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AIR FORCE MAGAZINE

ENGINES OF INNOVATION

Real propulsion breakthroughs may be ready to leave the lab.

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Homestead After
the Storm p. 52

Dream Team Fighter
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Mountaintop p. 40



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An F-22 performs a maneuver during a flight training and certification course in 2016. See "Engines of Innovation," p. 44. Photo by SrA. Chris Massey.



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August 2017, Vol. 100, No. 8

Air Force Magazine (ISSN 0730-6784) August 2017 (Vol. 100, No. 8) is published monthly, except for two double issues in April/May and October/November, by the Air Force Association, 1501 Lee Highway, Arlington, VA 22209-1198. Phone (703) 247-5800. Periodical postage paid at Arlington, Va., and additional mailing offices. **Membership Rate:** \$45 per year; \$30 e-Membership; \$110 for three-year membership. **Life Membership (nonrefundable):** \$600 single payment, \$630 extended payments. **Subscription Rate:** \$45 per year; \$29 per year additional for postage to foreign addresses (except Canada and Mexico, which are \$10 per year additional). Regular issues \$8 each. USAF Almanac issue \$18 each. **Change of address** requires four weeks' notice. Please include mailing label. **POSTMASTER:** Send changes of address to Air Force Association, 1501 Lee Highway, Arlington, VA 22209-1198. Publisher assumes no responsibility for unsolicited material. Trademark registered by Air Force Association. Copyright 2017 by Air Force Association.

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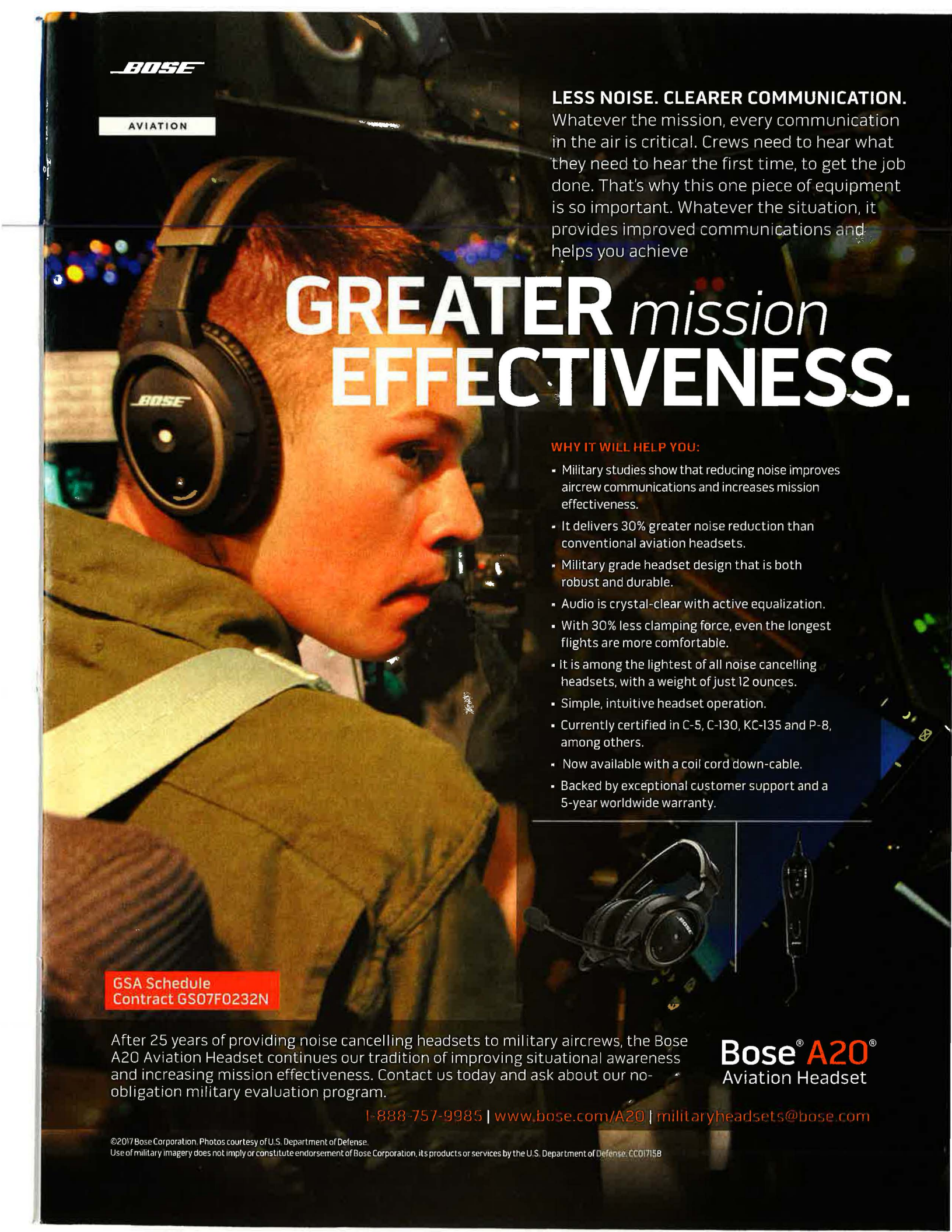
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A close-up, profile view of a pilot wearing a Bose A20 Aviation Headset. The pilot is looking forward, and the background shows the interior of a cockpit with various instruments and controls. The Bose logo is visible on the side of the headset.

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The Bumpy Road to Guard Modernization

In November 1949, Lt. Gen. Ennis C. Whitehead, commander of Continental Air Command, determined that "at best, the Air National Guard represents aircraft in flyable storage."

No one today should question the Air Guard's critical integration with the Active Duty force or its contributions to state or national security. Those still holding historical viewpoints should look closer. "Creative minds are necessary more than ever," notes Air Force Gen. Joseph L. Lengyel, chief of the National Guard Bureau, in the Guard's 2018 posture statement. "We must inspire a culture willing to change."

Change can be painful, irrespective of culture. The past 15 years at Michigan's Battle Creek Air National Guard Base, which once flew A-10 attack jets, are a useful case study in this.

In 2003, the 110th Fighter Wing was on the front line as Operation Iraqi Freedom began.

In 2005, the Battle Creek base—at W. K. Kellogg Airport—was marked for base realignment and closure (BRAC). Airmen there were later told they would transfer their A-10 mission to Selfridge Air National Guard Base, halfway across the state, and lose their flying mission—but not until 2008. The 110th was assigned a C-21 VIP airlift mission instead.

In early 2007, the 110th upgraded its soon-to-be-relocated A-10As to A-10C status. That September, the wing deployed to Iraq again. They were no sooner on the ground, when the unit was suddenly and unexpectedly moved to Afghanistan. USAF's F-15 fleet had been grounded after a Missouri Guard Eagle broke in half during a routine flight, so the 110th went to war in Afghanistan with no notice or mission-specific preparation.

The Air Guard is positioning for the future—a long and tumultuous process.

Throughout 2008 the wing phased out its A-10 operations and stood up an air operations group.

"2009 was spent converting to the C-21," said Col. Kier D. Knapp, 110th Attack Wing vice commander. "Originally we were supposed to get seven C-21s but ended up with only three." Knapp told *Air Force Magazine* the C-21 was intended to be a "bridge" to keep pilots current until a follow-on aircraft arrived.

The wing began preparations to convert to C-27J small airlift operations, another radical departure from attack jets or pointy-nose VIP transports. Then USAF canceled its plans to field the C-27J. Hundreds of airmen would lose their jobs, Knapp noted. "There was a mad scramble to ... start yet another conversion to a new mission."

What appears to be the permanent plan finally emerged in 2013, and the wing built an MQ-9 Reaper cadre. The 110th Attack Wing now flies the MQ-9, without aircraft at the base, but after more than a decade of churn, there is finally a solid, long-term plan.

In December 2015, the wing learned it would add another 21st century mission, gaining a cyber operations squadron.

And what of Battle Creek's old A-10s? They're still flying, at the 127th Wing at Selfridge, where airmen have experienced the



In 2008, A-10s of the 110th Fighter Wing, based in Battle Creek, Mich., fly over the southwest part of the state. The unit flew Warthogs from 1991 to 2009, then the C-21 and C-27J. It is now the 110th Attack Wing, operating the MQ-9.

same turmoil and uncertainty that has roiled Battle Creek and many other bases.

In 2005, Selfridge flew F-16s, C-130s, and Reserve KC-135 tankers. BRAC ordered the Reserve unit away and replaced the F-16s with Battle Creek's A-10s. Different, ANG-operated KC-135s arrived.

The 127th finished converting to the A-10C in 2011 and deployed to Afghanistan that year, just before USAF announced its intent to retire the A-10s but give Selfridge four more KC-135s.

This would have ended Selfridge's century-old fighter mission. In 2007, Col. Michael T. Thomas, then the 127th Wing commander, described this constant reorganization as a "shell game."

Selfridge still faces an uncertain future, but the base is on the short list of locations under consideration to receive Guard-assigned F-35 strike fighters in the early 2020s. Brig. Gen. John D. Slocum, the 127th commander, is optimistic about this summer's basing decision. He says Selfridge could easily park 21 F-35s inside the base's existing hangars, and there is plentiful, high-quality range space available in northern Michigan.

The Air Guard faces most of the same problems as the regular Air Force, including pilot, maintainer, and cyber operator shortages, old equipment, and an unsustainable optempo in some areas—such as KC-135 operations.

A constant state of flux damages readiness, recruiting, and morale at a time when USAF is being asked to do ever more. The ANG is posturing itself for the future, but a clear lesson from two Guard bases in Michigan is that long-term instability creates a host of problems. A note to Congress and the Pentagon bureaucracy: It's best for the nation to create a plan for airpower—and stick to it.



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Heckuva Tattoo

Wishful thinking, but I was wondering if it's possible to get a digital copy of the cover of the 2017 Air Force Almanac [*Air Force Magazine*, June]. I want to use the picture for a tattoo signifying my 14 years of service.

TSgt. Anthony Ruiz
Hurlburt Field, Fla.

I have to admit that at first glance I saw the cover of your magazine's USAF Almanac 2017 edition as a rather mundane black-and-white rendition of a fighting falcon. It wasn't until close further scrutiny that my eyes were opened and I realized that the drawing was actually an extremely detailed representation of the over 69 years of our Air Force's storied existence.

Finely detailed service mementos are embedded in artist [and former surgical resident] Dr. Don Stewart's ballpoint pen drawing "Aiming High" for each of us who served in our great Air Force. With the aid of my trusty Sherlock Holmes magnifying glass, I spied my ATC badge and the insignia off my enlisted "bus driver" cap.

This artwork is even more amazing when you consider that many of us mere mortals are challenged to control a pen while scrawling a simple payroll signature. Who said a doctor's scribbles can't be deciphered?

Col. Bill Malec,
USAF (Ret.)
O'Fallon, Ill.

Although I appreciate Mr. Stewart's artwork, it appears he favors the fighters. May I ask, besides the C-130 and the

C-5, where are those airlifters that were and are the mainstay of the Air Force: the C-124, C-133, and today's C-17, to name but a few? And by the way, the navigator wore wings and not a badge. For the future I suggest the magazine stick with photos of real bald eagles to which we've all become accustomed.

Lt. Col. Harry E. Heist,
USAF (Ret.)
Dover, Del.

I am interested in the cover design used on the 2017 Almanac. Do you have any products for sale with this emblem such as t-shirts? It's very unique and would make a great gift for enthusiasts.

Christen Ganley
Memphis, Tenn.

Copies of the artwork (and a list of the images used in creating the falcon) can be found on the artist's website, dsdart.com. The artist, Don Stewart, has dedicated half the proceeds from the sale of this image to AFA's Wounded Airman Program.

2017 Almanac

I enjoyed reviewing my 2017 *Air Force Magazine* Almanac [June] to see how our Air Force is performing, but was disappointed not to see the Civil Air Patrol included in the USAF Total Force numbers or as a member of Air Combat Command. The Civil Air Patrol, which was founded on 1 December 1941, became the Official Auxiliary of the United States Air Force on 26 May 1948 and since has been serving the nation and the Air Force by performing its three congressionally chartered missions of emergency services, cadet programs, and aerospace education. In August 2015, then-Secretary of the Air Force Deborah Lee James proclaimed the Civil Air Patrol a member of the Air Force's Total Force and the Air Force updated Doctrine Volume 2 to include its "auxiliary" members. On 24 June 2016, the Civil Air Patrol and CAP-USAF was transferred from the authority of Air Education and Training Command to Air Combat Command.

Hopefully you will consider listing the nearly 57,000 members of the Civil Air Patrol, our over 550 aircraft, and our 100,000 annual hours of volunteer service to the Air Force and the nation in

future almanacs. Keep up the great job you do reporting on the achievements of the Air Force and the outstanding work of our airmen around the world.

Col. Jon Stokes,
CAP
Redondo Beach, Calif.

I continue to enjoy reading the Almanac each year. You have been showing USAF grades and insignia, awards and decorations, devices, and USAF specialty berets.

I have only one comment: At one time your magazine showed USAF wings and career specialty badges. I recently saw them in the 1997 Almanac. I would like to see this information added or, at least, presented occasionally.

Col. Louis M. Salerno Jr.,
USAF (Ret.)
Beaver Creek, Ohio

The F-104 shown on p. 133 was from the 78th Fighter Wing of the Air Defense Force headquartered at Hamilton AFB. It was not part of the Tactical Air Force. I was part of the team that loaded one F-104 and two spare engines per aircraft for air transportation to Taiwan (in response to the mainland shelling of two offshore islands, Quemoy and Matsu).

Robert Dubman
Lake Worth, Fla.

The Monthly Military Basic Rates of Pay chart on p. 45 of the 2017 USAF Almanac contains a footnote (b) that has been in error for over 40 years now, regarding commissioned officers with prior service: "Applicable to O-1 to O-3 with at least four years and one day of

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—The Editors

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Active Duty or more than 1,460 points as an enlisted member." The official DOD pay scale chart states it more correctly as "points as a warrant and/or enlisted member."

This may seem like a small point to most Air Force members, as USAF is the only military service in NATO without warrant officers or technical officer equivalents. As the Vietnam War began to wind down, however, many of us ex-Army warrant officers were commissioned as lieutenants in the Air Force to continue our military careers. The other US military branches generally granted "equivalency" commissions to warrant officers who accepted commissions: W-1 to O-1, CW-2 to O-2, CW-3 to O-3. But the Air Force did not adopt that protocol. Any former warrant officer from another service had to start at the bottom of USAF commissioned ranks as a second lieutenant.

At first, no credit was given for prior service as a warrant officer, which was one reason the other services granted the equivalency commission. Ex-warrant officers entering the Air Force as O-1s, though, took a huge cut in pay, which Congress finally corrected in the mid-'70s. The law required prior warrant officer service to be counted the same as prior enlisted service for commissioned officer pay.

I separated from the Army in 1976 as a CW-2 over six. Imagine my surprise to find upon entering Air Force pilot training in 1979 that my paycheck was several hundred dollars less than my final Army pay had been. I saw that I wasn't being paid as an O-1E over six but as an O-1 (no prior service) over six, which was the same pay rate as O-1 over three. The base finance officer showed me the pay regulation, which stated that commissioned officers with over four years of service as warrant officers shall be paid the same as commissioned officers with over four years as enlisted members. "You don't have four years as either a warrant officer or enlisted person," she told me. "You don't qualify for the O-1E pay grade."

I copied the USC authority code for the regulation and took it to the JAG office. I found it in the law library and showed it to one of the JAG officers. Clearly the law did not intend for warrant

officer service and enlisted service to be treated separately. The JAG agreed with me that the DOD pay regulation did not follow the law as it was intended. He told me I could file an IG complaint about the discrepancy, which I did along with some 70 other complainants to date. I could also sign onto a lawsuit against DOD seeking redress, which I declined to do for fear of losing my security clearance in reprisal.

It took DOD nearly four years to make the regulation comport to the law Congress had passed years earlier. By that time I was a captain over 10, so there was no increase to my base pay. Nor was the correction made retroactive, to set right what was in reality an illegal taking of pay from me and the other ex-warrant officers. I calculate I lost over \$20,000 in career base pay because some bureaucrat at the Pentagon couldn't bother to write a pay regulation precisely and apparently had no adult supervision.

Words have meaning. They also often have far-reaching unintended but negative consequences. Please fix your footnote.

Lt. Col. Gary Peppers,
USAF (Ret.)
Cape Coral, Fla.

A Future Based on Assumptions

Upon receiving your June issue and reading "The Air Force's Low Aircraft Availability Rates" on p. 25, I discovered a potential systemic flaw in the way Air Force leadership determines future requirements based on assumptions ["Air Force World," June, p. 25]. I would not have noted the discrepancy, had you not included a brief story on p. 27 in "Air Force World" stating the requirement for 100 B-21 bombers. The article on p. 25 provides a comprehensive picture of aircraft availability (AA) average versus the standard for each type. In the case of the F-22, the initial requirement of 381 was lowered unceremoniously until the final quantity of 183 was guesstimated (dyslexia, anyone?). Several questions are raised.

Upon what assumptions of F-15 availability, remaining life cycle, potential SLEP programs, parts availability, and maintainer availability were the F-22 requirements based when penned in 1981? If any of these changed, the re-



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quirement should have been revised. The 10-year aircraft availability average of 56 percent for the F-22 and historical F-15 data appear to support the original requirement of 381. At that time, proponents of the original requirement pointed to the number and location of contingencies to support the demand—they can't be in two places simultaneously. The only doctrinal change I can recollect is a reduction in the number of concurrent contingencies for which we plan, from two to one. The original rationale for 381 F-22s was based on the original estimate. So instead of setting the capacity to meet the demand, our leaders reduced the demand to meet the "guesstimated" capacity—the tail is wagging the dog. Last I checked, Syria, South China Sea, Iran, and North Korea could all be concurrent contingencies, so our planning is off a bit.

Is the minimum requirement of 100 B-21 bombers based on having the current number of B-1B and B-2A aircraft in 2025? If the B-21 delivery date slips due to technical or budget constraints, the minimum requirement should rationally increase one-to-one since the probability of fewer legacy bombers is higher. If the minimum requirement is cut in half, we do have other options. We can pretend that only 0.5 regional conflicts will occur concurrently or that the B-21 can be in two places simultaneously.

Finally, if the B-21 is the "21st century bomber," when will we get the B-22?

MSgt. Rick Brumble,
USAF (Ret.)
Vancouver, Wash.

Bring Back Tactical Nukes

Secretary of Defense James N. Mattis stated, "Any attack on the United States, or on our allies, will be defeated, and any use of nuclear weapons would be met with [a] response that would be effective and overwhelming" ["Verbatim," April/May, p. 14]. Good, but not good enough to stop Kim Jong Un from his development of a nuclear capability. Words must be followed by a positive plan of action. I suggest the US coordinate with China, South Korea, and Japan for the deployment of a massive number of US -owned and -managed tactical nuclear weapons to South Korea and Japan. We have had tactical nukes there before,

so this is not a new idea. Just a stated plan to perform this deployment might even be a negotiating factor to convince China and/or North Korea to totally stop the North Korean nuclear weapons development. If not, the US deployment of tactical nukes would be a deterrent against North Korea from ever using their nukes. There would be no more concern about nuclear proliferation by South Korea or Japan, but they will have to agree to pay for the deployment, operations, and maintenance of the US tactical nukes. The US would provide the C3I and manpower to train and be ready to effectively employ the tactical nukes.

Lt. Col. Russel Noguchi,
USAF (Ret.)
Pearl City, Hawaii

The Versatile Canberra

Regarding the "Wingman" Canberra information, I have firsthand knowledge of the emergency described in the first two paragraphs about Capt. Larry Mason and Jere Joyner ["The Canberra," June, p. 152].

On 15 March 1966, I was piloting a C-130 Hercules and was on the downwind leg in the traffic pattern of DaNang AB, South Vietnam. The tower called and instructed me to hold in a racetrack pattern on the downwind leg due to a B-57 inbound for an emergency landing. I was able to watch the entire emergency landing of the B-57. After I landed, I went over to the B-57 to view its damage. I knew both crew members. I flew the B-57 Canberras for eight years and have almost 2,000 hours piloting them.

John Schaefer
Glendale, Ariz.

Thank you for publishing Mr. Steven Beeny's fine article titled "The Canberra" in your June 2017 issue. *Air Force Magazine* readers may be interested to know that only three flyable WB-57s remain in service in the world today. NASA's Aircraft Operations Division (AOD), at Houston's Ellington Airport, operates these three Cold War-era workhorses in support of global research, development, and testing missions. The aircraft are extensively modified and now incorporate many modern components such as ACES II ejection seats, digital autopilots, F-15 main landing gear and

brakes, and much more.

As publicly stated on the NASA AOD "WB-57 High Altitude Research" web page (jsc-aircraft-ops.jsc.nasa.gov/wb57): "The NASA WB-57 Program provides unique, high-altitude airborne platforms to US government agencies, academic institutions, and commercial customers in order to support scientific research and advanced technology development and testing at locations around the world. Mission examples include atmospheric and Earth science, ground mapping, cosmic dust collection, rocket launch support, and test bed operations for future airborne or spaceborne systems. The NASA Johnson Space Center (JSC) in Houston is the home of the NASA WB-57 High Altitude Research Program. Three fully operational WB-57 aircraft are based near JSC at Ellington Field. The aircraft have been flying research missions since the early 1960s and continue to be an asset to the scientific community with professional, reliable, customer-oriented service designed to meet all scientific objectives."

One of the aircraft, tail No. N927, holds the record of 41 years for the longest duration at Davis-Monthan AFB, Ariz., in the Aerospace Maintenance and Regeneration Group's "Boneyard" storage by an aircraft that has since been restored to full flight operations. The two-year-long restoration was completed in 2013—the 50th year anniversary of the WB-57F model of Canberra-type aircraft.

Jim Snowden
Houston

One version of the B-57 was left out of the story. The EB-57 electronic warfare version made a real impression on every air weapons controller at the old SAGE sites along our northern border air defense line. Watching your screen turn into a bicycle wheel with thousands of white spokes obliterating your view was impressive and of course frustrating. When we spoke with the crews in debriefs they chuckled at our comments and made sure we understood that of course what they did was nowhere near full power and full range application of their equipment. (The FAA prohibited that of course, as no radars would have been functional during a full blown EW

assault by the EB-57.) Nonetheless we understood that our training would be incomplete without the benefit of their "support" as Aggressors. Personally the -57 to me resembles a bat with its knuckles at the wing midpoints (engine cowlings)—simply beautiful. Sadly, the jet left service too soon after I entered service in '79 to see it often enough and witness its prowess in the electronic warfare arena. At least one article I read indicated that a couple of modified WB-57s are still flying in special test and service roles. Interesting to me is that if I let my imagination run wild, doing some extreme stretching of the wings, and relocating a single engine to the body, with pods replacing the engines, I see a Dragon Lady U-2. Give the Brits credit: Their design was a sound design with a lot of advantages. And remember when they sent us a copy for evaluation? It made first unrefueled jet flight over the pond to the US.

Gary S. Hedges
Rogers, Ark.

Missed That One

"Namesakes: Castle" [July, p. 76] was exceptionally meaningful to me, as my first assignment out of flying school in December 1952 was the 330th Bomb Squadron, 93rd Bomb Wing, at Castle, flying copilot on the B-50D with a great aircraft commander and a great crew. I transitioned to B-47s there in 1954. General Eubank was base commander, and I used to play handball with him. He asked for me to become his adjutant, but I declined, stupidly, saying I didn't have enough crew time yet. What an idiot.

Walter Boyne
Silver Spring, Md.

Umm ...

[Regarding "Bay of Pigs," July, p. 66]: The caption shows President Kennedy presenting national security medal to CIA Director Allen Dulles at Langley AFB, Va., in 1964. As I am sure you are aware, President Kennedy was shot and killed in Dallas Nov. 22, 1963.

Michael N. Ennis
Glen Rock, N.J.

Of course, you are correct. Apologies for the typo.—The Editors

SENIOR STAFF CHANGES

RETIREMENT: Lt. Gen. William J. Bender.

NOMINATIONS: To be Brigadier General: Richard H. Boutwell, DeAnna M. Burt.

To be Lieutenant General: Scott A. Howell, Jay B. Silveria, James C. Vechery.

CHANGES: Brig. Gen. (sel.) Richard H. Boutwell, from Exec. Asst. to the Cmdr., NORTHCOM, Peterson AFB, Colo., to Dir., Regional Affairs, Under SECAF, Intl. Affairs, Under SECAF, Pentagon ... Brig. Gen. Barry R. Cornish, from Cmdr., 18th Wg., PACAF, Kadena AB, Japan, to Dep. Dir., Ops. Team One, Natl. Jt. Ops. & Intel. Center, Jt. Staff, Pentagon ... Brig. Gen. (sel.) Case A. Cunningham, from Cmdr., 432nd Wg. & 432nd AEW, ACC, Creech AFB, Nev., to Cmdr., 18th Wg., PACAF, Kadena AB, Japan ... Brig. Gen. (sel.) Michael L. Downs, from Cmdr., 17th TW, AETC, Goodfellow AFB, Texas, to Dir., Future Warfare, DCS ISR, USAF, Pentagon ... Maj. Gen. Peter E. Gersten, from Dir., Strat. Plans, DCS, Strat. Plans & Rqmts., USAF, Pentagon, to Cmdr., Air Warfare Center, ACC, Nellis AFB, Nev. ... Brig. Gen. Alexis G. Grynkeiwich, from Dep. Dir., Ops., Ops. Team Three, Natl. Jt. Ops. & Intel. Center, Jt. Staff, Pentagon, to Dep. Dir., Global Ops., Jt. Staff, Pentagon ... Maj. Gen. Joseph T. Guastella Jr., from DCS, Ops., SHAPE, NATO, Mons, Belgium, to Dir., Integrated Air, Space, & Cyberspace and ISR Ops., AFSPC, Peterson AFB, Colo. ... Brig. Gen. David W. Hicks, from Cmdr., 438th AEW, ACC, Kabul, Afghanistan, to Dir., Strategy, Concepts, & Assessments, DCS, Strat. Plans & Rqmts., USAF, Pentagon ... Brig. Gen. Eric T. Hill, from Dep. Dir., Strategy, Plans, & Policy, SOCOM, MacDill AFB, Fla., to Dep. Dir., Plans & Policy, CENTCOM, MacDill AFB, Fla. ... Lt. Gen. (sel.) Scott A. Howell, from Cmdr., Spec. Ops JTF-Afghanistan, US Forces Afghanistan, Bagram, Afghanistan, to Vice Cmdr., SOCOM, Pentagon ... Brig. Gen. Darren V. James, from Cmdr., 379th AEW, ACC, Al Udeid AB, Qatar, to Vice Cmdr., 18th AF, AMC, Scott AFB, Ill. ... Maj. Gen. Brian M. Killough, from Dir. Strategy, Concepts, & Assessments, DCS, Strat. Plans & Rqmts., USAF, Pentagon, to Dir., Strat. Plans, DCS, Strat. Plans & Rqmts., USAF, Pentagon ... Brig. Gen. William M. Knight, from Dep. Dir., Ops., Ops. Team Two, Natl. Jt. Ops. & Intel. Center, Jt. Staff, Pentagon, to Vice Cmdr., USAF Expeditionary Center, AMC, JB McGuire-Dix-Lakehurst, N.J. ... Brig. Gen. (sel.) Albert G. Miller, from Cmdr., 22nd ARW, AMC, McConnell AFB, Kan., to Dir., CENTCOM Deployment & Distribution Ops. Center, CENTCOM, Southwest Asia ... Brig. Gen. James D. Peccia III, from Dir., Budget Ops. & Personnel, Office of the Asst. SECAF, Financial Mgmt. & Comptroller, Pentagon, to Dir., Financial Mgmt., AFMC, Wright-Patterson AFB, Ohio ... Maj. Gen. (sel.) John M. Pletcher, from Dir., Financial Mgmt., AFMC, Wright-Patterson AFB, Ohio, to Dep. Asst. Secy. for Budget, Office of the Asst. SECAF, Financial Mgmt. & Comptroller, Pentagon ... Maj. Gen. (sel.) John T. Rauch Jr., from Dir., Future Warfare, DCS, ISR, USAF, Pentagon, to Cmdr., AF Safety Center, Kirtland AFB, N.M. ... Lt. Gen. (sel.) Jay B. Silveria, from Dep. Cmdr., AFCENT, CENTCOM, Southwest Asia, to Supt., USAFA, Colorado Springs, Colo. ... Brig. Gen. Billy D. Thompson, from Dir., Regional Affairs, Dep. Under SECAF, Intl. Affairs, Under SECAF, Pentagon, to Cmdr., Jeanne M. Holm Center for Officer Accessions & Citizen Dev., AETC, Maxwell AFB, Ala. ... Maj. Gen. Glen D. VanHerck, from Cmdr., USAF Warfare Center, ACC, Nellis AFB, Nev., to Vice Dir., J-5, Jt. Staff, Pentagon ... Lt. Gen. (sel.) James C. Vechery, from Dir., Operational Capability Rqmts., DCS, Strat. Plans & Rqmts., USAF, Pentagon, to Dep. Cmdr., Mil. Ops., AFRICOM, Stuttgart, Germany ... Maj. Gen. Sarah E. Zabel, from Vice Dir., DISA, Ft. Meade, Md., to Dir., Info. Tech. Acq. Process Dev., Office of the Asst. SECAF, Acq., JB Anacostia-Bolling, D.C.

AIR NATIONAL GUARD CHIEF MASTER SERGEANT CHANGE: CMSgt. James L. Brown, from Kansas Natl. Guard Command Sr. Enlisted Leader, Jt. Forces Hq. Kansas, Topeka, Kan., to Command Sr. Enlisted Leader, JTF Civil Spt., JB Langley-Eustis, Va.

SENIOR EXECUTIVE SERVICE RETIREMENT: Lisa S. Disbrow.

SES CHANGES: Eldridge Andrew Colby, to Dep. Asst. SECDEF, Strategy & Force Dev., OSD, Pentagon ... Pete Giambastiani, to Prin. Dep. Asst. SECDEF, Leg. Affairs, OSD, Pentagon ... Thomas Goffus, to Dep. Asst. SECDEF for Europe & NATO, USD, Policy, Pentagon. ☛



HASC Chairman Rep. Mac Thornberry is frustrated that DOD acquisition isn't going fast enough.

THE RED TAPE MENACE

The Pentagon's sluggish buying processes represent as big a threat to the nation as any well-armed foreign adversary and needed a scorched-earth overhaul yesterday, a blue-ribbon reform commission said in its first report.

The Section 809 Panel—which takes its name from the portion of the defense bill that created it—said in a May report that though there've been more than 100 “reports, studies, and analyses” aimed at streamlining defense procurement over the last 50 years, this new effort has to succeed, because this time, the survival of the country is on the line.

The way the Pentagon “buys what it needs ... is from another era,” the panelists wrote in their first take on the situation. “DOD does not have the luxury to wait” for years of small moves to fix its buying bureaucracy.

“Adversaries are rapidly modernizing their militaries with an eye toward exploiting US vulnerabilities and negating traditional US advantages,” the 809 Panel said. The procurement system “has not fully adjusted to the pace of this environment, nor has it adjusted to a marketplace that bears no resemblance to that of just a few decades ago.” Modern acquisition requires “a degree of agility that DOD is not currently able to deliver.”

Previous efforts at defense reform have been “tinkering and incremental,” the panel observed, and this has only made things worse, “by adding more layers of sign-off, mountains of paperwork, and hundreds of additional regulations.” Now, nothing less than “bold” action is needed to speed up a bureaucracy that simply can't keep up with the pace of technological change.

Adversaries, the panelists pointed out, aren't burdened with congressional oversight or fair buying laws, and this makes them far more agile than the US in fielding advanced hardware.

The group wants to throw out vast handfuls of the Federal Acquisition Regulation (FAR), believing many to be vestigial rules emplaced by congressmen of yesteryear to promote constituent businesses or fix specific broken programs now long since gone.

Panel chair Deidre Lee, former director of defense procurement and acquisition policy, testified at a May 17 hearing of the House Armed Services Committee that the Section 809 Panel plans to give Congress “data-driven, actionable recommendations” to use to slice through existing red tape and eliminate the unnecessary steps bogging down the acquisition apparatus.

She said the group will go through the FAR, figuring out where

regulations came from and whether they are still relevant. Where a procurement step exists just to give Congress an unnecessary chance to intervene, the 809 Panel is hoping members will do the right thing and surrender some of their oversight authority, she said.

This overhaul will probably take until January 2019 to be completed, Lee said, asking the HASC to be patient.

Rep. Mac Thornberry (R-Texas), HASC chair, was visibly startled at this estimate of the length of time the review would take, saying he hoped the panel would offer interim updates “that [give] us some meat to work with” on revising procurement laws in the meantime. Most of the members in the hearing on both sides of the aisle voiced support for the panel and its goals.

THAT'S IT, I'M OUTTA HERE

The panelists testifying were former defense officials, some of whom said that, after leaving government service and joining the private sector, they had taken their own companies out of doing defense work because of the onerous requirements in competition and administration that it requires. They decried the interminable amount of time it takes the Pentagon to compete a contract and actually choose a winner.

William A. LaPlante, former Air Force acquisition chief, said it frequently takes 18 months “to go from the initial RFP [request for proposal] to award of a sole source contract.” Small businesses can't wait that long to find out if they should buy materials and hire workforce for a Pentagon job, he said, and he contended that some major companies are leaving DOD work because requirements change at the last minute.

In the report, panelists wrote that the existing system “creates obstacles to getting the needed equipment,” and the Pentagon is “an unattractive customer to large and small firms with innovative, state-of-the-art solutions.” Those ideas are crucial to the Defense Department leapfrogging competitor technology.

Lee and other panelists said industry is, after all, trying to do business and make a profit, and that motive shouldn't be portrayed as “criminal” by members of Congress. Members of the commission said Congress must curb its impulse to exact draconian retribution on a program manager who makes “an honest mistake” in the interest of speeding up the process of getting hardware to the combat forces faster.

Fear of losing a protest or seeming to be unfair is deterring program managers from doing “the right thing,” Lee said, such as if it makes the most sense to award a contract without the labor- and time-intensive step of competition.

The Pentagon's buying rhythms are way out of whack with the best practices of industry, LaPlante said. While DOD may take a year-and-a-half to do a simple software update on a weapon system, contractors can't work with that. Their own schedule of software updates is orders of magnitude faster; Facebook does many “every day,” he pointed out.

The panelists warned that current procedures are deterring new players from getting into defense work, and as a result, those that know how to work the system—and can weather the awful delays involved—are growing more powerful and crowding out potential competitors.

“We're one merger or acquisition away” from being down to a single supplier in categories such as ships, fighter aircraft, and

helicopters, LaPlante noted. The 809 Panel reported that out of a field of "300 prime contractors, platform providers, and subtier companies" in the 1980s, the Pentagon is down to "the five mega primes of today: Boeing, Lockheed Martin, Northrop Grumman, Raytheon, and General Dynamics."

The 18-member panel has hired staff and is beginning to tackle the project. Their going-in goals are to make the Pentagon more adaptable to an accelerating threat environment; make the Pentagon a more attractive customer; use scarce procurement resources more efficiently; simplify the process so things can be bought more quickly; and "encourage and incentivize the workforce to make sound, mission-driven decisions."

WHAT ABOUT "BUY RATE, BUY RATE"?

The Air Force is only asking for 46 F-35As in the Fiscal 2018 base budget. That's actually down two airplanes from the enacted Fiscal 2017 budget—and far short of the goal service leaders have been touting for years. In March, Chief of Staff Gen. David L. Goldfein said at AFA's Air Warfare Symposium that the service wants to get the purchase numbers on F-35s up "as quickly as we can," while recently retired Air Combat Command chief Gen. Herbert J. "Hawk" Carlisle made "buy rate, buy rate, buy rate" a mantra of his last year of service. In an exit interview with *Air Force Magazine*, Carlisle pointed out that by the plans of seven years ago, the Air Force by now was expected to be buying at least 80 F-35s per year and possibly as many as 110. (See "Combat Forces in Peril," July 2017.)

"We want to get to 60" per year, Air Force Secretary Heather A. Wilson said at an AFA-sponsored industry breakfast in June, but with direction from the administration to focus on readiness, along with a need to rebuild manpower, 46 was all that could be managed in Fiscal 2018, she said. Wilson said that "all 1,763" F-35As the service plans to buy "will not be on the ramp at the same time." By the late 2030s, when the last batches are slated to be bought, the initial lots will have reached retirement age.

Wilson said that 14 additional F-35As do appear in USAF's Unfunded Priorities List, and if those are added by Congress, the Fiscal 2018 buy would go up to 60. The list is prepared for Congress every year by the services in answer to the perennial budget testimony question, "If you had more money, what would you spend it on?" Those 14 F-35As would represent an additional \$1.76 billion in the Fiscal 2018 budget. The fighters were the fourth-highest unfunded priority listed by the service, preceded by a set of readiness initiatives, space defense systems, and training hardware for the Space-Based Infrared System.

The remainder of the top 10 of the more than 50 items in the unfunded priorities package include three KC-46 tankers beyond the 15 already on tap; a replacement for the EC-130 Compass Call fleet; modifications to existing aircraft; and sustainment initiatives such as depot process improvements, satellite communications upgrades, and cyber initiatives. Collectively, the Unfunded Priorities List totals \$10.7 billion worth of things USAF says it needs but couldn't fit into its budget topline.

Shortly before his retirement ceremony in May, outgoing F-35 system program office director Lt. Gen. Christopher C. Bogdan told *Air Force Magazine* that, while he thinks the F-35 production



USAF has asked for 46 F-35s in the 2018 base budget. Fourteen more are on the Unfunded Priorities List.

program could be accelerated, the rate is "probably about right," given the importance of not demanding more aircraft than vendors can supply parts to build at this stage. Procurement cost reductions are happening largely because the learning curve continues to decline and because the volume of production is high, driven by international partner purchases and foreign military sales (FMS) customers, Bogdan said. (See "Clear of the Turbulence," this issue.)

WE'LL WAIT FOR THE NEXT ONE

The biggest tip off as to why the Air Force isn't placing a higher priority on ramping up F-35 production, however, was likely given in February during hearings supporting USAF's supplemental budget request. Lt. Gen. Jerry D. Harris Jr., deputy chief of staff for strategic plans and requirements, said in written testimony for the House Armed Services Committee that USAF might be better off waiting until 2021 to start surging F-35 production to 80 a year or more. That's when the first Block 4 versions of the jet are expected to start coming off the production line. From now until then, production will focus on the Block 3F model—the baseline version all three US services will use—and Harris suggested that buying too many F-35s too early would hand USAF a big bill later to modify the early jets to the more capable configuration. By 2021, "we should examine the option of accelerating the F-35A program above the current procurement rate," Harris wrote.

By Harris' numbers, USAF's F-35 production would be parked at just 48 a year through 2021, then rise to 80 or more. That jibes with a recent Government Accountability Office F-35 program report, with a chart showing Air Force F-35 production hovering around 46 to 48 per year from Fiscal 2018 through 2021. The GAO cited Department of Defense data for its chart source.

The wait is problematic, though: Air Force leaders openly acknowledge that the bulk of the fighter fleet—F-15s and F-16s—have a shelf life of only about 10 more years in a fight against a near-peer adversary. After that, air defenses around the world will render the nonstealthy fourth generation fleet incapable of surviving modern air combat. They would have to be relegated to less-contested battles, and there might not be enough fifth generation fighters in the inventory by that point to do the job. Moreover, production of F-35s for partners and FMS customers is expected to keep climbing, making slots on the production line increasingly hard to get. Bogdan and Lockheed Martin have both quoted a maximum production rate of about 220 F-35s a year, without investment in significant additional tooling and workforce.

Past Is Prologue?

President Donald Trump's first defense budget left a lot to be desired for just about everyone on Capitol Hill, calling into question how much of the \$668 billion proposal will actually become law.

Democrats were, as expected, angry that Trump cut domestic programs deeply to foot the bill for defense, blowing past previously established budget caps by some \$54 billion for Pentagon programs.

But defense hawks were left wanting as well, making clear they want another \$40 billion next year to buy the aircraft, ships, and other weaponry they see as vital to securing the nation.

The summer legislative session is underway, and defense authorizers and appropriators are hard at work on their cornerstone bills, which manage to make their way through Congress each year.

In the end, the number for defense, as well as the detailed priorities, will require a significant compromise between the two parties on Capitol Hill and the Trump administration, which has listed a military buildup as one of its top priorities.

The topline for the base (non-war) defense budget—encompassing Pentagon spending, as well as national security programs at the Department of Energy and some other cats and dogs in the federal budget—was set in a 2011 budget law that also established firm limits for non-defense spending.

Over the last six years, Congress has managed to patch together a series of year or two-year compromises that have given the Pentagon a modest increase over those caps, but typically far less than what GOP hawks would like the military to have at its disposal.

The last agreement expired this fiscal year, so lawmakers will have to once again negotiate the defense—as well as the non-defense—figure before coming to any final decision on the budget.



Secretary of the Air Force Heather Wilson and USAF Chief of Staff Gen. David Goldfein prepare to testify June 6 on the Defense Authorization Request for Fiscal Year 2018.

If the final appropriation for Fiscal 2018 exceeds the established caps and there is no agreement for additional spending, the indiscriminate across-the-board cuts known as sequestration would take effect.

If past is prologue, there will likely be some agreement reached this year that will provide more money for defense for at least Fiscal 2018.

But Trump's proposed \$54 billion plus-up—let alone the additional \$40 billion demanded by the Republican chairmen of the House and Senate Armed Services committees—seems like a pipe dream in this political climate, particularly as Democrats try to safeguard non-defense priorities like foreign aid that Trump cut deeply in his first spending proposal.

The path ahead for defense legislation will be filled with hurdles, perhaps none as big as the administration itself.

That then leaves it to appropriators on Capitol Hill to try to squeeze as much into the defense spending bill as they possibly can. One option is to add unfunded base-budget programs to the overseas contingency operations (OCO) account, not capped under the long-standing budget law.

But Democrats will, as in years past, balk at that move as a ploy and an end run around the caps. Unless non-defense programs receive a similar boost, they likely won't go for the maneuver, making it a risky proposition that could hold up all spending bills in the Senate, where the minority party can (and will) use the filibuster to kill legislation.

House lawmakers attempted the OCO gambit last year, but their colleagues in the Senate opted to take a scalpel to the defense bill instead. They made hundreds of surgical cuts to the defense budget, spreading the financial pain across the Pentagon's massive portfolio rather than gutting a handful of line items.

As a result, they were able to free up billions to pay for 74 F-35 strike fighters, 11 more than originally requested by the Obama administration, and other pricey weapons priorities, many that the military chiefs outlined in their annual budgetary wish lists sent to Capitol Hill.

The path ahead for defense legislation and all of the spending bills will be filled with hurdles, perhaps none as big as the administration itself. Lawmakers have become accustomed to this ritual of renegotiating the caps, but the administration is new to this particular dance.

A continuing resolution for at least the first several months of the fiscal year—and perhaps longer—seems to be a sure bet for Oct. 1 and beyond. That will cause heartburn at the Pentagon, as it always does. But Democrats and Republican alike have shown repeatedly over the last several years that they are committed to pushing the defense spending bill to the President's desk for signature, even if that happens more than halfway through the fiscal year.

Megan Scully is a reporter for *CQ Roll Call*.

KEEPING ON IN QATAR

Saudi Arabia, United Arab Emirates, Bahrain, Egypt, and other Muslim nations in June cut diplomatic ties and sea and land connections with Qatar, saying the Gulf Cooperation Council (GCC) country supports terrorism.

Saudi Arabia made the decision "as a result of grave violations being committed by the authorities in Doha over the past years," according to a statement posted by the official Saudi news agency.

In the statement, Saudi Arabia accused Qatar of supporting the Muslim Brotherhood, ISIS, al Qaeda, Iran-backed "terrorist groups," and other extremists.

Just hours after the announcement, commercial airlines in the region began suspending flights between Doha and cities in the four other countries. However, US military aircraft continued to conduct missions out of al Udeid Air Base, Qatar, said Lt. Col. Damien Pickart, spokesman for US Air Forces Central Command.

That included flights in support of Operation Inherent Resolve, Freedom's Sentinel, and chartered flights that carry service members to and from the area, Pickart said.

"The United States and the coalition are grateful to the Qataris for their longstanding support of our presence and their enduring commitment to regional security," Pickart said in an email to *Air Force Magazine*.

"We encourage all our partners in the region to work towards common solutions that enable regional security," he continued.

Secretary of State Rex W. Tillerson, speaking at a press conference in Australia, said he believes there is "a growing list of some irritants in the region that have been there for some time, and obviously they have now bubbled up to a level that countries decided they needed to take action in an effort to have those differences addressed."

Tillerson said the US "certainly would encourage the parties to sit down together and address these differences," adding that "it is important that the GCC remain unified."

Still, he said he did not expect the move to have an impact on the "unified fight against terrorism in the region or globally."

Qatar's Ministry of Foreign Affairs said it was surprised at the decision by the countries to sever diplomatic relations and said the move was "unjustified and based on false claims and assumptions," according to a translation by Al-Jazeera.

Qatar "has been subjected to a campaign of lies," the statement continued, alleging that the move revealed "a hidden plan to undermine the State of Qatar."

Al Udeid is the home of the 379th Air Expeditionary Wing, and more than 11,000 US and coalition troops are deployed to or assigned to the base. Nearly 1,000 of those troops work in the combined air and space operations center, and an aircraft takes off or lands there about every 10 minutes, 24 hours a day, seven days a week, Pickart said.

PRACTICE MAKES PERFECT

In May, 12 F-15C Eagles, two KC-135 Stratotankers, and about 230 England-based airmen deployed to bases in Finland and Sweden for exercise Arctic Challenge 2017.



Despite upheaval in Qatar, USAF continues operations, like this B-52's arrival, at al Udeid Air Base.

The exercise included troops from Belgium, Canada, Finland, France, Germany, Norway, the Netherlands, Sweden, Switzerland, the United Kingdom, and the US. Arctic Challenge included live-flying training for offensive and defensive air combat.

The goal was to work with partner nations and increase interoperability, said Lt. Col. Jason Zumwalt, commander of the 493rd Fighter Squadron.

"These practice opportunities and experiences allow our pilots and maintainers to work together side-by-side with our partners and allies to plan, execute, and debrief some very complex missions. That allows us to see how we can better work together in the future," he said.

Also in Europe, the Baltic Operations exercise—known as BALTOPS—in June marked the first time in two decades that a US E-3 Sentry AWACS aircraft participated in a NATO exercise, according to the Air Force.

Lt. Col. Jim Matthey, detachment commander for the 513th Air Control Group, said since the airmen are Reservists, most of their training is in the US, "so it is vital we seek opportunities to integrate and exercise various operation plans."

The unit participated in three exercises in the Pacific region in the past two years and decided to work with US Air Forces in Europe this time "to learn and integrate with our European friends," Matthey said.

BALTOPS gave the Reservists the opportunity to work with about 900 airmen from 13 NATO nations—"quite an endeavor, considering we all fly and fight with very different equipment," Matthey said.

The annual exercise took place in the Baltic Sea during the first half of June and involved more than 50 aircraft, including three B-52H Stratofortresses from Barksdale AFB, La., as well as 50 ships and submarines, and was designed to strengthen response capabilities and demonstrate the ability of allied and partner nations to ensure stability in the Baltic Sea region—and defend it if necessary.

On June 6, the first day the bombers flew in support of BALTOPS, a Russian Su-27 intercepted a B-52 as it flew over international waters near Russia's border. The Russian fighter took off from its Baltic fleet air defense unit based in Kaliningrad, located between Poland and Lithuania. Russian officials said the presence of the US nuclear-capable bombers so close to the Russian border "hardly helps de-escalate tensions in Europe," according to the State-owned Sputnik news service.

Jennifer Hlad is a freelance journalist based in the Middle East and a former *Air Force Magazine* senior editor.

Photo: TSgt. Nathan Lipscomb

★ SCREENSHOT





06.12.2017

An E-4B belonging to the 595th Command and Control Group and operated by the 1st Airborne Command and Control Squadron flies over northern California. The E-4B serves as the National Airborne Operations Center for the President, Secretary of Defense, and the Joint Chiefs of Staff. Oct. 1 will mark the one-year anniversary of the 595th realigning under 8th Air Force as part of efforts to centrally manage USAF's nuclear enterprise and support systems.

■ CV-22 Airmen Awarded Distinguished Flying Cross

Maj. William J. Mendel, a CV-22 pilot assigned to the 20th Special Operations Squadron at Cannon AFB, N.M., and TSgt. James M. McKay of the 7th SOS at RAF Mildenhall, UK, each recently received a Distinguished Flying Cross.

Mendel's ceremony took place May 15, McKay's on June 2.

On Dec. 21, 2013, then-Captain Mendel and McKay, then a staff sergeant, were deployed with the 8th Expeditionary Special Operations Squadron to Djibouti. On a mission to evacuate American citizens from a United Nations compound, their aircraft came under heavy fire and "sustained severe damage, including ruptured fuel tanks, complete loss of the largest hydraulic system, and an inoperable emergency lubrication system," according to an Air Force Special Operations Command press release.

They conducted an emergency refueling that involved manual extension of the damaged refueling probe, to allow their aircraft to land outside the conflict zone. Mendel coordinated with a pararescue team to arrange medical treatment for four critically wounded personnel on the lead aircraft in his formation.

That team initiated a blood bank to give life-saving transfusions to the wounded on their emergency landing in Uganda. Mendel and McKay were responsible for safely recovering four crew members, nine passengers, and their aircraft, according to their award citations.



Maj. William Mendel at his Distinguished Flying Cross ceremony. The DFC recognizes heroism or extraordinary achievement in an aerial flight.



The actions and knowledge of TSgt. James McKay—shown here at his medal ceremony—allowed the crew to focus on arranging support for the wounded.

■ First F-35 Block Buy Contract

The Defense Department awarded Lockheed Martin a \$1.38 billion contract to start the process of the so-called block buy program, expected to save \$2 billion over three lots of production.

The contract buys "long lead time materials, parts, components, and effort" for 130 US and foreign F-35s in Lot 12, and

110 foreign F-35s in Lots 13 and 14, the Pentagon said.

The US can't participate in the block buy—akin to a US multiyear procurement—as such because a program must be in full-rate production to qualify, and the F-35 is still in a low-rate phase. However, the US can obtain cost benefits from F-35 partners purchasing economic order quantities—ma-

Most of the contract is for foreign-F-35 materials. The rest is long-lead purchasing for US aircraft.

terials in large volume—and from improvements in the learning curve stemming from the higher rate of production.

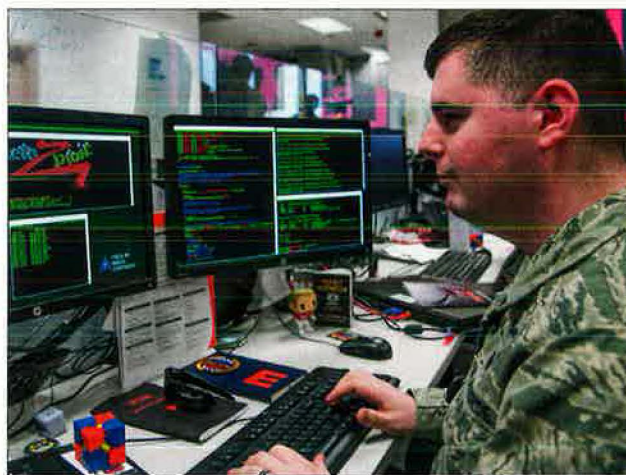
■ Not Enough People To Solve the Cyber Threat

Human personnel alone cannot adequately respond to the cyber threats facing the US military today, Deputy Secretary of Defense Robert O. Work told Congress. "This is an area where we will not be able to solve it with people," he told the Senate defense appropriations

subcommittee. As directed by the 2017 National Defense Authorization Act, the Pentagon is "elevating Cyber Command to a full combatant command," Work said, and "we're on track to have all of our cyber mission teams fully operationally capable by September 2018."

The refocused command will have defensive and offensive components.

"We're putting together the structure to be able to watch our networks and also to prepare tools that our national command authority can use if necessary," Work said. But he emphasized the need to develop "artificial intelligence and learning machines to push back" against cyber threats because "there just are not enough people to defend our networks against all of the attack surfaces that we have."



A cyber protection team member participates in the Air Force's Exercise Black Demon in May at Scott AFB, Ill. The exercise validated an ability to protect and defend critical missions and assets.

Photos: SRA, Lane T. Plummer; ATC Tenley Long; SRA, Christine Groening; ATC Daniel Garcia



A KC-135 sits in a hangar at McConnell AFB, Kan., built for its follow-on, the KC-46 Pegasus tanker. The White House requested funds for 15 of the new refuelers.

■ Trump Proposes \$574 Billion in Military Spending

President Donald Trump is requesting \$574 billion in base funding for the Department of Defense and \$65 billion in overseas contingency operations (OCO) funding for Fiscal Year 2018. The base budget requests a three percent increase over the Obama administration's final 2018 projection.

The budget includes money for 70 new F-35 strike fighters and 15 KC-46 tankers. The Army would also buy 61 new Apache helicopters, 48 Black Hawks, and 2,775 Joint Light Tactical Vehicles. The Navy would get 14 F/A-18 fighter aircraft, two Virginia-class submarines, two destroyers, a Littoral Combat Ship, and a carrier.

Members of Congress who had hoped Trump would lead a major rebuilding of the military immediately criticized the re-

quest. Sen. John McCain (R-Ariz.), chairman of the Senate Armed Services Committee, released a statement May 23, saying the proposal "fails to provide the necessary resources to restore military readiness" and would be "dead on arrival in Congress."

Rep. Mac Thornberry (R-Texas), chairman of the House Armed Services Committee, said in a statement, "The administration's budget proposal for defense is not enough to do what the President said he wants to do." Both McCain and Thornberry have supported a DOD budget that begins with a \$640 billion topline and adds OCO funding on top of that.



An MQ-9 Reaper remotely piloted aircraft prepares to land at Holloman AFB, N.M., last December.

■ Holloman MQ-9 Crashes During Training Mission

An MQ-9 remotely piloted aircraft assigned to Holloman AFB, N.M., crashed around 11:30 a.m. on May 2, "seven miles south of Highway 70," according to a base press release. A spokesperson told the

Alamogordo Daily News that the Reaper was on its way back to base after a routine training mission. An Air Force spokesman declined to say if any property was damaged or if anyone was injured when the RPA crashed, saying only that the incident was "still under investigation."

■ Pentagon Begins Nuclear Defense Review

The Defense Department began its Ballistic Missile Defense Review, an in-depth study of ways to strengthen homeland defense. The review comes at a time when North Korea is repeatedly testing ballistic missiles and challenging US interests in the Pacific. It will focus on strengthening missile defense capabilities and providing policy framework.



Selva

Like the recently announced Nuclear Posture Review, the Ballistic Missile Defense Review will be led by Vice Chairman of the Joint Chiefs of Staff USAF Gen. Paul J. Selva and Deputy Defense Secretary Robert O. Work. A final report is expected by the end of the year.

The War on Terrorism

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

■ Casualties

As of June 12, a total of 40 Americans had died in Operation Freedom's Sentinel in Afghanistan, and 43 Americans had died in Operation Inherent Resolve in Iraq and Syria.

The total includes 80 troops and three Department of Defense civilians. Of these deaths, 38 were killed in action with the enemy, while 45 died in noncombat incidents.

There have been 183 troops wounded in action during OFS and 42 troops in OIR.

■ Yemen Raid Kills Seven Militants

US special operations forces conducted a raid in the Marib governorate of Yemen on May 23 that killed seven militants and wounded several American personnel, Pentagon spokesperson Navy Capt. Jeff Davis told reporters. The raid was a "counterterrorism operation" against a "base of operations" for al Qaeda in the Arabian Peninsula.

The special operators engaged in a firefight and called in "precision air strikes" from an AC-130 gunship. The raid was conducted with the cooperation of the Yemeni government. It was also the "furthest inland" ground operation US forces have conducted in Yemen to date, Davis told reporters.

■ NATO Considering More Troops to Afghanistan

NATO is considering sending more alliance troops to Afghanistan, Secretary General Jens Stoltenberg said. "We have received a request from our military authorities to increase our military presence in Afghanistan with a few thousand troops,"

he said after a meeting with British Prime Minister Theresa May in London on May 10.

The troops would serve in the "train, assist, and advise" mission, helping Afghan forces as they fight to defeat the Taliban and other extremist forces. Stoltenberg said NATO would decide "on the scale and scope of the mission within weeks."

US Army Gen. John W. Nicholson, commander of US Forces Afghanistan, told Congress in February that the NATO mission there had a "shortfall of a few thousand troops." NATO currently has 13,000 troops stationed in the country, and the US has 8,400.

The Pentagon in May was expected to present a plan to the White House to increase the US troop presence in Afghanistan by as many as 5,000 troops.

■ New Counter-ISIS Strategy Is All About Speed

Speed is the focus of the Department of Defense's new counter-ISIS strategy. "No longer will we have slowed decision cycles because Washington, D.C., has to authorize tactical movements on the ground," Secretary of Defense James N. Mattis told reporters while briefing the new strategy.

Mattis claimed that speed already made a difference in the last stages of the battle for Mosul in Iraq and the lead up to the fight for Raqqa in Syria. The impact of the new strategy has "shown up clearly in our tactical reports," he said, without elaborating. The goal of this faster war is the "annihilation" of ISIS.

Two factors drive the new approach. First, Mattis said, President Donald Trump has "delegated authority to the right level to aggressively and in a timely manner move against enemy vulnerabilities." Mattis insisted that empowering commanders on the ground in this way would involve "no change to our rules of engagement" and "no change to our continued extraordinary efforts to avoid innocent civilian casualties."

Second, Mattis said, Trump has "directed a tactical shift" that emphasizes "surrounding the enemy in their strongholds so that we can annihilate ISIS." He said previous approaches have involved "simply shoving [ISIS fighters] from one [place] to another and actually reinforcing them as they fall back." This has allowed defeated fighters to escape to another area where they can fight another day.

380th Air Expeditionary Wing airmen salute the US flag June 2 during a ceremony in Southwest Asia. The commander of US forces in Afghanistan told Congress that the NATO mission there was short "a few thousand troops." The US has 8,400 stationed in Afghanistan.



Photo: SRA Preston Webb

■ Distracted Pilot Caused MQ-9 Crash

Preoccupation with checklist procedures and a failure to correctly respond to stall warnings led to the crash of an MQ-9A Reaper during a training flight at the Nevada Test and Training Range on June 7, 2016.

Just before the accident, a crew from the 26th Weapons Squadron at Nellis AFB, Nev., had received control of the RPA from the Launch and Recovery Element, 432nd Wing, Creech AFB, Nev. The pilot taking control mistook the Reaper's climb to a preprogrammed altitude as a system malfunction. He switched to landing configuration—which disables stall protection—to turn off the autopilot and take manual control of the aircraft. The pilot was "preoccupied with the handover checklist" when the aircraft stalled a moment later. He failed to recognize the display warnings, the accident investigation board report said.



An MQ-9 Reaper awaits maintenance at Creech AFB, Nev.

When his sensor operator alerted him to the stall, he increased power, causing the aircraft to spiral toward the ground and crash.

The MQ-9A was destroyed at a cost of \$11 million. The pilot had 767 MQ-9A flight hours and 451 hours of MQ-9A instructor flying time, according to the report.



SrA. Joseph Fletcher and A1C Christopher Kelly of the 71st Expeditionary Air Control Squadron prepare to inspect a TPS-75 radar. 3DELRR is a follow-on to this radar.

■ Raytheon Wins 3DELRR Contract, Again

The Air Force awarded a \$52.7 million engineering and manufacturing development (EMD) contract to Raytheon for the 3-D Expeditionary Long-Range Radar (3DELRR) system. The radar is a C-band follow-on system for the AN/TPS-75, and it can track aircraft, missiles, and remotely piloted aircraft.

Raytheon originally won a \$19.5 million EMD contract for the program in 2014, but Northrop Grumman and Lockheed Martin filed protests with the Government Accountability Office over the decision. When the Air Force reopened the competition, a Raytheon appeal of that decision was denied in federal claims court in 2015.

The Air Force now plans to buy 35 of the new radars with an anticipated initial operational capability of 2023, Air Force Life Cycle Management Center spokeswoman Patty Welsh told *Air Force Magazine*. Under the May 11 contract, Raytheon "will provide EMD of three 3DELRR production representative units."

■ USAF Lifts Weight Restrictions for F-35 Pilots

The Air Force has lifted the weight restrictions governing F-35 pilots. In 2015 the Air Force announced that pilots weighing less than 136 pounds could not fly the jet due to risks during ejections. Since then, the Air Force has installed a switch on the seat that delays parachute deployment at high speeds and decreases the opening force for lighter weight pilots, according to an Air Force news release.

The seat is now certified for any pilot weighing between 103 pounds and 245 pounds. The Air Force also installed a head support panel on the risers of the

parachute to prevent the pilot's head from snapping backward during an ejection, and it decreased the weight of the helmet to reduce risk.

USAF completed extensive testing of the changes before removing the restriction. F-35 Integration Office Director Brig. Gen. Scott L. Pleus said he personally briefed every USAF F-35 pilot about the changes. "I'm confident our pilots are no longer concerned with the safety of the F-35 ejection system," he said in the press release.

The new ejection seats are being retrofitted into the fleet, and lightweight helmets are in preproduction, according to the Air Force.



F-35 pilot Lt. Col. Dave DeAngelis prepares for a flight in May at Hill AFB, Utah. Ejection seat and other modifications were to improve safety for the airplane's pilots.

■ US Successfully Tests Ballistic Missile Interceptor

The United States tested its Ground-based Midcourse Defense (GMD) system on May 30 by intercepting a mock ICBM target for the first time. The test ICBM was fired from the Ronald Reagan Ballistic Missile Defense Test Site on Kwajalein Atoll in the Marshall Islands, and the interceptor launched from Vandenberg AFB, Calif.

"This system is vitally important to the defense of our homeland, and this test demonstrates that we have a capable, credible deterrent against a very real threat," said Missile Defense Agency (MDA) Director Vice Adm. James D. Syring.

In 2014, the US successfully tested the GMD against a long-range missile after a number of failed attempts between 2010 and 2013. The GMD is designed to destroy intermediate- and long-range ballistic missiles threatening the homeland.

Following the test validation of the system, the agency is "on track" to increase the number of ground-based interceptors from



The 341st Missile Wing, 576th Flight Test Squadron, and 30th Space Wing conducted the launch.

36 to 44 by the end of 2017, said J. Gary Pennett, MDA director of operations. Syring said the threat scenario was specifically designed with North Korean and Iranian capabilities in mind.

After the successful test, Syring said he is confident the GMD program will be able to address current and developing threats through the year 2020, based on US intelligence reports about global ballistic missile capabilities.



An artist's concept illustrates Boeing's Phantom Express autonomous Experimental Spaceplane.

■ DARPA Picks Boeing for XS-1 Spaceplane Project

The Defense Advanced Research Projects Agency has chosen Boeing to be its collaborator in a public/private partnership to develop the Experimental Spaceplane, or XS-1.

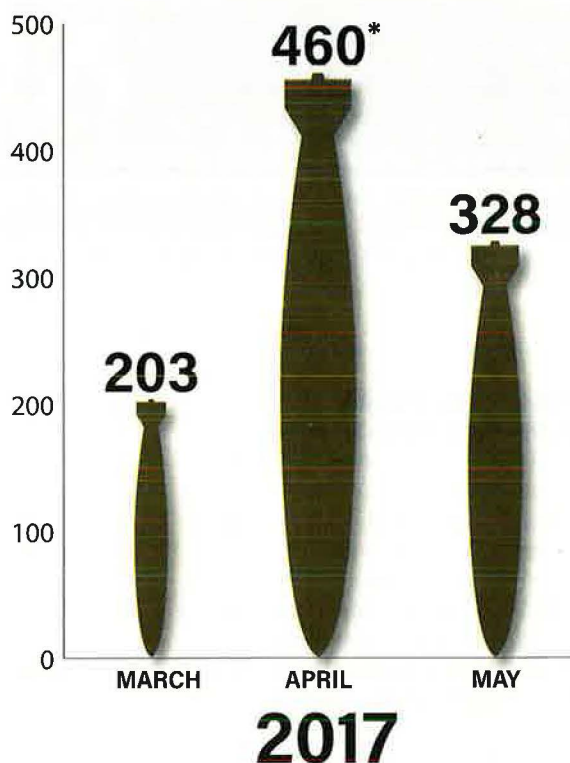
The winning concept—dubbed by Boeing as the Phantom Express, after its Phantom Works advanced projects organization—is a reusable winged launch vehicle that carries its payload with a booster rocket piggyback at hypersonic speed to high altitude. After releasing the payload and booster to continue their journey to orbit, the XS-1 will return to Earth, landing on a runway like an airplane.

Fabrication will take place through 2019, with flight evaluations projected for 2020. Both DARPA and Boeing are investing money in the concept; DARPA's share is about \$146 million.

Aimed at "short notice, low-cost access to space," according to a DARPA press release, the project calls for operating the engines on the ground 10 times in 10 days, followed by 12 to 15 actual flight tests without a payload, at speeds up to Mach 5. All this would culminate in 10 actual suborbital missions flown in 10 days, with one further flight to loft and deploy a 3,000-pound satellite. The overall idea is to achieve an "aircraft-like" operations tempo, DARPA said.

By the Numbers

NUMBER OF BOMBS DROPPED BY COALITION FORCES IN AFGHANISTAN

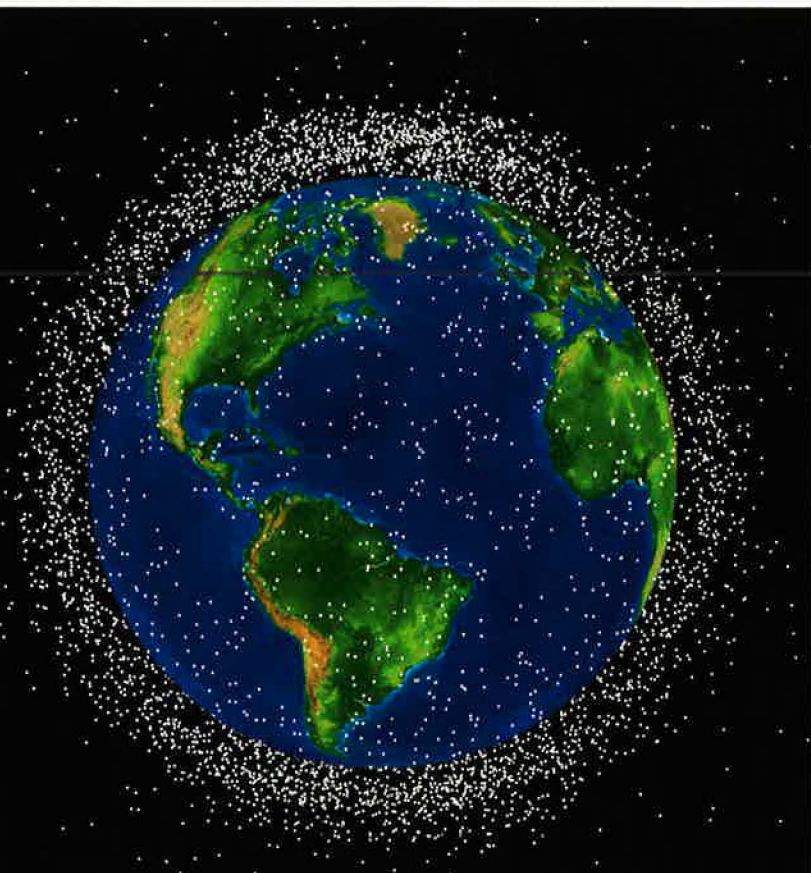


*Highest monthly total since August 2012

Source: US Air Forces Central Command Combined Air Operations Center

Photo: SRA, Christian Clausen; USAF; Paul Holcomb/USAF; DOD; Boeing illustration; Betsy Moore/AFA staff

A CLOSER WATCH ON SPACE



USAF is moving to better track junk and adversary actions in space.

By Wilson Brissett, Senior Editor

Gen. John W. “Jay” Raymond, the Air Force Space Command (AFSPC) chief, wants to bring space into the mainstream of combat domains—alongside air, surface, subsurface, and cyber. To do that, USAF must first refine its ability to spot and assess threats, achieving true situational awareness in space.

AFSPC has argued loudly about the need to speed up the acquisition process, in large part because of its needs in the arena of Space Situational Awareness. Mastery of SSA is “one of our top priorities,” Raymond said at an April Space Symposium press briefing.

At the same event, Lt. Gen. David J. Buck, who leads 14th Air Force and US Strategic Command’s Joint Functional Component Command for Space, added, “Our space intel expertise has not kept pace with emerging threats, so we’re revamping our intelligence approach. We’re finding that Russia and China particularly have the ability to perform complex on-orbit maneuvers,” and the Air Force needs to be able to accurately characterize what those craft are doing.

The problem is the US has been operating with an idea of SSA developed for an earlier era, where the worst that could

happen was an accident producing a lot of orbiting debris.

“If you are operating in a benign domain, knowing where something is in space is important, and that’s probably all you need” to avoid collisions, Raymond said, noting, “our SSA capabilities have really grown up around the space catalog.”

EXPANDING DEBRIS FIELD

Things changed forever in 2007, when China demonstrated an anti-satellite weapon against one of its defunct satellites. The resulting debris field of more than 3,000 pieces of space junk has created a lot of concern in the years since. The existence of the weapon caught AFSPC’s attention, though.

“They actually tested firing a kinetic weapon at one of their own spacecraft,” Peter Bernstein, AFSPC’s SSA chief architect, told *Air Force Magazine*. “That’s probably the most drastic end” of the threat spectrum SSA must defend against today, he said.

A graphic from the NASA Orbital Debris Program Office depicting space debris in low Earth orbit and the region of space within 2,000 miles of the Earth’s surface.

Photo: NASA graphic



“OUR SPACE INTEL EXPERTISE HAS NOT KEPT PACE WITH EMERGING THREATS.”

—Lt. Gen. David J. Buck
Commander, 14th Air Force

If an enemy “wanted to take a spacecraft and actually use that as an anti-satellite weapon,” Bernstein said, SSA needs to be good enough to anticipate such an event.

That’s why space cataloging is “probably not good enough,” Raymond contended. Buck insisted that, in contrast to “space traffic management,” SSA “gives me attribution, ... intent, [and] ... knowledge of who’s operating. It gives me knowledge of capabilities.”

SSA, then, is no longer just about tracking objects to avoid collisions in space. In fact, the Air Force is discussing with the FAA how it might hand over to a civil authority some of its space traffic management duties. USAF is beginning a pilot program this summer that will bring some FAA personnel to Vandenberg AFB, Calif., to “get a feel for what the mission is about,” Buck said. The change is a matter of prioritizing military space activities.

“I don’t think [Buck] has to be the person who pulls out the Rolodex and calls company X [and] says, ‘Hey, you might hit a piece of debris,’” Bernstein said. “Somebody else could do that and we could focus our military manpower on other things.”

NEW SPACE FENCE IN THE PACIFIC

One of them is characterizing threats. Characterization doesn’t disregard the tracking of space objects—in fact, it uses better tracking data to build a more granular level of knowledge about on-orbit assets.

The Space Fence is a wide area search and surveillance sensor the Air Force is building on the Kwajalein Atoll in the Pacific Ocean. The second such sensor built (the previous version was spread out at locations in the US), it is expected to reach initial operational capability sometime in 2018 and will be a significant part of achieving better vision of objects in space.

Bernstein said the Space Fence will allow the Air Force “to track smaller and smaller objects” to “filter out the clutter” and clarify the background picture in space. This is crucial work because, as more players get involved in space, the task of identifying lots of small objects becomes more urgent and more difficult. Bernstein mentioned “a recent Indian launch where there were over 100 payloads,” including very small satellites. “Space Fence’s ability to characterize the debris allows you to separate those small payloads from the background debris, ... so that you can focus in on the threats,” he pointed out.



Far left: The Space Fence testing facility near Philadelphia is similar to the larger digital radar system under construction on Kwajalein Atoll.

The AN/FPS-85, a 10-story-tall radar at Eglin AFB, Fla., tracks more than 22,000 orbiting satellites.



The Cobra Dane radar at Eareckson Air Station on Shemya Island, Alaska. It can detect objects 2,000 miles away and provides data for the Space Surveillance Network and the Ballistic Missile Defense System.

The goal is to use the refined sensor information—provided by systems like Space Fence—as a window into intent, strategy, and tactics in an increasingly uncertain space domain full of potential threats. The SSA of the future “would be able to tell you ... predictively that maybe [an adversarial] threat was going to maneuver and was going to engage with a [friendly] spacecraft,” Bernstein said.

VALUE OF PREDICTION

Prediction is the gold standard USAF is aiming for in SSA. It opens the door to understanding how adversaries’ space assets are behaving on orbit. To get that predictability, Bernstein said, “you want to know more about what an object’s capabilities are, what its potential uses could be, what’s [the] normal pattern of behavior versus [a] different pattern of behavior.”

Raymond told reporters that in this sense, “we do not have the level of SSA that we need today.”

The Air Force can make use of a broad spectrum of ground- and space-based sensors for the SSA mission. These range from radars and advanced telescopes to the Space Fence. Most are collateral sensors—having another primary mission but sharing information for the SSA mission—or contributing sensors, such as “labs or other folks that have a sensor or a telescope that for a small amount of time can augment SSA,” Bernstein said.

A key for the evolving SSA role is the Space Based Space

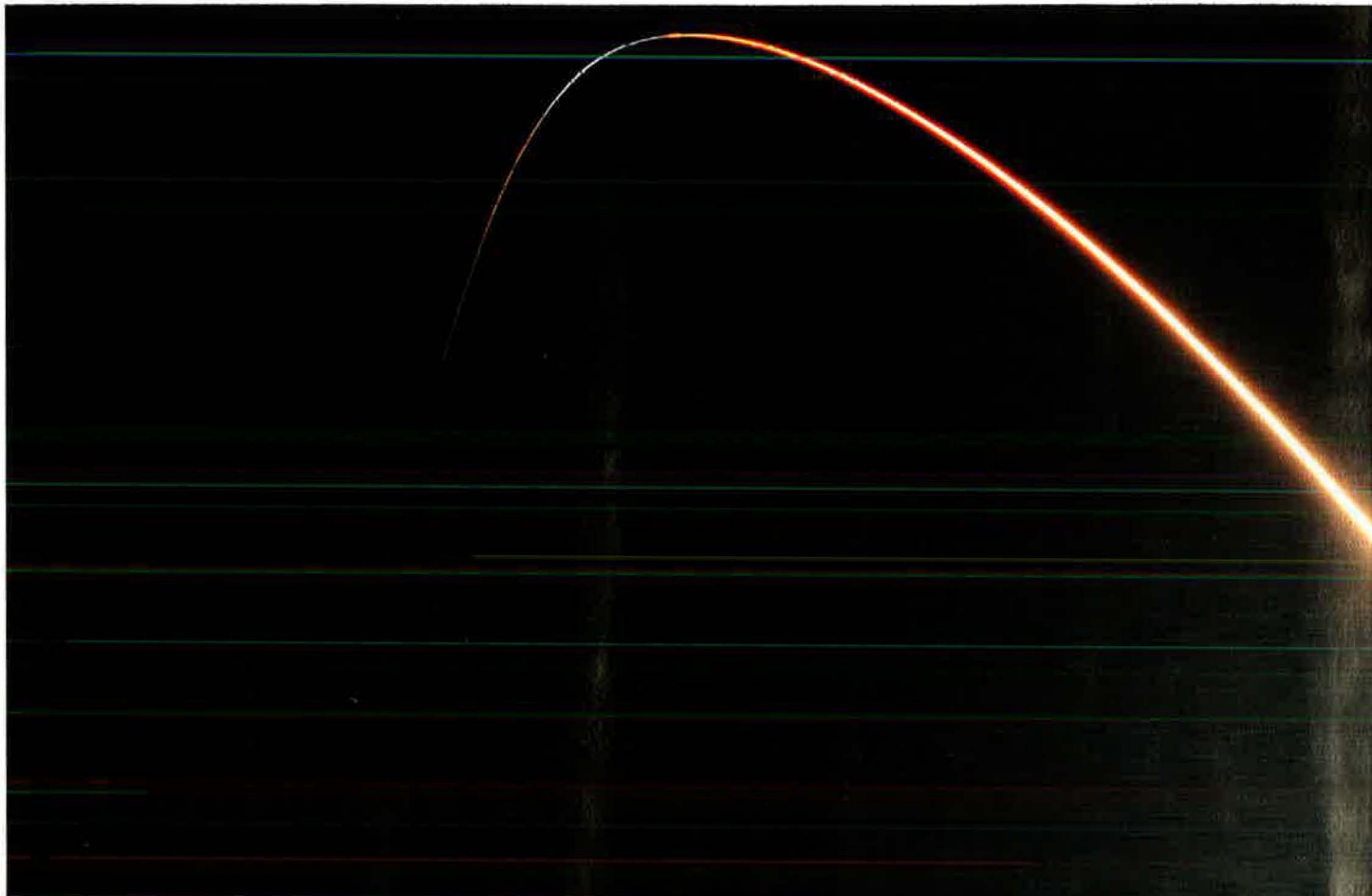
Surveillance (SBSS) system. It’s one of the few sensors dedicated to the SSA mission.

The current Block 10 SBSS will exceed its operational service life by the end of Fiscal 2020, but the follow-on won’t be ready until 2022. In the meantime, the fifth satellite in the Air Force’s experimental Operationally Responsive Space series may help. It was scheduled to launch in July.

“ORS-5 is going to be a partial gap-filler in the event that the SBSS Block 10 reaches its end of life before we get the follow-on online,” Maj. Brianna Keen, SBSS and Space Fence requirements lead, told *Air Force Magazine*. Keen said it’s still “to be determined” whether USAF will experience any lost capability during the transition.

Either way, Buck said ORS-5 will provide “another tool in our toolkit” to address the need for better SSA, but Air Force Space Command is developing other capabilities as well. “We are domain awareness vacuum cleaners right now,” Buck said. As a combat leader, “I can’t do what I want to do without domain awareness,” he said.

At the Space Symposium, Raymond told reporters he wants to establish ties with “organizations that may have the ability to go faster” in acquiring new capabilities, including SSA assets, and that he’s leveraging



Capt. Brian Goodman fine-tunes equipment before attempting to degrade a fighter squadron's space capabilities during a Red Flag exercise at Nellis AFB, Nev.

a number of existing strategies to achieve that goal.

The Air Force's Space and Missile Systems Center already has rapid acquisition authority through the office that manages the ORS series, Raymond said, and he has directed Lt. Gen. Samuel A. Greaves, SMC commander, to "use those authorities more broadly than we have

in the past." Raymond said he is looking for more ways to work with the Air Force's Rapid Capabilities Office (RCO), too.

FOSTERING PARTNERSHIPS

Bernstein said that SSA is "all about partnerships." To achieve better awareness in space, "you want to be able to collaborate with those that operate in that environment." Raymond pointed to AFSPC's ongoing cooperation with the National Reconnaissance Office as an example of how processes can be sped up. He noticed the NRO was already doing a space situational awareness program better than AFSPC, so instead of creating his own new program from the ground up, Raymond decided, "we'll just buy more of those capabilities" from the NRO. Fostering partnerships is a long-term approach, said Bernstein. "What we're trying to do is make sure, especially in a ... wartime environment, that we can achieve the necessary unity of effort."

Gen. Ellen M. Pawlikowski, head of Air Force Materiel Command and a former commander of SMC, told reporters at the symposium that today's space challenges are exactly the sort of problem rapid acquisition authorities were designed to solve. "The sweet spot" for those authorities, she said, comes "when you're trying to build that pathfinder, that first-of-a-kind that's trying to leverage innovative and creative approaches."

A Minotaur IV rocket launches from Vandenberg AFB, Calif., on Sept. 25, 2010. The rocket boosted the first Space Based Space Surveillance (SBSS) satellite into orbit.



Normalizing Military Space



Raymond

In a keynote speech at the annual Space Symposium in Colorado Springs, Colo., held in April, the commander of Air Force Space Command, Gen. John W. "Jay" Raymond, explained his new vision.

Space is "just like air, land, and sea," he said, asserting that the people of AFSPC are in a joint combat organization. To get this right, Raymond and Air Force leaders say—seemingly paradoxically—that the service must de-emphasize the uniqueness of space. Chief of Staff Gen. David L. Goldfein insisted at an AFA Mitchell Institute for Aerospace Studies event in February that "there is no such thing as war in space—it's just war, and it can extend into space."

To put space on the mainstream slate of combat, the Air Force should lead space operations among the services. Goldfein said in February that the Air Force "is eager to be named the lead service for space." At AFA's Air Warfare Symposium in March, Raymond explained that this isn't a USAF grab for influence but is about clarifying authorities in line with a congressional mandate to "push acquisition programs back down to the services." Single-service ownership will trim the number of authorizing voices required to bring new systems online and respond to new threats in space.

For this reason, the Air Force has created a new three-star deputy chief of staff position for space. The head of A11, who has not yet been named, will focus on "getting after rapid acquisition processes" and shifting "milestone decision authority" from the Department of Defense to the Air Force, Raymond told reporters.

authorities," the SMC commander can make an acquisition decision, "instead of going all the way up."

SPACE ENTERPRISE VISION

To collect as much data as possible for the SSA mission, the Air Force is looking to involve other nations. During the Space Symposium, US Strategic Command (STRATCOM) announced it's forming a new Multinational Space Collaboration (MSC) at Vandenberg. The effort will provide a framework for combined operations in space among the US, UK, Australia, New Zealand, Canada, and other nations, according to a STRATCOM press release.

As a first step in assembling an international partnership, STRATCOM expects "to have a German [liaison officer] in place at Vandenberg" sometime during this summer, Buck told reporters. He said a central focus of MSC will be improving situational awareness. "As space is a global commons, the MSC provides a vehicle to enhance sharing and collaboration with other like-minded nations," Buck said.

In April 2016, Gen. John E. Hyten, then chief of AFSPC and now head of US Strategic Command, announced a Space Enterprise Vision that sought a unified whole, "as opposed to a set of independent platforms." Maturing space situational awareness from largely monitoring space junk to characterizing the size, capability, and purpose of adversary spacecraft is the critical first step in realizing that vision. ★



Space situational awareness and SBSS crews operate in a new combined ops location at Schriever AFB, Colo.

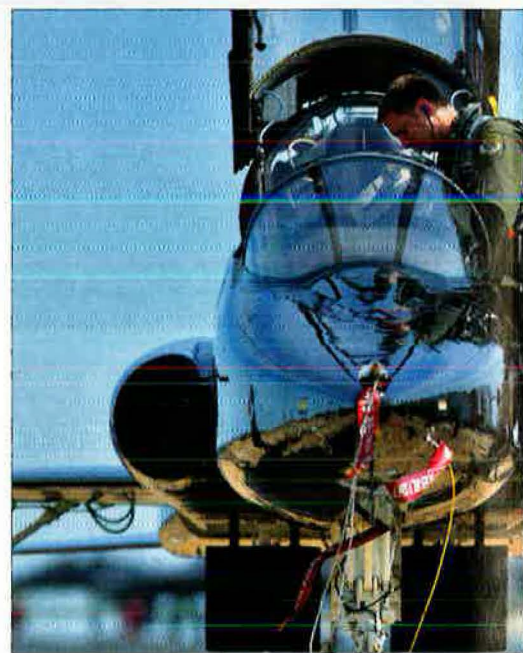
She said she was speaking not only of "new technologies" but of "new concepts of operation" for space. Pawlikowski added that using "other transaction authority" to "rapidly do contracts" for SSA as for other space mission sets would be crucial for making space acquisition happen faster.

A large part of the speed advantage is achieved through shortening the chain of command, she said. "Under the RCO



Atlantic Trident

A trilateral training exercise emphasizes the human element of air warfare.



The best fighter aircraft in the world—US Air Force F-22s and F-35s, British Typhoons, and French Rafales—gathered at JB Langley-Eustis, Va., in April to drill on air combat, hone alliance skills, and practice collaborative air supremacy.

Atlantic Trident 2017 was the second trilateral exercise among the countries, focused on preparing for high-end air combat. They flew together against US-supplied “Red Air” to test both the aircraft and their pilots.

“You can have the most capable

aircraft in the world,” said Col. Peter M. Fesler, the commander of Langley’s 1st Fighter Wing, but if a pilot can’t perform, “he will be beat.” Speaking with *Air Force Magazine* as the exercise wound down, Fesler explained, “That’s why training matters; it’s why we have to do things like [this exercise]. You can’t just buy airpower. ... Warfare is still a human endeavor.”

Midexercise, on April 21, the F-22 and Typhoon performed aerial demonstrations before assembled VIPs. The French demonstration team, the Patrouille de France, then painted the

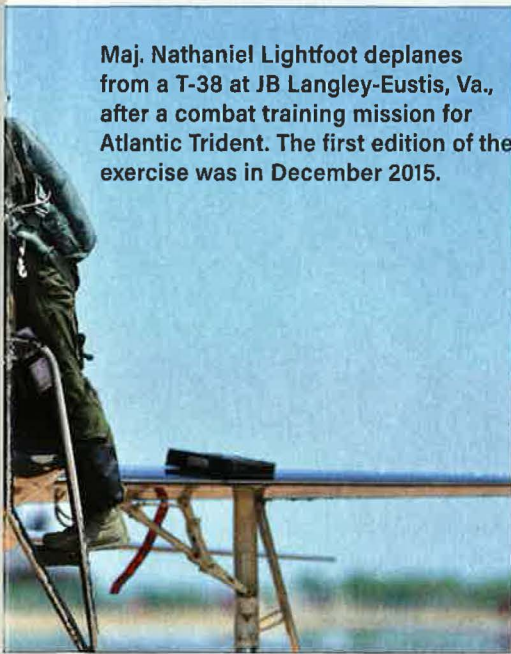
skies with red, white, and blue smoke. The daylong celebration marked the 100th anniversary of the US entering World War I—on April 6, 1917—a year after US pilots first volunteered for the Franco-American Lafayette Escadrille.

The first Atlantic Trident took place in December 2015, with the same cast of characters, minus the F-35. As the inaugural event, it centered on the logistics of the allied partners getting to Langley and operating at a high tempo. That first exercise was a public event, with air chiefs from all three countries appearing at a press confer-



L-r: A French Rafale, a British Typhoon, and a US F-35, F-15, and F-22 participate in the training exercise Atlantic Trident 2017.

Maj. Nathaniel Lightfoot deplanes from a T-38 at JB Langley-Eustis, Va., after a combat training mission for Atlantic Trident. The first edition of the exercise was in December 2015.



ence in front of their respective jets. Though the three air forces have flown together extensively in operations in Iraq and Afghanistan, Atlantic Trident provided an opportunity to address the high-end threat.

This second iteration stressed “‘Night One’ interoperability,” Fesler said.

Langley’s 1st Fighter Wing supplied the F-22s, while the 58th Fighter Squadron at Eglin AFB, Fla., sent F-35s. The UK’s Royal Air Force sent Typhoons from the 1 Squadron at RAF Lossiemouth, while France’s Armée de l’Air sent Rafales from its 30th and

4th Wings. The fleet of fourth and fifth generation fighters aimed to refine allied interoperability and develop tactics, techniques, and procedures for how they might fight together in wars of the future.

Tanker support came from the 2nd and 32nd Air Refueling Squadrons from JB McGuire-Dix-Lakehurst, N.J., while E-3 AWACS from the 552nd Air Control Wing at Tinker AFB, Okla., participated as the airborne command and control element.

Over the course of nearly three weeks, aircraft in the exercise flew about 510 sorties. The jets immediately took to the skies and flew together, executing two training scenarios per day.

Against the most advanced aircraft from three major allied powers, putting up a challenge was tough. For 16 days, the aircraft flew together in offensive operations in the suppression of enemy air defenses role. They also practiced offensive counterair and defensive counterair. Adversaries included F-15Es of the 391st Fighter Squadron visiting from Mountain Home AFB, Idaho, and T-38s from the 71st Fighter Squadron at Langley. The adversaries had a single, simple advantage: numbers.

“A big way to challenge fifth generation aircraft is to ... put a lot of aircraft in the air,” Fesler said. “You can run Raptors out of munitions and make pilots have to work.”

The F-22s and F-35s used stealth and

advanced sensors to coordinate the speed and firepower of the Eurofighters and Rafales in combat against F-15Es and T-38s, which in turn had to develop new tactics to take on the advanced aircraft, said Lt. Col. Brad Bashore, commander of the 58th FS.

While the 50-year-old T-38s can’t offer much of a firepower threat, the small and nimble jets can “sneak up” and fly close to the intruding aircraft and surprise them. The more modern and powerful F-15Es have advanced sensors that can pose a greater threat from a distance, Bashore said.

“Sometimes sheer numbers are more important than the actual technological capabilities of that airframe,” he said.

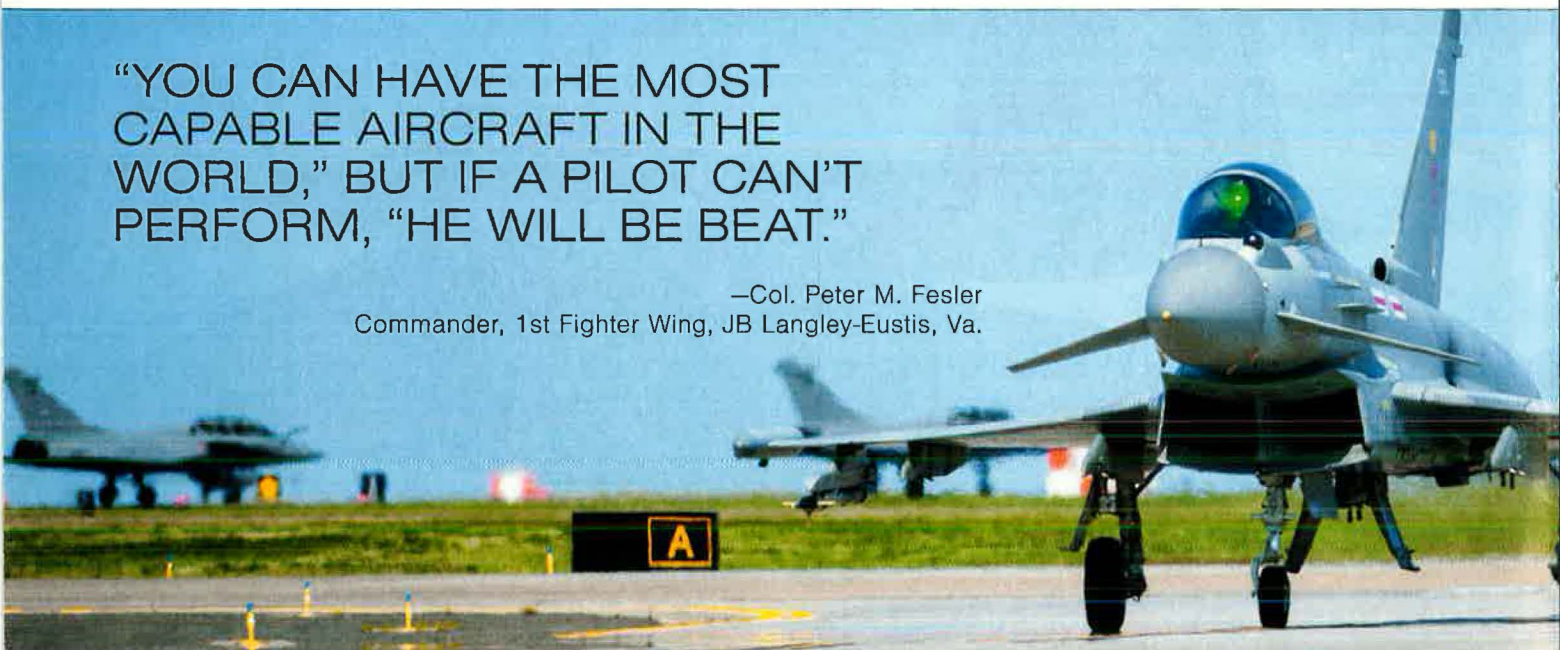
F-22 COMMUNITY IS FLEXED UP

The exercise comes as senior Air Force and Pentagon officials and members of Congress have sounded the alarm on readiness. USAF Chief of Staff Gen. David L. Goldfein, during a March appearance at a conference in Washington, D.C., said the service can sustain the tempo of today’s fights, but probably wouldn’t be able to fight simultaneous, large-scale wars. This is especially true if the opponent is a near-peer adversary with anti-access, aerial-denial capabilities.

For 1st FW, however, such training has been constant, and “the F-22 community is ready” for what comes next, Fesler said. Despite budget re-

"YOU CAN HAVE THE MOST CAPABLE AIRCRAFT IN THE WORLD," BUT IF A PILOT CAN'T PERFORM, "HE WILL BE BEAT."

—Col. Peter M. Fesler
Commander, 1st Fighter Wing, JB Langley-Eustis, Va.



An RAF Eurofighter Typhoon taxis at JB Langley-Eustis. Atlantic Trident integrated fourth and fifth generation fighters from the US, France, and the UK.

strictions, funding to keep F-22 pilots trained for the high-end threat—with exercises such as Atlantic Trident—has been steady.

"Some other platforms have been so focused on lower intensity conflict, [that] their skill set in the high end has atrophied," Fesler said. "They didn't have the excess capacity to focus on the next war. We're ready to go. We're ready for what might come."

LETHAL ASSETS

The 1st FW in April split its attention between current operations and high-end training. Even while Atlantic Trident was in full swing, F-22s from Langley's 27th FS were deployed to the Middle East flying daily missions targeting ISIS for Operation Inherent Resolve.

For the second edition of the exercise, F-22s weren't enough. The Air Force needed more fifth generation capability and called on Air Education and Training Command's main F-35 wing to participate. USAF's only operational F-35s, assigned to Hill AFB, Utah, were in Europe at the time of the exercise. Making the F-35A's first overseas deployment, jets from Hill flew to RAF Lakenheath, UK, for training with RAF units and with USAF F-15s stationed there. The F-35s made brief visits to Estonia and Bulgaria, to demonstrate their rapid deployability even from an already-deployed location.

Therefore, the "Gorillas" of Eglin's 58th FS flew up to Langley, but only

for part of the exercise. "We couldn't afford to be away for three weeks," Bashore said.

The F-35s flew in packages with the F-22 doing both offensive and defensive dogfight missions. The Raptors performed the air superiority mission, while the F-35s took on air-to-ground. The two USAF fifth generation fighters called on the Typhoons and Rafales for additional firepower in these missions, Bashore said.

"When you have these assets all together, it makes us all the more lethal," he observed.

The F-35 squadron sent instructor pilots to fly in the exercise, to capture lessons about the strengths and limitations of the aircraft, and so they could in turn pass this information on to students. Eglin's F-35s are flying with the Block 2B software suite. It is more limited than the Block 3I suite on Hill's operational F-35s.

THE MAN IN THE MACHINE

For the exercise, the jets were held to a top speed of Mach 1.6, a maximum 50 degree angle of attack, and seven G turns. Despite these limits, the F-35s were still able to use stealth and sensors to make a difference, Bashore said. The strike fighters brought an advantage in situations where they could stay on station longer and use sensors to pass along a "common picture" of the battlespace to the other fighter aircraft.

Much of the public attention on Atlantic Trident was on the jets them-



selves. It marked the first time USAF F-35As have flown in a large exercise with Eurofighter Typhoons and Dassault Rafales and was one of the earliest large-scale integration exercises combining all three with the F-22. It was about more than the exotic iron on the ramp, though.

"There's been a lot of interest in the machines. 'Which airplane is better? What are their capabilities? How are you using them?'" Fesler said. "The thing I think is particularly interesting: The man in the machine matters tremendously."

For the F-35s from Eglin, Atlantic Trident was a rare opportunity to fly with allied aircraft instead of single-type training sorties on Florida's Emerald Coast. The human element needs to evolve alongside the aircraft



F-15E pilots and weapon systems officers head to their aircraft during Atlantic Trident. The US air service's combat relationship with Britain and France dates to World War I.

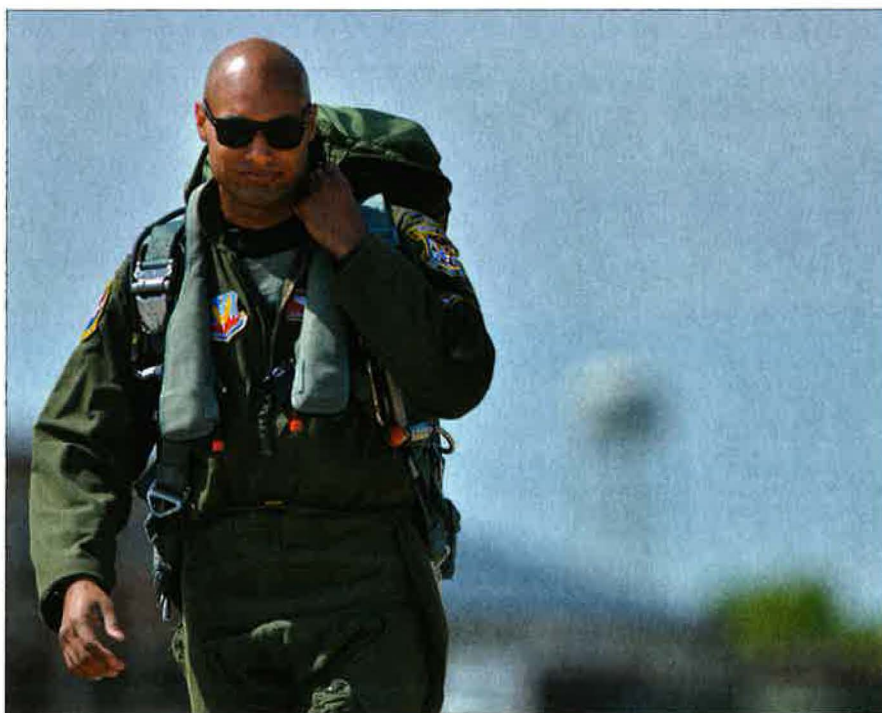
so pilots from individual countries can operate in an alliance and know how to work together.

"All these aircraft have tremendous capabilities, but if we don't plan them and integrate them and understand each other's capabilities and limitations, and use them to their full potential, then we could lose in any combat scenario," Bashore said. "It's more about the human element." ★

First Lt. Edward Galloway, an aggressor pilot, after an AT-17 mission. F-15Es and T-38 Talons played the adversary roles for the exercise.



USAF F-15Es lined up on the flight line during the exercise. USAF launched large numbers of "adversary" aggressor aircraft to combat "friendly" fifth generation fighters.



Photos: A1C Tristan Biese; A1C Anthony Nin Leclerc; SSgt. Natasha Stannard

Clear of the Turbulence?



By John A. Tirpak, Editorial Director

The F-35 program appears to have emerged from years of controversy and developmental turbulence, but there are ways it could still go “off the rails,” according to Lt. Gen. Christopher C. Bogdan, who retired in July after completing nearly five years of what was planned to be a two-year tour as

the strike fighter program manager.

The F-35 program is slated to hit one of its biggest milestones—the completion of system design and development (SDD)—late this year, when it starts delivering the first F-35s in the Block 3F configuration. This version, finally, represents the baseline aircraft that fulfills the Air Force, Marine Corps, and

Navy’s basic wartime needs. Those aircraft already serving operationally have earlier, transitional versions of the F-35 software and weapons capabilities. Bogdan said he thinks this move from development to full-up production makes for a good time to hand over the program to new leadership. He was succeeded by his deputy, then-Rear Adm. Mathias W. Winter, after a May 25 ceremony.

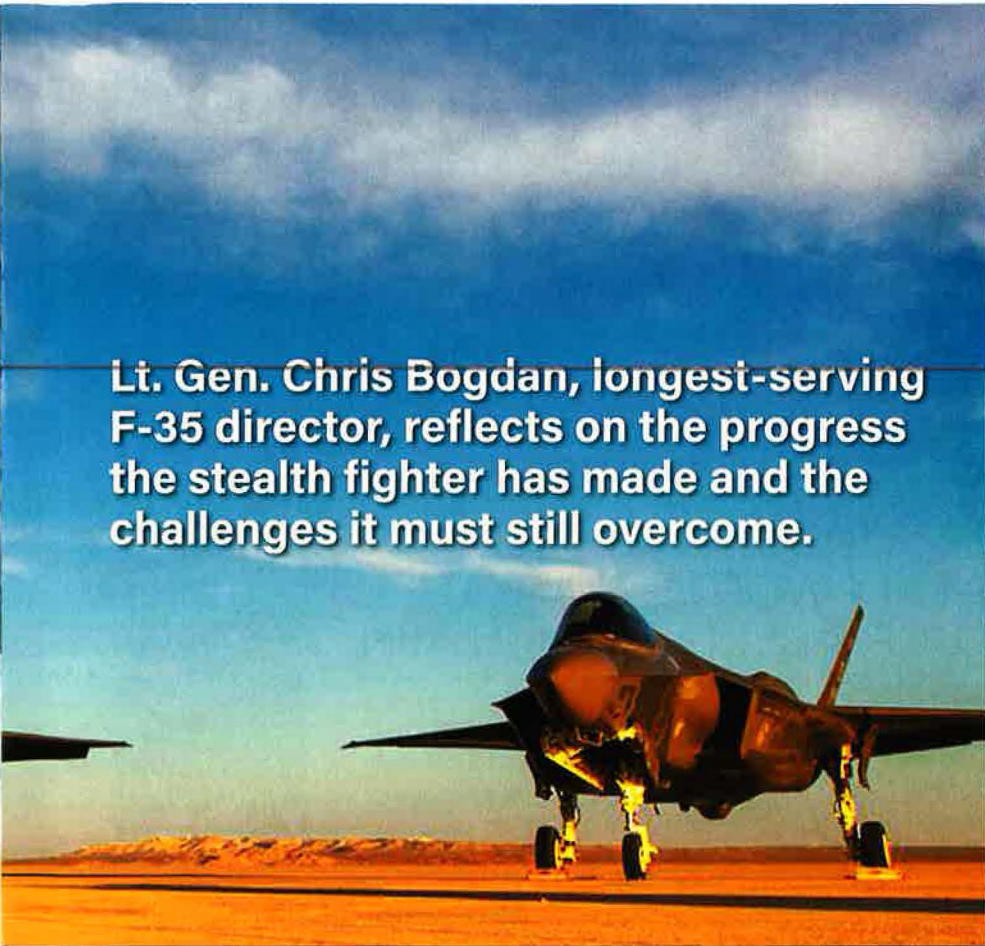
In an interview with *Air Force Magazine*, Bogdan discussed major “turning points” that convinced him the massive effort would succeed, the state of the relationship between the Pentagon and its major F-35 contractors, and how he thinks the project will evolve in the future.

Asked what the biggest risks to the F-35 program are from here on out, Bogdan replied, “I am worried about our ability to sustain these airplanes globally, with the numbers and locations we’ll have in 10 to 15 years,” as “there’s going to be an awful lot of airplanes in an awful lot of places in an awful lot of configurations.”

The US services alone expect to buy more than 2,400 F-35s, and international partners and foreign military sales customers are expected to buy a



Lt. Gen. Christopher Bogdan (r) shakes hands with Vice Adm. Mathias Winter during the change of command ceremony for the F-35 Joint Program Office on May 25.



Lt. Gen. Chris Bogdan, longest-serving F-35 director, reflects on the progress the stealth fighter has made and the challenges it must still overcome.

All three F-35 variants at Edwards AFB, Calif., in 2014. Left to right: the Navy F-35C carrier variant, USMC F-35B short takeoff and vertical landing variant, and USAF F-35A conventional takeoff and landing variant.

similar number. There are already dozens of operating locations, worldwide, identified for the F-35. The 200-plus aircraft already delivered are in many different configurations and will all require modifications to bring them up to 3F standard. It will be a massive enterprise—even more so than the development effort—and both user governments and industry need to prepare themselves to cope with its demands.

The ability of industry and government together to “sustain all those airplanes and all those customers well, and do it affordably, is probably the biggest risk to the program right now,” Bogdan asserted.

Normally, a prime contractor leads the effort to choose its sustainment subcontractors, suppliers, and regional depots or repair facilities, but the F-35 is so politically and technologically complex that these “value judgments ... cannot simply be left to industry,” Bogdan said. The US government, its partners, and the services all “need to be involved,” he said.

Because there are so many interim configurations of the F-35—across the three variants—there is a profusion of parts that only fit a specific batch of

airplanes, and that’s a headache still plaguing the program, Bogdan said. Some of those parts “have moved on” to a new design, but earlier jets have yet to catch up through retrofit.

Not only that, some of the “pieces and parts” aren’t meeting reliability and maintainability goals. A fuel pump, for example, expected to stay on the jet 5,000 hours may only last 3,000 hours, leading to greater-than-expected maintenance. The depot enterprise to fix those parts isn’t fully up and running yet, forcing such components to go back to the vendor for repair. That, in turn, slows the delivery of brand-new parts.

“We know all the bad actors,” Bogdan said of this situation. “We need to continue to improve the on-wing time of those components.” Some may need a redesign because “the way we’re operating them is not quite what it looked like on paper.”

HEALTHY SKEPTICISM

Taking over as director of the strike fighter in the fall of 2012, Bogdan had his doubts. The F-35 was way over budget and years behind schedule. In the press, it was always linked with

descriptors such as “troubled” or problem-plagued.

He inherited the project from Vice Adm. David J. Venlet, whom Bogdan credits with giving the F-35 its chance to succeed. Venlet secured permission from Congress and the Pentagon to restructure the program—adding money and years to the timetable and setting a new schedule for fielding the jet. When Bogdan took over, he pledged that he would not ask for any more money or any more time to deliver the F-35.

Bogdan and Venlet realized at the outset that the structure of succession for program leadership wouldn’t work. To balance the needs of the two biggest customers, the Air Force and Navy were slated to swap leadership of the project every two years, with other levels interleaved with authority. Under the original vision, a Navy program executive officer (PEO) would have an Air Force deputy and answer to the Air Force acquisition executive. Two years later, the structure would flip.

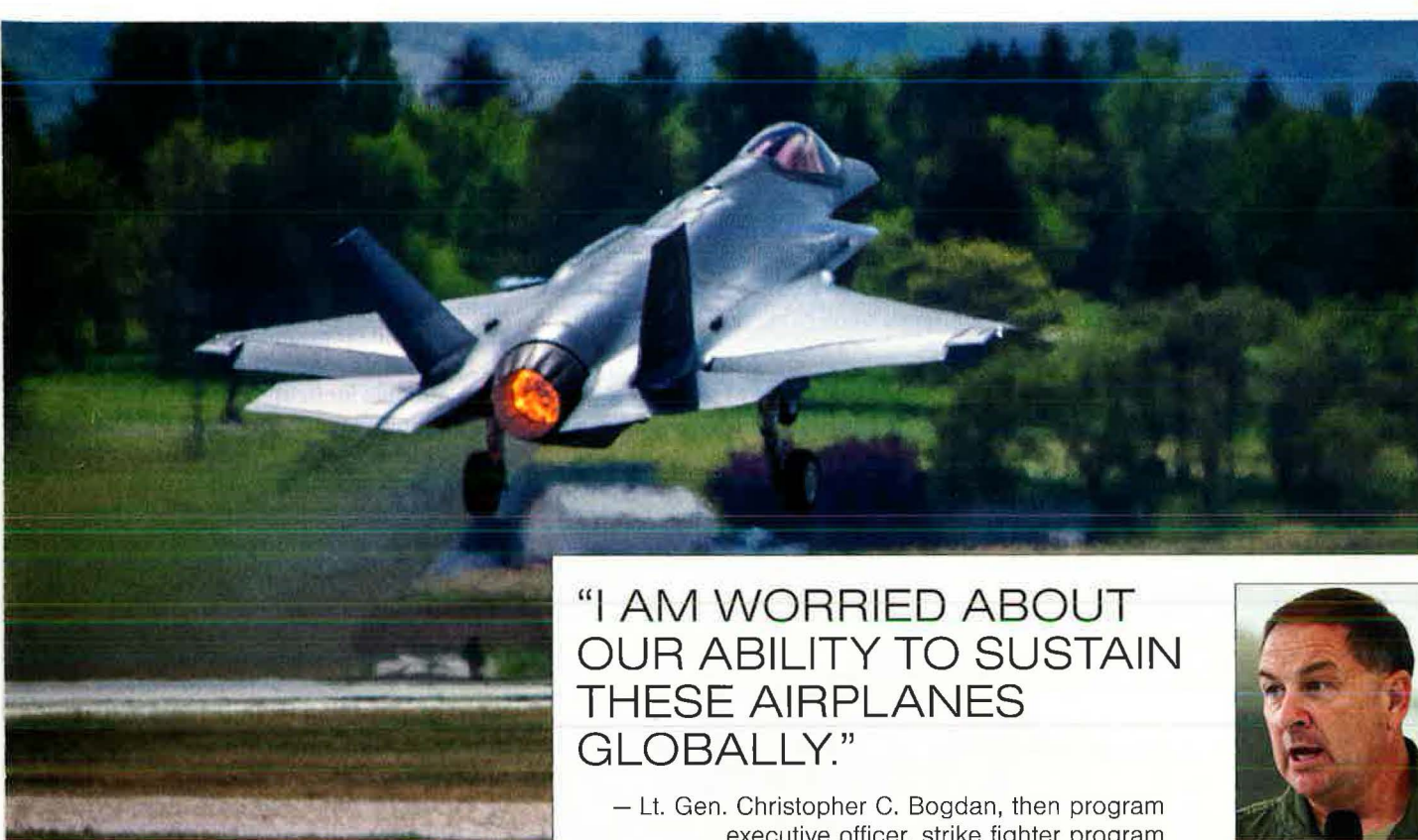
They went to the Pentagon leadership and argued that “we ought to change the charter” because repairing the culture of the dysfunctional program would take time, Bogdan recalled.

“Consistency of leadership” was critical, he said, along with consistency of message to Congress, the partners, and industry. Moreover, “people have to know, both on the industry side and the government side, that they can’t wait you out.” The two-year leadership rule was changed so that the PEO could stay “as long as the leadership wants them to be there.” He was gratified that at the two-, three-, and four-year points, “apparently, they liked” what he was doing because Bogdan was asked to stay in the job. Five years, though, he thought was “enough.”

“I appreciate them letting me go now,” he said.

Bogdan admitted, “I broke some glass” on taking over the project. At the 2012 AFA annual conference, he declared the relationship with Lockheed Martin, the F-35’s prime contractor, to be “the worst I’ve ever seen,” and he warned that cultural changes were due. The comment, he said, was “my shot across the bow to tell everybody” that a shake-up was due.

In the months that followed, Bogdan tightened up the program office and held contractors’ feet to the fire. In staff meetings, when one of his officers presented news of a technical



"I AM WORRIED ABOUT OUR ABILITY TO SUSTAIN THESE AIRPLANES GLOBALLY."

— Lt. Gen. Christopher C. Bogdan, then program executive officer, strike fighter program

An F-35 takes off on full afterburner.

problem, if it was the fault of a vendor, Bogdan would ask, "What do we say?" and would answer his own question as he had many times: "We're not paying for that."

Things started to improve. Airplanes were delivered, and pilot training got underway. The pace of flight testing edged up. Costs stabilized and began to decline. Schedules started to be met. But Bogdan was keenly aware that with 1,300 vendors, four major prime contractors, three services, eight international partners, and over 10 million lines of programming, the F-35 was a massive cat-herding job and perpetually just one crisis away from termination.

In June 2014, it looked like that crisis might have arrived. During takeoff roll for a training flight, an F-35 at Eglin AFB, Fla., caught fire on the ground. The pilot quickly escaped and no one was injured, but the airplane was badly damaged, the fleet had to be grounded, and the program's head of steam seemed to evaporate.

The fire "was a very big deal and it happened at a very bad time," Bogdan said. The fire embarrassingly canceled the F-35's planned premiere at the Farnborough International Air Show in the UK, then only days away.

The Joint Program Office (JPO) worked 24/7 to identify the cause of the fire, fix the problem, and get the show rolling again. Over a few months,

the problem was figured out—engine fan blades rubbing excessively in a groove—aircraft were allowed to return to flight (with more frequent inspections) and a fix was developed.

"That was really the first time," Bogdan said, that he thought the program would really come together and make good. "From a technical perspective, ... I thought, 'Hmmm, we're probably getting better.'"

Bogdan gained more confidence from solving problems with the F-35



An F-35 pilot tries out a Generation III helmet in 2015. The display system projects information on the helmet's visor, instead of the older head up display.

pilot's helmet, which he described as a key sensor of the airplane. He broke with Venlet's approach, canceling an alternative source competition. Rockwell Collins and Elbit, the helmet contractors, realized "I was putting my chips" on them, he said, and that told them "they better get this thing solved." His gesture of confidence "changed their attitude" and "helped them come up with better solutions."

The arrestor hook for the Navy version didn't work. "We couldn't trap anything" with the original hook design, Bogdan recalled, and "from the Navy's point of view, if you cannot land on an aircraft carrier, you don't have a C model."

It was a credit to Lockheed Martin, he said, that "they let us" hand over redesign authority for the system to Fokker, builder but not designer of the hook. This third physical correction convinced Bogdan that the JPO could solve any problem, expeditiously.

BIG BANG THEORY

Software is the hobgoblin of any major modern weapon system, and Bogdan rolled his eyes at the thought that the original planners of F-35 development expected the final, 3F version of the software would magically materialize without any hiccups or interim steps. He decried the "Big Bang Theory" of acquisition, describing it as: "I'm going to take all these huge

requirements and I'm going to build one single program from start to end, and in the end, I'm going to deliver you everything you want in one fell swoop."

It's a "terrible strategy," Bogdan said, and it "never, ever, ever works."

Early program managers aimed to go right for the all-up baseline software, an approach Bogdan recognized wouldn't succeed.

"You've got to build up, you've got to do things in increments," he said. "You've got to give the warfighters something to use and have that feedback loop of improving and learning." This applies to hardware and software alike, he insisted, and with additive increments, "you'll actually go faster in the end. And you'll get a better weapon system—my belief."

There's resistance to this approach from the user, Bogdan said, because the user fears "that if you run out of money, someday, all he's going to get is this increment." The "warfighter ... really wants increment five in the endgame, so he's really nervous about taking increment one, two, [or] three."

There's also resistance to this approach from financial managers and comptrollers, Bogdan continued. "They want to know, how much is the whole program going to cost, from end to end. And sometimes it's really hard to estimate" several increments away. Congress is hard to convince, too, because the building-block approach may result in early iterations having "actually less capability than the system out there that it's trying to replace. And it's a very hard sell to Congress to continue to put

up money to field a weapon system that is not an immediate improvement over what's out there now."

The poster child for this last situation is the Electro-Optical Targeting System, or EOTS, Bogdan said. The initial version of the EOTS was design-frozen so that the systems tied into it could develop and mature. In the meantime the Sniper pod used by fourth generation jets became better than the first version of EOTS. (The internal EOTS on F-35 is expected to surpass Sniper in capability during the Block 4 program of F-35 improvements.)

"There's a lot of institutional resistance to what some people call 'spiral.' I call it the 'incremental acquisition strategy,'" Bogdan said. But every program he's run that started out as a Big Bang was always turned into incremental, he said, "because that was the smarter way to do business."

Bogdan credits the SDD program with finishing on time because he ordered work stopped on the 3F version of the software. He told code writers to concentrate on the 3i version that equips the first operational Air Force F-35As. The 3i software had terrible instability, he reported—pilots frequently had to shut down the jet several times to reboot because sensors and the radar were shutting themselves off.

"Forget 3F for now," he told the team. "We've got to fix 3i. Because if you don't get 3i right, you don't get 3F." Bogdan said there was "a lot of pushback" from the contractors, worried about schedules and progress payments. Experts from other services and even

other contractors—competitors to the Lockheed team, who signed nondisclosure agreements—were brought in to help size up the issues and get things back on track. Again, Bogdan praised Lockheed Martin for being "willing and open" to bringing in experts from outside to help look at the problem.

Operational USAF F-35 pilots have recently reported good software stability with the 3i build, saying after deployments within the US and to Europe that it was never an issue.

"That was a turning point, also," Bogdan noted, "because once we got that fixed, then I knew 3F was going to be OK. I knew we could get through the end of SDD."

COMMON GROUND AND IOC

Besides the technical turning points, Bogdan pointed to two other events that told him the F-35 would succeed. One was programmatic: the contracts struck with Lockheed Martin on Low-Rate Initial Production Lots 6, 7, and 8. These went "a lot smoother" than Lot 5, which he said "took forever." Both the JPO and Lockheed Martin felt "it was a win-win" deal, and this agreement persuaded him that "we could do business with Lockheed. ... We could find a way to find common ground."

Another was the way the program reached initial operational capability. The Marine Corps reached IOC in July 2015 and the Air Force in August 2016, certifications that the services had enough jets, parts, and trained personnel to go to war if needed. In both cases, IOC was declared within days of the target date. This was a huge vote of confidence in the program and had a palpable effect on it, Bogdan said.

If IOC had slipped well beyond the target period, it would have "set the program back years," Bogdan said. There would have been "way more scrutiny and oversight" from the Pentagon leadership, international partners, and Congress, he contended. "Now you had the warfighter showing confidence in the weapon system," he said, observing that line pilots and maintainers could "learn the most and teach us the most about the airplane, and we needed that desperately. We needed their feedback to make this weapon system better, and the sooner that happened, the better off we were." The IOC declarations moved the F-35 from being "a paper airplane" with "a lot of bad history and bad baggage" into something real and allowed outside



AIC Nathan Kusters runs a preflight inspection on an F-35A during Red Flag 17-1 at Nellis AFB, Nev., in February.

Photos: Paul Holcomb/USAF; Jonathan Case/Lockheed Martin; R. Nial Bradshaw/USAF

observers to start “getting a glimpse at how good the airplane could be.”

Has the relationship with Lockheed Martin evolved from that “worst I’ve ever seen” comment at the outset of Bogdan’s tour?

It’s “better, but not good enough,” he said. There’s still “a trust deficit,” both on the part of the government and that of industry.

On the government side, “we’re still skeptical” that in some instances industry would put the combatant first, over anything else. Conversely, he suspects that industry doesn’t trust the government, worried “we’re going to take business away from them, in the long term.”

That last fear, Bogdan thinks, stems from Lockheed’s concern that more and more of the F-35 enterprise—maintenance support, repair, logistics, training—will be done by the government or will be put out for competition. He said that is the “natural evolution of every acquisition program I’ve ever seen, especially for airplanes, is that we do move a lot of stuff organically,” with USAF doing more work in-house. The service has also been pushing in recent years to “own the technical baseline” of programs so it can compete upgrades.

None of this is “to punish industry,” Bogdan explained. Organic support costs less, and sometimes industry “has moved on to something else” and is no longer able to offer support.

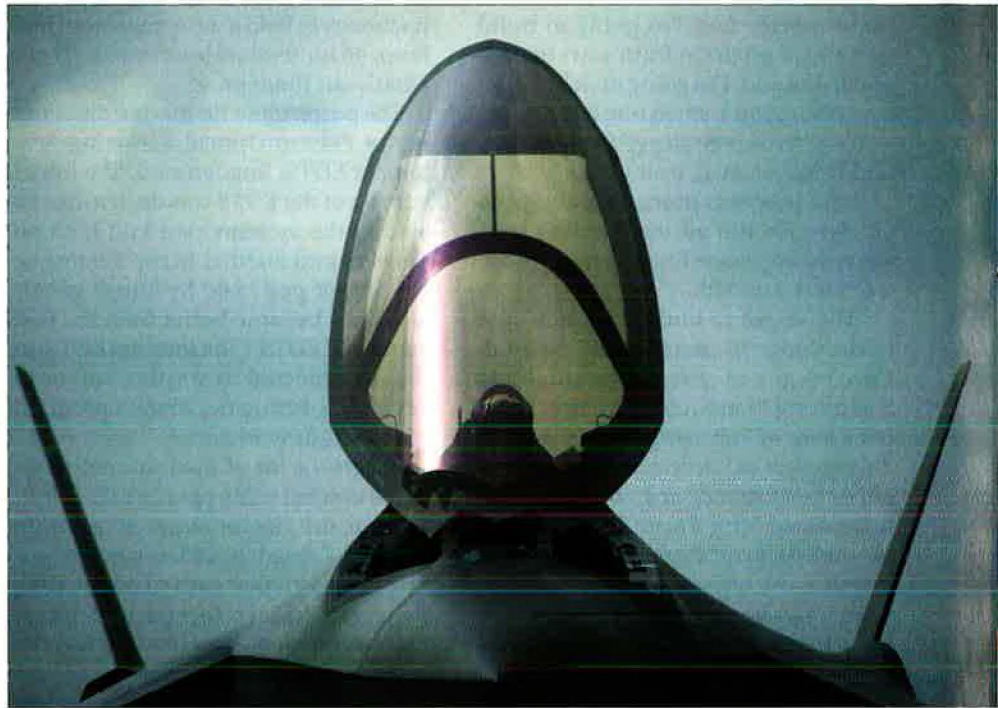
“On this program, everyone would be better served if we recognize [the evolution to organic support] and plan for it. And I don’t think we have a good-enough relationship to do that yet.”

How could that trust be improved? Bogdan said, “Over time, your actions and the way you behave and the things you do will engender trust. It’s not something you can just talk about and have it change right away. You’ve just got to do things for each other and with each other that just build it up.”

CAN IT GO ANY FASTER?

Air Force leaders in recent years have urged an acceleration of the F-35 to beef up fighter squadrons that have dwindled and are now too few in number to meet all the service’s commitments worldwide. Could the F-35 be sped up?

“We could go faster,” Bogdan allowed. However, “I think you’ll find that [the ramp-up in production is] probably just from Hill about right.” He said the Air Force, Navy, Marine Corps, and



A pilot from Hill AFB, Utah, prepares an F-35 for takeoff at RAF Lakenheath, UK, in May during a training deployment to Europe.

the international partners “recognize that for a finite period of time”—possibly 20 years—they are going to have fourth generation and fifth generation airplanes in their fleets, and learning to operate them together is going to be “pretty important.”

The services and partners will have to retain fourth gen fighters for a while “for presence and deterrence.” It may not be feasible to “get rid of fourth gen very, very quickly at the expense of adding fifth gen airplanes,” and “there’s an affordability factor, too, that you have to think about.”

Moreover, although SDD is drawing to a close, the airplane “is still modernizing,” Bogdan said. After operational test and evaluation, “we will have some things we find and want to fix.”

Finally, a big, unplanned uptick in production could harm the supply system. More foreign military sales customers are likely to join the program, though, and that should drive costs down even further, though perhaps straining the ramp rate.

Volume has a lot to do with unit costs, the real savings will come in knocking down sustainment costs, Bogdan said, and while they’re “trending in the right direction,” they are “clearly not going down as fast as we want.”

The goal, by the mid-2020s, is to have a sustainment cost about par with that of fourth gen fighters, he said. As more aircraft come to a standard configura-

tion, parts supplies will improve, and the program is leaning hard on getting parts to stay on wing longer. The quality issues are largely “out of the picture,” he said, but the program is still learning about the servicing rate for some parts, and a “robust repair” capability wasn’t built for them. “So we missed the boat a little bit on which ones.”

Bogdan said the F-35 can look forward to a healthy upgrade program, as engineers seek to improve its stealth, reliability, and electronic warfare capabilities and add new weapons. He said it’s virtually a “guarantee” that the Air Force’s new engine technology initiative will yield either components, engine sections, or all-new engines that will improve the F-35’s “efficiency, thrust, range, and reliability.”

The price of the baseline F-35 will “absolutely” dip below \$79 million in 2020—and “in 2020 dollars,” including the engine, Bogdan said.

Improvements will come in the 2022-28 time frame, and collectively, they’re “going to cause the airplane to cost more in the future.” The upgraded F-35 will be more adaptive to the environment that it fights in, Bogdan said, and new weapons will have to be developed for it because “what we’ve found out is, this airplane has such tremendous sensor capability, that we now have to make sure the weapons that go with [it] can use it. And I’ll just leave it there.”

Photo: MSgt. Eric Burks



MINOT'S BENT SPEAR

The Air Force made major changes in organization, culture, and leadership after nuclear missiles were accidentally flown from North Dakota to Louisiana.

By Peter Grier

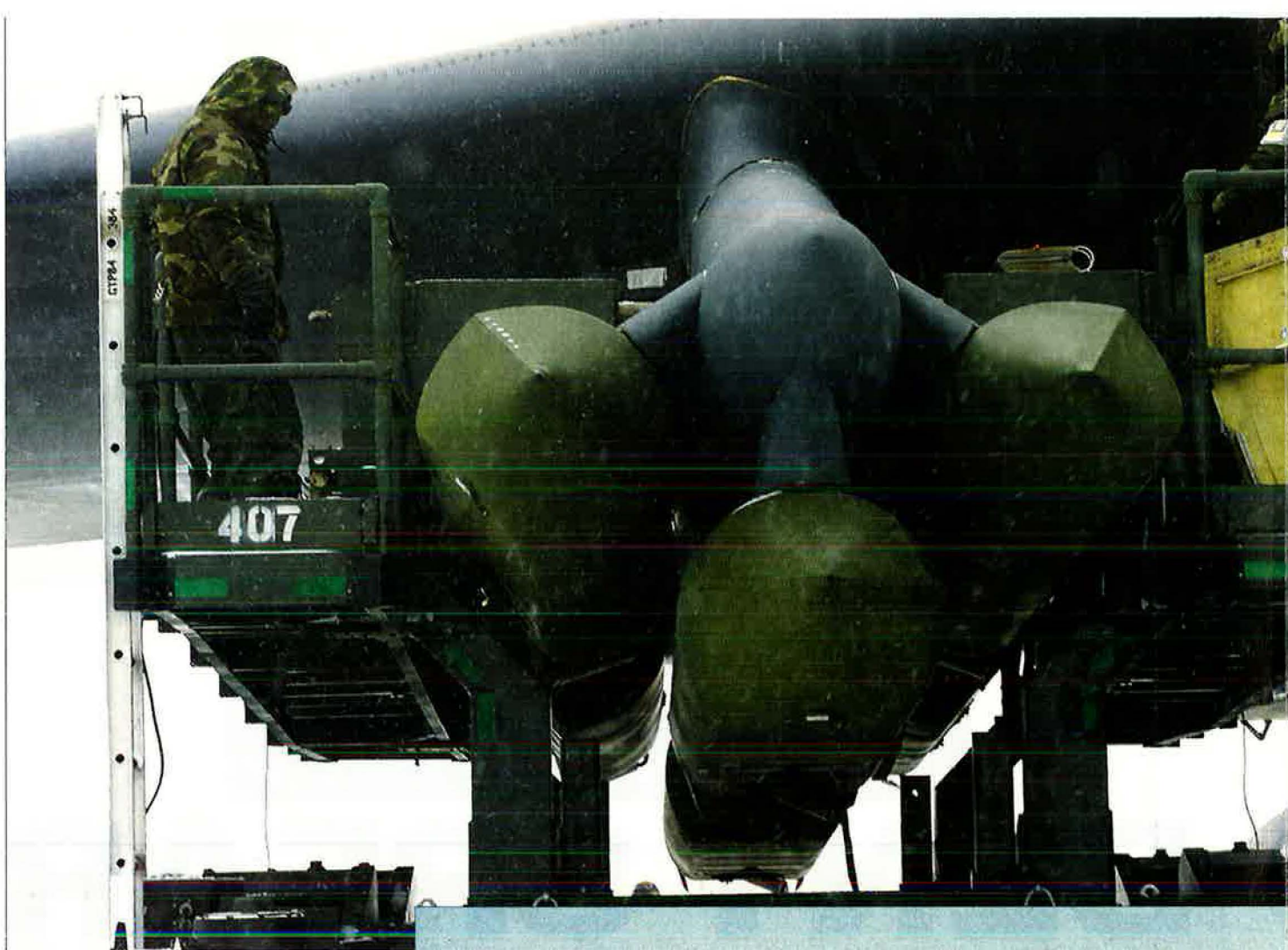
It was about 8:30 p.m. on Aug. 30, 2007, when a team of five munitions airmen pulled up to a B-52H parked on the flight line at Barksdale AFB, La., thinking they were about to do a routine weapons unloading.

The big bomber had ferried in a dozen AGM-129 cruise missiles—each capable of carrying a nuclear warhead—from Minot AFB, N.D., around 11:30 that morning. The Air Force was consolidating its inventory of the stealthy weapons at Barksdale for eventual elimination under arms treaties. Each wing of the B-52H carried a pylon loaded with six missiles apiece.

The missiles were supposed to be mounted with inert warheads—simple weights taking the place of nuclear warheads—used for training, or in this case, a ferry flight. As the crew prepared to unload the left pylon, however, one of the airmen saw something wrong and called over a supervisor.

Airmen load AGM-129 Advanced Cruise Missiles onto a B-52H during a snowstorm at Minot AFB, N.D., during an alert status exercise in 2002.

Photo: SSgt. Adam R. Wooten



Airmen load ACMs onto a B-52H at Minot. During a 2007 incident, six of 12 missiles loaded were "hot" (i.e., nuclear armed) instead of "cold." No one noticed.

During his safe status check, shining a flashlight through a small diamond-shaped window to verify the warheads were "cold," or inert, he discovered that one of them was "hot."

A check of the other missiles confirmed it: Minot personnel had loaded and dispatched a plane with six real nuclear weapons.

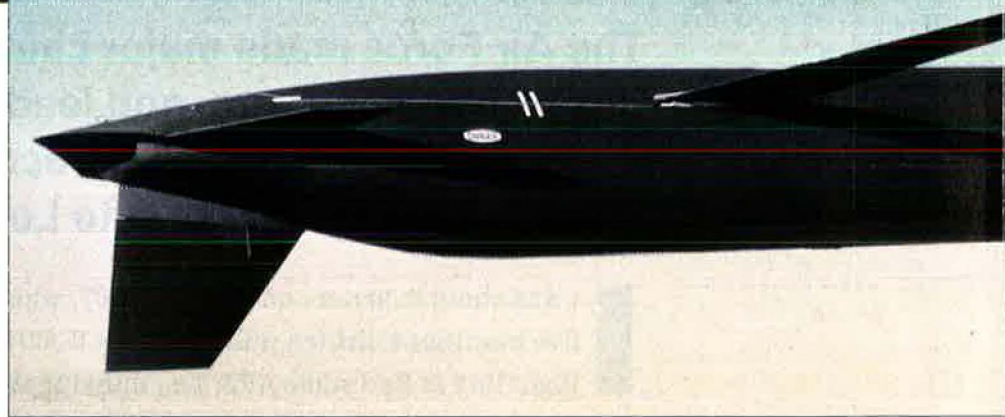
At Barksdale, the jet had been parked for about nine hours without a special guard.

SHOCK WAVES

How had this happened? The munitions team quickly called superiors to tell them about the seriousness of the situation and ask for direction.

"The five of us who were present did what we could to keep the area secure while we waited for security forces to arrive," one of the airmen told Air Force investigators a few weeks later.

The Minot episode sent shock waves through the Air Force and the Depart-



ment of Defense. The rare "Bent Spear" nuclear incident report grabbed the attention of the highest levels of the US government and headlines nationwide.

At a time when much of the military was largely focused on operations in the Middle East, the incident presented a clear symptom of a decline in attention to the nuclear mission.

Ten years later, the unauthorized, unintentional transfer of the nuclear-armed AGM-129s has resulted in wide-ranging improvements in the handling of nuclear weapons. It led to firings, revamped training procedures, a new nuclear culture, and higher per-

formance standards and elevated the nuclear mission back to the top of the Air Force's priority list. It also led to the creation of Air Force Global Strike Command, with a singular focus on nuclear missions and standards.

For context, it's important to remember what did not happen during the inadvertent transfer of nuclear-armed AGM-129s from North Dakota to Louisiana a decade ago.

The warheads were never unsecured. The crew of the B-52 carrying the weapons could not have launched them, or even armed them, according to the investigation carried out in the



An AGM-129 ACM.

immediate aftermath of the event by Maj. Gen. Douglas L. Raaberg, then director of air and space operations at Air Combat Command. The missiles were not electronically accessed in any way.

The incident revealed personnel, prioritization, and organizational failures, however. In the unclassified ver-

sion of his final report, Raaberg judged the transfer to have been caused by a "breakdown in training, discipline, supervision, and leadership."

Lost adherence to strict Air Force nuclear procedures was at the heart of the problem. At many steps along the way that day, one simple check would have caught the mistake. Somehow, all those checks were missed.

SHORTCUTS

In the hundreds of pages of personal testimony produced for Raaberg's report, there seems a clear sense of incredulity among many of those involved. Why did this happen? It just didn't seem possible at the time.

"All the checks were missed, by many different personnel involved in the scheduling and execution of the operation," said one member of a Minot weapons handling squadron in an interview with Air Force investigators.

The roots of the incident lay in Minot's weapons handling scheduling process. Those involved had become used to using shortcuts to lessen the workload. Senior NCOs permitted that to continue, according to USAF's investigations.

At issue were the activities of Minot's 5th Munitions Squadron. For this unit, the printed weekly schedule—a formal, signed document—was routinely virtually ignored, investigators discovered. Instead, squadron members worked off informal slides prepared by an inexperienced airman throughout the week for scheduling and production meetings.

This became a serious problem in late August 2007, when there was a change in plans. The squadron was preparing missiles for transfer to Barksdale. The formal schedule identified two particular missile pylons for preparation. But someone decided to swap one pylon for another. This was noted on the informal working slides but not on the official schedule.

On Wednesday, Aug. 29, tow crews showed up at weapons shelters to

transfer the missile pylons out to the Minot flight line for shipment. The transfer crews were working off the formal schedule, as approved by the wing commander.

"The wing was caught in their own faulty process and oversight," said the Raaberg report.

The incident still should not have happened. What followed were what Air Force officials later identified as five key procedural failures that occurred between the time the door was opened at the Minot weapons storage facility and the time the B-52H ferry aircraft took off for Barksdale the following morning.

The first procedural breakdown occurred around 8 a.m. on Aug. 29. Airmen assigned to the weapons storage area failed to examine all the missile-carrying pylons located in the storage area, said Maj. Gen. Richard Y. Newton III, assistant deputy chief of staff for operations, plans, and requirements, at a briefing for reporters in October after the Air Force had finished its initial round of investigations.

Procedural breakdown No. 2 occurred shortly thereafter. The crew operating the trailer that was supposed to move the pylons to the ferry aircraft began hooking up to their cargo while required inspections were still underway. They were supposed to wait for confirmation that everything had been done correctly, said Newton.

Breakdown No. 3 was related—and crucial. The crew failed to verify the status of the particular pylons they were moving.

"The crew is required to inspect the munitions before departing. They did not do that," Newton told reporters.

This inspection required shining a flashlight through windows in the cruise missile payload bay door. A stencil on the W-80 warhead would identify it as "nuclear," said a munitions squadron member interviewed by investigators following the incident.

A Type 3 trainer warhead for the missile would say "inert."

AT MANY STEPS ALONG THE WAY THAT DAY, ONE SIMPLE CHECK WOULD HAVE CAUGHT THE MISTAKE. SOMEHOW, ALL THOSE CHECKS WERE MISSED.

A tactical ferry payload would say "tactical ferry" and would be painted white.

MORE BREAKDOWNS

One of the pylons marked for removal on the morning of Aug. 29 did receive a safe status check, according to an airman who was present. Its cruise missiles were marked "tactical ferry," as expected.

Then the airman who conducted this first check turned to the second pylon. This person did not see anyone looking through the small, diamond-shaped window in the pylon's missiles. There was not even anyone holding a flashlight nearby.

The airman asked a coworker standing next to the second pylon if it was "good to go."

He "responded that it was," according to the report.

At this time no one mentioned that only one of the pylons was marked with placards indicating its readiness for movement. The other was not. While it's true that the placards on the properly prepared pylon were pretty low tech—two pieces of computer printer paper—the lack of marking on the other was yet another oversight.

The fourth procedural breakdown was an additional missed check, as the Minot munitions control center failed to verify the status of the missiles en route to the flight line at about 9:25 that morning. The center did not access a database—a required step—that would have flagged one of the pylons as unprepared for transfer, according to Newton.

At this point the wrong weapons arrived at the B-52 that was to ferry them south. Minot munitions handlers loaded the pylons onto the aircraft. They remained there overnight, in a secure area.

"Critical safeguard procedures had been disregarded," said Newton.

The fifth and final procedural breakdown occurred just before the B-52's flight time the morning of Aug. 30. The aircraft's Barksdale-based radar navigator was responsible for checking all weapons, to ensure they were in safe status, and for verifying the payload prior to takeoff. The navigator didn't fully perform this duty, however.

Instead, this crew member did a spot check of one missile on the right pylon. As bad luck would have it, this was the pylon carrying the expected, non-nuclear payloads. The other pylon was not checked and with this lapse, the last line of defense had failed.

"If the radar navigator had completed [the] checklist, the individual would have discovered the six warheads loaded onto the B-52 aircraft and prevented their flight across the United States," wrote Raaberg in his report.

That individual told investigators that he had been trained only to do a spot check of the weapons. Some members of the radar navigator's squadron concurred that the unit had developed a spot check "culture." But even these witnesses felt that a proper spot check needed to include a look at both pylons.

The B-52, call sign Doom 99, took off from Minot at 8:40 a.m. on Aug. 30 and arrived at Barksdale at 11:23 a.m.



that same day. The weapons unloading process began almost eight hours later, around 7 p.m. that evening.

Once the presence of nuclear weapons was discovered, munitions personnel followed correct procedures, according to Air Force investigators. They immediately reported the mistake, set up a quick security cordon, and reported the incident up the chain of command.

HEADS ROLL

That evening there was a senior NCO induction dinner at the wing involved at Barksdale. Near the end of the dinner, commanders got the word of a flight line emergency. They quickly left, found and briefed the wing commander, and went to the aircraft to see the situation for themselves.

The pylons were moved into safe storage at Barksdale by 11 p.m., according to an Air Force time line. This occurred while there were active thunderstorms within 25 miles of the area.

All the Barksdale airmen acted properly, said a senior Barksdale commander whose name was redacted from the unclassified version of the Raaberg report.

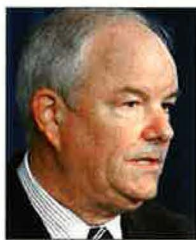
In the aftermath of the unauthorized transfer, the Air Force sacked a number of commanders. The munitions squadron commander at Minot was relieved of duty promptly, along with a number of officers and NCOs at lower levels. In October 2007, after further investigations, Air Combat Command decided to relieve Minot's wing commander and maintenance group command-



Secretary of the Air Force Michael Donley (I) answers questions from the press at the Pentagon on Oct. 24, 2008, when he announced the creation of Air Force Global Strike Command, a major command to control all USAF nuclear bombers, missiles, and personnel.



A B-52H takes off from Minot during a rapid-launch generation exercise Aug. 9, 2007, a few weeks before the Bent Spear incident.



Wynne



Moseley

er and Barksdale's operations group commander.

The accountability went all the way to the top. In June 2008, Defense Secretary Robert M. Gates asked for the resignations of Air Force Secretary Michael W. Wynne and Chief of Staff Gen. T. Michael Moseley.

Gates cited the Minot incident—as well as a subsequent misshipment of ICBM reentry vehicle assemblies to Taiwan that proved to largely be a failure of the Defense Logistics Agency—as his grounds for the firings, saying the two had allowed a lax culture to develop around the nuclear mission.

FADED SKILLS

It was the first time any military service's top uniformed and civilian leaders had been fired at once.

For the Air Force and the Department of Defense, the main takeaway from Minot was that the old, Cold War focus on the nuclear mission had taken a back seat to real-world combat. Partly because of competing priorities and airmen and equipment that split their time between strategic and conven-

tional missions, USAF's nuclear weapons skills had faded among younger airmen and at lower ranks.

As conventional weapons became more sophisticated and wars proliferated in the Middle East, those were the things the Air Force had stressed. Over time, USAF's nuclear skill faded.

"To emphasize, the nuclear skill sets have not been exercised. They are atrophied. It was evident in the testimony of every operations group member we interviewed," concluded the Raaberg report.

HANDS OFF

Perhaps an indicator of the environment in 2007 can be discerned from the fact that the instructor pilot for Doom 99, a distinguished graduate of the USAF Weapons School, had never physically touched a nuclear weapon, and none among the Barksdale-based crew had ever actually touched an AGM-129 prior to that mission.

In the aftermath of the Minot incident, a series of evaluations and reports were done about how the Air Force should refocus on the nuclear enterprise.

Raaberg's report, for example, urged a review of nuclear training and tighter standards for nuclear custodial procedures. In early 2008, the Defense Science Board, under the leadership of retired Gen. Larry D. Welch, former Chief of Staff, conducted another study. It recommended, among other things, that wing commanders be re-estab-

lished as the approval authority for the movement of any nuclear weapons outside storage areas and that nuclear and non-nuclear weapons should never again be stored in the same place.

The review having arguably the greatest impact was the 2008 Secretary of Defense Task Force on Nuclear Management, overseen by former Defense Secretary James R. Schlesinger. It urged a re-emphasis on nuclear weapons at the highest levels, including the White House. For example, the Schlesinger report recommended that the Secretaries of Defense and Energy periodically brief the President with a review of nuclear capabilities and forces.

This renewed DOD concern about the strategic nuclear mission led directly to the creation of Air Force Global Strike Command.

AFGSC ACTIVATED

This major command began operations in August 2009 and took over responsibility for the ICBMs, previously controlled by Air Force Space Command, and the nuclear bomber mission of Air Combat Command, consolidating USAF's two legs of the nuclear triad in a single command having one focus. Many called it a reincarnation of Strategic Air Command, which had responsibility for the whole nuclear mission from the Air Force's founding until SAC's inactivation in 1992. In 2015, USAF upgraded the AFGSC commander's position from a three-star position to four-star status.

Taken together, these changes increased concentration on the Air Force's nuclear enterprise and set new standards for training and performance. Gen. C. Robert Kehler, commander of US Strategic Command at the time, told defense reporters in 2013, "A lot has changed ... in terms of the intensity of the focus on the nuclear part of our mission [and] the assessment and evaluation that we put on the units." He said, "Perfection is really the standard when we talk about nuclear weapons."

This June, Gen. Robin Rand, AFGSC commander, said, "The Air Force and AFGSC have undertaken monumental shifts to support our No. 1 priority, the nuclear enterprise." ★

Peter Grier, a Washington, D.C., editor for *The Christian Science Monitor* is a longtime contributor to *Air Force Magazine*. His most recent article, "Perils of Hybrid War," appeared in the March issue.



SURVIVAL

on Takur Gar

**Keary Miller
became the third
airman, but the
first survivor, to
be awarded an
Air Force Cross
for heroism in
2002's Operation
Anaconda.**

On March 4, 2002, Air Force TSgt. Keary J. Miller crashed onto mount Takur Gar in Afghanistan with his quick reaction force (QRF) teammates. Their mission had been to rescue two special operators on the ground, trying to evade enemy capture, but it quickly turned into a simple mission of survival.

Over the next 17 hours, Miller provided critical medical care to 10 wounded US service members and helped recover the bodies of seven others killed in action, all while under heavy fire from Taliban and al Qaeda militants. In 2003, he was awarded a Silver Star for his actions that day in what is now variously known as Operation Anaconda's Battle of Roberts Ridge or Battle of Takur Gar.

This January, after a Department of Defense-wide review of medals awarded in the Afghanistan and Iraq wars, Miller's Silver Star was upgraded to the Air Force Cross. The medal is the highest service-specific award for valor, and Miller—now a retired master sergeant—is only the ninth airman to receive it since 9/11.

In 2002, the Shah-e-Kot valley in Afghanistan was a

By Wilson Brissett, Senior Editor

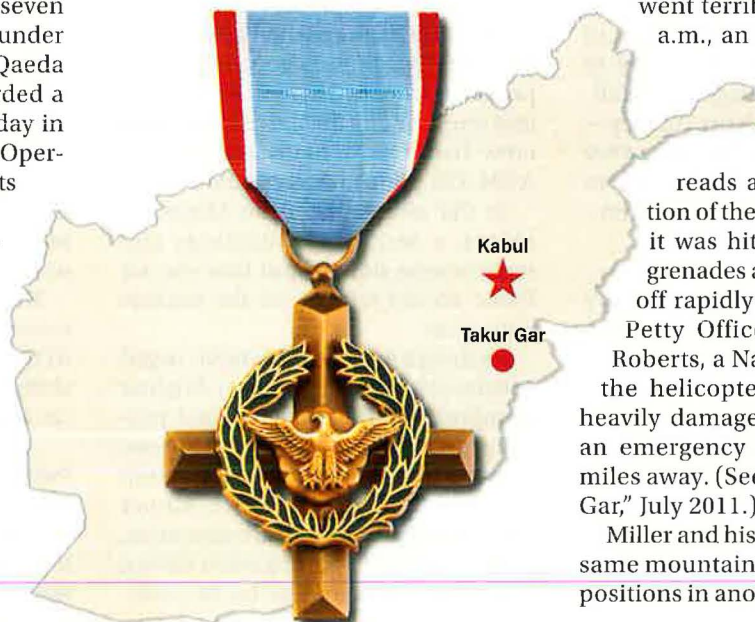
stronghold for al Qaeda and Taliban fighters, and early that year, US forces launched Operation Anaconda to dislodge the enemy presence. Planners had identified mount Takur Gar—at nearly 12,000 feet—as key high ground.

On March 4, the US attempted to seize control of the peak from enemy forces, but the mission, undertaken by special operations forces, went terribly wrong. At about 3

a.m., an Army MH-47E “tried to insert a special operations team on top of an enemy stronghold,”

reads an Air Force description of the battle. While landing, it was hit by rocket-propelled grenades and gunfire, so it lifted off rapidly to get away, causing Petty Officer 1st Class Neil C. Roberts, a Navy SEAL, to fall from the helicopter. With the MH-47E heavily damaged, the aircrew made an emergency landing about three miles away. (See “To the Top of Takur Gar,” July 2011.)

Miller and his team approached the same mountain and the same enemy positions in another Chinook. As they





Then-TSgt. Keary Miller in an undisclosed location. He was part of a quick reaction force trying to rescue two US military personnel stranded on Takur Gar.



In 2009, Miller, then a master sergeant, shows his son, Ian, the special operations display at the National Museum of the US Air Force.

drew near, militants on the mountain-top fired rocket-propelled grenades at the MH-47 and it too went down. The al Qaeda and Taliban forces continued to hold the peak above the crash site and rained fire down on the crashed Chinook with mortars and more RPGs.

The other members of Miller's team were combat controller SSgt. Gabriel P. Brown, pararescueman SrA. Jason D. Cunningham, and 10 Army Rangers. As a pararescueman (PJ), Miller's primary duty was to tend to wounded service members in combat.

As the team leader, Miller was also

responsible for the younger members of the group; Cunningham was on his first deployment.

The team's initial goal was to fight its way out of the wrecked chopper, a "virtual bullet sponge," Brown recalled recently. The Rangers fired up the mountain at the enemy position, a "hornet's nest," Miller said this April in a teleconference with reporters. He said he was amazed by "the ability of guys to bound towards the enemy fire."

The US forces had no time to think. Miller "was on his third magazine change before he had a conscious

thought," said Lt. Col. Sean McClane, his commanding officer at the time and now head of the Air National Guard's 123rd Special Tactics Squadron, Miller's home unit, at Louisville Arpt., Ky.

After fighting his way off the helicopter, Miller began tending to the wounded and dead, establishing a casualty collection point. Four members of his QRF had already been killed by enemy fire, and five more were seriously wounded. "Regardless of what's going on," Brown said, Miller was "focusing on the casualties, the patients, the triage."

The situation was tough for rendering aid. The air was thin, and Miller was working in up to four feet of snow on the ground. "Not only was it extremely cold, we were at 11,500 feet," Miller said. "So we were dealing with hypoxia and other things ... affecting the trauma of the patients."

Miller was forced to switch between providing first aid and getting into the fight. While the Rangers were battling their way up the mountain in an attempt to overrun the enemy bunker, Miller also left cover multiple times—exposing himself to heavy RPG fire—to bring ammunition to the team's various fighting positions.

He recovered a radio abandoned by a wounded team member and set up a second satellite communication line with home base, passing critical information about the status of the casualties and assault force.

At one point, he noticed a weak spot in the way the team had deployed, and he dislodged and repositioned the Chinook's tail gun to cover the gap.

Miller realized that the casualty collection point he'd established was too vulnerable. As the Rangers worked their way up the mountain, he began venturing out into enemy fire once again to move the wounded to a more protected spot. This slow, laborious process required Miller to repeatedly expose himself to direct enemy fire as he tried to save the wounded team members.

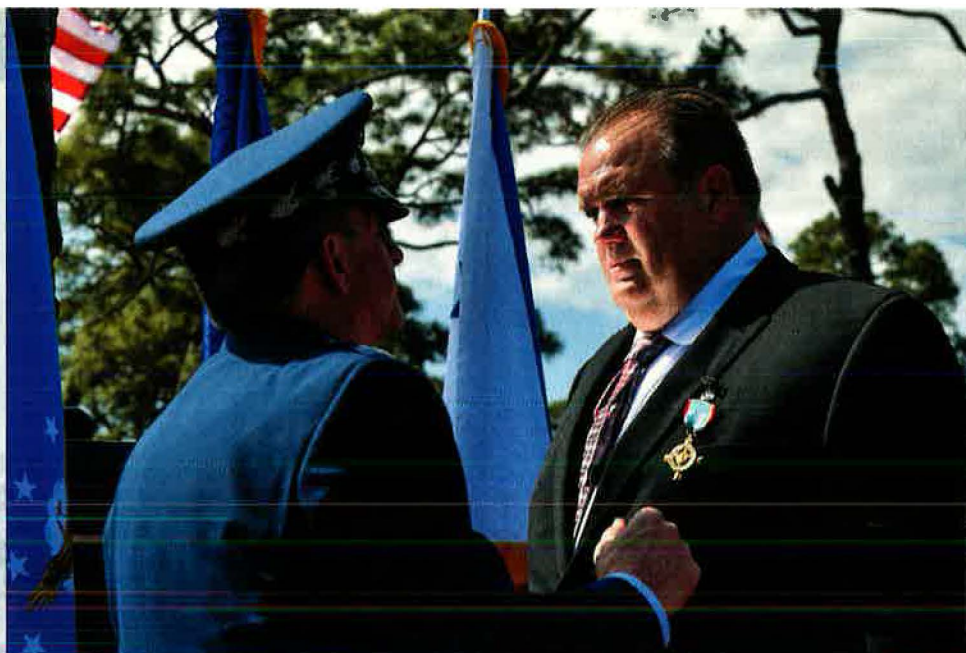
Almost eight hours after their helicopter crashed, the Rangers with Miller's team finally overran the Taliban bunker firing on them from the north, and they took the higher ground of that enemy position.

Brown had called in close air support from AC-130 gunships, and this proved decisive. From the new vantage point, Miller's team was able to spot and identify Roberts, who as it turned out had been killed by al Qaeda fighters, and TSgt. John A. Chapman, an Air Force combat controller who had died in an attempt earlier that day to rescue Roberts. Miller used the helicopter's rappelling rope to retrieve their bodies, in case they had been booby trapped.

His team carried the wounded up the slope to the new position, where they would be safer. Before they had completed the relocations, al Qaeda fighters began firing from a new position from the south. Cunningham, the PJ, was hit and eventually died from the wound. He was posthumously awarded the Air Force Cross for his heroism during the battle. Chapman was also posthumously awarded an Air Force Cross for his efforts to save Navy SEAL Roberts that day.

As they waited for a night rescue, temperatures began to fall, hypothermia became a pressing issue, and the team began to run out of supplies. "We had gone through all our medical gear," Miller said, and "we were maxing out our capability" to treat the wounded. He resorted to stripping insulation out of the helicopter to create makeshift shelters to keep the injured warm.

After 17 hours, Miller was still caring for three critically injured litter patients, as well as other wounded troops, when four helicopters from the Army's 160th Special Operations Aviation Regiment arrived to extract his team, the wounded, and the dead. He had saved the lives of team members and helped recover the bodies of the two killed in action.



At Hurlburt Field, Fla., on April 20, USAF Chief of Staff Gen. David Goldfein (left) presents Miller with the Air Force Cross—the highest service-specific award for valor.



L-r: Miller, SrA. Jason Cunningham, and SSgt. Gabe Brown (now a major) before the Battle of Takur Gar. Cunningham died from wounds sustained during that mission.

There was little reason to think the team would ever come back, McClane said. "Given the odds against them, they probably shouldn't have been successful, and yet they were."

Miller said his training made all the difference. During special tactics training, one of his supervisors was an Air Force Cross recipient. "We always had a saying," he said. "Train as you fight. That's what we did." The preparation "teaches you how to survive in really terrible situations"—and none worse than atop Takur Gar.

On April 20, 2017, Miller received the Air Force Cross at a ceremony at Hurlburt Field, Fla. Chief of Staff Gen. David L. Goldfein presented the award and told Miller that he represented "the finest traits America can ask of its warriors."

Despite their best-in-the-world training, this battle confronted the team with challenges it had never faced before, Miller told reporters before the ceremony. In 2002, the US was still new to Afghanistan, and US special operations forces were still learning how to fight this enemy. "That day we had things that weren't proven yet in tactics that we were able to pull off," Miller said.

He told reporters that some of the things he did at 11,500 feet "have been done in training or have been thought about on the chalkboard, but haven't been performed ... out in the battlefield."

Col. Michael E. Martin, commander of the 24th Special Operations Wing at Hurlburt, was involved in Operation Anaconda at the time. It was Miller's leadership on Takur Gar that most impressed him, Martin told *Air Force Magazine*. He imagines one of the most difficult aspects of the mission for Miller was the loss of his teammate Cunningham.

"His young pararescueman that he was responsible for [was] bleeding out," and yet Miller had the fortitude to "keep calm during chaos," Martin said.

"I remember the calls to try to get [Cunningham] off the mountaintop in broad daylight when no one would risk another helo to go in there," Martin said. Miller was making some of those calls.

"I don't think you can find a finer example of someone who selflessly put himself at risk to save other people's lives," Martin said. ✪

Photos: SrA. Ryan Conroy; USAF

A Russian Looks at America

"It's a mixture of disgust and sympathy. Disgust, because 99 percent of that is lies or a concoction—maybe 100 percent. As for sympathy, it's a desperate picture when a great democracy is killing itself, committing collective suicide."—**Sergey Karaganov, head of Russia's Council on Foreign and Defense Policy, giving his reaction to US obsession with alleged Russian hacking of 2016 election, *Washington Post*, June 1.**

Bad Day, Bad War

"The nature of war is all about a collision of will, fear, uncertainty, and chance. You have to ask yourself, 'How does fear play out in a world when a lot of the action is taking place between unmanned systems?' ... Surprise is going to be endemic, because a lot of the advances that the other people are doing on their weapons systems, we won't see until we fight them. And if they have artificial intelligence then that's better than ours, that's going to be a bad day."—**Deputy Secretary of Defense Robert O. Work, at Applied Physics Laboratory, *breaking-defense.com*, May 31.**

No Prisoners

"Our strategy right now is to accelerate the campaign against ISIS. ... We have already shifted from attrition tactics, where we shove them from one position to another in Iraq and Syria, to annihilation tactics where we surround them. Our intention is that the foreign fighters do not survive the fight to return home to North Africa, to Europe, to America, to Asia, to Africa. We are not going to allow them to do so. ... Once [ISIS fighters are] surrounded, then we will go in and clean them out."—**Secretary of Defense James N. Mattis, CBS News' "Face the Nation," May 28.**

To Separate ...

"We have to acknowledge that the national security space structure is broken. ... My vision of the future is a separate space force within the Department of Defense. ... The amputation [from the Air Force] is not going to begin tomorrow. That said, I believe reform is needed.

We must start now."—**Rep. Mike Rogers (R-Ala.), address to a space symposium in Colorado Springs, Colo., April 4.**

... Or Not to Separate?

"As we make this transition from a benign to a warfighting environment [in space], ... any move that actually ends up separating space—as opposed to integrating space ... I would argue is a move in the wrong direction. ... I would say that we ... keep that dialog open, but right now, I think it would actually move us in the wrong direction. I don't support it [a separate space corps] at this time."—**Gen. David L. Goldfein, USAF Chief of Staff, Senate Armed Services Committee, May 17.**

Pyongyang Ptomaine

"North Korea is a clear and dangerous threat. ... As former US Secretary of Defense Bill Perry once said, We have to deal with North Korea, 'as it is, not as we wish it to be.' Now I want all of you smart people in this room to stop and think about this. Combining nuclear warheads with ballistic missile technology in the hands of a volatile leader like Kim Jong-Un is a recipe for disaster. That is North Korea as it is."—**Adm. Harry B. Harris Jr., head of US Pacific Command, address to Sasakawa Peace Foundation in Tokyo, May 17.**

Naval Visions

"My sense is that we're [at] the dawn of something very substantial in terms of naval warfare—something as substantial as the transition from sail to steam, as the transition from wood to ironclad, as substantial as the advent of nuclear propulsion—in terms of what it means for naval power. ... Exponential types of growth, rather than lineal types of growth. ... There's a new dimension, the power of networking, that allows adaptive combinations to emerge. It's not all about the platforms."—**Adm. John M. Richardson, Chief of Naval Operations, remarks to reporters, May 16.**

Little Angela, Alone at Last

"The times when we can completely count on others, they are over to a cer-

tain extent. I have experienced in the last few days, and that is why I can only say that we Europeans must really take our fate into our own hands—of course in friendship with the United States and in friendship with Great Britain—and as good neighbors wherever it is possible, ... but we need to know that we have to fight for our own future and destiny as Europeans."—**German Chancellor Angela Merkel, campaign speech to crowd in a Bavarian beer tent in Munich, widely seen as a slap at the US and Britain, May 28.**

Drive, He Said

"This is a battle between barbaric criminals who seek to obliterate human life, and decent people. ... Drive them out. Drive them out of your places of worship. Drive them out of your communities. Drive them out of your holy land, and drive them out of this Earth."—**President Trump, remarks to a summit of Arab and Muslim heads of state in Saudi Arabia, May 21.**

Buggery in Days Gone By

"I think we've airbrushed out the fact that we've beaten them [the Irish Republican Army]. By the time I was directing Naval intelligence in 1989, 1990, we had them on the ropes. Everything was infiltrated. We had informers everywhere. They were absolutely bugged. ... Effectively, they knew they could not win. We were reading intelligence, we were reading conversations they were having, saying, 'What the hell are we going to do about this?' They were absolutely out. ... Why is it that [it] is hardly recognized now?"—**Retired Royal Navy Adm. Alan W. J. West, former UK intelligence chief, on why the Irish Republican Army laid down arms in 1998, *The Daily Beast*, May 9.**

First Use

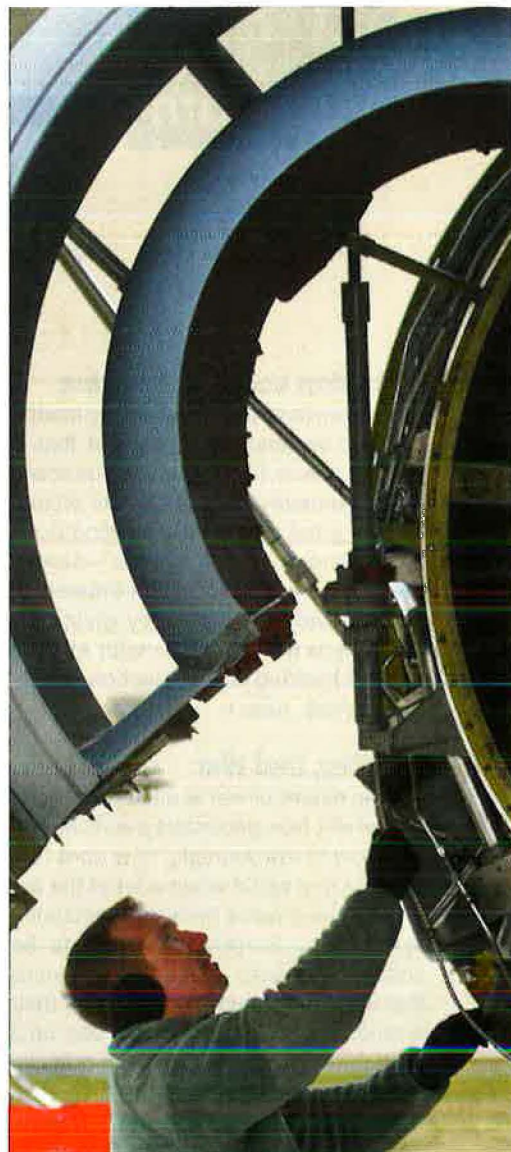
"I heard from the Russian military—and I think they are right—that, if US forces, NATO forces, are, were, in the Crimea, in eastern Ukraine, Russia is undefendable militarily ... without using nuclear weapons in the early stage of the conflict."—**Russian parliament member V. A. Nikonov, to European defense leaders at GLOBSEC forum in Slovakia, May 28.**

Air National Guard SSgt. Travis Laverne checks out an F108 engine on a KC-135 at JB McGuire-Dix-Lakehurst, N.J.



A1C Tyler Covington works maintenance on the blades of an F119 engine at Tyndall AFB, Fla. New engines in the works could improve fighter flight range up to 30 percent, improve stealth capabilities, and produce enough spare energy to fire directed energy weapons.

Real propulsion breakthroughs may be ready to leave the lab and enter the fleet.



ENGINES OF

Truly game-changing breakthroughs in US fighter engines are nearly in hand. After more than a decade of labor by Air Force Research Laboratory and engine-makers Pratt & Whitney and General Electric Aviation, increases in speed and range, reduced dependency on tankers, and a menu of new tactics are just some of the advantages coming in the next few years.

By 2021, engineers are expected to have built and tested flightworthy engines that could, for example, give new fighters 30 percent more range than they have today, produce enough spare power to fire directed energy weapons, or run cool enough to improve stealth. Besides those advantages, new engines could provide

great benefit to the F-35 strike fighter, allowing it to sustain high-speed flight at treetop altitudes, something it can't do today. The work is advanced enough that, given a green light, a new development program with a short execution time line could be launched and start producing new power plants by the early 2020s.

TREMENDOUS PROGRESS

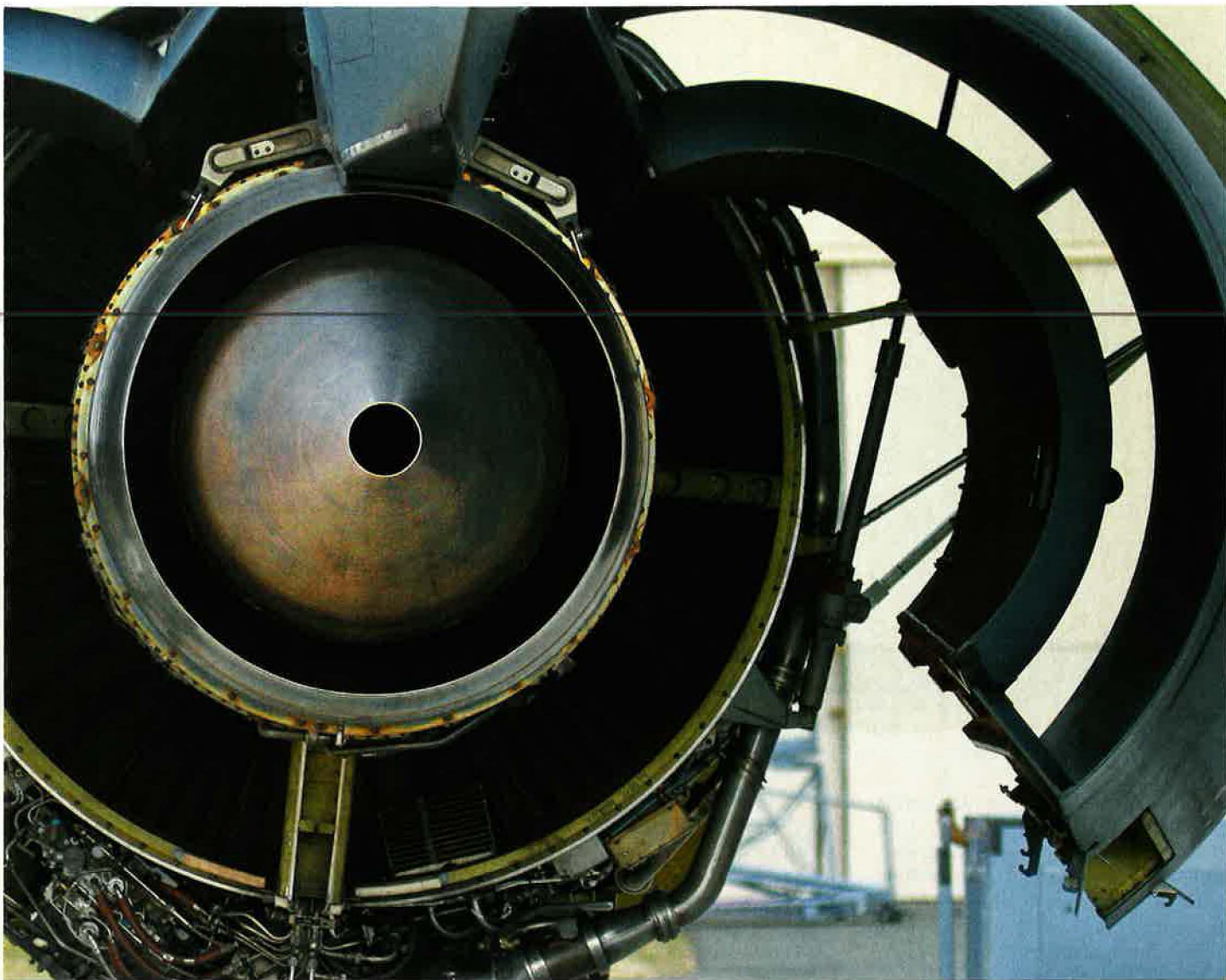
So significant are the improvements that the new engine technology effort has been exempt from recent budget cuts, to quicken the pace that the new power plants can be deployed in the inventory.

"We've gained tremendous insight from our experience designing engines for the F-22 and the F-35, which

By Jim Mathews

are truly a generation ahead," said Pratt & Whitney's James Kenyon, senior director of advanced programs and technology, in a 2016 news release. Subsequent development—funded by the Air Force, Navy, and in-house—have yielded "tremendous progress" since 2012 and "we're eager to move into the next phase of adaptive engine development," he said.

That next phase is the Adaptive Engine Transition Program, or AETP, a five-year project that began last summer with \$1 billion contracts each to Pratt & Whitney and General Electric Aviation. It will refine and mature technologies developed in the Adaptive Engine Technology Development



INNOVATION

program, launched in 2012 and concluding this year.

The term “adaptive” refers to an engine that can change its internal geometry to be efficient in a variety of missions and flight conditions.

TRADE-OFFS

Aircraft jet engines operate on what’s called the Brayton Cycle, named after the Englishman George Brayton, who commercialized this thermodynamic cycle in the 19th century. It describes the gas turbine process of compressing air, mixing it with fuel, causing combustion, expansion of the resulting gases, and vectoring them through an exhaust to produce thrust.

By a decade ago, refinements of the Brayton Cycle had nearly run their

course. Engineers, at the cost of millions of dollars, worked to find even one or two percent improvements in fuel efficiency.

These refinements focused on managing the trade-offs between higher thrust and fuel efficiency. In the 1990s, those compromises led to the introduction of commercial “big fan” engines—typically seen slung under the wings of airliners—designed to move large masses of air with the least fuel possible. The bigger the fan, the more air that could move and thus the more thrust that could be generated per input of fuel. Typically, more than three-quarters of the air “bypassed” the core engine.

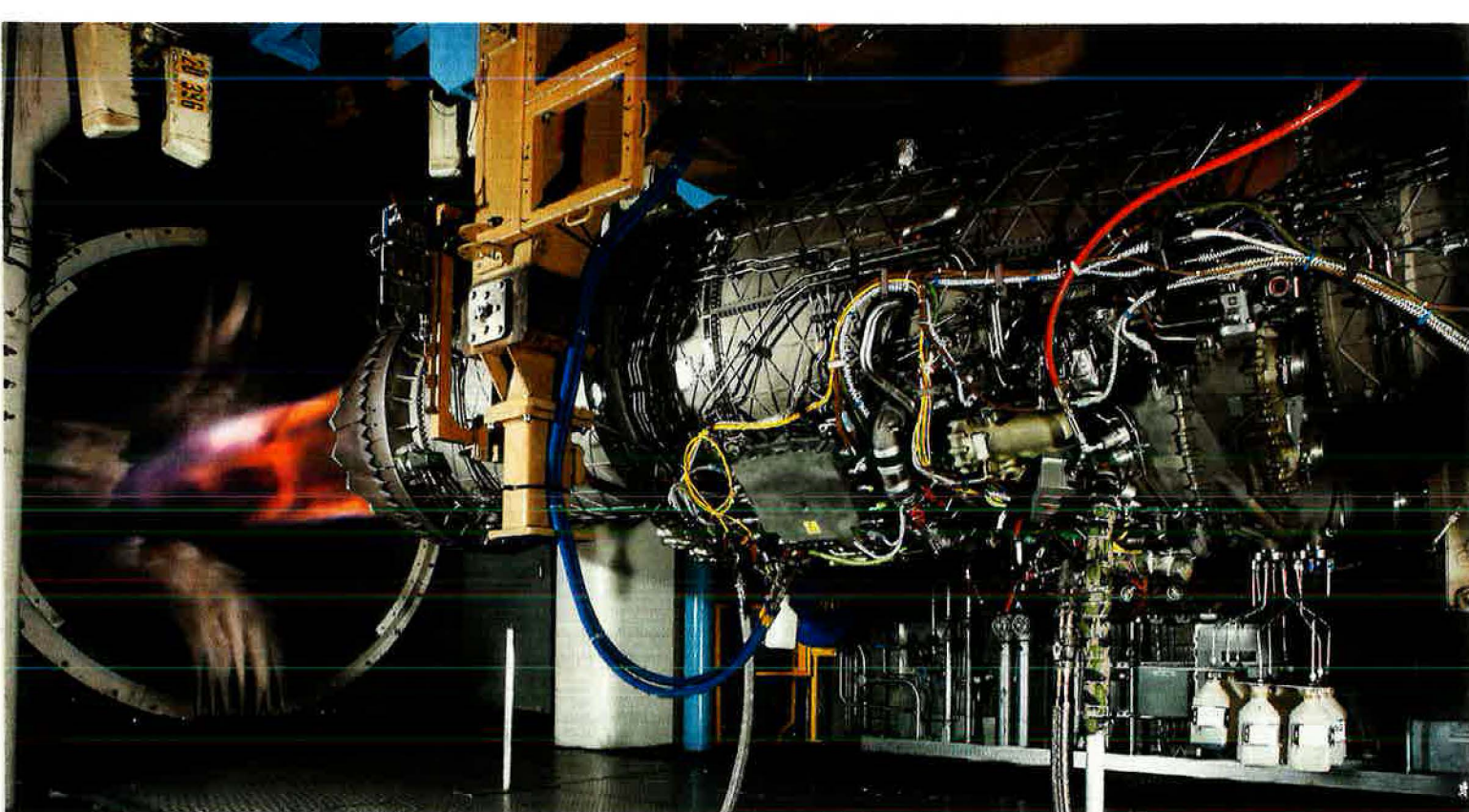
In the tactical arena, though, a 12-foot fan would never work on a nee-

dle-nosed fighter and would be incapable of developing the kind of high-thrust performance a fighter must have.

Then came ADVENT, shorthand for the Air Force’s ADaptive Versatile ENgine Technology. Started in 2007, it coalesced ideas on adaptive designs and variable cycles that engineers had been talking about for years.

In ADVENT, the Air Force funded GE Aviation and Rolls-Royce North America—the two engine-makers not then involved in the F135 engine program for the F-35 strike fighter—to work on very high-pressure ratio engine cores and adaptive, multistage fans and low-pressure sections.

Higher pressure ratio compressors can drive more core engine airflow, producing higher thrust. With com-



The F135 engine, used in the F-35 Lightning II, demonstrates hot-life capability at the Arnold Engineering Development Complex at Arnold AFB, Tenn.

puter controls, fan pressure ratios could be adjusted as needed. That meant obtaining the fuel-sipping benefits of big commercial airliner-style turbofans while being able to reconfigure an engine on the fly to create higher fan-pressure ratios needed for fighter-like maneuvers.

ADVENT and the Adaptive Engine Technology Development (AETD) program have produced impressive gains. Engine-makers have run core engines at high temperatures never before seen in turbomachinery. Meanwhile, efficiencies have been measured at record levels.

NEW MATERIALS

Materials such as ceramic-matrix composites (CMCs)—lightweight, nonmetal materials able to withstand immense heat—have been matured to where they can take up a larger share of an engine's components. That paves

the way for engines to run hotter, making them more efficient. CMCs can be as much as a third lighter than nickel alloys, and components made of them can run at temperatures that would melt metals. They also need less air to be diverted for cooling, which reduces efficiency.

Most importantly, the technology programs have proved the feasibility of a true "three-stream" jet engine, where the core engine airstream and fan-bypass stream is joined by a third bypass stream that flows around the outside area of the engine case. According to F135 maker Pratt & Whitney, this third stream of airflow can be put to work, improving propulsion efficiency and lowering fuel burn, or delivering additional airflow through the core for higher thrust and cooling air.

Dan McCormick, general manager of advanced combat engine programs

at GE Aviation in Evendale, Ohio, explains the challenge: "How do we create thrust in a much more fuel-efficient manner in a combat environment?" Adaptive technology, variable-cycle, and high-temperature materials hold the keys to the answer, he said.

While "the basic physics of the cycle haven't changed, ... changing the architecture of the engine allows us to move air around the engine in a different way than we did before," McCormick said. This "step-change in fuel-efficient thrust generation" is creating an engine as different from today's frontline fighter engines as those engines are from Frank Whittle's first crude turbojets in the early 1940s.

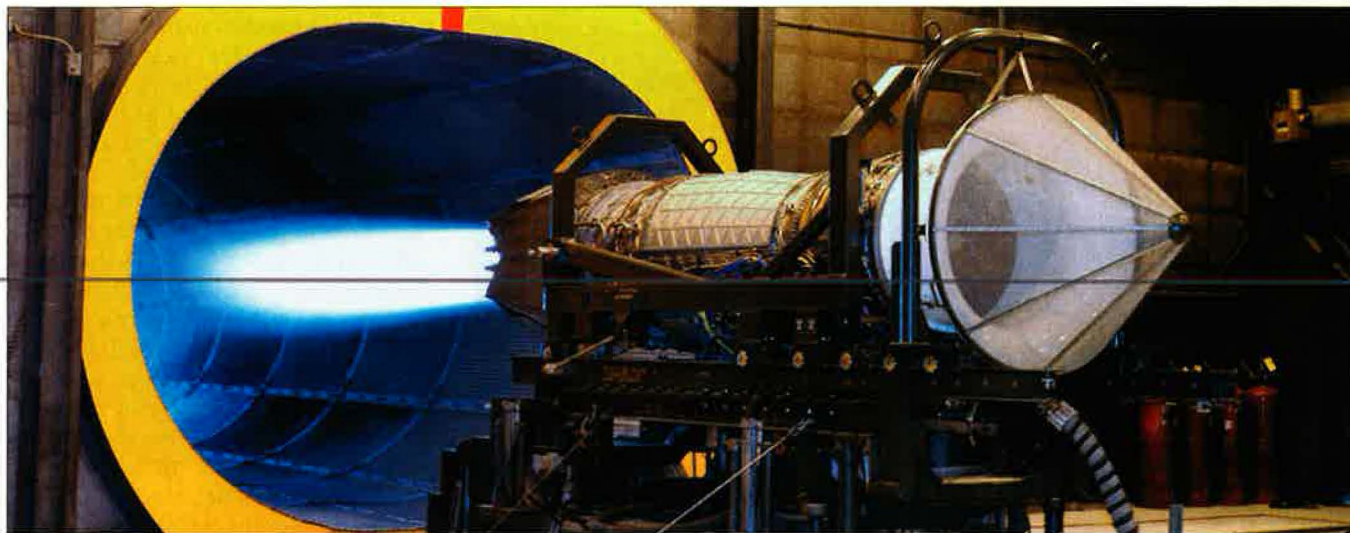
The engine configuration that emerged from GE's AETD work includes a three-stage, variable-geometry adaptive fan, a large annular duct to accommodate the third stream, and a very high-pressure ratio compressor.

FIGHTERS EQUIPPED WITH NEW GENERATION ENGINES WOULD HAVE:

25-30%
increased
combat radius

40%
more persistence
in the target area

74% less
dependency
on aerial tanker
support



An F119 thrust-vectoring aircraft engine undergoes testing and evaluation at Nellis AFB, Nev., in the 57th Component Squadron's hush house.

This last element was borrowed from the commercial CFM International's Leap engine that will power the Airbus A320neo and Boeing 737 MAX airliners.

General Electric is a 50/50 partner in CFM with France's Safran Aircraft Engines.

"What we're seeing now is that many, if not most, of the technologies that have to do with generating more thrust more efficiently are really being matured in our commercial product lines," McCormick said. Those commercial centerline engines allow him to "reverse history and pull those technologies into the engines we're doing for the military."

It's truly an example of technology coming full circle: The CFM56 product line—the world's most successful commercial jet engine, with 30,000 delivered to date—was built on the core of the F101 turbofan, developed to power the B-1B Lancer bomber. The CFM56 itself found some of its first work re-engining KC-135 tankers.

GE has worked "very hard to be able to exploit any technology that we have for our commercial business as well as applying those technologies on the military side of our business," McCormick added.

FUEL SAVERS

It's not just about bringing fuel efficiency to the world of fighter engines, however. GE reports adaptive-geometry variable-cycle engines can deliver a 25 percent improvement in specific fuel consumption. That can save billions of gallons of fuel outright, but fighters equipped with new generation engines would also enjoy a 25 to 30 percent increased

combat radius, as much as 40 percent more persistence in the target area, or the ability to reach 36 percent more targets. That would translate to as much as 74 percent less dependency on aerial tanker support.

These enhancements become even more crucial when considered in the context of the Air Force's sharply reduced capacity. The service has 59 percent fewer combat-coded fighter squadrons and 37 percent fewer aircraft overall than it did during the 1991 Gulf War. Making each aircraft more effective and productive can help close the capacity gap.

"The adaptive feature of the engine and its fuel efficiency plays most advantageously in a platform that has a very diverse mission," McCormick observed. For fighters, getting into the target area, persisting there, and getting out are phases of the mission where "you would like all of that to be extremely fuel efficient." When engaging an enemy, that's when "you want that combat capability" of high thrust and performance.

Another advantage is in cooling. In an F135-sized engine, that third airstream could be a significant source of cooling, drawing off heat generated by sophisticated fighter aircraft equipment.

"We've created great, insulated fuselages made of composites and packed them with electronics that are good at making heat," McCormick noted. "That third stream of air provides a significant opportunity" with thermal management. "It really is a game-changer; it's not just an incremental improvement," he asserted.

Better thermal management should make it possible for the F-35 to spend

a lot of time flying at near supersonic speeds at altitudes as low as 500 feet—a feat the F-35 today is restricted from sustaining because of thermal management concerns.

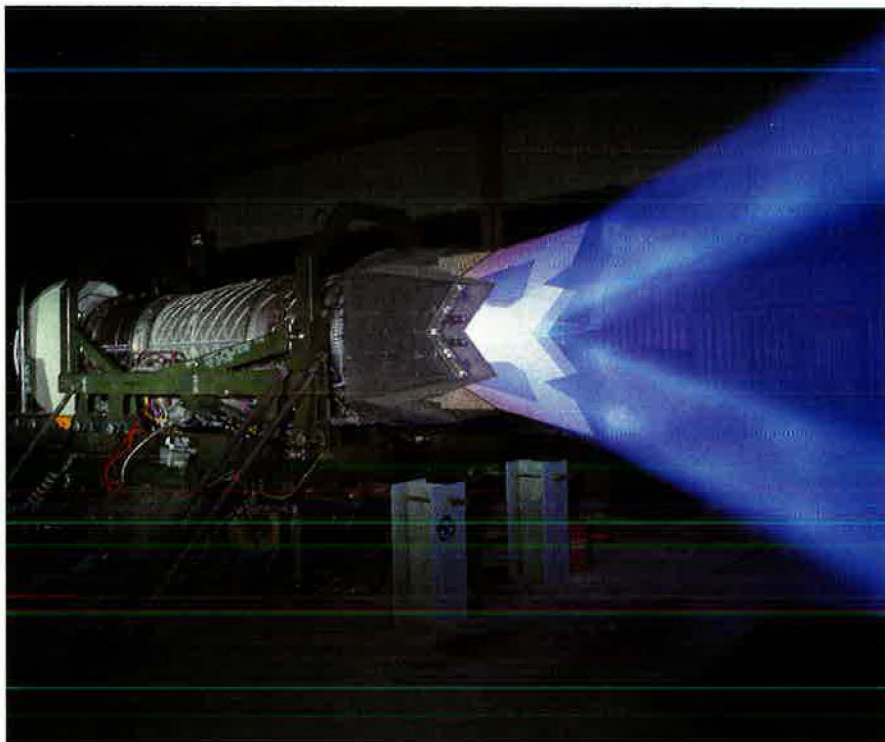
In a different non-F135 engine configuration, the third stream could also do double duty. Besides helping to cool all the heat-generating onboard electronics, it could potentially create a source for as much as a megawatt of onboard power for next generation weapons and systems, such as electric lasers and high-powered microwaves.

The Air Force is showing increased interest, now that such capabilities are tantalizingly close. In Fiscal 2016, the service accelerated funding to the AETP. USAF sees this as a low-risk way to start refining technologies for a next generation engine development program.

PURE SCIENCE

ADVENT began as a pure science and technology program. It was to solve the basic engineering and physics problems of propulsion improvement without worrying about creating flight-rated hardware or addressing installation challenges. The Air Force created the Adaptive Engine Technology Development program as a bridge, with component development and rig testing intended to lower the risk associated with eventually maturing the technologies.

Pratt & Whitney demonstrated a three-stream fan in a rig in 2013 as part of the AETD agenda. Earlier this year,



An F119-PW-100 turbofan engine is tested at a Pratt & Whitney facility. Two such engines power the F-22 Raptor.

the company was scheduled to demonstrate the three-stream technology in an actual engine environment.

For its part, GE finished its compressor rig testing in fall 2016 at Wright-Patterson AFB, Ohio. In May, a fan rig and core engine were being tested as well. GE expected to finish its AETD fan rig tests near the end of May, and core engine tests were to finish in late May or early June.

In the follow-on, five-year AETP, both engine-makers will design, develop, build, and test full-scale adaptive engines in the 45,000-pound thrust class. Pratt sees it as the logical extension and maturation of the next generation F135 engine it has been producing for the F-35 fighter.

GE'S TICKET TO RIDE

For GE Aviation, AETP represents a chance to get back in the frontline fighter engine game. GE wasn't chosen to be the primary engine-maker for either the F-22 or F-35. Then, a planned, interactive competition with Pratt & Whitney for F-35 engines was nixed in 2011 by Defense Secretary Robert M. Gates as a short-term cost-saving measure.

The AETP could be GE's ticket to reprise its role in the "Great Engine War" of the 1980s when the Air Force competed construction of power plants for the F-15 and F-16.

The Air Force has broken the AETP out of the broader Propulsion Technology Transition research, development,

test, and evaluation program for "greater transparency," the service said.

Despite USAF's belt-tightened Fiscal 2017 budget request, AETP was given priority status and the five-year proposed spending profile is a robust \$2.4 billion. It steadily grows from \$285 million in Fiscal 2017 to \$603.2 million by Fiscal 2021.

Pratt & Whitney said in a 2016 news release that its AETP engine will "benefit fully" from technologies refined and matured in AETD, noting its successful "demonstration of advanced turbine blade cooling technologies that allowed the company to achieve the highest ever turbine temperature in a production-based fighter engine."

Although the AETP engine will be nominally aimed at an F-35 class power plant, the Air Force is treating it as a more generic engine development effort—at least for now. There also seems to be some room for additional competition, with budget documents hinting that the engines that result from AETP could become the basis for a family of engines with multiple applications.

"The program will leverage adaptive turbine engine science and technology demonstrations to develop a multi-platform common adaptive engine built around a commercially derived core," the Air Force said in Fiscal 2017 budget documents. This suggests this engineering and manufacturing development work will set the stage for a comprehensive roadmap for powering combat aircraft. AETP will mature

component technologies and reduce risk to prepare for "next generation propulsion system development for multiple combat aircraft applications," according to the DOD contract listing.

Lt. Gen. Arnold W. Bunch Jr., USAF's top uniformed acquisition official, told *Air Force Magazine* there may be spin-offs from the new technology that could benefit the F-15 and F-16. Though the engines being looked at are designed to fit the power plant space in the F-22 and F-35—larger than the space in the F-15 and F-16, carrying an older and slimmer engine—Bunch said one aim of the program is to see if it can be "scaleable" to a smaller engine.

"We're keeping a focus on keeping our options open for whatever we need to do in the future," Bunch said.

TOUGH CHOICES

Does the Air Force's planned \$2.4 billion investment signal a return to the Great Engine War?

The service, "at least through this point in the program" sees "some advantages in keeping us both involved," McCormick said. Although USAF is keeping mum on the details of its thinking, "the behavior we see today shows they're certainly very much interested in retaining competition."

With the possibility of many different combat aircraft applications on the table, Pratt & Whitney and GE could each supply adaptive engine technology for different combat platforms and avoid splitting the fighter-engine buy as was done in the 1980s. The reality is that it costs a lot of money to certify two engine-makers to compete year after year in a budget environment that supports two-thirds fewer combat squadrons than 25 years ago.

On the other hand, each engine company is bringing unique technologies to bear and until very recently, it appeared that USAF was willing to spend money on both companies as an investment in combat capability.

It may well now boil down to a tough choice for the Air Force: financially unaffordable competition or strategically unaffordable sole-source next generation engines. ✱

Jim Mathews became CEO of a national transportation nonprofit organization after 26 years as a reporter, editor, and executive at *Aviation Week*. His most recent article for *Air Force Magazine* was "CAP Joins The Total Force" in the January issue.

Photo: Pratt & Whitney



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Gates Says, "I Want YOU"

It had been nine years since the 9/11 attacks. For all that time, US military men and women had been grinding it out in Afghanistan and Iraq. Secretary of Defense Robert M. Gates, lecturing at Duke, devoted most of his words to triumphs and tribulations of the all-volunteer force, but he ended with a bang. Gates challenged the students sitting before him and at other elite US colleges to give serious thought to military service, to "take a risk in every sense of the word." The 1,200 young people in the Duke audience received his words in stunned but respectful silence.

The Iraq and Afghan campaigns represent the first protracted, large-scale conflicts since our Revolutionary War fought entirely by volunteers. Indeed, no major war in our history has been fought with a smaller percentage of this country's citizens in uniform full-time—roughly 2.4 million active and reserve service members out of a country of over 300 million, less than one percent. This tiny sliver of America has achieved extraordinary things under the most trying circumstances. ...

I'd like to ... speak ... about another narrow sliver of our population—those attending and graduating from our nation's most selective and academically demanding universities, such as Duke. In short, students like many of you.

Over the past generation, many commentators have lamented the absence of ROTC [Reserve Officer Training Corps] from the Ivy League and other selective universities. ... University faculty and administrators banned ROTC from many elite campuses during the Vietnam War and continued to bar the military based on the Don't Ask, Don't Tell law, with Duke being a notable and admirable exception with your three host programs.

I am encouraged that several other comparable universities ... are at least reconsidering their position on military recruiting and officer training, ... but a return of ROTC back to some of

"The All-Volunteer Force"

Secretary of Defense Robert M. Gates
Lecture at Duke University
Durham, N.C.
Sept. 29, 2010

Find the full text on the
Air Force Magazine's website
airforcemag.com
"Keeper File"

these campuses will not do much good without the willingness of our nation's most gifted students to step forward. Men and women such as you.

One does not need to look too hard to find Duke exemplars of selflessness and sacrifice. Consider the story of Jonathan Kuniholm, currently a Duke graduate student in biomedical engineering, who lost part of his arm as a Marine reservist in Iraq. Now he is putting his experience and expertise to work designing new prosthetics—work that will help other amputees in and out of uniform. There is Eric Greitens, class of 1996, Rhodes Scholar, Navy SEAL. After narrowly missing injury himself during a mission in Iraq, he came back home and founded the nonprofit The Mission Continues to help wounded troops and veterans continue serving in some capacity. ...

No doubt, when it comes to military service, one can't hide from the downsides: The frustration of grappling with a huge and frequently obtuse bureaucracy. Frequent moves to places that aren't exactly tourist destinations or cultural hubs. Separation from loved ones. The fatigue, loneliness, and fear on a distant dusty outpost thousands of miles from home. And then there is the danger and the risk.

Next to the sidewalk between your chapel and the divinity school there is an unobtrusive stone wall. For decades, the only names on it were your alumni killed in World War II. Last October, 54 names were added to the wall—for those Duke men and women who died in the wars since then, including two who made the ultimate sacrifice in Iraq: Matthew Lynch, class of 2001, champion swimmer, following in his father's footsteps as a United States Marine; and James Regan, class of 2002, son of an investment banker who turned down offers from a financial services firm and a law [school] to join the Army Rangers.

But beyond the hardship and heartbreak and they are real there is another side to military service. That is the opportunity to be given extraordinary responsibility at a young age—not just for the lives of your troops but [also] for missions and decisions that may change the course of history. In addition to being in the fight, our young military leaders in Iraq and Afghanistan have, to one degree or another, found themselves dealing with development, governance, agriculture, health, and diplomacy. They've done all this at an age when many of their peers are reading spreadsheets and making photocopies. ...

So I would encourage you and all young Americans, especially those at the most selective universities who may not have considered the military, to do so. To go outside your comfort zone and take a risk in every sense of the word. To expand what you thought you were capable of doing when it comes to leadership, responsibility, agility, selflessness, and—above all—courage. ★

Photo: Sgt. A. J. Freeman



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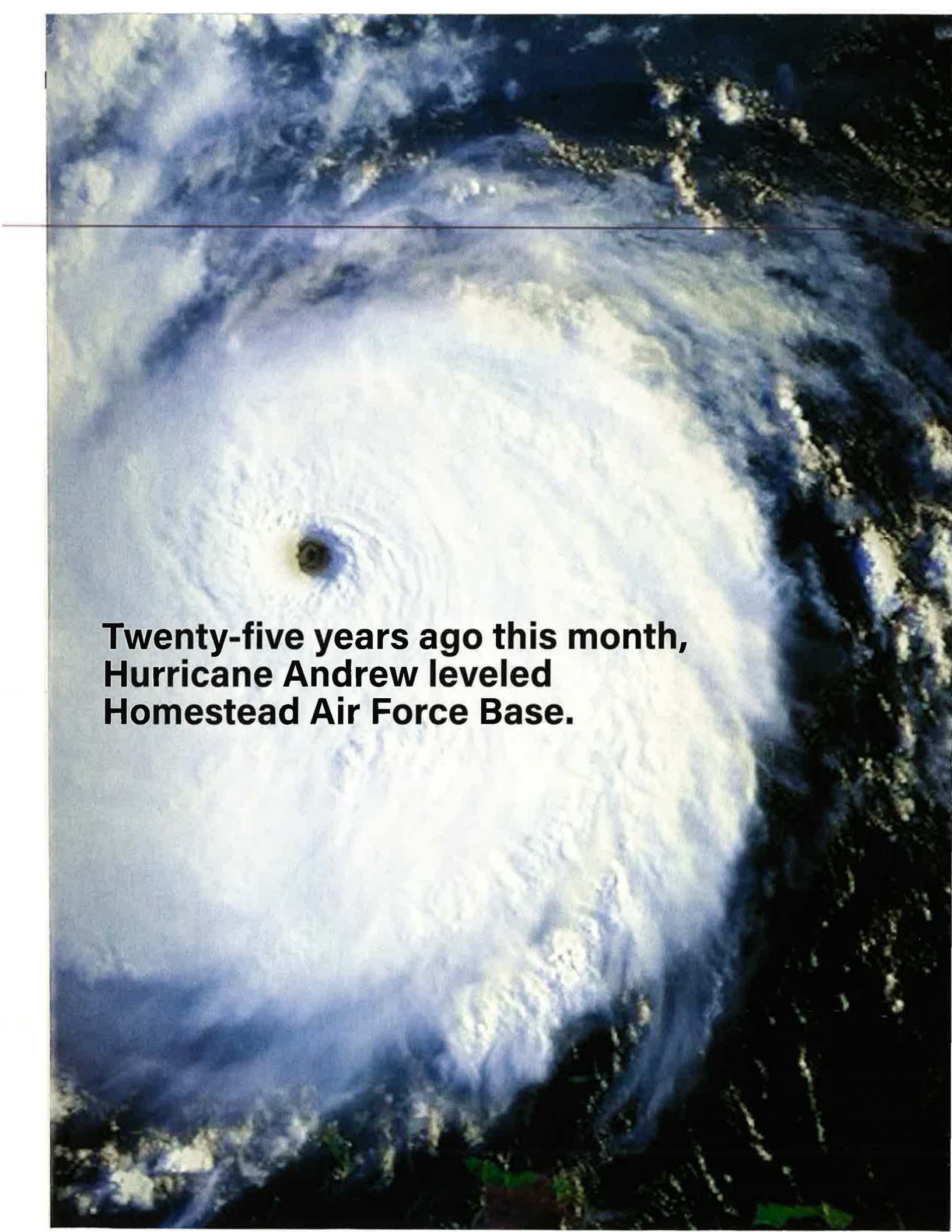
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WHEN ANDREW **HAMMERED** HOMESTEAD



By Gideon Grudo, Digital Platforms Editor

A satellite image of Hurricane Andrew, showing a well-defined eye and a dense, swirling cloud structure over the ocean. The eye is a small, dark, circular feature in the center of the storm. The surrounding clouds are bright white and spiral outwards. The ocean surface is visible as a dark, textured area at the bottom and right of the frame.

**Twenty-five years ago this month,
Hurricane Andrew leveled
Homestead Air Force Base.**



Four days before Hurricane Andrew struck Florida in 1992, Air Reserve Technician TSgt. Eugene Ritaldato took a trip from his home south of Miami to Naples, Fla., with his wife and friends.

After eating a steak dinner and catching Clint Eastwood's "Unforgiven" at a movie theater, the two couples headed back to their hotel rooms. There, watching the news, they realized the hurricane they hoped would nudge up north was instead headed directly toward them.

Ritaldato, 32 at the time and a weapons standardization supervisor with Homestead Air Force Base's 482nd Aircraft Maintenance Squadron, called his friend. Recounting the conversation recently with *Air Force Magazine*, he said he asked his friend, "Are you watching this? ... We better get back home."

At Homestead on Sunday—the day before impact—Ritaldato helped secure government property, such as vehicles and equipment, against the storm. "The last thing I saw was a sign saying we had to evacuate," Ritaldato remembers. After that, he went home to his wife, packed their belongings, and they left their residence, located just north of the base.

That Monday, Aug. 24, 1992, the Category 5 hurricane struck the United States. Its winds slashed through Homestead Air Force Base. This was the same base Air Force brass considered a service "jewel," according to John DeMilly, Homestead city's mayor at the time. He was quoted in a 1993 *Los Angeles Times* article.

The air base was all but destroyed by Hurricane Andrew, leaving it a "ghost town," reported Mike Clary in the newspaper story. "Windows are smashed out, insulation drips from shattered ceilings, and the eerie evidence of former





Previous pages: Hurricane Andrew destroyed hangars and aircraft at Homestead Air Force Base. A satellite image shows the Category 5 hurricane approaching Florida on Aug. 23, 1992. /1/ With winds exceeding 140 mph, the storm damaged the control tower and operations building. The base's host unit at the time was the 31st Fighter Wing. /2/ Debris surrounds an AC-130. /3/ The base was closed for days because of the destruction. /4/ Eugene Ritaldato, then an Air Reserve Technician at Homestead, took this photo of a wrecked supply building. "There was debris all over the flight line. One jet had a nose ripped off the front of it," he recalled recently. "The hangars were peeled away. Every single facility was damaged, either moderately or completely destroyed." /5/ A photo by Ritaldato shows how powerful winds drove an object through a palm tree.

Previous pages: USAF; NOAA. These pages: USAF; MSgt. Don Wetterman; USAF; Eugene Ritaldato (4-5)



lives—including clothing, furniture, medicines, and breakfast cereals—sits moldering in the heat and humidity,” Clary wrote. The damage was record breaking, with Andrew being the costliest hurricane in US history until Hurricane Katrina hit New Orleans in 2005.

The National Hurricane Center said the storm cost the country nearly \$25 billion in 1992 dollars. Twenty-six died as a direct result of the hurricane.

USAF sent 85 people to “comb through the rubble” at the 3,300-acre base to “determine how much damage had been done,” reported *The New York Times*.

“The house was destroyed,” said Ritaldato, who spent days after the hurricane basically camping out in what was left of his off-base residence. His 1989 white Pontiac Grand Am was pushed up against the front of his house. “My neighbor’s car somehow got some air under it and flew toward my bedroom, crashing into the front window.”

The rest of the neighborhood was demolished, Ritaldato said. “We lost just about everything we owned. When they say it’s like a bomb going off, it is. Everything is stripped bare. Everything is wiped out.”

The base fared no better. “A lot of the hangars were flattened. Ritaldato said. “One of them looked like someone just stepped on it.”

USAF said some mission essential commanders and support personnel stayed on base, but the majority of personnel and aircraft left. The base was completely closed for four days after the storm and reopened for official business only on Aug. 28, 1992.

The 482nd Maintenance Squadron and the 482nd Fighter Wing, Homestead’s largest tenant, took their F-16A and B



/1/ The hurricane’s winds left 50 percent of base housing without roofs and 90 percent of house windows broken. Trees were stripped and flattened. /2/ Lt. Col. Fred VanValkenburg of the 308th Fighter Squadron and his family survey their damaged quarters. /3/ The base chapel had its roof torn off. /4/ Maj. Wanda Velez Bustos photographs her destroyed home. /5/ A billeting office van landed atop a car. /6/ What remains of a 307th Fighter Squadron F-16. Six F-16s undergoing maintenance were left behind when the 31st FW evacuated its jets to other bases. The 31st FW commander and 17 support personnel weathered the storm in place. Today, the wing is located at Aviano AB, Italy.



Photos: Sgt. 1st Class Javier Otero, MSgt. James Ferguson (2-3); MSgt. Don Wetterman (4-6)



model aircraft and relocated to Wright-Patterson AFB, Ohio, until April 1993. Although Andrew destroyed Homestead's air traffic control tower, a mobile control tower was set up and the base began receiving relief supplies for both the Air Force facility and the surrounding communities.

Despite finding a way initially to brave the reality of post-Andrew destruction, the Ritaldatos would soon leave the Homestead area again. Three days after impact, Ritaldato's wife told him she was pregnant. They often joke that at the same time the hurricane was born in the Atlantic, their daughter Gina was conceived. After 10 days, they grabbed all their belongings, got in the car, and headed north to Broward County.

By early September, though, when President George H. W. Bush visited the base, 23,500 military personnel, in addition to the airmen stationed there, were helping with everything from security to rebuilding the base.

Initially, DOD dropped more than \$100 million in new construction and infrastructure improvements on Homestead. Unusable buildings were razed and base infrastructure was repaired. The three top priorities in fixing the place up were reconstructing an Air National Guard hangar, the air traffic control tower, and maintenance hangars. Within years the base would also add new facilities, including a wing headquarters and buildings to house vehicle maintenance, communications, medical, and security units.

While airmen were reinventing lives and rebuilding homes, Homestead Air Force Base was on the 1993 Base Closure and Realignment Commission's base closings list. But a coalition of civilian, state, and federal leaders fought the closing. After May 1993 hearings, the list was finalized and

sent to President Bill Clinton. Homestead was no longer on it.

In April 1993, the 482nd Fighter Wing relocated to MacDill AFB, Fla., for one year.

Homestead Air Force Base was officially redesignated as an Air Reserve Base on March 31, 1994, and got back the 482nd.

Hurricane Andrew wasn't the first storm to cause trouble for Homestead.

On Sept. 15, 1945, precisely three years after the base was established, a hurricane carrying winds measuring 145 mph tore through, leaving it in ruins until 1955, when a cleanup was completed and the base reactivated.

"When people have gone through something like this, you only do it once," Ritaldato said, explaining he'd leave immediately if he heard anything like that was coming for him again. "With a hurricane, it lasts for hours—and you're talking about hours of sheer terror and devastation and that can be very psychologically damaging—it can really tear your mind up."

Today, Ritaldato is a GS-12, working at the base as a weapons safety manager. Most of the buildings on Homestead have either been rebuilt or renovated to meet Dade County's several-times-updated building code, according to Ritaldato, and some of them may stand up to a hurricane of Andrew's magnitude. But the hangars won't. "They would fare the same," he said.

The 482nd flies Air Force Reserve F-16Cs and states its goal as: "Ensure trained, qualified airmen ready to support the joint fight."

In early 2017, some 200 of Homestead's Total Force airmen were deployed to Southwest Asia where they are battling ISIS through Operation Inherent Resolve. ★

Photos: TSgt. Rose Reynolds; MSgt. James Ferguson; Sgt. Kevin Thomas (3-4); MSgt. Dor. Wetterman



/1/ Florida Air Guardsmen from the 202nd RED HORSE Civil Engineering Squadron repair the roof on a foster-child care facility. After the storm passed, one of the largest cleanup and salvage operations in the peacetime history of the military began. /2/ An emergency hospital was set up in a damaged hangar. /3/ A makeshift building served as the Army and Air Force Exchange Service laundry facility. /4/ A temporary base exchange in a trailer truck opened for business. /5/ Sgt. Cindy Zimmerman and A1C Candice Kotch serve up a hot lunch in the base exchange parking lot during the cleanup operation. The National Weather Service called Hurricane Andrew the most expensive natural disaster in Florida's history.





By John T. Correll

If the Vietnamese took over the war, the Americans could go home.

It was a strange war that Richard M. Nixon inherited when he began his presidency in 1969. His predecessor, Lyndon B. Johnson, had given up on winning, called off the air campaign against North Vietnam, and opened negotiations with the enemy.

North Vietnam, encouraged and emboldened, was not interested in a peace settlement unless all of its war aims were met—in effect, the unconditional withdrawal of US forces and surrender of the South Vietnamese government in Saigon.

To make matters worse, former members of the Johnson administration demanded that Nixon move promptly

to extricate the United States from Vietnam. Nixon had no desire to continue the war. The question was how to get out of it with what he called “peace with honor.”

As Nixon’s national security advisor, Henry A. Kissinger, explained later, “America, the bulwark of free people everywhere, could not, because it was weary, simply walk away from a small ally, the commitments of a decade, 45,000 casualties, and the anguish of their families whose sacrifices would be retroactively rendered meaningless.”

The solution was seen to be “Vietnamization.” If South Vietnam could be enabled to take over the war and persuaded to do so, US forces could pull out and go home.

Credit for the “Vietnamization” term is usually given to Secretary of Defense Melvin R. Laird, who proposed it as an improvement on “de-Americanization,” suggested previously.

South Vietnamese President Nguyen

Van Thieu took exception to the term because, he said, it implied that up to then, the US had done all of the fighting alone. The Pentagon kept using the word anyway on the basis that it referred only to “the assumption by the Vietnamese of that portion of the war effort carried on previously by the United States.”

THE BIG SWITCH

The Vietnamization policy was decided upon at a National Security Council meeting in March 1969. The timetable set by the White House called for the program to start in July with a completion date sometime between December 1970 and December 1972.

In the first phase, South Vietnam would take over responsibility for the ground war. Phase two would include a buildup of the South Vietnamese air force. In the final phase, US presence would be reduced to a military advisory mission.

VIETNAM



A South Vietnamese UH-1H helicopter in flight over Southeast Asia in August 1971.



Secretary of Defense Melvin Laird, left, and President Richard Nixon. Laird was a zealous advocate of Vietnamization.

Over the next four years, Laird would be the strongest advocate for Vietnamization. In May 1969, he informed the Joint Chiefs of Staff that Vietnamizing the war was the highest priority of the Department of Defense.

In August, Laird rewrote the mission statement for US forces in Southeast Asia. Previously, the objective had been to defeat the enemy. The new mission, as Kissinger explained it, “focused on providing ‘maximum assistance’ to the South Vietnamese to strengthen their forces, supporting pacification efforts, and reducing the flow of supplies to the enemy.”

In a speech in November, Nixon declared, “In the previous administration, we Americanized the war in Vietnam; in this administration, we are Vietnamizing the search for peace. ... Under the plan, I ordered first a substantial increase in the training and equipment of South Vietnamese forces. ... We have adopted a plan which we have worked

out in cooperation with the South Vietnamese for the complete withdrawal of all US combat ground forces, and their replacement by South Vietnamese forces.”

The first US troop withdrawal—800 men from the 9th Infantry Division—was on July 8, 1969.

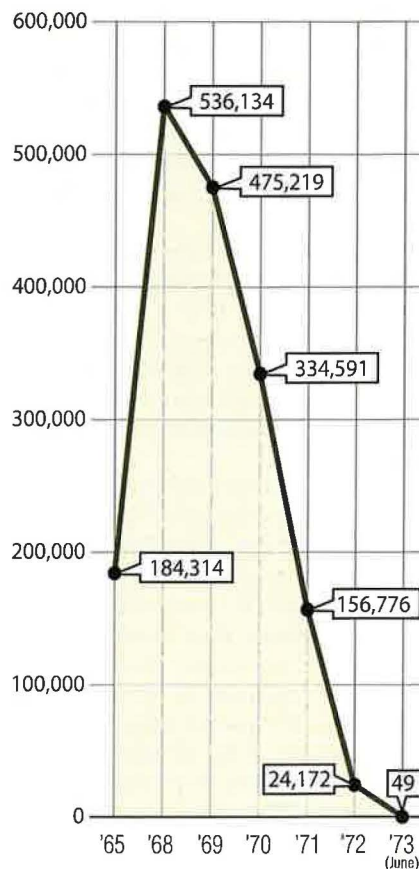
Nixon’s intention was for the mutual withdrawal of US and North Vietnamese forces, but Hanoi refused to cooperate. “The demand for mutual withdrawal grew hollow as unilateral withdrawal accelerated,” Kissinger said.

“Withdrawals would become like salted peanuts to the American public,” Kissinger added. “The more troops we withdrew, the more would be expected.

THE US DRAWDOWN

US troop strength in Vietnam peaked at 543,000 in April 1969. By the end of the year, a net reduction of about 7,000 had been achieved. Units not yet withdrawn continued to receive new arrivals

US MILITARY PERSONNEL IN SOUTH VIETNAM



Except for 1973, numbers are as of Dec. 31 for each year.

Photos: USAF/National Archives; Oliver F. Atkins White House via National Archives

IZATION



A US instructor teaches South Vietnamese pilots about a Cessna A-37 light attack aircraft. In the process of Vietnamization, the final phase would see the US military role reduced to that of an advisory position.

as replacements for troops rotating home at the end of their one-year tours.

Nearly all of the early reductions were ground forces. Airpower was drawn down more slowly and assumed a greater share of the American involvement in the war. The level of US Air Force presence in country did not change much. In fact, the aggregate number of US aircraft in South Vietnam increased by 40 in 1969.

Ever since the Rolling Thunder air campaign against North Vietnam ended in 1968, aircraft from USAF units in South Vietnam and Thailand and from Navy carriers offshore had been available for operations in the South and for interdiction of the Ho Chi Minh Trail in Laos.

Some of the older USAF aircraft were pulled out or transferred to the Vietnamese but the principal fighter and attack platforms in South Vietnam—F-4s, F-100Ds, and A-37s—took on a stronger role than before. B-52 bombers flying from bases in Guam, Thailand, and Okinawa provided an exceptionally lethal form of close air support.

The nature of the drawdown created a unique resource problem for the Air Force. “The other services were cutting back on their SEA [Southeast Asia] commitments drastically and could devote their money and efforts to neglected future force planning,” said

USAF historian Elizabeth H. Hartsook. “But Air Force commitments continued to increase.”

The Army had a different problem in the drawdown: the breakdown of morale and discipline among troops who were reluctant to engage in combat to buy time for the South Vietnamese in a war the US was no longer trying to win. The most extreme manifestation of this was “fragging” attacks on those perceived as overzealous to fight. In 1970, there were 209 instances of “fragging” with 45 killed, mostly officers and NCOs.

Laird reminded commanders that “the chief mission of our forces in South Vietnam continues to be to [ensure] the success of Vietnamization.”

THE SOUTH VIETNAMESE BUILDUP

Between 1968 and 1972, the personnel strength of the Army of the Republic of Vietnam (ARVN) and the “Ruff Puffs”—the Regional Forces and Popular Forces territorial militia—increased by about 75 percent.

The United States transferred large numbers of weapons, 44,000 radio sets, and 1,800 tanks to the South Vietnamese ground forces. The Ruff Puffs were able to replace their World War II vintage M-1 Garands and Thompson submachine guns with M-16 assault rifles.

Buildup of the Vietnamese Air Force (VNAF) was more complicated. Prior to 1965, the VNAF was an all-propeller force, mainly flying T-28 and A-1 fighter-bombers and attack aircraft and C-47 transports. VNAF was a limited capability force, configured to deliver limited firepower in support of ground troops against a lightly armed enemy.

The South Vietnamese obtained jets—A-37 attack aircraft and F-5 fighters, both modifications of US Air Force trainers—between 1966 and 1968 but did not possess them in significant numbers until Vietnamization began. UH-1 Huey helicopters replaced the older H-34s. AC-47 and AC-119 gunships were added as well.

VNAF was built strictly to defend South Vietnam. It did not have the capability to strike North Vietnam on its own or to conduct interdiction missions in high-threat areas like Laos. “In the time remaining, we’re not going to create a force that will take the place of the force that’s here now,” Air Force Gen. George S. Brown, who was the deputy commander for air ops at Military Assistance Command Vietnam (MACV), said in 1970.

Thieu asked for high-performance F-4 fighters but he did not get them. Among other considerations, F-4s were “grossly beyond current VNAF maintenance capabilities,” historian Hartsook said.

VNAF coped reasonably well with the changes and in 1971, flew 63 percent of the combat air sorties in South Vietnam.

Airfields and base facilities were transferred as well. By November 1972, USAF had turned over to the South Vietnamese all installations except for Tan Son Nhut in Saigon, where 7th Air Force and MACV were headquartered.

The strength of the South Vietnamese forces peaked in 1972 at just over a million, close to the 1.1 million calculated by US planners as the limit the South

GROWTH OF THE VNAF

	AIRCRAFT	SQUADRONS	PERSONNEL
1962	70	8	4,000
1966	393	16	15,000
1968	362	17	16,200
1970	746	37	29,000
1972	2,075	47	47,000
1973	1,769	64	61,700
1975	1,673	65	63,000

The “Enhance Plus” surge in 1972 dumped aircraft and equipment on the South Vietnamese Air Force faster than they could be absorbed. Between June and December, VNAF gained 678 additional airplanes. Thereafter, some aircraft were lost to attrition and others were redistributed in a realignment of assets and squadrons.

ARVN AND THE RUFF PUFFS

	1968	1972	1975
Number of Personnel	606,100	1,061,400	662,600
Main Force ARVN	302,000	535,500	180,600
Regional Forces	152,200	282,100	289,000
Popular Forces	151,900	243,800	193,000
Tanks	—	550	350
APCs	—	900	880

The "Ruff Puffs"—Regional Forces and Popular Forces territorial militia—fought the Viet Cong in the countryside. The Army of Vietnam (ARVN) took over when significant numbers of the enemy were concentrated against district and province centers.

Vietnamese population and economy could support.

The US dumped resources and responsibilities on the South Vietnamese faster than they could absorb them. With the possibility of a peace agreement suddenly looming in 1972, almost 700 additional airplanes—including improved model F-5E fighters—were delivered within a few months, anticipating that a cease-fire would impose restrictions on military assistance and the further provision of equipment.

"This force, although stretched by the expansion, was considered to be capable of providing close air support in an effective manner," said USAF Gen. William W. Momyer in a postwar analysis. "It was not considered, however, that VNAF would be able to provide the highly sophisticated support that ... USAF repeatedly did when there was a major engagement."

TRAINING AND OTHER ISSUES

The rapid expansion of the South Vietnamese forces created a huge new training requirement, of which instruction for aircrews and technicians was the most difficult part.

Through 1975, VNAF continued to send several hundred officers a year to the United States for undergraduate pilot training. At the same time, South Vietnam began to develop an aircrew training program of its own. After primary training in the T-41D Mescalero at Nha Trang, fledgling airmen went to Phan Rang and the T-37 trainer for transition to F-5s and A-37s.

Training for mechanics and other technical specialists was conducted in English. This left instruction open only to those who were proficient in English, but the practice was kept for several reasons.

"The Vietnamese language, reflecting its society, had not developed words for sophisticated technology," said journalist David Fulghum. "The language could come no closer to

the M-48 tank's 'ballistic computer,' for example, than to render it as an 'adding machine.' As late as May 1971, almost 6,000 pages of helicopter maintenance and repair manuals had yet to be translated."

Poor maintenance was a continuing deficiency, especially on the Huey helicopters, which were the most numerous aircraft in the VNAF fleet and which required extensive service. At times in the 1970s, half of the Hueys were grounded with mechanical failures.

Yet another kind of problem was

"THE SOUTH VIETNAMESE WERE NOT IMPROVING AS FAST AS THE US FORCES WERE WITHDRAWING."

—USAF historian Elizabeth H. Hartsook

created by service politics. Thieu was an army general and the army was his power base. He effectively sidelined and isolated others, such as his rival, Air Vice Marshal Nguyen Cao Ky, and put his own people in positions of authority.

"What counted for Mr. Thieu was personal loyalty, so generals in the South Vietnamese army and provincial chiefs in the South Vietnamese government tended to be promoted on the basis of their allegiance to Mr. Thieu rather than merit," said Fox Butterfield of *The New York Times*. "It was an old-fashioned, Confucian system, often greased by corruption."

ESTIMATES OF PROGRESS

Opinions were divided about the progress of Vietnamization. Gen. Creighton W. Abrams of MACV and Adm. John S. McCain, commander of US Pacific Command, said the program was working. Laird, returning from a visit to Saigon in 1971, said Vietnamization was "on schedule or ahead of schedule in all respects."

Seventh Air Force historian Kenneth Sams, writing in *Air Force Magazine* in

April 1971, reported that USAF generals regarded South Vietnamese pilots as "the elite of their nation's armed forces" and "among the most professional flyers in the world." Their experience was measured in years rather than months and some of them had logged as many as 4,000 combat missions.

The assessment was considerably more negative from junior officers and NCOs engaged in training the ground forces. Some ARVN units and leaders were good, but too many soldiers were deficient in everything from marksmanship to tactics and taking care of their equipment. "Vietnamization is a word for the politicians," one major told *The New York Times*.

There were also reservations about the combat effectiveness of Vietnamese airmen. As shoulder-fired SAM-7 anti-aircraft missiles became more prevalent, VNAF pilots were reluctant to go below 10,000 feet to launch close air support strikes. Accuracy was not possible from such altitudes.

On balance, Hartsook said, "The South Vietnamese were not improving as fast as the US forces were withdrawing."

DECLARING SUCCESS

Further evaluation of Vietnamization was based on South Vietnamese participation in three broader military operations during the transition period: the incursions into Cambodia in 1970 and Laos in 1971, and the "Easter invasion" from North Vietnam in 1972.

In Cambodia, ARVN performed effectively alongside US ground forces in the destruction of enemy sanctuaries and supply bases. In Laos, the search-and-destroy ground operation against the Ho Chi Minh Trail was conducted by the South Vietnamese army—the use of US ground forces in Laos having been specifically forbidden by an act of Congress—supported by American airpower and logistics. Some units did well; others did not.

The more critical test came in March 1972 with a three-pronged invasion by the North Vietnamese across the Demilitarized Zone and eastward out of Laos and Cambodia.

Most of the US ground forces were already gone, so it was up to the South Vietnamese and US airpower to repel the attack. They succeeded in doing so but the key factor was clearly airpower.

"From the Easter offensive of 1972, it was apparent that the ARVN couldn't stand up to the North Vietnamese without continuous and massive air support," Mommyer said. "ARVN was most dependent upon airpower and generally would not initiate major attacks unless airpower was assured."

The last US Army combat troops left Vietnam in August 1972 and most of the remaining US Air Force contingent in Southeast Asia was in Thailand.

In November, seeking to persuade Thieu to support a peace agreement, Nixon gave him "absolute assurance" that "if Hanoi fails to abide by the terms of the agreement, it is my intention to take swift and severe retaliatory action."

Operation Linebacker II, the massive air strikes on Hanoi and Haiphong in December, helped persuade the North Vietnamese to negotiate in earnest.

In congressional testimony Jan. 8, Laird said that "the Vietnamization program has been completed" and that the South Vietnamese armed forces were "fully capable" of providing security against North Vietnam within the borders of South Vietnam, making possible "the complete termination of American involvement in the war," even if the peace talks failed.

The peace accords were signed Jan. 27, 1973, and the cease-fire went into effect Jan. 28. By June, the American military presence in South Vietnam had dwindled to a few dozen.

SOUTH VIETNAM ALONE

In a March 29 speech, Nixon said, "We have prevented the imposition of a Communist government on South Vietnam." It was a bold claim, but Nixon was no longer in a position to influence events in Vietnam.

He was already engulfed by the Watergate scandal that would eventually drive him from the presidency in August 1974, and now that the United States was out of Vietnam, Congress was determined to make sure it stayed out.

In July, Congress denied funding to finance "directly or indirectly" combat operations by US forces "in or over or from the shores" of Vietnam or anywhere else in Southeast Asia. Congress also reduced assistance for South Vietnam from \$2.1 billion in 1973 to \$700 million in 1975.



In his memoirs, Nixon faulted Congress for withholding "the means to enforce the Paris agreement at a time when the North Vietnamese were openly violating it" and "cutting back on military aid for South Vietnam at a time when the Soviets were increasing their aid to North Vietnam."

South Vietnam had a large army and air force but the logistics system was dismally inadequate. Aircraft and helicopters often stood idle for lack of maintenance or spare parts. After the cease-fire, there were no more replacements for aircraft lost to combat or accidents.

The effectiveness of VNAF was further diminished by the South Vietnamese style of command and control, which divided the air force up into smaller segments that were assigned to corps commanders, who were always soldiers. These army officers exercised control over all of the air and ground forces within their territory and employed them with a limited, local perspective. Without US aid, South Vietnam could not sustain or support a force of the previous size. ARVN numbers fell sharply, with high casualty and desertion rates contributing further to the decline.

THE FALL OF THE SOUTH

The North Vietnamese began the final campaign of the war March 10, 1975, attacking with a force that included 18 army divisions—more than twice as many as they employed in the Easter invasion of 1972—as well as armor and artillery in large numbers.

North Vietnam made no effort to establish air superiority but the army

In 1972, anticipating a peace agreement, the US gave South Vietnam some 700 aircraft, including F-5Cs and Es, plus modified trainer airplanes.

was accompanied by so many radar-controlled anti-aircraft guns and SAM-7 missiles that VNAF's slow-moving helicopters and attack aircraft were seldom able to operate in the battle areas.

ARVN, spread thin and poorly led, could not hold, so Thieu decided to abandon the highlands region and two northern provinces and make a stand farther south. The situation soon deteriorated into a disorganized rout. Hundreds of aircraft and huge stores of supplies were left behind and fell into enemy hands.

In some places, the South Vietnamese soldiers did well; elsewhere they broke and ran. "VNAF as a whole fought better than any other element of the RVNAF [Republic of Vietnam Armed Forces]," Mommyer said.

Thieu resigned April 23 and flew into exile. Most of the remaining VNAF aircraft fled to Thailand on April 29 to avoid capture.

VNAF's last combat sortie was by A-37s against North Vietnam columns moving toward the capital on April 30. Saigon fell later that day, bringing the long war in Vietnam to an end. ☐

John T. Correll was editor in chief of *Air Force Magazine* for 18 years and is now a contributor. His most recent articles, "Airpower at the Bay of Pigs" and "Eisenhower and the Eight Warlords" appeared in the July issue.



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Pedal power here & there



AFA volunteers on two continents raised funds for wounded airmen.

From Arlington, Va., to Agadez in the African country of Niger, volunteers pedaled in the Wounded Airman Cycling Challenge and surpassed their fund-raising goal for AFA's Airmen and Family Programs, including the Wounded Airman Program.

Riders on stationary bikes in the US—led by AFA national headquarters staff members in Arlington, Alamo Chapter members in San Antonio, and other individual and corporate supporters—raised over \$56,000 through this cycling challenge. It took place primarily at indoor cycling studios CycleBar in Arlington, Va., and CycleBar Stone Oak in Texas, where on May 20, the fund-raisers spent an hour spinning. Afterward the IT company Technica hosted a reception for the Virginia-based group.

"Our first annual Wounded Airmen Cycling Challenge exceeded all of our expectations," commented retired Gen. Larry O. Spencer, AFA's president. Not only did the US volunteers beat the event's original goal of \$50,000, the cyclists in Arlington were surprised that their workout involved some lifting of weights and push-ups from the handlebars while they pedaled.

IN THE SAHEL

Meanwhile, in Africa's Sahel—where the land transitions to the Sahara desert—US Air Force personnel building an airfield in Niger decided to organize a remote version of the cycling challenge.



In Arlington, Va., AFA staff members and supporters—including AFA President Larry Spencer, far left in the second row—pedal for wounded airmen. The Alamo Chapter held a simultaneous challenge in San Antonio.



By McKinnon Pearse

In Agadez, Niger, more than 100 airmen cycled a 9.5-mile circuit from sun up to sun down during a Memorial Day Cycling Challenge. Inset photo: SrA. Isis Arroyo is second from left. The white truck in the background followed behind the cyclists, carrying water.

Undeterred, airmen like SrA. Isis Arroyo of the 60th Civil Engineering Squadron, began riding on May 1 in off-duty hours, early in the morning or in the evening before the sun went down. Volunteers from the fire department to the medical flight saddled up. "Those five bikes got a lot of miles put on them," emailed Lawrence, who is first sergeant for the 724th Expeditionary Air Base Squadron. Arroyo rode 100 miles.

On Memorial Day, the airmen held an air base bike ride, with teams of four to five riding all day.

By the end of a month's effort, they had put in more than 400 hours of riding. They were continuing fund-raising through July at <https://fundly.com/users/1513423>.

AFA has provided more than \$300,000 in direct support to wounded airmen and families since 2013. The funds have been used for adaptive sports equipment, ramps, emergency financial support, and transition assistance.

But first, they needed wheels. Led by Ramstein Chapter member MSgt. Dustin E. Lawrence, they obtained 10 mountain bikes through the air base's services flight. Flat tires, faulty brakes, and chain defects soon sidelined half of them, however, because there were no spare parts.

McKinnon Pearse is AFA's communications coordinator and personally raised \$700 for this edition of the Wounded Airmen Cycling Challenge. **MSgt. Dustin E. Lawrence** provided additional reporting from Niger.

Wounded Airmen Cycling Challenge

Fundraiser to support Wounded Airmen & Family Programs

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AIR FORCE ASSOCIATION

AFA.org



Cadets take part in an induction ceremony at the Arnold Air Society/Silver Wings national convention, this year called IMAGINATCON 2017. Cadets and college students in both professional honor societies are AFA members.



Lt. Gen. Charles Brown receives a 3-D printed aircraft after his IMAGINATCON address. Now US Central Command deputy commander, Brown was an ROTC cadet.

Ready. Willing. Able.

Arnie cadets and Silver Wing students are AFA's future.

Having the boundless energy that comes from youth, Arnold Air Society and Silver Wings truly hold the keys to AFA's future.

At the AFA National Convention last year, Vice Chairman of the Board for Aerospace Education Richard B. Bundy told the delegates that the cadets and students in those two organizations are "our strongest source of young college-age members."

Here are some fast facts on these young adults who have fresh ideas and an eagerness to carry out community service projects.

THEY ALL BELONG



Did you know that Arnies—and Silver Wings through their affiliation with the cadets—have partnered with AFA since 1950? Today, the two college organizations number some 3,200 people, including Air Force Academy cadets.

WHAT IS ARNOLD AIR SOCIETY?



In 1947, University of Cincinnati cadets decided to create an honorary society for members of AFROTC. They named their organization for Gen.

Henry H. "Hap" Arnold, head of the wartime Army Air Forces.

THEY'RE YOUNG BUT OLD

In April, 900 Arnold Air Society AFROTC cadets and Silver Wings college students met in Orlando, Fla., for their annual National Convention. For the Arnies, this NATCON marked their 70th anniversary. For Silver Wings, it was their 65th.

THE SOURCE OF AFA LEADERS

This year, four of AFA's six Emerging Leaders—Molly Mae Potter, Gabrielle M. Kearney, Hannah M. Richmond, and Evan T. McCauley—originally came from AAS or Silver Wings.

WHAT IS SILVER WINGS?



Originally called Angel Flight, Silver Wings founded its first chapter in 1952 at the University of Omaha. Members built a professional, service-oriented organization of students and supported AFROTC units on campus.

WHAT THEY CAN DO

These cadets and students annually perform nearly 100,000 service hours, some of them involving AFA chapter projects. They have helped educate the public about the service and sacrifice of the World War II "Greatest Generation"; helped those with disabilities assimilate into communities; and helped honor POWs and MIAs.

McKinnon Pearse is AFA's communications coordinator and a Silver Wings national administrative consultant.

AFA CHAPTER NEWS

MOUNT CLEMENS CHAPTER

Air Force Magazine Editor in Chief Adam J. Hebert was a guest speaker at an annual dinner of the Mount Clemens Chapter (Mich.) in May.

Hebert, a Michigan native, spoke about Selfridge Air National Guard Base as viewed from a national level while Brig. Gen. John D. Slocum, both base commander and Michigan ANG's 127th Wing commander, spoke on current missions at the base.

The dinner was coordinated by Michigan state president-elect Randy Whitmire and Chapter President Dan Heaton. More than 160 people attended the dinner and eight people signed up to become AFA members that evening, said Heaton.

During the dinner, the chapter celebrated the centennial of the base and the 70th anniversary of the Air Force.



Air Force Magazine Editor in Chief Adam Hebert speaks at a Mount Clemens Chapter dinner in Michigan. Brig. Gen. Joseph Slocum, base commander, also spoke at the dinner.

■ GEN. BRUCE K. HOLLOWAY CHAPTER

The Gen. Bruce K. Holloway Chapter (Tenn.) recently held its monthly executive committee meeting at McGhee-Tyson ANGB, Tenn. Chapter President Paula Pen-son led discussions on a golf tournament fund-raiser and plans to celebrate the Air Force's 70th birthday in September, said Joseph E. Sutter, former AFA chairman of the board.

Present at the meeting were Col. Kevin M. Donovan, then-commander of the I. G. Brown Training and Education Center at McGhee-Tyson and AFROTC cadets from the University of Tennessee.

■ TEACHERS OF THE YEAR AWARD

AFA chapters from around the US highlighted a number of teachers:

■ The **Cape Canaveral Chapter** (Fla.) presented its Chapter Teacher of the Year Award to Judy Houser of Holy Trinity Episcopal Academy in Melbourne, Fla. Houser is the director of enrichment for the academy's lower school. According to chapter VP for Communications Jerry May, she is a three-time Teacher of the Year recipient.

■ The **Lewis E. Lyle Chapter** (Ark.) selected teachers Denise Gregory of Arkansas School for Mathematics, Sciences, and the Arts in Hot Springs and Cassie Kautzer of Hellstern Middle School in Springdale for Chapter Teachers of the Year. Gregory

teaches high school math and computer science and Kautzer teaches sixth grade science. Kautzer was also selected to be the State Teacher of the Year, according to Chapter Secretary William Jervis.

■ The **Green Mountain Chapter** (Vt.) awarded math teacher Tim Ulrich of Lyndon Institute in Lyndon, Vt., the Chapter and State Teacher of the Year Award. Chapter President Ray Tanguay and other chapter leaders traveled to Lyndon for the ceremony. Ulrich "was recently named "Educator of the Year" by the state, according to Tanguay.

■ The **Eglin Chapter** (Fla.) named Penny Parmer as its Chapter Teacher of the Year during a ceremony, said chapter VP for Communications Amy Gold. Parmer is a math and language arts teacher at C. W. Ruckel Middle School in Niceville, Fla. The chapter also awarded 17 students with scholarships through its Aerospace Education Foundation. The ceremony was "especially significant" because Gen. William L. Kirk, who had served more than 25 years as AEF chair, had passed away earlier that day, said Gold.

■ OUTSTANDING CADET AWARDS

■ During an AFJROTC awards ceremony at Hinckley High School in Aurora, Colo., **Mile High Chapter** (Colo.) President Richard Wendt presented an AFA Outstanding Cadet award to Biruk Hamussa. The ceremony featured JROTC detachments

from three schools, including Hinckley, and the Color Guard that had posted the colors for the final banquet at AFA's recent StellarXplorers competition, said Wendt.

■ Chapter President John Schmidt of the **Col. H. M. "Bud" West Chapter** (Fla.) presented AFA awards during an AFROTC awards ceremony at Florida State University in Tallahassee, Fla. Matthew Long received an AFA Silver Medal; April Bradley and Francis Cullen III received Outstanding Cadet awards; and William Chirinos received the Chief Schmidt Award for community service.

■ RICHARD M. SKINNER III (1924-2017)

Richard M. Skinner III of Silver Spring, Md., died May 6 at the age of 92.

From 1959 to 1989, Skinner was an editor and later associate publisher of *Air Force Magazine*.

Skinner was born in Princeton, Ill., and graduated from Knox College in Illinois and later Columbia University in New York. Skinner served in World War II as a cryptographer with Seventh Air Force in the Pacific, working with B-24 bomber units.

"He ran magazine production and quality control with a sure and dependable hand. ... He was a good teacher. I was one of his students," said John T. Correll, former Editor in Chief of *Air Force Magazine*.



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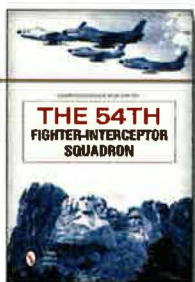
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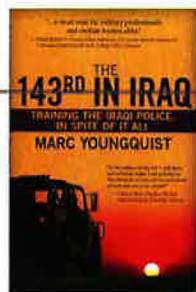
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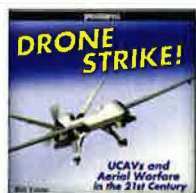
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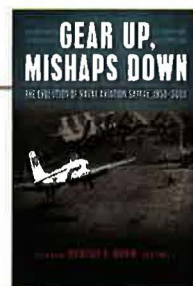
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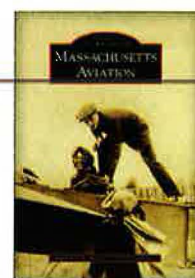
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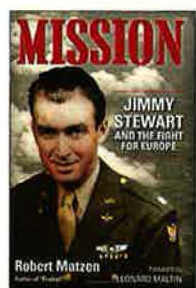
Drone Strike: UCAVs and Unmanned Aerial Warfare in the 21st Century
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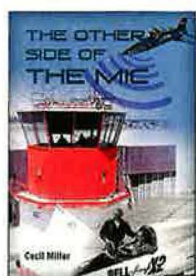
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Images of Aviation: Massachusetts Aviation
Frederick R. Morin and John Galluzzo. Arcadia Publishing, Mount Pleasant, SC (844-882-1651). 127 pages. \$21.99.



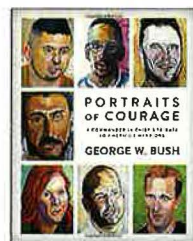
Mission: Jimmy Stewart and the Fight for Europe
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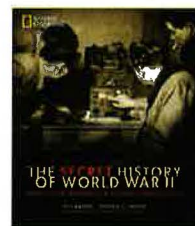
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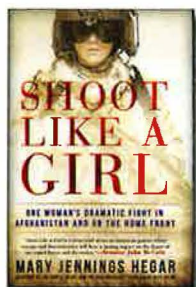
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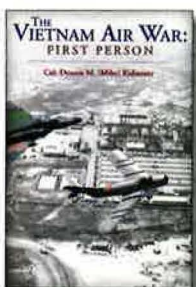
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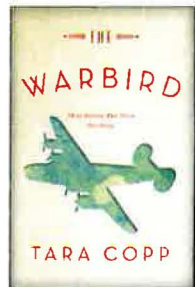
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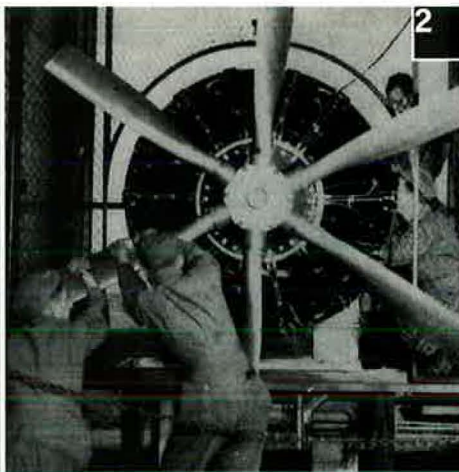
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Julie B. Ta and Robert C. Treviño. https://www.nasa.gov/sites/default/files/atoms/files/walking-to-olympus_tagged.pdf. 164 pages.



The Warbird: Three Heroes. Two Wars. One Story.
Tara Copp. Squadron Books, Portland, OR (503-888-0993). 235 pages. \$17.99.



SHEPPARD

The First Casualty

He never wore the uniform and never commanded forces, but Morris Sheppard left his mark on America's military. USAF's largest training base bears his name. There's more to his story, however.

John Morris Sheppard was born May 28, 1875, on a Texas farm. His rise in life appeared foreordained. He was a direct descendant, through his mother, of Robert Morris, a Founding Father and signer of the Declaration of Independence. His father was—in order—the local district attorney, a state judge, and member of Congress.

Sheppard took law degrees from the University of Texas and Yale. In 1902, the young Texas attorney, a Democrat, was elected to the House. In 1913, he won a hard-fought race for the US Senate to fill the vacancy after the death of his father.

In Washington, Sheppard stood out. He was five feet four inches tall. He was a student of literature who penned a 35-volume work on Shakespeare. He was close to William Jennings Bryan, the silver-tongued, three-time presidential candidate. The Texan was himself one of the most entertaining speakers of his day.

Sheppard was a Senate success. Early on, he became a trusted ally of President Woodrow Wilson. Later, he successfully pushed for progressive rural credit, child labor, and antitrust laws. He was an ardent backer of women's suffrage (and foe of desegregation). In the mid-1930s, Sheppard was key to much New Deal legislation.

Sheppard is best known for two wildly divergent achievements.

First, he became "the Father of Prohibition." A strident supporter of the temperance movement, Sheppard penned the 18th Amendment banning production, transportation, and sale of alcohol. He proposed it in 1917. By 1919, it was law of the land. He assisted Rep. Andrew J. Volstead with writing the Volstead Act, providing an enforcement mechanism.

Widely seen as a disaster, Prohibition was scrapped in 1933. Five times, Sheppard tried and failed to make America dry again.

Second, Sheppard led the preparation of US forces for World War II. In the period 1933-41, the Texan was chairman of the Senate Military Affairs Committee, a post from which he inveighed against isolationism and military weakness—well before Pearl Harbor.

Sheppard, allied with President Franklin D. Roosevelt, worked to expand defense spending—for the Air Corps, especially—and generate more and better training of US troops. With the outbreak of war in Europe in 1939, he led efforts to pass the Selective Training and Service Act and legislation authorizing Lend-Lease.

Less than one month after his Lend-Lease success, Sheppard suffered a brain hemorrhage, possibly from overwork. He died April 9, 1941. Gen. Douglas MacArthur offered accolades to Sheppard as a warrior, calling him "the first casualty of World War II."

The senator's legacy, Sheppard Air Force Base near Wichita Falls, Texas, is

MORRIS SHEPPARD

Born: May 28, 1875, Wheatville, Texas

Died: April 9, 1941, Washington, D.C.

College: University of Texas (B.A., law), Yale University (law)

Military Service: None

Occupation: Attorney, Congressman, Senator

Political Party: Democrat

Offices: US House, 1902-13; US Senate, 1913-41

Honors: Chairman, Military Affairs Committee 1933-41

Famous Friends: William Jennings Bryant, Gen. Douglas MacArthur

Famous Relatives: Robert Morris (signer of the Declaration of Independence); grandsons Connie Mack III (US Senator), Morris S. Arnold (federal judge), Richard S. Arnold (federal judge),

Buried: Texarkana, Texas

SHEPPARD AFB

State: Texas

Nearest City: Wichita Falls

Area: 6.3 sq mi / 4,032 acres

Status: Open, operational

Opened: (as Sheppard Field) June 14, 1941

Inactivated: Aug. 31, 1946

Acquired: (by Army) April 30, 1947

Reacquired: (by USAF) Aug. 1, 1948

Renamed: (Sheppard AFB) Aug. 15, 1948

Former Owners: Air Training Command, Strategic Air Command

Current Owner: Air Education and Training Command

1/ Sen. Morris Sheppard, circa 1930s. 2/ Aircraft mechanic trainees at Sheppard Field during World War II. 3/ Sheppard (r) and Ralph "Tall Cowboy" Madsen, a seven-foot-six-inch actor, on the steps of the Capitol in Washington, D.C.

the most diverse base in Air Education and Training Command. The 82nd Training Wing provides specialized technical training for airmen. The 80th Flying Training Wing hosts the Euro-NATO Joint Jet Pilot Training program for NATO combat pilots.



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