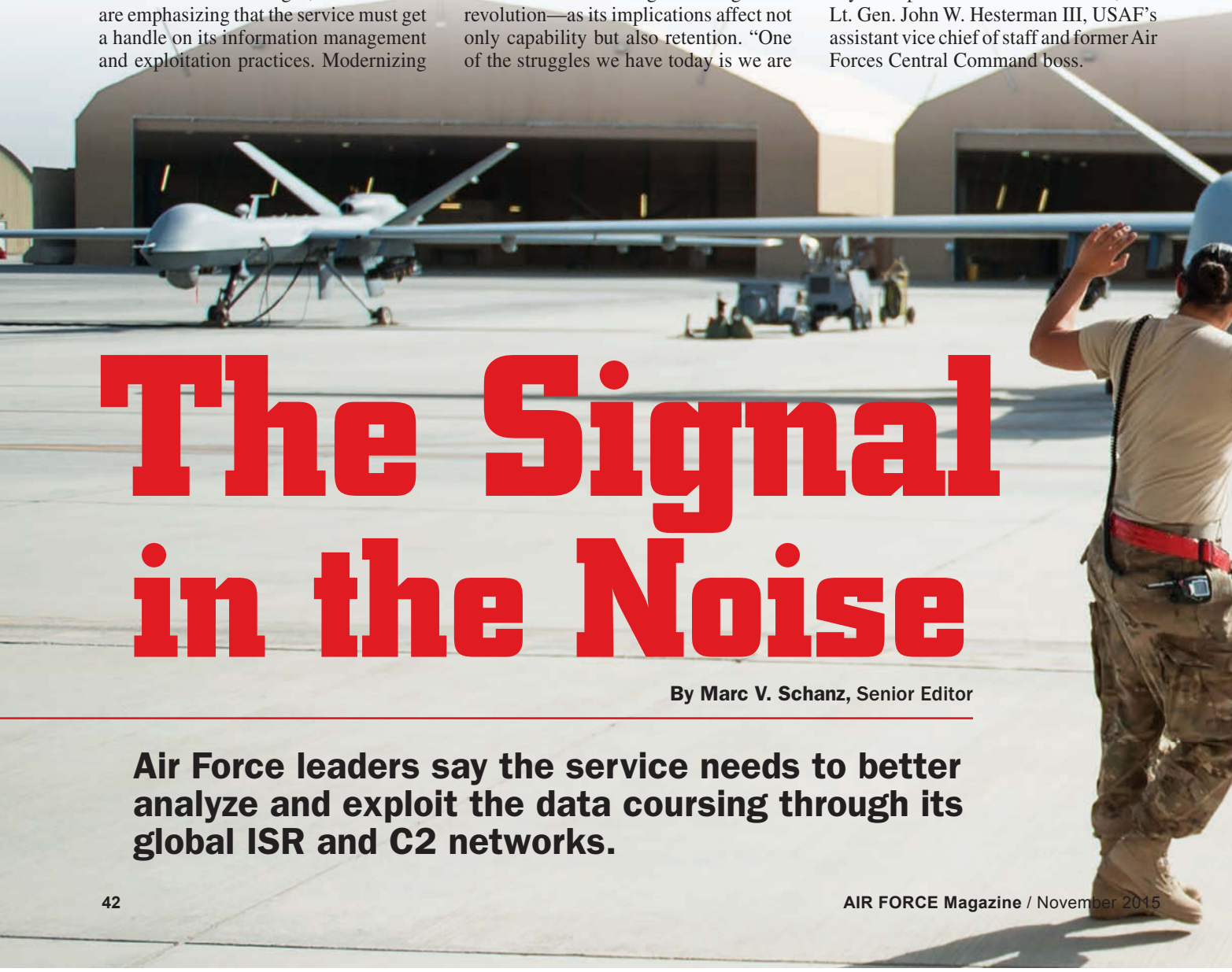
Airmen "are drowning in data," he said during his speech on fifth generation warfare. "We have to help them figure out how to sift through that raw data and get better at it. We need to change data into knowledge to give us the decision advantage against our adversaries."

As sensors and networks get more capable, the problems are mounting. The Air Force needs to reinvest in trade craft, and build more "all-source" analysts who can solve increasingly difficult, time-sensitive problems. They will turn raw data from satellites, sensors, and even open sources into targetable information—rather than just stare at screens for hours at a time tracking 24/7 full-motion video feeds, several leaders noted.

Lt. Gen. Robert P. "Bob" Otto, deputy chief of staff for ISR on the Air Staff, told attendees that USAF has to figure out how it will leverage the "big data" revolution—as its implications affect not only capability but also retention. "One of the struggles we have today is we are taking very bright airmen, and ... having them do some pretty mundane stuff," Otto said. These geospatial analysts who are doing shift work trying to keep up with FMV requirements will get bored, and eventually leave, he added.

Instead, USAF could train intelligence airmen to go "solve problems," use databases and insights to a key question in real time. "We are much more likely to harness their interests and therefore retain them over time," he added. Analytics in the Air Force of the future will be very different than they are today, he emphasized. "The ability to rapidly retrieve and assess and act, kind of indiscriminate of the sensor or the domain, is the goal," he said.

Refining information quickly is a critical challenge in today's combat operations—which is why investing in intelligence skills such as targeting is so vital. Air strikes on ISIS forces are overwhelmingly successful because the process of turning intelligence into "targetable data" over Iraq and Syria has improved vastly since the opening days of Operation Inherent Resolve, said Lt. Gen. John W. Hesterman III, USAF's assistant vice chief of staff and former Air Forces Central Command boss.



"In my humble opinion, ... our ability to do [rapid targeting] had atrophied a little bit before we started this campaign," Hesterman added.

CLOSING THE TECH GAP

Otto said one reason targeting has atrophied is because the services and combatant commands cut the number of targeteers at the same time precision guided munitions were proliferating and becoming more capable. Now a single aircraft can hit 10 different targets on a mission. Targeting is a "higher level analytic skill" that the Air Force needs to invest in, he added, especially as it confronts challenges in contested environments against highly capable adversaries with advanced weapons.

One of the issues exacerbating the stress on analysts is the rapid growth in network capacity. Otto pointed out when he commanded the 9th Reconnaissance Wing at Beale AFB, Calif. (from 2008 to 2010), data network transfer rates were around five megabits per second (Mbps), while today those rates can hover around 3,000 Mbps. From full-motion video to light detection and ranging information (LIDAR) to classified and commercial space imagery, there is an increasing flood of data "through the pipes," Otto said.

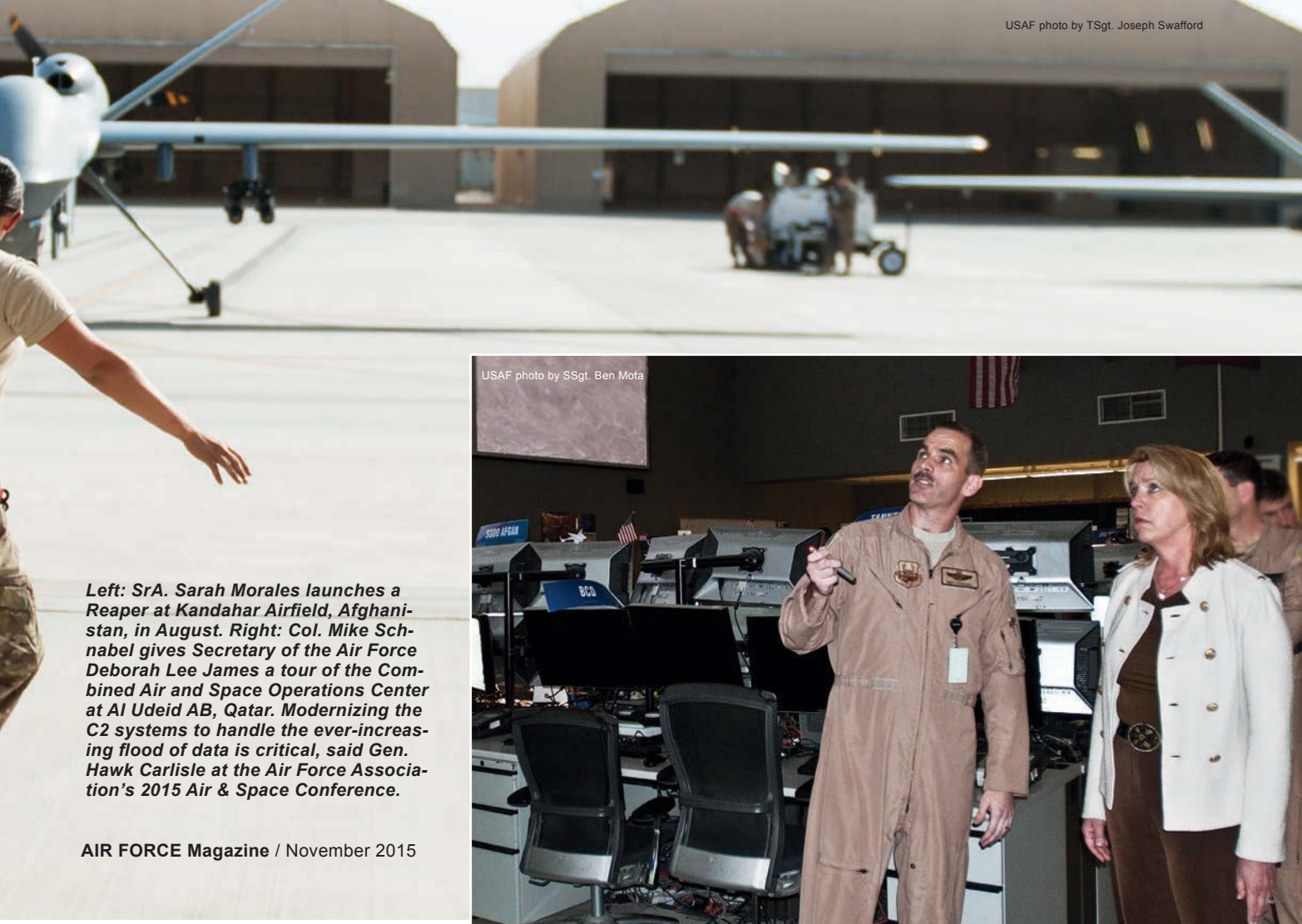
In response, USAF must expand its partnership with commercial industry—where the state of the art is being constantly refined in fields such as data analytics, tagging, speech-to-text technology, machine learning, and other information exploitation advances. "The commercial sector is going to have tools, some of which are phenomenal," Otto added. But the question is whether the Air Force can vet these technologies and improve them on a timetable.

Automation and machine learning are two areas that could have great impact on how analysts sift through seas of data, and a field where commercial firms are making great progress.

Speaking on the panel with Otto were James Crawford, CEO of the geo-mapping firm Orbital Insight, and Samuel Druker, director of data science at Microsoft. Crawford noted that commercial satellite imagery is more accessible than ever and his company can now track data related to industries ranging from oil and gas to construction and agriculture yields. Druker called his company's process of finding insight for customers "pixels to numbers," that helps humans look at smaller more relevant data sets. "The numbers are just a signal, and … that signal is hidden within a huge amount of noise," he said. While technology and data science will help assemble this information, the human will remain incredibly important. "In some sense, what you are looking for is a needle in a haystack. And what we are trying to do with the automation is to sift out the haystack into a very, very small pile of hay, so that the humans don't have very much to look through," said Druker.

Beyond the technological gap, what will make the difference long term is investment in intelligence tradecraft, said Steven Rogers, USAF's senior scientist for automatic target recognition and sensor fusion. "How we interface humans and computers together to do what we do … is unique and that's where our advantage will lie," said Rogers. "It won't be in the technology, ... it will be in how we do that tradecraft." ✪

USAF photo by TSgt. Joseph Swafford



USAF photo by SSgt. Ben Mota

Left: SrA. Sarah Morales launches a Reaper at Kandahar Airfield, Afghanistan, in August. Right: Col. Mike Schnabel gives Secretary of the Air Force Deborah Lee James a tour of the Combined Air and Space Operations Center at Al Udeid AB, Qatar. Modernizing the C2 systems to handle the ever-increasing flood of data is critical, said Gen. Hawk Carlisle at the Air Force Association's 2015 Air & Space Conference.

USAF photo by Maj. Jefferson S. Heiland

By Amy McCullough, News Editor

The F-22 Raptor is performing even better than expected in the war zones of Iraq and Syria, and the Air Force is planning to take full advantage of its capabilities in "everything we do," said Air Combat Command boss Gen. Herbert J. "Hawk" Carlisle in September during the Air Force Association's Air & Space Conference in National Harbor, Md.

The fifth generation fighter made its combat debut in September 2014 during the opening assault against ISIS extremists in Syria, and Carlisle said the aircraft is "doing extraordinarily" as it continues to play a vital role in Operation Inherent Resolve.

Since it entered the fight, the F-22 has flown hundreds of sorties, thousands of hours, and dropped hundreds of bombs, but perhaps the fighters' most important contribution to the mission is the situational awareness it provides. Carlisle said this "makes every single airplane in the airspace on the coalition side that much better."

In the fight against ISIS, the F-22 has been "absolutely incredible," said Carlisle. "I'd venture to say it does more than was even thought it could do. It produces greater capability and when you put it in the hands of our airmen, it does fantastic things. It's an aerial quarterback."

Here: A Raptor takes on fuel from a KC-10 after an operation in Syria Sept. 23, 2014. The September strikes marked the F-22's first combat use. Right: Gen. Frank Gorenc (r), USAFE commander, said the F-22's presence in Europe helped assure allies the US would protect them from Russian aggression. To his right is ACC Commander Gen. Hawk Carlisle.

USAF photo by Scott M. Ash

Fifth Gen Quarterback

The F-22 has proved its mettle against ISIS.

In fact, the Raptor's situational awareness, precision attack capability, and newfound quarterback role is so critical USAF won't even send other aircraft into certain areas in Syria and Iraq unless they are escorted by F-22s, he added.

The Raptor also is reliable, with recent mission capable rates around 75 percent, and "even better in the field." Carlisle said the fighters have proved to be "far more" maintainable than originally expected.

In late August, four F-22s from the 95th Fighter Squadron at Tyndall AFB, Fla., and a C-17 from the 60th Airlift Wing at Travis AFB, Calif., arrived at Spangdahlem AB, Germany, for the Raptor's first European deployment.

It also was the first "rapid Raptor" deployment for ACC, said Carlisle. The concept, which was first developed in Pacific Air Forces, involves dispatching a contingent of F-22s with a smaller logistics package to a forward location with the expectation that the fighters will be combat-ready within 24 hours of deploying.

Carlisle said the concept worked well, and the Raptors flew "100 percent of the [planned] sorties," including stops at Lask AB, Poland, and Amari AB, Estonia, where they trained with USAF and allied forces and demonstrated the United States' commitment to NATO and European security.

"I was eager to get the F-22 in theater to show and assure our allies that we are serious about our contribution to NATO," said US Air Forces in Europe-Air Forces Africa boss Gen. Frank Gorenc.

SURPRISE MESSAGE

The decision to introduce the aircraft into the European theater "was made a long time ago in our effort to try and send a message to assure allies and to deter" a "very aggressive Russia," said Gorenc.

"I don't know how well it deterred President [Vladimir] Putin; however, it's done a lot to assure our partners," he said.

By mid-September the European deployment had wrapped up, but Gorenc said the short visit helped pilots and crews see how the fifth generation fighter can operate and collaborate with USAF units and allies in the region. Each of the stops during the deployment was conducted in "rapid order," also proving that the infrastructure is available to support the F-22, he added.

"When American airpower shows up in a place people don't expect, … it sends a pretty big message. [It] assures our allies, friends, and partners, and also sends a distinct message to potential adversaries out there that we can be where we need to be when we need to be there," said Carlisle.

Gorenc said, "You can bet that I will be asking for that capability" in the future, but when asked if there were any plans to bed down F-22s in Europe or create a semipermanent detachment similar to the continuous bomber presence on Guam, he said, "it depends."

"I recognize there are priorities to be accomplished and I'm hoping that … every once in a while, [we] come above the line, but I think already, we proved a lot," said Gorenc.

Carlisle said ACC is developing a "rapid personnel recovery, roll on, roll off capability," which he dubbed "Rapid Next." He said the command expects to exercise the capability at "an overseas location" in a couple months.

"We're developing this and it's getting better all the time," said Carlisle. "I also believe that when we get this right, we will truly be able to give more capability to combatant commanders with the amount of capacity we have. It's developing at a rapid pace."

"One of the ways" for the Air Force to benefit from its flexibility "when we have a capacity problem, is to act faster, is to move things faster, and get them faster. That's where Rapid Raptor comes from," Carlisle said. "Rapid Next will take us to an even greater level." ✪

Boeing photo by Ed Turner

USAF photo by Sara Vidoni

Gadgets Every Gunship

The AC-130J needs new eyes and new weapons to kill its enemies and bring airmen home again.

USAF photo by SrA. Christopher Callaway

Lt. Gen. Bradley Heithold, Air Force Special Operations Command boss, wants a drone that can fly under weather to gather target coordinates and transmit them back to his gunships.

Air Force Special Operations Command's AC-130 gunships are facing increasingly challenging threats while enemies exploit its inability to see through clouds to operate freely in foul weather. "You've got to put the airplane over the objective" and safely ingress and egress, noted AFSOC Commander Lt. Gen. Bradley A. Heithold at the Air Force Association's Air & Space Conference in September.

Given the proliferation of man-portable air defense systems on the battlefield today, "the world in which we can do that continues to shrink," he added. In current operations against ISIS, "my AC-130 gunships are flying every single night delivering violence to my customer," except when weather hampers their ability to see the target, Heithold said. "The enemy is maneuvering, massing against an objective, oftentimes because of the cover of weather, and we need to take that away."

AFSOC is rapidly pursuing two hi-tech solutions: a high-energy laser weapon to counter surface-to-air threats and tactical offboard sensing to peel back the clouds and make the next gunship an all-weather battleplane. "Those two things I think are ripe right now; the technology is mature enough" to pursue in a very serious way, Heithold said.

GETTING SERIOUS

"I've challenged my folks [to] get a high-energy laser on an AC-130J by the close of the decade," he said, adding that he believes "we can do it." A legacy AC-130W Stinger II airframe is already earmarked to become a laser test bed and AFSOC has begun sketching out performance requirements and operating concepts. "I have to show that I'm serious about pursuit of this high-energy laser," Heithold pointed out. "When I said this is my 'close-of-decade thing,' we're showing in a serious way that we want to pursue this."

The Air Force's Advanced Tactical Laser program several years ago matured directed energy weapon technology to the point where it's both feasible and practical. "We learned a lot from the Advanced Tactical Laser. . . . That took the whole back of a C-130, but it did, in fact,

Lockheed Martin photo

Needs

By Aaron M. U. Church, Associate Editor

work," Heithold noted. "To me, the hard part of this will be directing the beam" to destroy incoming weapons before they hit the aircraft. The laser will need to be able to track a missile-size object flying at supersonic speeds and disable its seeker—from a moving platform.

Ground based systems are already capable of taking out incoming mortars before they impact a friendly base. "Now you've got to put it [on] an aircraft," Heithold said, explaining the challenge. He said industry is confident they can overcome the technical hurdles to keep the gunship a viable, potent weapons platform.

Unlike the 12,000-pound ATL, the new laser weapon won't have the whole back end of a C-130 to itself. The weapon must weigh less than 5,000 pounds and fit within the space allocated to the gunships' 30 mm or 105 mm gun. "I don't want to have to take a gun off the airplane, but I'll give [industry] that much space," said Heithold.

AFSOC foresees a secondary offensive role for the weapon against specialized targets where sneaky destruction is useful, such as disabling vehicles before a snatch-raid. Burning a hole through an aircraft wing or boat engine is sufficient to render it useless.

"You set the trap and then disable the escape mechanisms, … nobody hears or sees anything" until they attempt to escape. AFSOC is already studying how to use the weapon effectively against hardened targets but "not, I repeat, *not*, against humans," emphasized Heithold. A laser weapon would give the AC-130J an almost endless magazine of shots, its ample fuel load allowing the generation of electricity to power the weapon as long as it's aloft.

The solution to denying the enemy cover of weather is elaborate but "not that daunting a challenge" technologically, Heithold said. "What we want to do is take the sensor off of the gunship and drop it out of the back."

FLYING A COYOTE

The idea is to push a small remotely piloted aircraft out of the common launch tube, normally used to deploy precision guided weapons such as the Griffin missile. The RPA would parachute to a predesignated altitude before deploying its wings and setting up an orbit under the cloud deck. It would then feed live imagery back to the AC-130, giving the crew a real-time view of the target. A joystick aboard the gunship would allow an operator to steer the sensor, but the RPA would fly itself until it was no longer needed, and then crash.

"Whatever the sensor's looking at, I'm sending coordinates back. Once I've got the coordinates, it directly feeds it into my fire-control system" and the gunship can fire at the target coordinates, Heithold said.

L-r: The Advanced Tactical Laser, mounted on a C-130 test bed, flies over the New Mexico desert; a new AC-130J Ghostrider readies for takeoff at Eglin AFB, Fla.; a laser weapon damages a truck to demonstrate its effectiveness against ground targets. AFSOC is serious about getting a high-energy laser on an AC-130J by the end of the decade.

Although AC-130s can launch Small Diameter Bombs or even fire a 105 mm round at a set of coordinates today, the crew can't see if they've hit the target or by how far they've missed. With the RPA, "once I know where the round hit I can adjust fire" to destroy the target and also avoid inadvertently shooting something else.

AFSOC is already flying an internal proof-of-concept using the electrically powered, three-foot-long, 14-pound Coyote RPA, controlled from a laptop computer aboard the aircraft, Heithold said. Air Force Materiel Command is conducting a longer-term feasibility study evaluating all available RPA platforms, or even development of a new one.

Heithold said he wouldn't be surprised if the AC-130J goes to war with a derivative of the original laptop-controlled Coyote concept, though. "As innovative as our command is, [that] might be the one we take to the battlefield," he said, recalling the gunships' own legacy. "We took [the gunship] to the battlefield in Vietnam as a proof of principle and it never came home." That hastily deployed concept spawned a new kind of aerial weapon that has fought in every major engagement since. ✪

USAF photo by 2nd Lt. Logan Clark

An instructor guides a student through a training mission on an MQ-1 simulator. The Air Force is relying more and more heavily on simulators to train RPA operators in an environment where the intelligence, surveillance, and reconnaissance demand is insatiable.

21st

USAF photo by TSgt. Joshua Strang

Lt. Gen. Darryl Roberson, commander of Air Education and Training Command, speaks at JBSA-Randolph, Texas, in August. Roberson wants to double the number of undergraduate RPA pilots by 2017.

Century Training

USAF seeks to reinvent training for its pilots and RPA operators. Simulations will play a key role.

By Brian W. Everstine, Pentagon Editor

The way pilots train in both the manned and unmanned worlds is changing. The Air Force is trying to adapt to the demand for more pilots flying remotely piloted aircraft by increasingly relying on simulators, and USAF is also increasing the role simulators play in manned flight training, to prepare airmen for next generation threats.

Leaders from multiple major commands outlined the need for a new generation of training across the Air Force, a need to prepare the next generation of pilots for new challenges—and help the greater Air Force address shortages that could limit where and when the service could fight.

"We've got to be able to think quickly, we've got to be able to change direction when necessary," Air Force Chief of Staff Gen. Mark A. Welsh III said at the Air Force Association's Air & Space Conference in National Harbor, Md., in September. Airmen are "remarkably talented and they can [remain adaptable] as long as we invest the money and the resources into education and training. We cannot take a dime out of this effort. In fact, we should add to it."

The Air Force's remotely piloted aircraft pilots and sensor operators have been under unrelenting pressure as the demand for intelligence, surveillance, and reconnaissance has steadily and unrelentingly increased.

The Defense Department attempted to provide some relief this summer, authorizing the Air Force to decrease its required 65 combat air patrols per day to 61 as a way of relieving instructors to train more RPA pilots, said Lt. Gen. Darryl L. Roberson, commander of Air Education and Training Command.

The service's goal is to double the number of undergraduate RPA pilots it trains by next year, from 192 now to 384. The command wants to hit its maximum capacity by 2017, a needed move to "sustain requirements and crew for the foreseeable future," Roberson said.

The Air Force is also wrapping up a grassroots review of personnel issues among RPA crews, with a look at the stress the job has exerted on both airmen and families. Air Combat Command sent 3,366 surveys to officers and enlisted airmen at RPA bases to pinpoint specific causes of stress and overwork in the career fields. Dozens of officials visited bases to speak with airmen and produced a report for ACC and Air Force leadership to review and plan a way forward in an attempt to alleviate the problems. Leadership will review the report and decide what steps to take later this year at a Corona conference of top Air Force leadership this month.

SUSTAINED TRAINING

The steady drumbeat of training requirement doesn't stop when the RPA pilots leave AETC and are assigned to their first operational post, however. Operational pilots have been dealing with a constant pressure to stay on the job, sometimes working six days on and one off, or even seven days on and no days off. The long hours are necessary to keep up with the constant operational demands that stem from Operation Inherent Resolve—the air war against ISIS terrorists in Iraq and Syria—along with other operations around the globe.

Gen. Herbert J. "Hawk" Carlisle, commander of ACC, said the service needs to find a way to give these pilots time to train, so they can both stay proficient in different mission sets and work with the airframes to conduct new missions that have so far been unattainable.

"It's not just a capability to counter ISIS," Carlisle said. "There's potential for the MQ-9 in a variety of different mission sets we've never been able to train to."

Carlisle said he wants to see remotely piloted aircraft increase their role in high-level training exercises, such as Red Flag, where pilots can have a chance to try different things than are possible in their regular operational flights.

Both the Predator and Reaper have demonstrated in exercises capabilities for missions beyond intelligence gathering and close air support, said Maj. Jason Willey, MQ-1 and MQ-9 functional manager for the RPA capabilities division at headquarters Air Force. Both aircraft can play a pivotal role in global precision attack and even personnel recovery operations.

VIRTUAL IMPORTANCE

Going forward, much of the training for pilots—especially those in manned aircraft—will need to be virtual, or of a combined live-virtual construct, to help airmen face missions that cannot be replicated in a physical training environment.

"We have the technology," Welsh said. "How else are we going to put them together? It's really not all that expensive and there are a lot of people here that can help, and they're ready, willing, and able to help. We've just got to be willing to have the conversation."

The pilots of the future will need this training early on, and the ability to simulate missions accurately and with high fidelity will drive one of the service's biggest procurement decisions—the next generation trainer.

The Air Force will award the contract for the coming T-X trainer, set to replace the aging T-38 currently in use for pilot training, not just on the aircraft's flight performance, but also on how well the winning contractor can build simulators. Tomorrow's pilots need to be ready to perform in threatened environments, requiring simulators with high enough fidelity to replicate anti-access/area-denial situations.

"We in AETC are focused on getting the state-of-the-art capability in the virtual constructive environment so we can, from the beginning, train to a level that's going to allow us to fight in that [high-threat] environment," Roberson said.

The goal is that a pilot in a simulator will be focused on a mission to the level that he can't tell "he's not out flying in the airplane for real," Roberson said. ✪

Fixing the Skies for the Next Gen

By June L. Kim, Associate Editor

The Federal Aviation Administration is working to modernize the nation's airspace.

For more than a decade, the Federal Aviation Administration has been working to restructure the airspace over the US. One way the FAA is doing that is through the Next Generation Air Transportation System, or, for short, NextGen. It is a major overhaul of the national airspace infrastructure aiming to modernize and simplify the current system, said Edward L. Bolton Jr., the assistant administrator for NextGen at the FAA.

The United States has the world's largest controlled airspace of five million square miles—and it is the most diverse, most complex, and safest. Yet, with the current aging system, a rising number of passengers, and other factors, the US aviation industry has been looking to find ways to modernize the airspace for quite some time, said Bolton, a retired Air Force major general, at the Air Force Association's Air & Space Conference in National Harbor, Md., in September.

NextGen is a series of programs intended to increase airport efficiency, reduce flight delays, shorten flight paths, improve airport arrival rates, enhance controller productivity, increase safety, and reduce fuel costs, according to the "NextGen Priorities Joint Implementation Plan," an FAA report issued to Congress in 2014.

The NextGen concept was first envisioned in 2003 and an advisory committee, made up of FAA officials and members of the aviation industry, was later established to develop and implement a number of priorities for the new system. The NextGen advisory committee (NAC) came up with four focus areas: multiple runway operations, performance-based navigation, surface and data sharing, and data communications.

FIRST STEPS

According to the FAA, multiple runway operations focus on improving runway access through new and improved technology, updated standards, analysis, and modifications.

Performance-based navigation uses satellite-based area navigation and required navigation performance "to improve access and flexibility for point-to-point operations."

Surface and data sharing focuses on airport surveillance information, automation, and enhanced cockpit displays that would "provide increased situational awareness for controllers and pilots," states the FAA.

Finally, data communications uses messaging services, similar to texting, "to deliver clearances, coordinates, and commands."

Although it superficially sounds like a routine technological refresh of the sort government agencies perform all the time, in reality NextGen "is the most complex and difficult modernization project since the [interstate highway system]" in the 1950s, said Bolton during a panel discussion on the national airspace structure.

Since last year, NextGen has been implementing the first steps in airports all around the country. Pathfinder NextGen locations include airports serving Atlanta, Chicago, Cincinnati, Detroit, Houston, Los Angeles, Philadelphia, and New York City. In these first steps, the NAC was able to implement 28 "milestones of actual capabilities"—items that were important to stakeholders, said Bolton.

In Atlanta alone, Delta Air Lines saved some $14 to $19 million in a year through a NextGen initiative called the Wake Turbulence Recategorization, which safely decreased the distance between aircraft taking off. That increased capacity and

FAA illustrations

Screenshots from an FAA video show traditional flight paths in red, and NextGen's suggested flight paths in green. More efficient flight paths save both time and money.

efficiency, leading to fewer delays, shorter takeoff times, less fuel burn, and a reduction in the aviation carbon footprint, according to the FAA website.

Having just completed the first phase of NextGen, the system still has a long way to go but is on track for initial operating capability in 2025, said Bolton.

So far, so good, but there are no guarantees NextGen will stay on track for long, said Paul Rinaldi, president of National Air Traffic Controllers Association. There are many external factors looming over its implementation, such as the threat of a return to sequestration and the need for Congress to pass an FAA reauthorization bill.

DRONE WARNING

The FAA must also find a way to safely integrate unmanned aircraft into the nation's airspace, urged Rinaldi. NextGen does not entirely prepare the FAA or the nation for the rapidly expanding presence of remotely piloted aircraft. "We didn't understand the magnitude to which [remotely piloted aircraft] would be an oncoming tidal wave, something that must be dealt with, and quickly," Bolton said in 2014.

Commercial drones have had several close-calls with airplanes in metropolitan areas, and this growing threat "is probably one of the biggest challenges" in airspace, said Rinaldi. He also alluded to the giant online store Amazon.com, which in 2013 announced it is doing research and development in anticipation of launching drones to deliver packages in as little as 30 minutes after customer purchase.

"That's a recipe for disaster," said Rinaldi.

The military has also demonstrated an exponentially increasing use of RPAs over the past two decades, with much more growth still likely to come. According to Paul Scharre, senior fellow at the Center for a New American Strategy and director of the 20YY Warfare Initiative, also speaking at AFA's conference, RPAs will increase the military's precision, reliability, speed, and significantly reduce costs compared to manned aircraft alternatives.

The FAA has a "tremendous challenge" ahead in managing the nation's airspace, Bolton said, and the demands on the space are only expected to continue to evolve and grow. ✪

Photo by Brittany Gray

Edward Bolton, FAA assistant administrator for NextGen, speaks in a panel discussion on reinventing the national airspace structure at the Air Force Association's 2015 Air & Space Conference on Sept. 15.

Air & Space Conference and National Convention 2015

Photo by Brittany Gray

By Brian W. Everstine, Pentagon Editor

More than 6,800 attendees gathered for the 2015 Air Force Association National Convention and the Air & Space Conference and Technology Exposition, dedicating time to better understand Air Force issues.

Top USAF leaders, such as Secretary of the Air Force Deborah Lee James, Chief of Staff Gen. Mark A. Welsh III, and CMSAF James A. Cody took the stage at the Gaylord National Resort and Convention Center in National Harbor, Md., just outside Washington, D.C. Secretary of Defense Ashton B. Carter gave a keynote address. All speakers shared with audiences their present challenges as well as their visions for the Air Force's future.

The 67th annual AFA National Convention began Saturday, Sept. 12, with two days of AFA business, followed by three days of conference activity, filled with 50 speaker sessions.

The conference commenced with welcoming remarks by James and an awards ceremony highlighting more than 40 individuals and groups for their contributions to the aerospace community. James, Welsh, and major command leaders presented citations of honor and Air Force crew and team awards, Air National Guard and Air Force Reserve awards, and professional, civilian, education, management, and environmental awards.

AFA formally honored the Air Force's 12 Outstanding Airmen of the Year with a ceremonial dinner following a reception sponsored by Northrop Grumman on Sept. 14.

Cody congratulated the 12 airmen during his keynote address at the dinner ceremony.

SSgt. Qunita Humphries, one of the 2014 Outstanding Airmen of the Year, acted as master of ceremonies, and Chief of Chaplains Maj. Gen. Dondi E. Costin led the gathering in prayer. The US Air Force Honor Guard presented the colors and the US Air Force Band provided entertainment during the evening's festivities.

Thanks to financial support from Lockheed Martin, the 12 Outstanding Airmen attended events in and around Washington, D.C., throughout the conference. The "golden dozen" toured Capitol Hill and Arlington National Cemetery and visited the Pentagon.

The conference acknowledged the profound challenges facing today's US defense complex and celebrated the achievements of the airmen operating within it. The event concentrated its focus via military leaders and national defense and policy experts on subjects ranging from cyber, space, intelligence, surveillance, and reconnaissance, to nuclear and energy issues.

The first day of the conference, Monday, saw much focus on the changing role of airpower in the US. Tuesday discussions centered on the cyber realm and acquisition in tough budget times.

Thirteen senior leaders discussed everything from training to innovation during the Four-Star Forum. At the Command Chief Master Sergeants Forum, leaders addressed areas such as professional development, readiness, resiliency, and force management, offering insight into what affects airmen.

James, joined on the main stage by Welsh, Cody, AFA leaders, and AFA industry supporters, snipped the ceremonial red ribbon with oversized scissors—a sign of the official opening of the technology exposition—on Sept. 14. More than 100 exhibitors showcased their products.

A wreath-laying ceremony took place Sunday morning, Sept. 13, at the Air Force Memorial in Arlington, Va. AFA Chairman of the Board Scott P. Van Cleef paid tribute to the lives and contributions of AFA members and friends who have died in the last year. Retired Maj. Gen. William J. Dendinger, AFA's national chaplain, conducted the invocation, homily, and benediction for the event. Van Cleef and Cody read a memorial tribute list of the deceased, and Gen. David Goldfein, vice chief of staff of the Air Force, closed the ceremony by laying a wreath at the memorial.

AFA's Air Force Anniversary Gala toasted the service's 68th anniversary on Sept. 16. Kenneth Goss, a former AFA department director, served as master of ceremonies. During the event, the following were saluted with national aerospace awards:

Retired Gen. Janet C. Wolfenbarger, former commander, Air Force Materiel Command, with the H. H. Arnold Award, recognizing the most significant contribution to national defense by a member of the military; William A.

Photos by Brittany Gray

Air Force Secretary Deborah Lee James (l) and USAF Chief of Staff Gen. Mark Welsh (r) were key speakers at AFA's Air & Space Conference.

LaPlante, assistant secretary of the Air Force for acquisition, with the W. Stuart Symington Award, recognizing the top contribution by a civilian in the field of national defense; Lockheed Martin's F-22 Raptor, with the John R. Alison Award, for the most outstanding contribution by industrial leadership to national defense; the Northrop Grumman Foundation, recognized with the AFA Chairman's Aerospace Education Award, for long-term commitment to aerospace education with a significant nationwide impact.

AFA Lifetime Achievement Awards were presented to: retired Gen. Michael V. Hayden, R. A. "Bob" Hoover, and Eugene F. "Gene" Kranz.

This year's annual Spouse and Family Forum focused on the resiliency of our Air Force families. After hearing from James, Welsh, and Cody, attendees heard of challenges to military and veteran caregivers with Steve Schwab, the executive director of the Elizabeth Dole Foundation; addressing caregiver concerns with Lynda C. Davis, the executive vice president of the Tragedy Assistance Program for Survivors; resilience in children with Christina App, project director for US social impact at Sesame Workshop; habits of effective military families with Julienne Stathis, senior client partner with FranklinCovey; caregivers' stories with Heather Gray, founder of Finish Strong Ministries; and heard personal stories of wounded, ill, and injured warriors from TSgt. Alex Eudy, Alyson Eudy, SrA. Justin Deskin, and Heather Deskin.

Frank Beatty, Betty Welsh, and Athena Cody—spouses of Deborah Lee James, Gen. Mark A. Welsh III, and CMSAF James A. Cody, respectively—shared personal stories of resiliency and the issues they focus on in meetings with Air Force families around the world. Attendees were able to tour the Airmen & Family Programs Pavilion, part of the Technology Exposition. The program exhibited tools and resources families can use in recovering from deployments, injuries, or day-to-day realities.

AWARDING EDUCATION

Mark Westlake, a physics teacher at Saint Thomas Academy in Mendota Heights, Minn., was honored as the 30th recipient of AFA's National Aerospace Teacher of the Year Award. Westlake distinguished himself by integrating aerospace into his classroom, school, and community. In addition to teaching grades 9 through 12, Westlake is also a master teacher for the Lemelson-Massachusetts Institute of Technology Program in Cambridge, Mass., where he mentors invention programs in the US. He also moderates the Saint Thomas Academy Experimental Vehicle Team, serves as chairman of the advisory committee for the Solar Car Challenge Foundation, and writes a blog for *National Geographic*. The award recognizes educators for their accomplishments and achievements in promoting and engaging today's youth in science, technology, engineering, and math. As AFA's top teacher, Westlake received a $3,000 cash award and plaque.


Photo by Jose Ruiz

Evan Dygert (l), the CyberPatriot Mentor of the Year from Winter Springs, Fla., and Chris Sutton, CyberPatriot Coach of the Year from Huntsville Ala., discuss the program before a banquet held during the conference.

Above left: Capt. Jerry Yellin (l), pictured here with AFA President Larry Spencer, spoke about his time during World War II in the Pacific and his organization "Keep the Spirit of '45 Alive." Above right: Secretary of Defense Ashton Carter delivered the keynote address.

In addition, AFA honored Chris Sutton of Huntsville, Ala., as the CyberPatriot Coach of the Year. Evan Dygert, of Winter Springs, Fla., was named CyberPatriot's Mentor of the Year. CyberPatriot, AFA's flagship STEM program, is the nation's largest youth cyber education program.

AFA BUSINESS

Forty-seven state delegations with 207 authorized delegates attended the National Convention where they conducted AFA business, including elections and program management. In concert with AFA's mission to educate, advocate, and support, the delegates approved a Statement of Policy and Top Issues for 2016, a document that represents AFA's position on topics of importance to the Total Force, veterans and retirees, and Air Force civilians, as well as key modernization and national security issues.

AFA ELECTIONS

In national officer elections, Scott P. Van Cleef, of Fincastle, Va., was elected for a second term as Chairman of the Board. David A. Dietsch, of Arlington, Texas, was elected for a second term as Vice Chairman of the Board for Field Operations. Richard Bundy of Spotsylvania, Va., was elected for a first term as Vice Chairman of the Board for Aerospace Education. Tim Brock of Oveido, Fla., was elected for a first term as National Secretary. Nora Ruebrook, of Honolulu, was elected for a second term as National Treasurer.

In other elections, national directors elected for a three-year term were: Charles Heflebower of Fairfax Station, Va., Director at Large; Eugene Santarelli of Tucson, Ariz., Director at Large; Joan Sell of Littleton, Colo., National Director, West Area. Tom Gwaltney of Montgomery, Ala., was elected to fill one remaining year of a three-year term as National Director, Central Area.

Newly elected Region Presidents are: Wayne Kauffman, Far West; Bill Yucuis, Florida; Kevin Grady, New England; Ron Mielke, North Central; Rodgers Greenawalt, Southeast; John Toohey, Southwest; Gary Copsey, Texoma.

DOD AND USAF LEADERS

Many Air Force leaders participated in the conference as presenters and session attendees. Many senior Air Force leaders also took part in media-only sessions.

Senior Air Force, DOD, and government leadership speaking at the conference included Carter, James, Welsh, and Cody. Other high-level leaders included Assistant Secretary of the Air Force for Acquisition William A. LaPlante;

The Four-Star Forum session featured three- and four-star generals along with CMSAF James Cody and was moderated by USAF Chief of Staff Gen. Mark Welsh.

Photo by Brittany Gray

CMSAF James Cody addresses an audience. It included many dignitaries.

L-r: AFA Executive Vice President Mark Barrett, USAF Secretary Deborah Lee James, A1C Spencer Stone, AFA Chairman of the Board Scott Van Cleef, and USAF Chief of Staff Gen. Mark Welsh after discussing Stone's heroic takedown of a terrorist on a train in France. Photo by Lyndsey Akers

SECAF James (l) and Chief of Staff Welsh unveil a painting presented to the Air Force Art Collection by the artist (c) Maj. Warren Neary.

Gen. Herbert J. "Hawk" Carlisle, commander, Air Combat Command; Gen. Lori J. Robinson, commander, Pacific Air Forces; Gen. Ellen M. Pawlikowski, commander, Air Force Materiel Command; Gen. John E. Hyten, commander, Air Force Space Command; Gen. Frank Gorenc, commander, US Air Forces in Europe-Air Forces Africa; and Lt. Gen. Bradley A. Heithold, commander, Air Force Special Operations Command.

AFA hosted Pacific Air Chiefs from various countries, who offered their insight during sessions and panels: Air Marshal Gavin Davies, the chief of air force of the Royal Australian Air Force; Air Marshal Abu Esrar, the chief of air staff of the Bangladesh Air Force; Lt. Gen. Soeung Samnang, commander of the Royal Cambodian Air Force; Lt. Gen. Michael Hood, commander of the Royal Canadian Air Force; Air Chief Marshal Agus Supriyatna, chief of the air staff of the Indonesian Air Force; Gen. Harukazu Saito, chief of staff of the Japan Air Self-Defense Force; Gen. Tan Sri Dato Sri Roslan bin Saad, chief of Royal Malaysian Air Force; Col. Shiileg Enkbat, commander of the Mongolian Air and Air Defense Forces; Brig. Gen. Sudheer Shrestha, director general of Army Aviation, Nepal; Air Vice-Marshal Michael Yardley, chief of Royal New Zealand Air Force; Lt. Gen. Jeffrey Delgado, commanding general of the Philippine Air Force; and Maj. Gen. Hoo Cher Mou, chief of the Republic of Singapore Air Force.

A number of other senior officers took part in the conference: Lt. Gen. Christopher C. Bogdan, F-35 program executive officer; Lt. Gen. Arnold W. Bunch Jr., military deputy, office of the assistant secretary of the Air Force for acquisition; Lt. Gen. Stanley E. Clarke III, director, Air National Guard; Lt. Gen. Gina M. Grosso, deputy chief of staff for manpower, personnel, and services; Lt. Gen. John W. Hesterman III, assistant vice chief of staff of the Air Force; Lt. Gen. James M. "Mike" Holmes, the deputy chief of staff for strategic plans and requirements; Lt. Gen. James "JJ" Jackson, commander, Air Force Reserve Command; Lt. Gen. Steven Kwast, commander and president of the Air University; Lt. Gen. Wendy M. Masiello, director of the Defense Contract Management Agency; Lt. Gen. Robert P. "Bob" Otto, deputy chief of staff for intelligence, surveillance, and reconnaissance; Maj. Gen. David A. Harris, commander of the Air Force Test Center; Maj. Gen. James R. Marrs, director of intelligence for US Cyber Command; Maj. Gen. Thomas J. Masiello, commander of the Air Force Research Laboratory; Maj. Gen. John F. "Jeff" Newell III, director of strategy, concepts, and assessments; Maj. Gen. Karen A. Rizutti, mobilization assistant to the commander of 24th Air Force; Maj. Gen. Burke E. "Ed" Wilson, commander of 24th Air Force and commander of Air Forces Cyber; Brig Gen. Duke Z. Richardson, executive officer, Air Force program, tankers.

ACKNOWLEDGEMENTS

The Air Force Association thanks supporting partners Northrop Grumman, Lockheed Martin, BAE Systems, Boeing, Pratt & Whitney, SES Government Solutions, L-3 Communications, AECOM, General Dynamics, Rolls-Royce, INTELSAT, Aurora Flight Sciences, Bombardier, Mercer, Top Aces, Elbit Systems, and Leidos for making this year's conference possible.

AFA National Convention Parliamentarian was David T. "Buck" Buckwalter, AFA's former executive vice president. Inspectors of Elections were Gavin MacAloon (chairman), Ron Adams, Lee Barnby, and Gary Copsey. Michael Cooper chaired the Credentials Committee, serving with Vance Clarke, Bob Gehbaurer, and Karel Toohey.

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By mail: Complete the enrollment form on the back of this page and mail with your payment to: AFA Group Legal Enrollment, PO Box 14464-8993, Des Moines, IA 50306

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- Debt Collection Defense
- Demand Letters
- Document Review
- Domestic Violence Protection
- Elder Law Matters
- Eviction and Tenant Problems (for tenants)
- Guardianship
- Home Equity Loans (primary, secondary, or vacation home)
- Identity Theft Defense
- Immigration Assistance
- Incompetency Defense
- Juvenile Court Defense
- Living Wills
- Mortgages
- Name Change
- Personal Bankruptcy
- Personal Property Protection
- Powers of Attorney
- Prenuptial Agreement
- Promissory Notes
- Property Tax Assessment
- Restoration of Driving Privileges
- Sale, Purchase, or Refinancing (primary, secondary or vacation home)
- Security Deposit Assistance (for tenants)
- Small Claims Assistance
- Tax Audits
- Traffic Ticket Defense (excludes DUI)
- Trusts, Wills, Codicils
- Zoning Applications

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- Appeals and class actions
- Farm matters, business or investment matters, matters involving property held for investment or rental, or issues when the participant is the landlord
- Patent, trademark, and copyright matters
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- Frivolous or unethical matters
- Matters for which an attorney-client relationship exists prior to the participant becoming eligible for plan benefits.

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Date of Birth:_____ Gender:_____

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I acknowledge that I am a member of the Air Force Association and understand that the Hyatt Legal Plan coverage period is January through December 2016.

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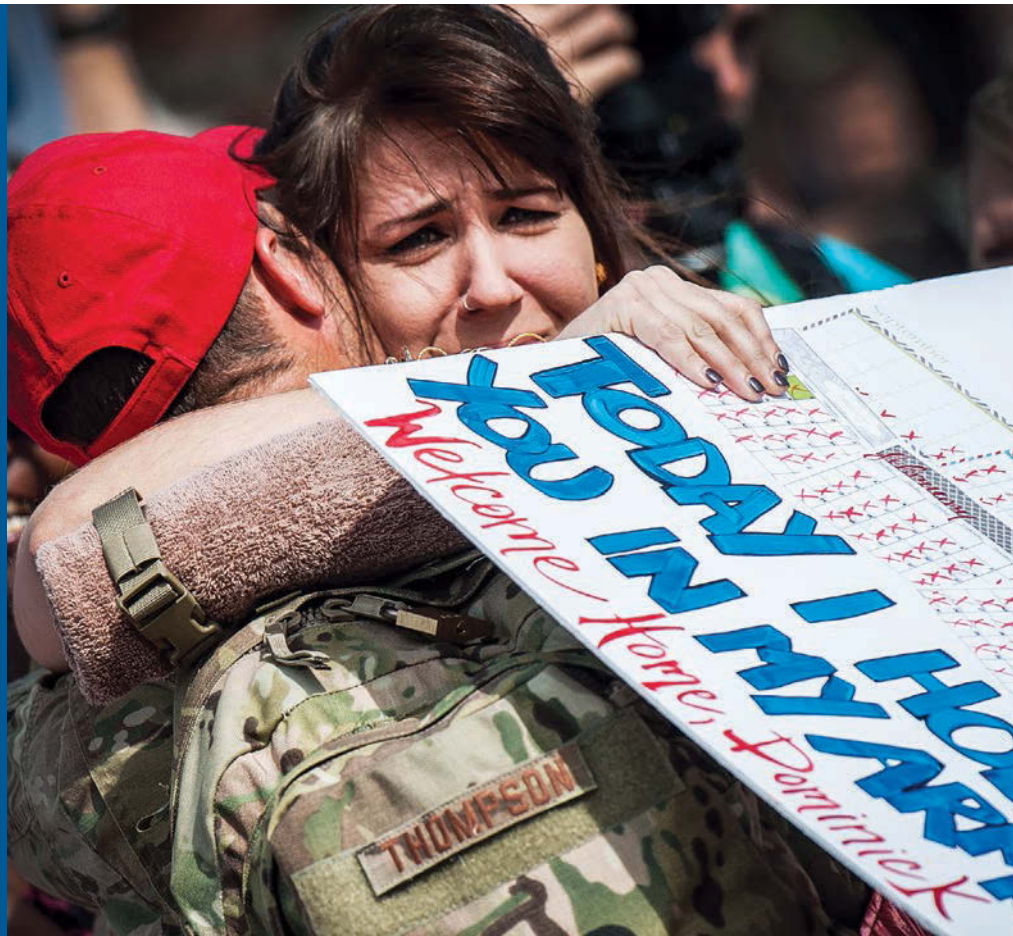


Air Force Association Technology Exposition 2015

Staff photography by Heather Lewis

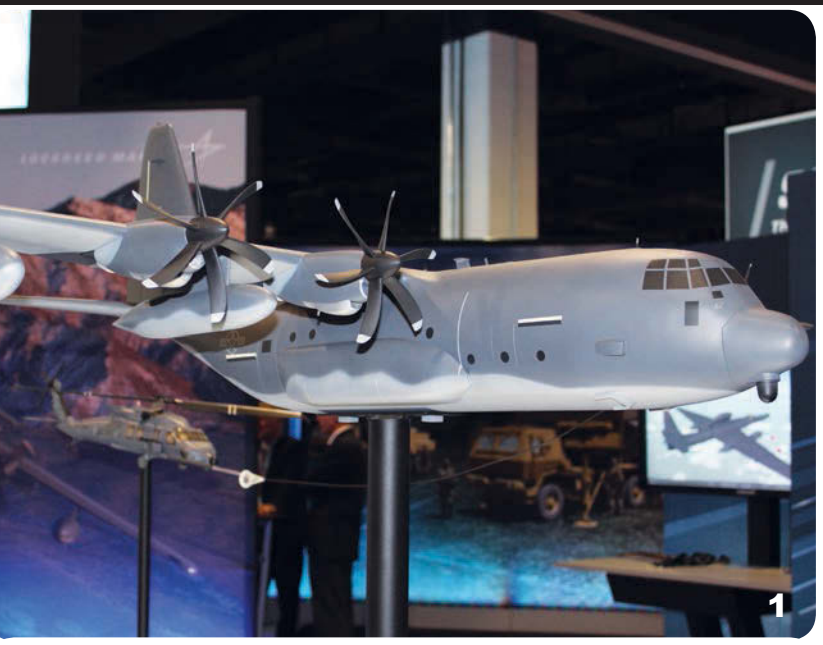
*Attendance was up sharply at the Air Force Association's 2015 Air & Space Conference, with thousands more blue-suit and government attendees and the strongest-ever presence of Air Force general officers touring the Technology Exposition. Exhibitors presented specific solutions to USAF's most pressing needs, this year focused more on near-term requirements than futuristic capabilities. **I1I** BAE Systems presented a Boeing F-15E model highlighting the company's Eagle Passive Active Warning Survivability System offering—a contract it won just two weeks after the show. **I2I** Alenia Aermacchi's T-100 and **I3I** Lockheed Martin's T-50 offerings for USAF's T-X trainer competition, both based on off-the-shelf designs. Boeing and Northrop Grumman brought their new-design T-X models in enclosed trailers, available for view on an "invitation-only" basis. Textron showed its Scorpion T-X candidate as well. **I4I** UTC Aerospace presented an ACES 5 ejection seat.*

Aerospace technology of the highest order was on display at AFA's annual showcase.

|1| Retired Lt. Gen. Stephen Wood (left) and Phil Burkholder, senior vice president and president of Rolls-Royce Defense Aerospace, respectively, stand ready to answer questions about engines for C-130J transports. *|2|* L-3 Communications' booth was overflown by a variant of its Cutlass unmanned aircraft. *|3|* The Air Force Research Laboratory showed off its BATMAN concept for lighter-weight gear for battlefield airmen, including wrist-, chest-, and helmet-mounted color displays, lightweight batteries, and communications equipment. *|4|* Northrop Grumman's RQ-4 Global Hawk Block 40 "soared" over its booth. *|5|* A General Atomics model of an MQ-9 Reaper showed off the impressive weapon load the remotely piloted aircraft can carry, including Hellfire missiles and laser guided JDAM bombs.

I1I Retired Gen. Larry Spencer, who recently took office as President of AFA, visits with one of the association's youngest Life Members. I2I LEKTRO's electric tow vehicle was a bright red splash among the gray airplane models in the exhibit hall. I3I A re-enactor portraying Gen. John "Black Jack" Pershing called attention to the World War I Centennial Commission and how people can participate in centennial activities. I4I Bombardier's Global 6000 bizjet will serve as the platform for Lockheed Martin's entry in the JSTARS recapitalization program. I5I Pratt & Whitney's PW4062 engine, shown in a cutaway scale model, will power the KC-46 fleet. As many as 368 could be built by 2027.

I1I Martin Baker's T-38 ejection seat was joined by its F-35 seat, offered for use in whatever T-X trainer the Air Force selects. I2I Alan Kollien of Raytheon tries a Rockwell Collins F-35 Generation 3 helmet on for size. Chief of Staff Gen. Mark Welsh described the headgear as far more than just a head protector, but as also the "work space" of the F-35 fighter. I3I A full-scale model of MBDA's air-breathing Meteor radar guided missile, planned to equip some Eurofighter Typhoons, could extend the reach of jets like the F-35. I4I AgustaWestland's AW139 is a potential candidate to meet Air Force Global Strike Command's need for a new support helo. I5I A Boeing Scan Eagle unmanned reconnaissance aircraft swooped low over attendees' heads—one of many actual-size models on display.



|1| *Special ops in miniature: A model Combat King refueling aircraft tanks up an HH-60 Pave Hawk at Lockheed Martin's booth.* *|2|* *and* *|3|* *Top Aces USA displayed large models of its Alpha Jet and F-16 aggressors-for-hire, an increasingly attractive training support service for air forces worldwide.* *|4|* *AgustaWestland's AW609 tilt-rotor, being developed for the commercial market, could have military applications as well.* *|5|* *A two-seat remotely piloted aircraft operator station was displayed by AECOM. It provides RPA maintenance, support, and communications.*

I1I *A cutaway model of Pratt & Whitney's F135 engine, based on the F119 that powers the F-22 (background painting). The turbofan powers the multiservice, multinational F-35 fighter.* ***I2I*** *Roger Giese with the Warrior Canine Connection led "Tamer" around the exhibit hall. The program helps veterans by teaching them to train therapy dogs to help other combat vets.* ***I3I*** *Kratos displayed a BQM-167A target drone tricked out with specialized target gear.* ***I4I*** *Orbital ATK's family of vertical-launch vehicles on display in model form.* ***I5I*** *Lockheed Martin's trio of USAF fighters: the F-35A, F-22A, and an F-16 Block 50 soar out from the company's booth. High visitation from key decision-makers made the ASC15 Expo a standout success.* ✪

AIR FORCE ASSOCIATION'S

REBUILD FULL COMBAT READINESS

- The Air Force is the first responder for engagement around the globe.
- The demand is rising: Russia, Chinese Pacific posturing, North Korea, ISIS, Libya, Syria, Iraq, Afghanistan, and future unforeseen crises or natural disasters.
- Readiness has eroded under Budget Control Act (BCA) restrictions:
  - The standdown of 31 flying squadrons
  - The furlough of most of the Air Force's 180,000 civilians
  - The drastic reduction of training exercises like Red Flag
  - The curtailment of advanced mission training
  - Canceled operations at the Air Force Weapons School
- Fifty percent of the affected squadrons have yet to return to pre-sequestration levels of readiness.
- The Air Force faces the possibility of not being able to respond to a crisis when America needs it most.

RECAPITALIZATION/MODERNIZATION

The Air Force needs to continue to invest in aircraft modernization programs for our aging fleet to ensure all mission sets remain viable now and in the future.

- AFA supports the Air Force's top three acquisition priorities: The F-35 Joint Strike Fighter, KC-46 tanker, and Long-Range Strike Bomber programs must stay on schedule and on budget.
- Congress should provide the Air Force the resources to acquire the needed capability and capacity of fifth generation fighter aircraft platforms and intelligence, surveillance, and reconnaissance assets to meet growing threats.
- The Air Force must have flexibility to make budget decisions for more survivable, multirole platforms to provide close air support in high-end threat environments.
- AFA supports the Air Force's need for recapitalizing its trainer fleet of T-38s, its combat search and rescue fleet, and its Joint Surveillance Target Attack Radar System (JSTARS) fleet.

TRAINING

AFA supports continual investment in high-end pilot training, aircraft/equipment maintenance, and range operations.

SECURE SPACE AND CYBERSPACE

In the face of rising threats, AFA supports investment in capabilities and platforms to defend and maintain US superiority in space and cyberspace.

The US must retain clear superiority in these critical mission areas, and Congress must act to end Budget Control Act limits, invest steadily and strategically, and strengthen air, space, and cyber forces to support the national military strategy.

INVEST IN AIRPOWER FOUNDATIONS: INNOVATION, EDUCATION, AND TECHNOLOGY

AFA promotes early and continued education in science, technology, engineering, and math to stimulate the development of the next generation of aerospace engineers, scientists, and technicians conducting future research and development.

AFA supports science and technology funding necessary to support and maintain a robust defense industrial base necessary for meeting national defense objectives.

TOP ISSUES FOR 2016

REVITALIZE AND SUSTAIN THE NUCLEAR DETERRENT

AFA supports strengthening and modernizing our nuclear deterrent. We must maintain readiness of delivery systems and warheads, upgrade support equipment and infrastructure, and ensure accountability of the nuclear force.

PREPARE AND SUPPORT AIRMEN; CARE FOR VETERANS AND RETIREES

Military and veterans benefits are earned through years of service, sacrifice, and in many cases, personal injury and disability.

Tricare for life is a national obligation to retirees, long ago earned.

MILITARY RETIREMENT REFORM

AFA supports combining a matching 401(k) and a defined benefit for career military members while maintaining the overall value of the current military retirement system.

The volunteer force increasingly comprises service members born after 1980, the millennial generation. Research has shown millennials change jobs frequently and favor flexible retirement options, rather than defined benefit pension plans. The blended system proposed by the FY 16 National Defense Authorization Act (NDAA) tries to attract and retain the talent of the best and the brightest of today, and those we need to serve tomorrow.

The proposal offers the 83 percent of service members who serve for less than 20 years an opportunity to participate in a new plan that blends the recruiting benefits of a modern 401(k) plan with the retention benefits of the current military retirement annuity, career continuation pay, and retention bonuses paid at important career milestones.

AFA was behind military retirement reform from the beginning and urged members of the House and Senate Armed Services Committees to retain the following provisions in the final version of the FY16 NDAA:

- Initial one percent employer contribution to a service member's TSP upon entry of service, then matching contributions to five percent.
- Continued government contributions through the end of the service member's career.

SEXUAL ASSAULT PREVENTION AND RESPONSE

The Air Force has led the way among the services and improved every aspect of the sexual assault response system. This has resulted in fewer incidents and more victims reporting the crime. However, there is more work to be done.

TOUGH CHOICES

With so many security challenges, it is imperative America has a strong national defense. The Department of Defense needs a budget that provides world-class training, readiness, and equipment, and it must offer service members fair pay and a compensation package to recruit and retain the very finest.

Tough decisions must be made. Personnel compensation must be weighed against the need for readiness and recapitalization of an aging fleet. The Air Force of the 21st century must have the capability, capacity, and readiness to perform its core missions today and in the future.

Air Force Association National Awards 2015

NATIONAL AEROSPACE AWARDS

H. H. Arnold Award
For the most significant contribution by a military member to national defense
Gen. Janet C. Wolfenbarger, USAF (Ret.), Former Commander, Air Force Materiel Command

W. Stuart Symington Award
For the most significant contribution by a civilian in the field of national defense
The Honorable William A. LaPlante, Assistant Secretary of the Air Force, Acquisition

John R. Alison Award
For the most outstanding contribution by industrial leadership to national defense
F-22 Raptor, Lockheed Martin

AFA Chairman's Aerospace Education Award
For long-term commitment to aerospace education, making a significant impact across the nation
Northrop Grumman Foundation

David C. Schilling Award
Outstanding contribution in the field of flight
16th Air Command and Control Squadron, Robins AFB, Ga.

Theodore von Karman Award
Outstanding contribution in science and engineering
X-37B, The Boeing Company

Gill Robb Wilson Award
Outstanding contribution in arts and letters
Maj. Warren Neary, HQ AFRC, Robins AFB, Ga.

Hoyt S. Vandenberg Award
Outstanding contribution in aerospace education
Keep the Spirit of '45 Alive!

Thomas P. Gerrity Award
Outstanding contribution in systems and logistics
Maj. Mark Heil, HQ AETC, JBSA-Randolph, Texas

Thomas D. White Space Award
Recognizing outstanding contributions to space
Lt. Gen. John W. Raymond, HQ AFSPC, Vandenberg AFB, Calif.

Department of Veterans Affairs Employee of the Year
Outstanding performance by VA employee
Michael F. Welch, Adaptive Sports Program Specialist, Washington, D.C.

Gen. Billy Mitchell Award for C4 Excellence
Outstanding contribution toward warfighting capability
Capt. Nathaniel D. Amsden, 7th Intelligence Squadron, Fort George G. Meade, Md.

Gen. George C. Kenney Award
Outstanding contribution in lessons learned
Blue Devil Team, Sensors Directorate, Air Force Research Laboratory, Wright-Patterson AFB, Ohio

Lt. Gen. Claire L. Chennault Award
Outstanding aerial warfare tactician
Capt. Keith Moore, 77th Fighter Squadron, Shaw AFB, S.C.

Gen. Larry D. Welch Award
Outstanding contribution toward the nuclear mission
Col. Ryan Britton, Air Force Nuclear Weapons Center, Hill AFB, Utah

Joan Orr Award for Air Force Spouse of the Year
For civilian spouses of military members for their significant contributions to the United States Air Force
Stephanie L. Ewers, Air Force Global Strike Command, F. E. Warren AFB, Wyo.

CMSAF Thomas N. Barnes Award
Most outstanding crew chief in the Air Force
SSgt. Andrew P. Vrahiotes, 86th Aircraft Maintenance Squadron, Ramstein AB, Germany

PROFESSIONAL, CIVILIAN, EDUCATION, MANAGEMENT, AND ENVIRONMENTAL AWARDS

AFMC Management Award—Executive Division
John D. Matyjas, Air Force Research Laboratory, Rome, N.Y.

AFMC Management Award—Middle Division*
Lt. Col. Chad T. Searle, Air Force Nuclear Weapons Center, Hill AFB, Utah

AFMC Management Award—Junior Division*
Capt. Robert J. Mullinax, Air Force Sustainment Center, Tinker AFB, Okla.

AFROTC Cadet of the Year
Cadet Brian Bilbo, Det. 765, The Citadel, Charleston, S.C.

CAP Aerospace Education Cadet of the Year
C/Maj. Caleb Couture, Central Missouri Composite Squadron, Mo.

Chaplain Corps Award
SMSgt. Tommy Tipton, 633rd Air Base Wing, JB Langley-Eustis, Va.

Civilian Program Manager of the Year*
Lesley H. Bernys, 7th Field Investigations Squadron, Pentagon, Washington, D.C.

Civilian Program Specialist of the Year*
Michael A. Wadkins, 35th Force Support Squadron, Misawa AB, Japan

Civilian Senior Manager of the Year
Pearl Mundt, 8th Field Investigations Region, Peterson AFB, Colo.

Civilian Wage Employee of the Year*
Robert M. Crane, 5th Logistics Readiness Squadron, Minot AFB, N.D.

Juanita Redmond Award for Nursing
Capt. Bernadette Gabucan, 374th Surgical Operations Squadron, Yokota AB, Japan

Paul W. Myers Award for Physicians
Maj. Danielle Cermak, 20th Medical Group, Shaw AFB, S.C.

Stuart R. Reichart Award for Lawyers
Col. Gordon Hammock, HQ ACC, JB Langley-Eustis, Va.

Verne Orr Award for Effective Utilization of Human Resources
18th Wing, Kadena AB, Japan

Gen. Edwin W. Rawlings Award—Management
Not awarded for 2015.

Gen. Edwin W. Rawlings Award—Technician
Not awarded for 2015.

*presented at recipient's location

AFA LIFETIME ACHIEVEMENT AWARD

Recognizes a lifetime of work in the advancement of aerospace.

GEN. MICHAEL V. HAYDEN, USAF (RET.)

Gen. Michael V. Hayden served nearly 40 years in the Air Force. He also served as the director of the CIA and NSA and chief of the Central Security Service. Hayden is currently a principal at the Chertoff Group and a distinguished visiting professor at the George Mason University School of Policy, Government, and International Affairs. His memoir, *Playing to the Edge: American Intelligence in the Age of Terror*, is due out in early 2016.

R. A. "BOB" HOOVER

R. A. "Bob" Hoover has thrilled millions of men, women, and children over the last five decades with aerobatic flying maneuvers in his yellow P-51 Mustang. In addition, he has flown more than 300 types of aircraft and flight tested or flown nearly every type of fighter aircraft. He is a WWII combat veteran and the holder of several aviation records. Hoover was enshrined in the National Aviation Hall of Fame in 1988. The 2014 documentary "Flying the Feathered Edge" honors Hoover's aviation achievements and contributions.

EUGENE F. "GENE" KRANZ

Eugene F. "Gene" Kranz has dedicated more than 55 years of his life to serving his nation. From USAF fighter pilot and flight test engineer to a multitude of leadership roles with NASA, Kranz has impacted countless lives and advancements. He is a recipient of the Presidential Medal of Freedom, awarded by President Nixon for the Apollo 13 mission, and was designated a distinguished member of the Senior Executive Service by President Reagan.

Photos by Brittany Gray

***Above left:** Air Force Association Chairman of the Board Scott Van Cleef presented the Gen. H. H. Arnold Award for most significant contribution by a military member to national defense to retired Gen. Janet Wolfenbarger, former commander of Air Force Materiel Command.*

***Above:** The W. Stuart Symington Award for most significant contribution by a civilian in the field of national defense was presented to Assistant Secretary of the Air Force for Acquisition William LaPlante.*

***Left:** Van Cleef presented the John R. Alison Award for the most outstanding contribution by industrial leadership to national defense to Lockheed Martin for its F-22 efforts. The award was accepted by Orlando Carvalho, Lockheed Martin executive vice president of aeronautics.*

CITATIONS OF HONOR

Outstanding contribution of an individual or organization to the development of aerospace power.

67th Cyberspace Operations Group
JBSA-Lackland, Texas
The 67th Cyberspace Operations Group executed offensive cyber operations in support of multiple combatant commanders, delivered integrated effects against 109,395 combat targets, defeated numerous improvised explosive devices, and sparked the kill chain for direct action resulting in the decisive neutralization of more than 200 high-value targets.

318th Special Operations Squadron
Cannon AFB, N.M.
The airmen of the 318th Special Operations Squadron excelled in their contribution to national defense. The squadron provided critical air-to-ground support to assault forces, time-sensitive targeting, and support to national air assets, and with short notice moved to a new area of responsibility to combat an emerging enemy threat. During this time, the unit directly contributed to 152 enemy forces killed and 20 high-value individuals captured.

384th Air Refueling Squadron
McConnell AFB, Kan.
The leadership and expertise of the 384th Air Refueling Squadron was crucial to the fulfillment of national objectives. The squadron led numerous firsts, to include spearheading the first tanker deployment in East Africa and refueling the first day offensive in Syria. Finally, the squadron led the ground breaking for the KC-46A and primed McConnell Air Force Base for the Air Force's top acquisition priority worth $47 billion.

560th Flying Training Squadron
JBSA-Randolph, Texas
Since 1973, the "Charging Cheetahs" have flown 195 Freedom Flights and have returned more than 150 airmen to active flight status. In 2015, the members of the 560th coordinated the 42nd Annual Freedom Flyer Reunion and Symposium, the nation's premier and longest running annual Air Force POW reunion. More than 600 airmen were in attendance to hear the firsthand accounts of 15 POWs. The squadron also serves as the guardian of Freedom Hall, one of only five Air Force-sanctioned museums, showcasing hallowed Air Force heritage and artwork.

CREW AND TEAM AWARDS

Airborne Battle Management Crew for best airborne battle management crew:
7th Expeditionary Airborne Command and Control Squadron Combat Crew 5, 12th Airborne Command and Control Squadron, Robins AFB, Ga.

Brig. Gen. Ross G. Hoyt Award for best air refueling crew:
The crew of Elite 60, 350th and 384th Refueling Squadrons, McConnell AFB, Kan.

Gen. Curtis E. LeMay Award for best bomber aircrew:
69th Bomb Squadron, Minot AFB, N.D.

Gen. Jerome F. O'Malley Award for best reconnaissance crew:
The crew of Elite 72, 55th Wing, Offutt AFB, Neb.

Gen. Thomas S. Power Award for best missile combat crew:
741st Missile Squadron, Minot AFB, N.D.

Space Operations Crew for best space operations crew:
1st Expeditionary Space Control Squadron, Rotation Team 10, Peterson AFB, Colo.

Lt. Gen. William H. Tunner Award for best airlift aircrew:
The crew of Anvil 54, Hurlburt Field, Fla.

Lt. Gen. Howard W. Leaf Award for best test team:
73rd Special Operations Squadron Tactics Team, Cannon AFB, N.M.

Gen. John P. Jumper Award for best remotely piloted aircraft crew in USAF:
Pilot: Capt. Kenneth J. Winters
Sensor Operator: SSgt. John A. Jackson
Mission Intelligence Coordinator: A1C Joel E. Campbell.

AIR NATIONAL GUARD AND AIR FORCE RESERVE COMMAND AWARDS

CMSgt. Dick Red Award
Best ANG maintainer
TSgt. Jacob J. Young, 141st Aircraft Maintenance Squadron, Fairchild AFB, Wash.

Earl T. Ricks Award
Outstanding ANG airmanship
Maj. Gregory Ebert, 149th Fighter Squadron, JB Langley-Eustis, Va.

Outstanding ANG Unit
Best ANG unit airmanship
151st Maintenance Group, Utah ANG

George W. Bush Award—Enlisted
Outstanding civilian employer and enlisted member
Not awarded for 2015.

George W. Bush Award—Officer
Outstanding civilian employer and commissioned member
Not awarded for 2015.

President's Award for AFRC
Best AFRC flying unit or individual of the year
Lt. Col. John P. Marks, 303rd Fighter Squadron, Whiteman AFB, Mo.

AFRC Unit Award
Best AFRC wing of the year
301st Fighter Wing, NAS JRB Fort Worth, Texas

AFRC Citizen Airman Award—Enlisted
Outstanding civilian employer and enlisted member
MSgt. Harvey McClain, USTRANSCOM, Norfolk, Va.
and
North Carolina Department of Public Safety State Highway Patrol, Troop C, District IX, Raleigh, N.C.

AFRC Citizen Airman Award—Officer
Outstanding civilian employer and commissioned member
Not awarded for 2015.

Donald W. Steele Sr. Memorial Award

(AFA Unit of the Year)

Lance P. Sijan Chapter
President Donald Kidd

Outstanding State Organization

Florida
President Dann Mattiza

Outstanding Chapters by Size

Small Chapter
David C. Jones Chapter, N.D.
President George Masters

Medium Chapter
Minuteman Chapter, Mass.
President Yvonne Thurston

Large Chapter
Tennessee Valley Chapter, Ala.
President Frederick Driesbach

Extra Large Chapter
Donald W. Steele Sr. Memorial Chapter, Va.
President Kevin Lewis

Aerospace Education Excellence Award

Presented to one chapter in each of the AFA size categories annually for excellence in aerospace education programming. To qualify, a chapter must have received the Aerospace Education Achievement Award this year.

Large Chapter
Swamp Fox Chapter, S.C.
President David Hanson

Extra Large Chapter
C. Farinha Gold Rush Chapter, Calif.
President Raymond Coughlin

Jack Gross Awards

Presented to the chapter in each size category with the highest number of new members as a percentage of chapter size at the beginning of the membership year. A minimum of 10 is required.

Small Chapter
Keystone Chapter, Japan
President Abraham Almonte

Medium Chapter
Ramstein Chapter, Germany
President Bradley Williams

Large Chapter
Robert H. Goddard Chapter, Calif.
President Juan Cruz

Extra Large Chapter
Paul Revere Chapter, Mass.
President Paul Zauner

Chapter Larger Than 1,100
Montgomery Chapter, Ala.
President Scott Key

Unit Exceptional Service Awards

Airmen and Family Programs
Thunderbird Chapter, Nev.
President Robert Cunningham

Best Single Program
Nation's Capital Chapter, D.C.
President Bruce VanSkiver

Communications
Lance P. Sijan Chapter, Colo.
President Donald Kidd

Community Partners
Altus Chapter, Okla.
President Jeanette Warr

Community Relations
Hurlburt Chapter, Fla.
President James Connors

Overall Programming
Paul Revere Chapter, Mass.
President Paul Zauner

Veterans Affairs
Paul Revere Chapter, Mass.
President Paul Zauner

Aerospace Education Achievement Award

Presented to chapters for outstanding achievement in aerospace education programming.

Ak-Sar-Ben Chapter, Neb.
Albuquerque Chapter, N.M.
C. Farinha Gold Rush Chapter, Calif.
Central Florida Chapter, Fla.
Gen. Charles A. Gabriel Chapter, Va.
Danville Chapter, Va.
David C. Jones Chapter, N.D.
Hurlburt Chapter, Fla.
Lance P. Sijan Chapter, Colo.
Lincoln Chapter, Neb.
Swamp Fox Chapter, S.C.
Wright Memorial Chapter, Ohio

Arthur C. Storz Sr. Membership Award

Presented to that AFA chapter which produces the highest number of new members during the 12-month period ending June 30, 2015, as a percentage of total chapter membership as of July 1, 2014. This award is based on both the quantity of new members as well as sustained new member recruitment. A chapter must be chartered for at least three years to qualify.

Keystone Chapter, Japan
President Abraham Almonte

Member of the Year

James R. Lauducci
Alexandria, Va.

Distinguished Sustained Education Achievement Award

L. Boyd Anderson
Ogden, Utah

Special Citation

StellarXplorer's Proof of Concept Team Members:

Tim Brock, Fla.
David "Buck" Buckwalter, Texas
Stephen Gourley, Colo.
Timothy Tichawa, Colo.
William Yucuis, Fla.

Chairman's Citation

Ronald Adams, Mass.
Lee Barnby, Calif.
Ross Lampert, Ariz.
F. Gavin MacAloon, Va.
Donald R. Michels, N.C.
William Yucuis, Fla.

Individual Awards by Region

Central East Region

Medal of Merit

William Carter, Va.
Jack J. Catton Jr., Washington, D.C.
Steven M. Jones, Washington, D.C.
John W. Robinson Jr., Washington, D.C.
Darryl Terrell, Washington, D.C.
Bruce A. VanSkiver, Washington, D.C.
John B. Wilt, Va.

Exceptional Service Award

Scott McClean, Washington, D.C.
John K. Murphy, Del.

Far West Region

Medal of Merit

Christina M. Diaz, Calif.
Sean W. McNally, Calif.
Marcia P. Peura, Calif.
Alison L. Schneider, Calif.
Jennifer Stokes, Calif.
Arnie Streland, Calif.

Exceptional Service Award

Juan E. Cruz, Calif.
Olivia Cruz, Calif.
David Fields, Calif.
Ed Peura, Calif.

Florida Region

Medal of Merit

Michael G. Farrell, Fla.
Amanda D. Gold, Fla.
Rodrigo J. Huete, Fla.
Leo R. Gray, Fla.
Ben Langer, Fla.

Exceptional Service Award

Todd Freece, Fla.
Gary A. Lehmann, Fla.

Great Lakes Region

Medal of Merit

Tom DiNino, Ohio
Gene Longo, Ohio
William Megnin, Ind.
Larry L. Michael, Ind.
Dean H. Roller, Ind.

Exceptional Service Award

George Simons, Ohio
Bob Van Hook, Ohio

Midwest Region

Medal of Merit

Gerald Ashley, Ill.
James B. Caughron, Kan.
Chris Canada, Neb.
Russell Klatt, Ill.
Bill Mavity, Neb.

Exceptional Service Award

Robert Athan, Neb.
Vicki L. Swingle, Neb.

New England Region

Medal of Merit

Joel A. Clark, Vt.
Jeffrey W. Katz, Mass.
Raymond Tanguay, Vt.
Steven Winsor, R.I.

Exceptional Service Award

Dan Caron, N.H.
Devon L. Messecar, Mass.
Emily C. Shay, Mass.
Yvonne Thurston, Mass.

North Central Region

Medal of Merit

Robert M. Herrington, N.D.
Sylvia A. Wages, N.D.

Exceptional Service Award

George Masters, N.D.
Lawrence Sagstetter, Minn.

Northeast Region

Medal of Merit

Cole H. Kleitsch, N.J.
Stephen J. LaPoint, N.J.
Joseph V. Traina, N.Y.

Exceptional Service Award

Howard H. Leach Jr., N.J.
Tobia F. Terranova, N.J.

Northwest Region

Medal of Merit

Richard Bailey, Ore.
Amy Tiemeyer, Wash.
Tony Versandi, Alaska

Rocky Mountain Region

Medal of Merit

Linda Aldrich, Colo.
Barbara Binn, Colo.
Frances Bradshaw, Utah
Bob Hanrahan, Utah
Kirk Schmierer, Utah
Randy Tymofichuk, Utah
Lorrell Walter, Wyo.

Exceptional Service Award

Mickey McPartland, Utah
Timothy J. Tichawa, Colo.

South Central Region

Medal of Merit

George Krym, Ala.
Philip Z. Horton III, Tenn.
Robert J. Hovde, Ala.
John Pennell Jr., Ala.
Patrick "Irish" McCoy, Ala.
William S. Naron, Miss.
Ben Quintana, La.

Exceptional Service Award

Steve Carey, Ala.
Jerry Reichenbach, Ark.

Southeast Region

Medal of Merit

Larry "PZ" Przybyla, S.C.
Dick Roberts, N.C.

Southwest Region

Medal of Merit

Adria L. Baker, Ariz.
Bob Deurloo, N.M.
Scott Hines, Ariz.
Dick Roberts, Ariz.

Exceptional Service Award

Dan Guilmette, Nev.
Mike McNeese, Ariz.

Texoma Region

Medal of Merit

Lynn Bentley, Texas
Cory Moore, Okla.
Jason Naaktgeboren, Texas
Micah Telmo, Okla
Robbie Walsh, Okla.
Larry "Ski" Werbiski, Texas

Exceptional Service Award

Vance Clarke, Texas
Robert "Bob" Kjar, Texas
Kathleen M. McCool, Texas
George C. Pankonin, Okla.
Angela L. Petersen, Okla.
Terry Thomas, Texas

Overseas Region

Medal of Merit

Ryan D. Fraser, AE
Kevin A. Paul Jr., AE
Shaun Michael Spencer, AE

Community Partner Membership Awards

GOLD AWARD

Presented to chapters whose Community Partners represent at least six percent of overall chapter membership, with a minimum number of Community Partners. The minimum number is determined by chapter size.

Altus Chapter, Okla.
Cheyenne Cowboy Chapter, Wyo.
Enid Chapter, Okla.
Fairbanks Midnight Sun Chapter, Alaska
Fort Wayne Chapter, Ind.
Gen. David C. Jones Chapter, N.D.
Leigh Wade Chapter, Va.
McChord Field Chapter, Wash.
Mel Harmon Chapter, Colo.
Meridian Chapter, Miss.
Montgomery Chapter, Ala.
Northeast Texas Chapter, Texas
Paul Revere Chapter, Mass.
Robert H. Goddard Chapter, Calif.
Swamp Fox Chapter, S.C.
Tennessee Valley Chapter, Ala.

ACHIEVEMENT AWARD

Presented in the field to chapters whose Community Partners represent at least three percent of overall chapter membership, with a minimum number of Community Partners. The minimum number is determined by chapter size.

David D. Terry Jr. Chapter, Ark.
Eglin Chapter, Fla.
Gen. Bruce K. Holloway Chapter, Tenn.
Golden Triangle Chapter, Miss.
Happy Hooligan Chapter, N.D.
Hurlburt Chapter, Fla.
Mercer County Chapter, N.J.
Ute-Rocky Mountain Chapter, Utah
Shooting Star Chapter, N.J.

Special Recognition

SUSTAINED NEW MEMBER RECRUITMENT

These chapters have attained the quarterly new member recruitment goal for three consecutive quarters, extending from October 2014 to June 2015.

Central Florida Chapter, Fla.
David D. Terry Jr. Chapter, Ark.
Donald W. Steele Sr. Memorial Chapter, Va.
Everett R. Cook Chapter, Tenn.
Falcon Chapter, Fla.
Frank Luke Chapter, Ariz.
Gen. David C. Jones Chapter, N.D.
Golden Triangle Chapter, Miss.
Inland Empire Chapter, Wash.
Keystone Chapter, Japan
Langley Chapter, Va.
Mel Harmon Chapter, Colo.
Miami Homestead Chapter, Fla.
MiG Alley Chapter, South Korea
Montgomery Chapter, Ala.
Paul Revere Chapter, Mass.
Ramstein Chapter, Germany
Spangdahlem Chapter, Germany
Robert H. Goddard Chapter, Calif.
Tucson Chapter, Ariz.
Whiteman Chapter, Mo.

CHAPTER GROWTH

These chapters have realized a growth in total membership from June 2014 to June 2015.

Abilene Chapter, Texas
Altoona Chapter, Pa.
Altus Chapter, Okla.
Central Maryland Chapter, Md.
Delaware Galaxy Chapter, Del.
Donald W. Steele Sr. Memorial Chapter, Va.
Enid Chapter, Okla.
Falcon Chapter, Fla.
Flying Yankee Chapter, Conn.
Gen. Bernard A. Schriever L.A. Chapter, Calif.
Gen. David C. Jones Chapter, N.D.
Highpoint Chapter, N.J.
Keystone Chapter, Japan
Lt. Col. B. D. "Buzz" Wagner Chapter, Pa.
Lt. Erwin R. Bleckley Chapter, Kan.
Mel Harmon Chapter, Colo.
Metro Rhode Island Chapter, R.I.
Nation's Capital Chapter, Washington, D.C.
Northeast Iowa Chapter, Iowa
Paul Revere Chapter, Mass.
Ramstein Chapter, Germany
South Alabama Chapter, Ala.
Stan Hryn Monterey Bay Chapter, Calif.

REGION GROWTH

These regions have realized a growth in total membership from June 2014 to June 2015.

Central East
Pacific

STATE GROWTH

These states have realized a growth in total membership from June 2014 to June 2015.

Delaware
North Dakota

Chapter Retention Award

OVERALL RETENTION AWARD

Small Chapter	Danville Chapter, Va. *President Gerald Hovatter*
Medium Chapter	Cape Fear Chapter, N.C. *President John Lasley*
Large Chapter	Snake River Valley Chapter, Idaho *President Zachary Maurer*
Extra Large Chapter	Ak-Sar-Ben, Neb. *President Christopher Canada*
Chapter Larger than 1,100	Waterman-Twining Chapter, Fla. *President Edward Hance*

FIRST-YEAR RETENTION AWARD

Small Chapter	Keystone Chapter, Japan *President Abraham Almonte*
Medium Chapter	Tulsa Chapter, Okla. *President Damon Bowling*
Large Chapter	Tennessee Valley Chapter, Ala. *President Frederick Driesbach*
Extra Large Chapter	Cape Canaveral Chapter, Fla. *President Chris Bailey*
Chapter Larger than 1,100	Gen. Charles A. Gabriel Chapter, Va. *President John Kennedy*

CyberPatriot Coach and Mentor of the Year

COACH OF THE YEAR

Chris Sutton
Grissom High School, Huntsville, Ala.

MENTOR OF THE YEAR

Evan Dygert
Winter Springs High School, Winter Springs, Fla.

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for your free RX discount card

- Medical Air Services Program

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By Robert S. Dudney

The New Bomber ....

"We have viable bids. ... When I look at a program, I look at whether it's affordable, whether the program plan is executable—is it a reasonable schedule, reasonable amount of money, reasonable requirements? I already did all that. So unless we learn something from the bids that changes some of those parameters, it's merely a matter of verifying that those parameters were valid. ... I do not consider this to be a difficult decision. ... We're comfortable with the risk reduction that's been taking place. [The Air Force] will have to make a choice, then off we'll go."***—Frank Kendall, undersecretary of defense for acquisition, on the status of new USAF bomber development, interview with Anthony Capaccio of*** **Bloomberg News,** ***Oct. 5.***

... and Bomber Requirement

"We haven't firmed that up yet. We currently have 159 bombers, of which 96 are combat-coded. I certainly can't imagine a situation where we would need less than that. ... As we get the LRS-B [Long-Range Strike Bomber] in production, procure them, and start fielding them, we will have to have a very healthy discussion of the requirement."***—Gen. Robin Rand, commander of Air Force Global Strike Command, House Armed Services Committee, Sept. 29.***

Hiding Among Civilians

"When insurgents try to use civilians and public places to hide, it makes it very, very difficult, and we understand how this can happen. You have [a choice]: Either continue operations to clean up—and that might involve attacks in public places—or you just let the Taliban control. In this case, the public understands we went with the first choice, along with our international allies."***—Afghan legislator Fawzia Koofi, on the accidental US air attack on a hospital,*** **Washington Post,** ***Oct. 4.***

Same Old Ivan

"To me, it [Russia's initial air attack in Syria] was representative of what you'd expect from dumb bombs, being dropped from airplanes at medium altitudes, which is not that impressive. I think precision matters. If they approach this with indiscriminate bombing, then I think it's going to create second or third effects for them. ... I'd be hard pressed to think of what intelligence I'd want to share with the Russians at this point. Speaking just for myself, I have a low level of trust with the Russians."***—Lt. Gen. Robert P. "Bob" Otto, Air Force deputy chief of staff for ISR, remarks to Defense Writers Group, Oct. 1.***

What Could It Be?

"We see some very sophisticated [Russian] air defenses going into those [Syrian] airfields. We see some very sophisticated [Russian] air-to-air aircraft going into these airfields. I have not seen ISIL flying any airplanes that require SA-15s or SA-22s [Russian missiles]. I have not seen ISIL flying any airplanes that require sophisticated air-to-air capabilities. These very sophisticated air defense capabilities are not about ISIL. They're about something else."***—USAF Gen. Phillip M. Breedlove, Supreme Allied Command of NATO, quoted in*** **Military Times,** ***Oct. 4.***

Foregone Conclusion

"We have at the present six positions, six career fields, which are closed to women. They all relate to our special operations team. They're all very physically demanding positions, and they all demand a great deal of mental acuity. So over the last couple of years now, we have been looking at putting in place and developing gender-neutral, operationally relevant standards. And the idea is once we have in place these standards, we would like to open up these six positions to women."***—Secretary of the Air Force Deborah Lee James, interview with the*** **Washington Post,** ***Oct. 1.***

Warm and Cuddly

"We thought that people's responses to the robots ... would be fearful—'Oh, it looks like a Terminator; I should be scared of it.' We discovered this other effect. The effect was extreme. When the robot fell down, people went, 'Oh my God!' At one point, the MIT bot fell down, and a woman at the press briefing asked, almost with tears in her eyes, 'Do you know if the MIT robot is OK?' I don't quite understand it, but I suspect that the bond between people and robots will be very strong."***—Gill Pratt, program manager for the DARPA Robotics Challenge, quoted in*** **Defense One,** ***Aug. 30.***

Lost Generation

"Washington tends to want fixed and easily met deterrence requirements, and the 1990s post-Cold War threat environment seemed to promise a benign new world order with little demand for US nuclear capabilities. The Cold War was over; US-Russian relations were moving to partnership; terrorism was the only threat; US conventional forces would be unbeatable forever; nuclear deterrence and weapons were increasingly irrelevant; and history supposedly was moving toward nuclear 'abolition.' The main US nuclear policy question was not modernization, but which nuclear forces to reduce and how quickly. An entire generation of Americans has grown up with this unrealistic view of the world."***—Strategic analyst Keith Payne, president of National Institute for Public Policy, op-ed in*** **Defense News,** ***Sept. 1.***

Receding Frontier

"Over the next five to 15 years, if US and [China's] PLA forces remain on roughly current trajectories, Asia will witness a progressively receding frontier of US dominance. The United States would probably still prevail in a protracted war centered in virtually any area. ... US and Chinese forces would likely face losses on a scale that neither has suffered in recent decades. But PLA forces will become more capable of establishing temporary local air and naval superiority at the outset of a conflict. In certain regional contingencies, this temporal or local superiority might enable the PLA to achieve limited objectives without 'defeating' US forces."***—From "The US-China Military Scorecard: Forces, Geography, and the Evolving Balance of Power 1996-2017," published by Rand Corp., Sept. 14.***

It was assumed that in the fullness of time, Air Force pilots would fly through space in rocket ships.

The Faded Vision of "Military Man in Space"

By John T. Correll

An X-15 is released from a B-52. The X-15 flew to a height of 67 miles, 17 miles higher than the beginning of what is considered "space."

Science fiction got into space before the astronauts did. The standard assumption in those days—from H. G. Wells to Buck Rogers—was that men would eventually fly through space in rocket ships. It was further assumed that many, perhaps most, of the spacefarers would be military.

In reality, military interest in space took off after World War II, when long-range missiles pointed the way. The first objective was to put an artificial satellite into orbit around Earth but the concept of a "military man in space" was part of the vision. (It was not until many years later that the terminology evolved to the more inclusive "human space flight.")

The idea of going into space had special appeal for the Air Force, which saw the "aerospace" domain as an extension of air operations closer to earth. The Air Force expected to fly into deep space—and to fight there.

In November 1945, Gen. Henry H. "Hap" Arnold, commanding general of the Army Air Forces, predicted that "true

USAF photo

The original seven Project Mercury astronauts in March 1960. First row, l-r, are Walter Schirra, "Deke" Slayton, John Glenn, and Scott Carpenter. Second row: Alan Shepard, "Gus" Grissom, and Gordon Cooper.

spaceships, capable of operating outside of the earth's atmosphere" would be launched "within the foreseeable future."

Jimmy Doolittle famously predicted in *Air Force Magazine* in March 1958 that by 2000, "a man or men will be landed on Mars or Venus and brought back."

About the same time, Gen. Thomas D. White, USAF Chief of Staff, said, "It is technically feasible for manned spaceflight to become routine in a very few years," and "in the not-too-distant future, efficient ballistic missiles and true piloted spacecraft will enter our forces as operational weapons."

However, the National Aeronautics and Space Act in 1958 directed that US activities in space be "devoted to peaceful purposes" and created NASA, which—rather than the armed forces—would lead the leap into space.

After the Moon landings in the 1960s and 1970s, the manned space program shifted focus. Spaceflight was consolidated into the Space Shuttle, in which the Air Force was a junior partner. Nevertheless, it revived hopes for a military man in space.

Space had become critical to the armed forces for early warning, communications, intelligence, navigation, weather, and other functions, but the realization gradually set in that these activities did not necessarily require a human presence in space. The Air Force was unable to specify a mission that could not be performed as well or better by operators on earth "flying the satellite."

The armed forces drastically reduced their participation in the shuttle program in 1989. The shuttle itself went out of business in 2011, leaving the United States with no active human space flight capability, military or otherwise, for the next several years.

The vision of military flight in deep space would appear to be dead, returned to the realm of science fiction, but maybe not. The National Space Policy projects a manned mission to Mars by the 2030s. The role of the armed forces in it—if any, and if it happens—is yet to be determined.

Most of USAF's early research dealt with spacemen rather than spacecraft. In 1947, the Air Force School of Aviation Medicine began a project to study ecological conditions on other planets, notably Mars. In 1949, the school opened a department of space medicine to pursue experiments in weightlessness in space, the effects of heavy acceleration and deceleration, and life support capsules for the vacuum of space.

In 1954, the school obtained an "imitation spaceship" to study human passage through space. In 1958, A1C Donald G.

USAF photo

A1C Donald Farrell takes a meal in the "imitation spaceship" built by the Air Force School of Space Medicine to test the effects of space travel on the human body. During the actual test, Farrell spent a week in the cramped capsule.

Farrell made national headlines when he spent a week under harsh conditions in a cramped, windowless cabin simulator. He breathed repurified air over and over and lost four pounds but emerged from the experience in good spirits.

The X-15 rocket plane was a joint project initiated by the Air Force and the National Advisory Committee for Aeronautics—the forerunner of NASA—in 1955. The expectation was that the X-15, carried aloft by a missile, might reach an altitude of 300 miles, well beyond the distance required for low Earth orbit. The X-15 was overtaken by other space projects, but not before it flew to a peak altitude of 67 miles. Thirteen X-15 flights went higher than 50 miles, qualifying the pilots for astronaut wings.

Air Force interest in space made officials in Washington, D.C., nervous. In 1957, Maj. Gen. Bernard A. Schriever of Air Research and Development Command called for "space superiority" and predicted that "several decades from now, the important battles may not be sea battles or air battles, but space battles."

The next day, Secretary of Defense Charles E. Wilson ordered Schriever to avoid the word "space" in all future speeches.

In early 1958, the Air Force announced "Man in Space Soonest," a four-phase project to put a capsule with instruments into orbit, followed by primates and then men. The final stage would be a Moon landing. One of the participants was test pilot Neil Armstrong from the Flight Research Center at Edwards AFB, Calif., a former naval aviator and a veteran X-15 pilot who went on to greater fame as the first man on the Moon in 1969.

The Air Force argued that air and space were indivisible, forming a single operating medium that consisted of the total expanse beyond the Earth's surface. Around 1958, USAF leaders started referring to this domain as "aerospace" and it was so incorporated into Air Force basic doctrine in 1959.

NASA TAKES OVER

The military man in space movement suffered two critical blows in the summer of 1958 when Congress created NASA and President Dwight D. Eisenhower awarded NASA overall responsibility for human spaceflight.

Military space assets were shifted wholesale to NASA. USAF's Military Man in Space Soonest was canceled, replaced by NASA's Project Mercury. At that point, however, the Army and Navy were invested more heavily in space than the Air Force was, and thus took the brunt of the losses.

NASA absorbed the Army's entire space operation at Huntsville, Ala., and renamed it the Marshall Space Flight Center. Included in the transfer was rocket scientist Wernher von Braun, who became director of the Marshall Center.

By Eisenhower's order, the Project Mercury astronauts were all military test pilots, but NASA was calling the shots. The pilots wanted to fly the rockets off the launch pad but NASA and von Braun thought otherwise. Von Braun said "human intervention" in the launch process was "actually undesirable."

He told the astronauts that the program would "substitute automatically controlled guidance for your hands and muscular systems."

NASA photo

The original Mercury astronauts with a USAF F-106. They were all military test pilots, and wanted to fly a rocket plane directly off the launchpad. Wernher von Braun, the director of NASA's Marshall Center, thought otherwise.

USAF photos

The X-20 Dyna-Soar spaceplane was a hypersonic glider that would dip into the Earth's atmosphere out of space to perform a mission, then resume orbit. The program was canceled in 1963 and Dyna-Soar never flew.

The rocket plane pilots at Edwards hooted in derision, gleefully applying the phrase "Spam in a can" to Project Mercury. Their view, according to Tom Wolfe in *The Right Stuff,* was that "anybody in Project Mercury was more of a test subject than a pilot." The astronauts disliked the term "capsule" for the vehicle they would ride into space and promoted the nomenclature of "spacecraft" instead.

The organizational realignment left the Air Force with the strongest space program in the armed forces. In 1961, USAF was designated the lead service for space R&D. For a while, the Air Force managed to hang on to a few of its manned space initiatives.

Foremost among these was the X-20 Dyna-Soar spaceplane, which evaded NASA's clutches because it was intended to fly in the atmosphere as well as in space.

The X-20 was a hypersonic glider that would dip out of space ("dynamic soaring") to perform reconnaissance or some other task, then fire its rockets to resume orbit. At the end of the mission, Dyna-Soar would land on a runway on Earth.

Dyna-Soar had a low-wing delta shape and more than a passing resemblance to the Space Shuttle and the more advanced spaceplane designs of later years. However, the X-20 never flew. It was canceled in 1963 before it was built, supposedly replaced by another Air Force program, the Manned Orbiting Laboratory.

The MOL anticipated in limited fashion the space station concepts of the future. It would have used refurbished spacecraft from Project Gemini—the second stage of NASA's Moon program—to send military astronauts into near-Earth orbit for up to 30 days to perform experiments.

The MOL was also canceled, in 1969, before making any flights. Secretary of Defense Melvin Laird explained that "the most essential Department of Defense space missions can be accomplished with lower cost by unmanned spacecraft."

TO THE MOON

The Air Force had not given up on the idea of a fighting spaceship and in 1962 floated the notion of a military platform to "rendezvous with hostile craft" in space. However, the Kennedy Administration adhered to the congressional charter for "peaceful purposes" in space and kept the concentration on NASA.

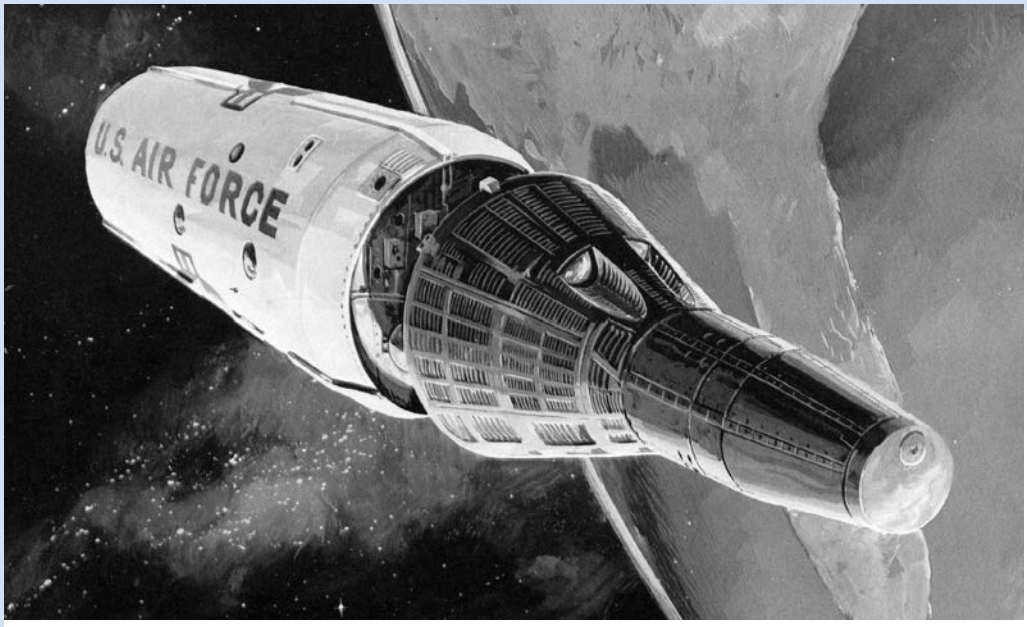
The orbital flights of Project Mercury were followed by Project Gemini, in which two-member astronaut crews in larger capsules explored space travel techniques for the coming voyage to the Moon. The Gemini astronauts had considerably more control of orbital maneuvers than the Project Mercury astronauts did.

There was a flurry of interest in "Blue Gemini," in which the Air Force would obtain a few Gemini capsules for use in a "Military Orbital Development System." The Air Force leadership, fearing a competing program that might put Dyna-Soar in jeopardy, wanted nothing to do with it and the proposal foundered.

Project Apollo, the final stage of the NASA Moon program, introduced spacecraft to be flown by three-member astronaut crews. In addition to the command module there was a service module and a lunar lander. Most of the astronauts were still military, but by then, Neil Armstrong, the first man on the Moon in 1969, was a civilian.

The Moon landings continued into 1972, but after that, enthusiasm for the NASA space program deflated. It no longer had a driving objective.

Unlike the armed forces, which regarded space as a means for better achieving various military missions, NASA essentially saw spaceflight as an end in itself. The military-NASA partnership continued



The Manned Orbiting Laboratory (MOL) was designed to put astronauts into orbit for up to 30 days, completing experiments, but was canceled by Defense Secretary Melvin Laird, who believed space missions could be better—and more cheaply—accomplished by unmanned spacecraft.

but the conflicting views on space were a signal of friction ahead.

The centerpiece of the US spaceflight program through the rest of the 1970s was NASA's Skylab space station. It was launched unmanned by a Saturn rocket. The astronauts were launched separately, made rendezvous with the station, and spent as much as three months aboard. Skylab functioned as a workshop and solar observatory and was on orbit from 1973 to 1979.

THE SHUTTLE ERA

The space shuttle entered service in 1981, operated by NASA with the Air Force as executive agent for the Department of Defense. It was supposed to be the answer to all of the nation's space needs, military as well as civilian. Procurement of expendable launch vehicles was curtailed.

During the shuttle's development phase, there was some belief that a new era in spaceflight was at hand. Writing in *Air Force Magazine* in August 1974, Lt. Gen. Kenneth W. Schultz, commander of USAF's Space and Missile System Organization, said, "It seems safe to predict, with the trailblazing possible with the shuttle, that before the end of this century—perhaps long before it—people will be flying suborbitally in space, much as we today fly in jet aircraft."

A joint service "Manned Spaceflight Engineer" program in 1979 made a bid for all-military crews on all-military shuttle flights. Some in the Pentagon wanted to go still further with the Department of Defense getting its own shuttle fleet. The proposal failed but it set off defensive reflexes in NASA, which worried about excessive military influence on the shuttle.

Then, in an initiative that tragically misfired, NASA opened shuttle participation to citizen astronauts, notably "Teachers in Space."

In January 1986, the shuttle *Challenger* exploded 73 seconds into flight, killing all seven persons onboard, including schoolteacher Christa McAuliffe.

Critics faulted NASA for an ill-advised public relations scheme and said crew status should be restricted to professional astronauts.

It would be another 20 years before the next teacher, Barbara Morgan—McAuliffe's backup for the *Challenger* mission—flew on the shuttle, and then only after qualifying as a mission specialist.

The *Challenger* disaster grounded the shuttle for almost three years and delayed the scheduled launch of military satellites. Even before that, the Air Force had grown wary of the cost and unreliability of the shuttle to put its payloads into orbit. In 1989, the Department of Defense went back to expendable booster rockets for space launch.

Nevertheless, NASA continued to draw most of its astronauts from the armed forces. In the 1980s, about 60 percent of the astronauts were Active Duty military officers but the phrase "man in space" was rendered obsolete in 1983 when Sally Ride flew on a shuttle mission.

In 1995, USAF Col. Eileen Collins became the first woman to pilot a US spaceship and in 1999 was the first woman to command a space shuttle. As of 2013, of the 338 astronauts from Project Mercury, 207 have been military and 52—including some of the military astronauts—have been women.

SEARCHING FOR A MISSION

In 1985, the Air Force undertook yet another study, this one entitled "Military Man in Space," to explore possible roles for human spacefarers. The main patron was Edward C. Aldridge Jr., who became Air Force Secretary in 1986 and who had a special interest in space. Aldridge acknowledged the failure of previous attempts to discover a requirement for human military presence in space but he wanted to try again. This effort failed as well and was finally dropped in 1991.

NASA photo

The space shuttle* Discovery's *crew cabin and part of its payload bay and docking system.* Discovery *was the third shuttle built, and eventually launched and landed 39 times.

L-r: Jeffrey Ashby, pilot, and Eileen Collins, mission commander, go over checklists in the space shuttle Columbia's middeck in 1999. Collins, an Air Force colonel, was the first woman to pilot a US spaceship and the first to command one as well.

"We've had military man in space from the dawn of manned spaceflight, looking for missions, and we have found very few, if any," said Gen. Donald J. Kutyna, commander of US Space Command, in 1990. "Just look at the nature of things we do in space—communications, surveillance, warning systems, navigation. We don't use man for most of those things down on Earth, so why would we put man in space to do them?"

Nor was there much logic for human maintenance of satellites 22,300 miles away in geosynchronous orbits. It would cost far more to "take Mr. Goodwrench out to those orbits" than it would to "build reliability into the vehicles [satellites] in the beginning," Kutyna said.

In 1987, Secretary of Defense Caspar Weinberger directed the military departments "actively to explore potential roles for the military man in space," but nothing came of that either.

Time and again over the years, the Air Force has taken up the quest for a spaceplane—an aerospace vehicle that would take off from a runway on Earth, enter space orbit or fly through the transatmosphere at hypersonic speeds, and return to land on a runway. The X-15 and Dyna-Soar were early examples.

Development of the X-30, dubbed "the National Aerospace Plane," was announced with great fanfare in 1986. It was to use scramjets (supersonic-combustion ramjets) powered by liquid hydrogen to reach hypersonic speeds up to 8,000 miles an hour. By the time it was canceled in 1994, the X-30 was almost a decade late and 500 percent over budget. Besides, no compelling mission for it had been found.

That was not the end of the spaceplane idea, though. Between 1996 and 2001, NASA experimented with the X-33 Advanced Technology Demonstrator, a half-scale prototype for a spaceplane to be called VentureStar and flown in either manned or unmanned configuration. In 2014, the Air Force's X-37B robotic spaceplane test vehicle landed on Earth after 674 days in orbit. There was discussion of a scaled-up version with room for astronauts.

The current spaceplane concept is the X-51A Waverider, a joint test venture of the Air Force and the Defense Research Projects Agency. Independent of DARPA, USAF envisions a hypersonic vehicle that could fly manned space missions sometime around 2040.

OUTWARD BOUND?

In 1984, NASA announced plans for the space station *Freedom.* In the 1990s, this concept evolved into a multinational effort, wherein the US and Russia combined efforts to put the International Space Station into orbit. The shuttle did much of the lifting to deploy modules for the station and afterward flew astronauts back and forth for their tours of duty.

The 135th and last shuttle flight returned to Earth in July 2011. The shuttle was retired with nothing available to replace it.

US astronauts today travel to the space station in seats purchased aboard Russian Soyuz spacecraft, launched by large expendable rockets. NASA has awarded contracts to Boeing and SpaceX to ferry US astronauts to the station aboard commercial spacecraft, with the first launch projected for 2017. The first four astronauts for these flights have been announced: All are military, two of them—Col. Robert Behnken and Col. Eric Boe—Air Force colonels.

Except for work on the space station, military presence in space is dormant but not necessarily dead. The US is intent, or so it says, on manned flight deeper into space.

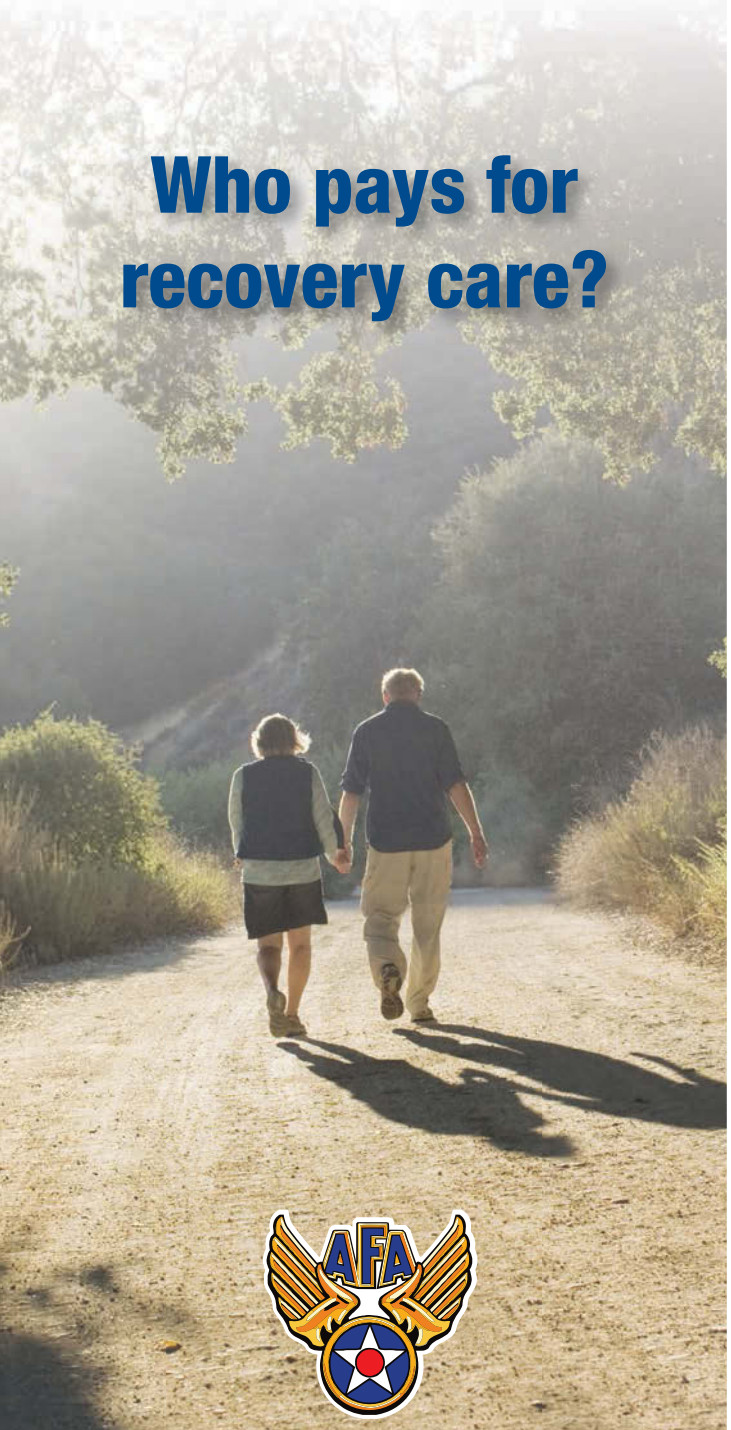
The George W. Bush Administration's Constellation program in 2005 proclaimed a return to the Moon and a base there by 2020, and an ultimate goal of manned flight to Mars. That was superseded by the Obama Administration's 2010 space policy, which dropped Moon landings but added "crewed missions" beyond the Moon to an asteroid by 2025 and on to Mars in the 2030s.

"Our next step is deep space, where NASA will send a robotic mission to capture and redirect an asteroid to orbit the Moon," NASA announced in December 2014. "Astronauts aboard the Orion spacecraft will explore the asteroid in the 2020s, returning to Earth with samples. This experience in human spaceflight beyond low-Earth orbit will help NASA test new systems and capabilities such as solar electric propulsion, which we'll need to send cargo as part of human missions to Mars. Beginning in Fiscal 2018, NASA's powerful Space Launch System rocket will enable these 'proving ground' missions to test new capabilities. Human missions to Mars will rely on Orion and an evolved version of SLS, [which] will be the most powerful launch vehicle ever flown."

It is difficult to imagine that military spacers will not figure into those plans, one way or another. ✪

John T. Correll was editor in chief of Air Force Magazine *for 18 years and is now a contributor. His most recent article, "The Super," appeared in the October issue.*

Who pays for recovery care?



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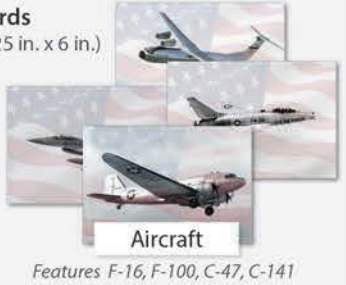

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AFA National Report

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By Frances McKenney, Assistant Managing Editor

Spouse Scholarship Winner

Blame Thomas K. Keller for the pun. The **Gen. Joseph W. Ralston Chapter's** communications director wrote that Christine Stahl received "a lift" from the Ohio chapter: an Air Force Association Mike & Gail Donley Spouse Scholarship.

Stahl will use the $2,500 award—one of 12 granted in 2015—to help fund studies for a master's degree in family nursing.

Chapter President Robert L. Brewster made the presentation in August.

The scholarship is open to Total Force spouses, including Department of the Air Force civilian spouses, to help pay their college education expenses.

"This is an important recognition of the great sacrifices made not only by the men and women in our armed forces, but by their families," said Brewster. He pointed out that Sergeant Stahl has deployed to Iraq and Afghanistan with the 123rd Air Control Squadron, part of the Ohio Air National Guard's 178th Wing.

AFA named the spouse scholarship in 2014 for the 22nd Secretary of the Air Force and his wife. The assocation, through what was then its Aerospace Education Foundation, granted its first spouse scholarships in 1995. That year, 500 spouses competed for 10 scholarships.

Vietnam War Medal

The **Long Island Chapter** conducted its latest Vietnam War 50th Anniversary medal ceremony on Aug. 1 at the American Airpower Museum in Farmingdale, N.Y.

The chapter participates in an ongoing program to support Vietnam veterans, most formally by holding presenta-

Photo by Thomas K. Keller

Christine Stahl and her spouse, MSgt. Michael Stahl, watch Gen. Joseph W. Ralston Chapter President Bob Brewster examine a Wright Flyer model built by Chapter Communications Director Tom Keller.

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I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits material or information requested on the form may be subject to criminal sanctions (including fines and imprisonment) and/or civil sanctions (including civil penalties).

tion ceremonies, where former troops receive the 50th Anniversary of the Vietnam War commemorative medal.

The colors of the medal's ribbons represent the flag of the Republic of Vietnam, Vietnam's jungles, the American flag, and the POW/MIA banner. The medal itself depicts a dragon, the Vietnam Service medal, and on the reverse side, the POW/MIA flag.

The chapter first held a commemorative medal ceremony in April. This time around, some 250 family members and friends observed 30 veterans receiving honors. US Rep. Lee Zeldin (R-N.Y.) and chapter member Col. Thomas J. Owens, commander of the 106th Rescue Wing, presided over the ceremony.

William G. Stratemeier Jr., chapter treasurer, said the museum's hangar, where the ceremony took place, "was filled with emotion and a great sense of patriotism."

Air Force Ball at Air Force Museum

Team Wright-Patterson celebrated the Air Force anniversary with a ball hosted by the **Wright Memorial Chapter** at the National Museum of the US Air Force in Dayton, Ohio.

"There is no better place to celebrate the 68th anniversary of the Air Force than this museum," said Tom Koogler, chapter president.

Photo via Mike Pierson

Janine Rozina (center) attended a meeting of the Colorado chapter named for her brother, Vietnam War Medal of Honor recipient Capt. Lance Sijan. She spoke about a program that helps students learn about his life. Here, she joins Mike Pierson from Air Force Space Command and Chapter VP Linda Aldrich holding a letter from AFSPC Commander Gen. John Hyten. It congratulated the chapter for being named AFA unit of the year.

Both past and present Air Force leaders were among more than 450 guests that evening, with its theme saluting Vietnam War veterans.

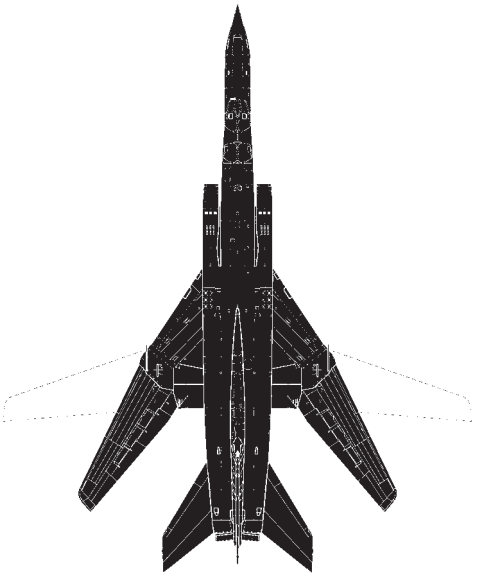
The evening began with a social and silent auction that raised more than $3,300 for the Air Force Aid Society. Col. John M. Devillier, 88th Air Base Wing commander, spoke about the experiences of Vietnam veterans, whose numbers included his father.

AFA awardees recognized at the ball were retired Gen. Janet C. Wolfenbarger, Air Force Materiel Command's former boss, who received the prestigious Heritage Award; Phillip L. Parker, president and CEO of the Dayton Area Chamber of Commerce; John Griffin of the Dayton Development Coalition; and chapter member Christopher P. Z. Stanley, retired first sergeant for the 74th Medical Operations Squadron and now executive director for the base's Fisher/Nightingale Houses.

The chapter reported that many Star Sponsors—representing corporations backing AFA programs with financial support—hosted attendance at the ball by airmen who have deployed. This garnered the corporate sponsors the additional designation as "True Blue" supporters. ✪

Artwork by Zaur Eylanbekov

Tu-22M Backfire



The Tu-22M Backfire bomber was developed in the 1960s as a supersonic, variable-sweep-wing bomber for the Soviet air forces and Navy. Equally capable as a strategic bomber or naval strike platform, the Tupolev aircraft provided the power to strike naval targets on the Soviet periphery or, given the right equipment, targets at intercontinental range. Its primary mission in a war against NATO was to cut US supply lines to Europe by destroying strategic harbors and airfields. Russia inherited the Soviet inventory.

Backfire's advanced wings were key to the project. They were variable in sweep and tapered with curved tips. When extended, they permitted relatively short takeoff and landing. Swept, they provided efficient cruising, high top speed, and stable high-speed, low-level flight. The long and slender fuselage and pointed nose gave it a rakish look. Its low-level penetration features made it more survivable than its predecessors.

Upgrades gave the basic airplane stronger engines, better avionics, and more ordnance—including supersonic missiles. It could accept air-refueling probes to increase range, a fact that became a major issue in US-Soviet SALT II negotiations.

In the 1980s, Backfires were employed in conventional bombing raids in Afghanistan, particularly during the last year of direct Soviet involvement. Russian pilots flew some 100 operational sorties against rebels in Chechnya in the mid-1990s and against Georgian forces in the 2008 South Ossetian War. It was in the latter conflict that the first Backfire was lost in combat, shot down by a Georgian missile. In the 2000s, Russian Backfires resumed combat patrols in international airspace.

—Robert S. Dudney with Walter J. Boyne

This aircraft: Soviet Tu-22M2 Backfire B—*Bort 42 Red*—as it looked in 1985 when assigned to the 43rd Combined Training and Flight Crew Training Center, Dyagilevo AB, USSR.

In Brief

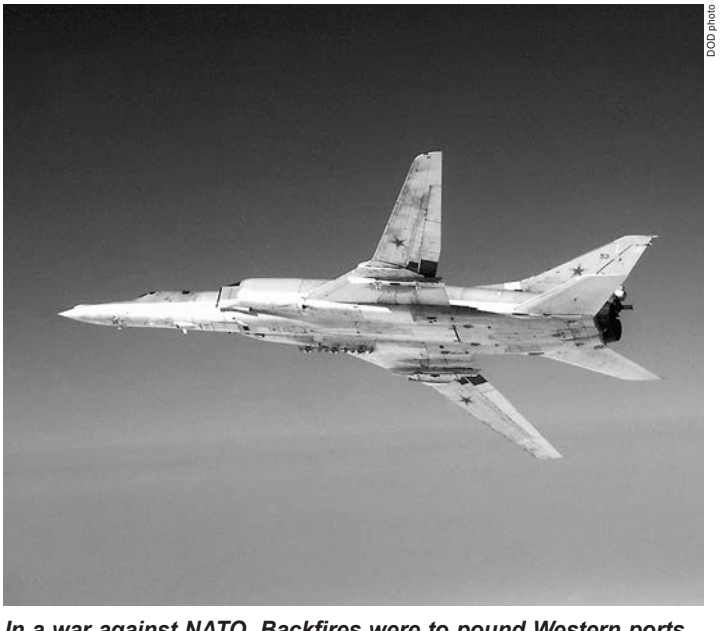
Designed, built by Tupolev ★ first flight Aug. 30, 1969 ★ number built 497 ★ crew of four (pilot, co-pilot, navigator, weapon systems operator). **Specific to Tu-22M3:** two Kuznetsov NK-25 turbofan engines ★ defensive armament one 23 mm GSh-23 cannon in remote-controlled tail turret ★ max payload 53,000 lb of nuclear and/or conventional munitions (gravity bombs, PGM, cruise missiles, naval mines) ★ max speed 1,429 mph ★ cruise speed 560 mph ★ max range approx. 4,200 mi (unrefueled) ★ combat radius 1,367 mi ★ weight (max T/O) 273,373 lb ★ span 76 ft 6 in (swept) and 112 ft 6 in (spread) ★ length 139 ft 4 in ★ height 36 ft 3 in ★ service ceiling 45,932 ft.

Famous Fliers

Notables: Lt. Col. Aleksandr Koventsov (shot down, MIA, 2008 war with Georgia); Maj. Vyacheslav Malkov (shot down, POW, war with Georgia). **Test Pilots:** Boris Veremey, V. P. Borisov, A. Bessonov.

Interesting Facts

Conducted simulated attacks on US Navy battle groups in 1970s ★ saw first combat in 1984 in Afghanistan ★ flown by Russian pilots in 1995 strikes against Chechen rebels near Grozny ★ originally named Samolyot 145 (Airplane 145) ★ derived from smaller Tupolev Tu-22 Blinder ★ judged by the Defense Intelligence Agency to have intercontinental strike capability when fitted with refueling probe ★ offered to China, India but never exported ★ nicknamed "Troika" (M3 variant) or "Trio" ★ converted to reconnaissance variant (12 aircraft) ★ made numerous simulated attacks on Sweden in 2013 and 2015.



DOD photo

In a war against NATO, Backfires were to pound Western ports and airfields.

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