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SPIRIT AEROSYSTEMS®

By Adam J. Hebert, Editor in Chief

No Carrier, No Problem

Feb. 16, 2017

The *Dwight D. Eisenhower* carrier battle group departed the Middle East in December 2016 and returned home to Norfolk, Va., after completing a seven-month combat tour. *Ike's* replacement, the *George H. W. Bush* battle group, departed Norfolk for the Middle East three weeks later, on Jan. 21.

By Feb. 6, *Bush* was making a port call at Souda Bay, Greece. More than six weeks passed without a US aircraft carrier in the Middle East, a fact that generated considerable national media attention.

The gap "comes at a particularly inopportune time," read *Defense News,* reflecting a common opinion. "Numerous media reports indicate intelligence organizations and analysts are on the lookout for provocative actions by potential antagonists—in particular Russia, China, North Korea, Iran, or ISIS. Terror alerts … are high in many regions … due to a confluence of factors—the new year, ISIS' diminishing power in the face of counterattacks in Iraq and Syria, and a natural tendency to test a new administration."

The Navy's carrier groups had repeatedly surged to meet combat demands in recent years, which took a toll on the flattops. *Bush* needed a longer-than-expected overhaul before returning to the high seas, and there were no other carriers available to fill in for it in the waters around the Middle East.

Besides the carrier gap, other January operations also generated considerable attention. That month saw a successful B-2 strike against ISIS training camps in Libya and an airpower-supported raid against al Qaeda facilities in Yemen, an attack that left Navy SEAL William "Ryan" Owens dead and an MV-22 Osprey destroyed.

But an interesting thing happened while there was no carrier available to support combat operations in the Middle East: The US-led coalition air campaign attacking ISIS delivered a record amount of ordnance and continued to grind down ISIS. The flexibility and versatility of airpower allowed other units, including an Air National Guard detachment from Vermont, to overcome the carrier gap and continue Operation Inherent Resolve (OIR) at a record pace.

USAF photo by MSgt. Benjamin Wilson

An F-16 from the 134th Fighter Squadron on a Southwest Asia flight line at sunset in February.

This fact generated considerably less media attention.

Coalition air forces released 3,606 weapons against ISIS targets in January 2017, according to the Combined Air and Space Operations Center (CAOC) at Al Udeid Air Base in Qatar. This was fully 10 percent more weapons delivered than in any previous month of the war on ISIS.

Lest anyone fear activity masks a lack of progress, the CAOC noted airpower is helping "overwhelm [ISIS] in its last major strongholds." By Jan. 31, ISIS had lost 60 percent of its territory in Iraq, while in Syria, Raqqa ("the nexus of [ISIS'] external operations") is increasingly isolated.

In all, officials wrote, "we've disrupted their command and control apparatus and imposed an incredible strain on their leaders, industrial base, financial systems, and communication networks."

The war on ISIS reached a new high while the Middle East experienced a "carrier gap."

For example, over Syria, "the coalition in the last 24 hours conducted 10 air strikes," hitting tactical units and the oil infrastructure ISIS depends on to finance its operations, Pentagon press secretary Peter Cook said Jan. 5. Coalition forces conducted eight air strikes supporting anti-ISIS operations in Mosul, Iraq, the same day.

On p. 12, Jennifer Hlad has the story of the Vermont Air Guard's 134th Fighter Squadron deploying to an undisclosed forward base to battle ISIS.

Airmen and a squadron of F-16s deployed on a month's notice, although Guard deployments of this scale are typically planned a year in advance. The 134th began flying combat missions 15 hours after touching down. "The presence of the F-16s demonstrates the Air Force's flexibility to meet the dynamic requirements of the warfighting commanders," US Air Forces Central Command officials observed.

"The CAOC is continuously evaluating airpower requirements and making adjustments as necessary to ensure we have the right amount of combat airpower overhead," added Lt. Gen. Jeffrey L. Harrigian, the Inherent Resolve air commander.

Operations were similarly aided by a surge in coalition sorties and the presence of the Marine Corps' 11th Marine Expeditionary Unit centered on the large-deck amphibious assault ship *Makin Island.* "Amphibious forces at sea provide a formidable presence … although they might not be as noticed or tracked as the larger nuclear powered carriers," wrote *US Naval Institute News* in January.

It is no surprise the lack of a carrier generated more attention than airpower's ability to step up and deliver the greatest single month of attacks on ISIS. Carriers occupy a unique place in the American psyche. But the events of early 2017 reaffirmed how airpower destroys enemies and defends friends—whether there is a carrier available or not. ✪

Letters

letters@afa.org

Flying Wing

Excellent article in the February 2017 issue of *Air Force Magazine* by John T. Correll on early flying wing aircraft ["Jack Northrop's Flying Wing," p. 68]. One interesting fact involves the copilot, Glen Edwards, of the YB-49 that crashed on June 5, 1948, killing all onboard. He emigrated from Canada at the age of 13 and was raised right here in Lincoln, Calif. He served with distinction in World War II and went on to test pilot duties at Muroc Army Airfield in the high desert area of California. He is interred in Lincoln and a school here is named Glen Edwards Middle School. Muroc AAF was renamed Edwards AFB in 1949.

Col. Vern Luke,
USAF (Ret.)
Lincoln, Calif.

The B-35 and B-49 designs had well-documented performance and design issues, while the Convair B-36 needed more development money. At that time, it appeared the B-36 program might be canceled, as well as the B-35. USAF and the Texas congressional delegation desired to have a production program for the large Fort Worth aircraft production factory, and Convair had much more effective lobbyists in Washington, D.C. Northrop Corp. was always a technological trailblazer but the independent nature of Jack Northrop often collided with the political wheeling-and-dealing in Washington that tended to run huge military allocations. Consequently, the B-36 prevailed, with just over 380 aircraft built. Furthermore, earlier the same year, when the YB-49 jet bomber was canceled, Northrop received a smaller production contract for its F-89 Scorpion fighter as compensation for the lost Flying Wing contract.

Phillip R. Earles
Princeton, Ind.

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

—THE EDITORS

Vulture

I was so glad to read about the Vulture Rescue program taking place at Bagram ["Forward Deployed," February, p. 8]. When I was deployed in Afghanistan in 2011, we were working to lay the groundwork to use EAES [expeditionary aeromedical evacuation squadron] assets on rescue HC-130J aircraft. I'm very happy to see that this idea has continued and that it is in operation to partner our aeromedical evacuation members with our rescue professionals to provide the best patient care during transport.

Lt. Col. Paul Jones,
USAF (Ret.)
Kansas City, Mo.

Fighter Competition

The catalyst for the Lightweight Fighter program leading to the F-16 was not the urging of Congress, as Erik Simonsen claims in his otherwise excellent article "Legacy of the Lightweight Fighter Competition," [February, p. 59] but the persistence and tenacity of one Air Force officer, Col. John Boyd. The omission of any mention of Boyd's contribution in the article is disappointing in the extreme. Boyd's creation of the theory of energy maneuverability became the key design tool for the competitors in the LWF competition in the early 1970s. Harry Hillaker was the father of the YF-16 design, as Simonsen attributes, but Boyd was the creator, the father of the operational concept and the engineering theories upon which the LWF designs were based.

Boyd was forceful in debate and irascible in demeanor. If you didn't have keen knowledge of his EM theory and fighter tactics, or if you tried to use rank or position to advance your point, it was best to avoid arguing with John Boyd.

I worked side by side with Boyd in the Fighter Requirements Shop at the Pentagon for two-and-a-half years, from 1970-72, putting together the arguments, rationale, and initial requirements documents for the LWF. Air Force leadership was dead set against the LWF for two reasons. The attitude was that small, lightweight fighters would lack range and internal space for sensors necessary for its missions. And secondly, Air Force leaders viewed the LWF as a threat to the F-15 program just underway at the time.

Overturning the first objection required data from flight demos of the prototype YF-16 and YF-17 and the technical revolution in smaller sensors and miniaturized electronics just beginning. The myth that small fighters lack range was based on the belief that range was dependent on fuel quantity. But, any aero-design engineer knows that range depends on fuel fraction, not fuel quantity. The fuel fraction (weight of internal fuel divided by takeoff gross weight) was higher for the F-16 than the F-15. The F-16 actually outranged the F-15 on internal fuel.

Secondly, to overcome the Air Force fear that the LWF would cause the F-15 program to be canceled or shortened required the help of another LWF advocate, Secretary of Defense James Schlesinger. Schlesinger saw the potential for the LWF and brokered a deal with then-Air Force Chief of Staff Gen. David Jones. After the post-Vietnam downsizing, the Air Force needed to expand its fighter force size. Schlesinger agreed to keep the full size of the F-15 program, 750 fighters, and allow the Air Force to fill the

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remainder of its desired 26 fighter wings with the winner of the LWF competition. General Jones agreed. This was a win-win for the LWF supporters and the Air Force hierarchy.

A big lesson from the F-16 program that needs to be relearned today is to start with a basic, no frills, "A" model baseline configuration while providing for growth to incorporate additional capabilities and systems over time. The F-16 multistaged improvement program, from the initial Block 5s to the current Block 50s and 60s has validated a key principle: Start with a low risk baseline and only add systems and capabilities when technical risk and cost is lowered. The Air Force seems to have forgotten this in some recent acquisitions. Let's hope they apply it to the JSTARS and T-X programs.

In the end, the F-16 has become the most successful fighter ever developed and produced. But, make no mistake, it would never have happened without the vision, ingenuity, and persistence of Col. John Boyd.

Gen. John Michael Loh,
USAF (Ret.)
Williamsburg, Va.

I read with great interest your article "Legacy of the Lightweight Fighter Competition." In June 1974 I was a brand-new second lieutenant and flight test engineer and was assigned to the Lightweight Fighter Program at Edwards. There are a couple of points I would like to make concerning your article.

The F-15 was designed to be a long-range standoff fighter with close in, air-to-air dogfighting capability. The YF-16 and YF-17 were prototypes designed to be a close in, duke it out, air-to-air fighters. The first flight of the YF-16 was a direct result of the sidestick controller having only a quarter-inch movement. This was insufficient to give feedback to the pilot that a joystick input had been made. An immediate minor modification was made, as this was viewed as a hazard to flight. A more extensive update was completed after the test program was completed.

The YF-16 mission was air-to-air and at least during the prototype evaluation phase no real consideration was given to an air-to-ground mission. This resulted in a hyperconcern for weight, which drove several decisions, which ultimately cost the Air Force a great deal of money. Once the decision was made that the F-16 would have an air-to-ground mission, minor weight concerns were no longer an issue.

The YF-16 was far more maneuverable than the YF-17. The YF-16 frequently put on a demonstration where it would compete with an F-4E in a max turn at 10,000 feet, and the YF-16 would be on the tail of the F-4 before the F-4 was able to complete half the maneuver. The YF-17 was not able to demonstrate the same level of turning maneuverability.

Toward the end of the competition, the Navy let it be known that they would not accept the YF-16 if the YF-16 won the competition as they required a twin-engine aircraft. They also let it be known that if Northrop could modify the YF-17 to include both wing and landing gear they would be interested in possibly acquiring this aircraft for the fleet. General Dynamics made a valiant effort to try and convince the Navy that with modifications the F-16 would meet their needs, but they could never overcome the two-engine bias of the Navy.

Col. Talbot N. Vivian,
USAF (Ret)
Yorktown, Va.

Having worked with the Hornet program for much of the last 20 years, I'd like to offer a couple of minor comments.

The F/A-18A and B were production aircraft, with the Navy and Marine Corps acquiring 380 As and 41 Bs between FY78 & 87. On their second-ever cruise (and the first Atlantic Fleet cruise), F/A-18As from the USS *Coral Sea* were

Senior Staff Changes

CHANGES: Brig. Gen. Patrick J. **Doherty,** from Cmdr., 82nd Tng. Wg., AETC, Sheppard AFB, Texas, to Cmdr., 19th AF, AETC, JB San Antonio-Randolph, Texas … Brig. Gen. Dirk D. **Smith,** from Dir., Air & Cyberspace Ops., PACAF, JB Pearl Harbor-Hickam, Hawaii, to Dep. Cmdr., Ops. & Intel., Combined Jt. Task Force-Operation Inherent Resolve, CENTCOM, Southwest Asia … Brig. Gen. Kirk W. **Smith,** from Dir., Force Mgmt., SOCOM, MacDill AFB, Fla., to Dep. Cmdr., Spec. Ops. Jt. Task Force-Afghanistan, US Forces-Afghanistan, CENTCOM, Kabul, Afghanistan … Brig. Gen. Stephen C. **Williams,** from Commandant of Cadets, USAFA, Colorado Springs, Colo., to Dir., Air & Cyberspace Ops., PACAF, JB Pearl Harbor-Hickam, Hawaii.

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

Advocate for aerospace power and STEM education.

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key players in the April 1986 Operation Eldorado Canyon attack on Libya. They provided SEAD and CAP for the Navy's attack of targets in the Benghazi area. Ninety-four later A models were upgraded to A+ (and eventually A++) configurations to keep them relevant to continue in frontline service today. Canada, Australia, and Spain bought these early Hornets.

The F/A-18C and D were introduced in FY86 and continued in production until FY97 with the US buying 465 Cs and 147 Ds. Most of the upgrades from A/B to C/D were internal, including the introduction of color multifunction displays. Thirty early Cs are in the process of being upgraded to the C+ configuration to bring them up to standards of the later blocks. In addition, many of these aircraft are being fitted with the AN/APG-73 radars originally installed in the F/A-18E/F Super Hornets, as the newer jets are being retrofitted with the AN/APG-79 AESA radars. Finland, Switzerland, Kuwait, and Malaysia bought this version of the Hornet.

The current production versions are the Super Hornets. Beginning in FY94 the Navy (so far) has bought 297 Es and 276 Fs. Keeping with Hornet tradition, the E/Fs' first cruise was a combat cruise in support of Operation Iraqi Freedom. The EA-18G Growler entered production in FY06, with 153 being contracted for so far. Australia has also bought Fs and Gs. Kuwait was recently cleared to buy the E/Fs, and Canada has recently announced a small buy of Super Hornets while they decide whether or not to remain in the F-35 program.

Maj. Jim Rotramel, USAF (Ret.)
Fredericksburg, Va.

I enjoyed the article about the Lightweight Fighter competition. A few comments to expand on that article. The request for proposals to demonstrate a LWF specified that the engine(s) to be used were government furnished, and the companies could propose either the Pratt & Whitney F100 engine (in production and used on the F-15) or the General Electric YJ101, which was still considered a "development" engine.

Northrop was the only one of the five submitting contractors that proposed the YF101 in a dual-engine configuration.

The prototype program office managed several projects that eventually resulted in operational airplanes beside the F-16, including the A-10 and, eventually, the C-17. Col. (later Lt. Gen.) William Thurman directed the Lightweight Fighter prototype program and was supplanted by Brig. Gen. James Abrahamson (later Lt. Gen.) who managed the five-nation multinational F-16 full-scale development and production program.

The multinational F-16 full-scale development and production program (Belgium, Denmark, the Netherlands, Norway, and the US) could deserve an article by itself and will probably never be duplicated in defense procurement. The FSD program specified production of 998 aircraft for the five nations and also specified prices for the FSD airplanes and production airplanes.

To expand a little on the F100 engine part of the F-16 FSD program. The F100 engine was originally managed by the F-15 System Program Office (SPO). The engine had a known problem of stall-stagnation in the F-15, which required the stagnating engine being shut down and restarted as the only way to clear the stagnation. This was a problem for the F-15, but that airplane had a "spare" engine to keep flying until the stagnation was cleared. Obviously this was not a solution in the F-16 since it did not have a spare engine onboard. The problem was probably most responsible for removal of F100 management from the F-15 SPO and placement in the Propulsion System Program Office under Brig. Gen. Richard Steere who spent several weeks with Pratt & Whitney's military engine office in West Palm Beach, Fla., until a successful engineering solution to stall-stagnation was achieved.

Duane Zieg
Springfield, Va.

Soundly Defeated

I have never written before, [but] to this piece I must reply. Extremely disappointed in your portraying of Trump and your political persuasion coming out ["Editorial: Twelve Days in December," February p. 4].

Have you soon forgotten that you Democrats were soundly defeated last November? Do you remember that Americans coast to coast overwhelmingly voted to replace the establishment in Washington, Trump calling the process "draining the swamp"?

Are you, editorial staff, one of the "Establishment" that has your "security" in Washington in trouble?

I, for one, and probably speak for the majority, support what Trump has done to advance the ball down the field! He is using sound ideas, for example, the rethinking of the Air Force One replacement program. Let me see, how many trillion dollars are we in debt??!

How about putting some conservative editors in charge of the magazine from this day on. You all have had your chance. I, we, want to hear from conservatives.

Alan Leibundguth
Evansville, Ind.

Corrections

■ *The MC-130 fuselage static trainer featured in "Monster Garage" in the January issue is from MC-130 tail No. 64-0559. Tail No. 64-0567, commonly known as "Wild Thing," is on static display at Hurlburt Field, Fla.*

■ *In "Northern Exposure" (February p. 54), the rank and title for Lt. Gen. Ralph J. Jodice II (Ret.) were incorrect. Jodice was the Combined Forces Air Component Commander (CFACC) for Operation Unified Protector, the NATO effort in Libya. Canadian Defense Forces Lt. Gen. Charles Bouchard was overall head of the operation.*

Notice to readers

This print issue of *Air Force Magazine,* bearing a cover date of "April/May," covers two calendar months.

The next print issue of the magazine, arriving in mailboxes and newsstands in May, will be the annual June Almanac. This is part of our new-for-2017 shift to 10 print issues and two digital-only issues per year.

In late March, *Air Force Magazine* will publish an online-only special edition covering all the news from the Air Force Association's annual Air Warfare Symposium.

Similarly, in September, we will publish a combined October/November issue, which will be followed in early October by a digital-only special edition with the news from AFA's annual Air, Space & Cyber conference.

These digital-only editions will allow us to provide you with comprehensive coverage from AFA's premier events weeks sooner than is possible under traditional print schedules. These marquee events are attended by all the top Air Force leadership and always produce a large amount of important news.

In conclusion, AFA members and magazine subscribers will still receive 12 issues of *Air Force Magazine* per year. Ten of them (including the June USAF Almanac and our October/November double issue) will be in print. Two issues, delivered electronically in late March and early October, will be digital only.

We welcome your feedback and suggestions for the future as we work to make *Air Force Magazine* ever more timely, comprehensive, and responsive. As always, you can reach the editors at afmag@afa.org. Thank you.

Adam J. Hebert
Editor in Chief

By John A. Tirpak, Editorial Director

Nutritional supplements; Will it materialize? T-X ejections; Who's left? ...

Feb. 8, 2017

REBUILDING THE MILITARY IN THREE ACTS

The Trump administration has pledged to strengthen the US military. Recent guidance issued by Defense Secretary James N. Mattis laid out how it will proceed, but getting through the interim steps means the Fiscal 2018 defense budget may not get to Congress until May at the earliest.

Readiness accounts will be addressed first, followed by more "pressing shortfalls" and then on to a "larger, more capable, and more lethal joint force," Mattis wrote in a four-page memorandum to the service Chiefs, combatant commanders, Office of the Secretary of Defense departments, field units, legislative affairs, and other elements of the military hierarchy.

The money will come in three phases, as well: first, a Fiscal 2017 budget amendment, then a revamped 2018 budget request—to be delivered to the Office of Management and Budget by May 1—and finally a rescoped 2019-23 program objective memorandum.

The budget amendment will address "urgent warfighting readiness shortfalls" and requirements driven by "acceleration of the campaign against ISIS." Force structure will be increased in areas where doing so will have an immediate impact. Though there will be some offsets taken from "lower priority programs," the net effect will be an increase in the Fiscal 2017 budget signed by President Barack Obama, Mattis wrote.

Defense Secretary James Mattis (left) briefs reporters while flying to Brussels Feb. 14. Mattis said military readiness accounts will soon be bolstered.

The supplemental budget was to be developed under the direction of Deputy Secretary Robert O. Work, held over from the Obama administration, and the budget is to be finished by March 1.

Air Force leaders said they have long lists of readiness accounts—flying hours, munitions, depot maintenance, etc.—that could immediately benefit from a flush of new money. Chief of Staff Gen. David L. Goldfein told reporters in February that increasing the buy rate on the F-35 will be a high priority, as the fighter fleet has suffered from heavy force structure cuts in the last decade, but the F-35 will be "balanced" with other accounts, such as nuclear modernization.

SLOW AND STEADY

Goldfein said, however, that he is instructing budgeteers not to expect a "big infusion" of cash that may not be sustained. "The worst thing we could do," he said, is to set up a program of new starts that anticipates more money than actually materializes, wasting effort and funds on projects that must be terminated or scaled back.

The Fiscal 2018 budget, according to the Mattis memo, will focus on program shortfalls while "continuing to rebuild readiness." It will include "buying more critical munitions," adding money for facilities sustainment, adding money for "promising advanced capability demonstrators," investing in "critical enablers," and growing force structure "at the maximum responsible rate." Work is to develop this budget, and Mattis said he would review it. Work would provide "fiscal guidance" from OMB "when it becomes available" as to specific amounts.

The final phase will start with a new National Defense Strategy, Mattis said. The document will be closely coordinated with the "new National Security Strategy" and will include "a new force-sizing construct, which will inform our targets for force structure growth." There hasn't been a force-sizing construct since the old idea of one-and-a-half major theater wars fell by the wayside. The strategy will also determine an approach to "enhancing the lethality of the joint force against high-end competitors" and assess US military capability "against a broad spectrum of potential threats." This will form the basis of the new 2019-23 defense plan, specifying investments in "advanced capabilities."

Besides combat effectiveness, the strategy will aim for improving how the Pentagon does business. It will contain "an ambitious reform agenda," flattening DOD reporting chains and taking advantage of economies of scale. This will happen against a backdrop of keeping faith with our service members and their families, Mattis said. "We will ensure that we are caring for those charged with defending the nation and its interests."

DOD photo by TSgt. Brigitte N. Brantley

Pilots prepare to exit a T-38 Talon during a refueling stop. In January, two major contractor teams bailed out of the contest for the $16.3 billion contract to replace the T-38.

T-X MESSAGING

Two major contractor teams—one headed by Raytheon and the other by Northrop Grumman—bailed out of the Air Force's $16.3 billion T-X trainer competition in January, just a few weeks after they got a look at the service's final request for proposal (RFP). Though the terms had not changed from a previous draft, the companies indicated the price USAF is willing to pay for its T-38 replacement was either lower than they could match or wouldn't make the deal profitable enough to be worth the investment, effort, and risk required.

Other companies said they're still vigorously pursuing the program, but the Air Force's early hopes for a lot of competition on the T-X may not come to fruition.

The Air Force's RFP, released Dec. 30, 2016, said the service will weigh all performance—the technical capability of an offeror's jet, the quality of its training system, and support—about equally with price. In a move to encourage smaller companies to compete and broaden the field of potential suppliers, the Air Force crossed the usual criterion of prior performance off its contest checklist.

Moreover, the service had labored to keep anything not absolutely essential to T-X performance out of the requirements, because this could arbitrarily and unnecessarily exclude competitors. USAF wanted to render the competition protest proof, so no contractor could say afterward that it hadn't been fully informed about what the Air Force really valued and what USAF would and would not pay extra for.

Perhaps most telling about the RFP was the price, however. When the Air Force first issued its draft performance specifications for the T-X in 2015, it envisioned a program costing about $20 billion. The RFP in December called for a program of about $16.3 billion—but with no reduction in the planned 350 aircraft or ground training element.

The first to drop out was the team of Raytheon/Leonardo. They were offering the Italian M-346 Master, rebranded as the T-100. In a joint statement issued Jan. 25, they said that while they think the T-100 "is a strong solution, our companies were unable to reach a business agreement that is in the best interest of the US Air Force. Consequently, Raytheon and Leonardo will not join the T-X competition." The next morning, during Raytheon's fourth-quarter earnings call, the topic of the T-X wasn't even raised.

Though neither company would comment further for the record, industry sources said Leonardo balked at the price Raytheon thought was absolutely necessary to be competitive in the contest, and the companies couldn't come to terms on this key point.

Leonardo announced on Feb. 8, however, that it would enter the contest on its own, fronted by its US subsidiary,

USAF photo by SrA. Tristin English

Leonardo DRS, with no change in the content of its offering.

Raytheon was not Leonardo's first partner on the T-100. Originally, the Italian firm had partnered with General Dynamics as the US lead for T-X, but General Dynamics withdrew in early 2015, saying it had "reorganized its businesses" and had decided "to discontinue pursuit of T-X as a prime contractor." Alenia (since renamed Leonardo) eventually reteamed with Raytheon, a strong contender since Raytheon built the T-6 Texan II and T-1 Jayhawk, two of the three aircraft, along with the T-38, in the Air Force's undergraduate pilot training program. Raytheon's knowledge of the Air Force's pilot training syllabus was unmatched.

EXIT THE INCUMBENT

Next to depart the T-X was Northrop Grumman, ostensibly the incumbent since Northrop designed and built the very successful and widely adopted T-38 starting in the 1950s. In a Feb. 1 announcement, the company and its partner, BAE Systems, said they had decided not to submit a proposal "as it would not be in the best interest of the companies and their shareholders."

Just a few days earlier, Northrop Grumman CEO Wesley G. Bush raised industry eyebrows by being noncommittal when asked about the T-X during an earnings call. Bush said Northrop was taking its time about deciding whether to submit a bid, to ensure "we are not kidding ourselves about what the real investment and cost would look like." He said that when a customer shows a preference for price over best value in a contract, and there's not much "differentiation" between the products being offered, such opportunities are less interesting for Northrop Grumman. He indicated that the also-upcoming E-8 JSTARS recapitalization program, with plenty of room for a value-added solution, was a more compelling program for his company.

Northrop Grumman had invested quite a bit in T-X, having refined the BAE Hawk trainer as a first potential entry, then dumping it and starting over with a clean sheet design that wound up bearing a family resemblance to the T-38. Unlike some of its competitors, however, Northrop Grumman never held a flashy unveiling ceremony for the press, despite having flown its T-X—fabricated by subsidiary Scaled Composites—a number of times. Bush, in the earnings call, said he doesn't want to keep investing in a project "just because we've *been* doing it."

NARROWER FIELD

So where does that leave T-X? An Air Force spokeswoman said the service can't really comment on the progress of the program, as it has moved into the competitive phase. However, "the Air Force continues to believe there will be a robust competition for the Advanced Pilot Trainer, AKA T-X, and continues to look forward to the results of the ongoing source selection," she said.

It's worth noting that the T-X competition is not just for an airplane, but for a training system that will combine live-fly piloting experience with in-the-cockpit and in-the-simulator live, virtual, and constructive instruction.

In a Mitchell Institute for Aerospace Studies paper released in December 2016—"Building Better Pilots: Considerations to Ensure T-X Success"—the author, retired Maj. Gen. Lawrence A. Stutzriem, said, "The Air Force needs to remain focused on attaining this enterprise approach, for budget decisions have historically pinched pennies by cutting procurement and sustainment of simulation and assorted nonaircraft training components. The service must stop this habit, as it is now a dangerous relic of 1950s-era attitudes." The T-X will have to be a great airplane, but it will have to have a great training system to go with it.

Boeing/Saab developed a T-X entry from scratch. They said through a spokeswoman that their team is "excited to compete and looks forward to submitting a proposal." Lockheed Martin, partnered with Korean Aerospace Industries, is offering the T-50A derivative of the KAI/Lockheed T-50, already in service with the Republic of Korea Air Force for about 12 years. A Lockheed Martin spokesman said, "We're all in this competition and will be ready to start producing the T-50A … on Day One of the contract award."

Others potentially competing are Sierra Nevada, teamed with Turkish Aerospace Industries on the Freedom Trainer, and Textron, which is continuing to look for a market where its Scorpion privately funded aircraft can prevail. As now configured, the aircraft would not meet USAF's T-X requirements, so the design would have to be refined.

Stavatti Aerospace, of Eagan, Minn., said in early February it will offer a variant of the Javelin, an aircraft it inherited from Aviation Technology Group, now out of business, and is looking to partner with another company for manufacturing and the ground-based training and simulation system.

The T-X was originally envisioned by the Air Force as a commercial, off-the-shelf product that, with minor tweaks, could be adapted to USAF's needs. Industry officials said, however, that it became apparent after the first iteration of USAF's requirements that most foreign trainers couldn't perform as USAF wanted, driving Boeing and Northrop Grumman to design new airplanes.

THE CHIEF'S PERSPECTIVE

"I think … we could have predicted this," Chief of Staff Gen. David L. Goldfein told reporters when asked in February about the T-X dropouts.

"It's not surprising to me" that as the companies and the Air Force conducted their exhaustive dialogue, the contractors "got more fidelity on what the customer is thinking" and were able to make "informed business decisions to say whether they wanted to compete or not," he said. Industry offered up about "1,300 different individual recommendations" on refining the T-X RFP, Goldfein said, and once the companies truly understood what the Air Force wanted and valued, "and what the other competitors have," some made a "business decision not to jump into this race."

"I'd be concerned right now if I had one competitor," Goldfein added, but USAF now has "two competitors that have a very good sense of what we're looking for." The longer dialogue up front led to "a far more informed and better-written RFP," and so, "I think we're probably about where we should be" with the T-X competition. ✪

By Jennifer Hlad

An F-16 assigned to the Vermont ANG's 134th Expeditionary Fighter Squadron readies to roll out for a takeoff in Southwest Asia. Combat missions flown by the squadron have degraded the capabilities of ISIS.

WEAPONS CARRIERS

Most Air National Guard units get a year to prepare for deployments. The Vermont ANG's "Green Mountain Boys" got about a month.

Normally, "you know well in advance, upwards of even years, … especially in the [US Central Command area of responsibility] for combat rotations," said Col. David C. Lyons, commander of the 407th Air Expeditionary Group at an undisclosed Middle Eastern location.

Getting around a month's notice "is pretty astounding," he said.

The unit rose to the challenge, mobilizing about 300 airmen for the deployment that began in December, to help fill a carrier gap in the region.

Lyons' command includes several coalition partners and a unit of US marines; before the Vermont unit arrived, there were no USAF air assets on the ramp at his location in Southwest Asia.

But, he told *Air Force Magazine,* his team of airmen at the base did a fantastic job of speeding up preparations for airmen from the 158th Fighter Wing out of Burlington Arpt., Vt.

"We're focused on customer service here," Lyons said.

Maj. Jack Green, commander of the 407th Expeditionary Operations Support Squadron, led the beddown preparations.

In an Air Force news release, Green said that from the time they received word of the deployment, "our hair was on fire getting everything prepped."

He continued, "We identified the day that the [operation] was going to kick off and we built our timeline back from that."

The base had not been used for USAF combat operations for several years, and some of the space had been recapitalized or reassigned in the absence of a USAF mission, Lyons said. "One of the most difficult things we had to overcome is taking a little bit of that space back, or really just going out and surveying the land and figuring out what would work best, where."

The next biggest challenge, Lyons said, was quickly getting the base prepared to generate combat operations—namely, getting weapons assembled.

"When the parts and pieces that make up weapons arrive on the base, they're not ready to just slap onto an airplane. The bombs, specifically, have to be put together," he said.

The airmen already at the base identified what they believed the Vermont Guardsmen would need for their expected missions, then determined when they needed the ammunition troops to arrive, Lyons explained.

Because of those preparations, and the professionalism of all the airmen, he said, "we were able to generate combat sorties two days ahead of schedule—and within 15 hours of jet arrival."

That speed to the fight garnered praise from Lt. Gen. Jeffrey L. Harrigian, commander of the combined force air component.

The Vermont ANG "did a phenomenal job in generating combat sorties to put the hurt" on ISIS, he told *Air Force Magazine.*

The extra airpower was helpful because there was no US aircraft carrier in the region at the time.

Eisenhower launched hundreds of air strikes for Operation Inherent Resolve during its seven months at sea, then returned to Norfolk, Va., in late December. It was scheduled to be replaced by the aircraft carrier *George H. W. Bush,* but maintenance delays and additional repair requirements left a carrier gap in the Middle East.

Bush left Norfolk in late January.

Harrigian said the Combined Air Operations Center is "continuously evaluating airpower requirements and making adjustments as necessary" to ensure there is the "right amount of combat airpower overhead for those guys on the ground."

In this case, Harrigian said, "coalition partners … made additional sorties available," and the Vermont F-16 squadron, the 134th Expeditionary Fighter Squadron, deployed to the region in December.

Between Dec. 10, 2016, and Feb. 1 the Vermont airmen flew 498 sorties and delivered 766 weapons, including missions for operations in Mosul, Iraq, and Raqqa, Syria, averaging more than 100 weapons drops per week during the first seven weeks of deployment.

"They're flying 24-hour ops, seven days a week," Lyons said. The missions include close air support and deliberate and dynamic targeting.

"We're pretty proud of the efforts that Vermont has given to those specific fights, although, anywhere that you find Da'esh on the map, our folks have the opportunity and are potentially going to be tasked, anywhere in Iraq and Syria, to seek and to wipe [them] off the face of the earth," Lyons said. ✪

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

USAF photo by MSgt. Benjamin Wilson

By Megan Scully

Magicians and Machines

A little-noticed provision in the sprawling Pentagon policy bill could give the Air Force a big boost in its readiness rates. The language would allow the service to more quickly hire mechanics and other civilian personnel at its three major aircraft maintenance facilities.

The provision, tucked deep into the 3,076-page law, allows the Defense Department to circumvent the government's long and often tedious hiring processes. DOD would have direct-hire authority through the end of Fiscal 2018 to recruit personnel much more quickly at military depots, arsenals, and shipyards around the country.

For the Air Force, this could allow the service to keep up with an anticipated uptick in depot-maintenance hours at its three air logistics complexes—Ogden in Utah, Oklahoma City, and Warner Robins in Georgia—as the service watches its overall fleet age rise as it simultaneously populates its inventory with new F-35 strike fighters, KC-46 aerial refueling tankers, and other acquisitions.

Air Force officials have expressed concerns about the slow hiring processes and its effects on attracting skilled workers to their depots, particularly at Ogden and Warner Robins, according to a February Government Accountability Office (GAO) report.

While the depots can use overtime hours to keep up with the current workload, which has fluctuated at the three facilities since 2012, all could most certainly use the extra personnel as newer systems come in for maintenance and repairs on some of the service's most complex equipment.

Indeed, Warner Robins' future workload includes aviation electronics for the KC-46, F-35 and F-22 fighters, and MQ-9 Reaper remotely piloted aircraft.

Its workforce, however, was reduced from 8,500 civilian personnel to 7,200 between Fiscal 2012 and 2015, in part from cutbacks due to budget caps.

While automated processes may allow Warner Robins to limit the growth of personnel, the facility still has hundreds of people it would like to hire to maintain cargo and fighter aircraft there.

Oklahoma City, meanwhile, will soon be tasked with repairs on the KC-46, as well as engine work for the tanker, MQ-9, and RQ-4 Global Hawk—though officials there told GAO they have a relatively easy time filling slots, thanks to a recruiting-rich environment.

At Ogden, slated to work on the Ground-Based Strategic Deterrent ICBM system and the T-X trainer aircraft, the biggest personnel shortage is in software maintenance.

At his June 2016 confirmation hearing before the Senate Armed Services Committee, Air Force Chief of Staff Gen. David L. Goldfein counted weapon systems sustainment second on his list of five key elements that the service must keep in balance, underscoring the importance of depot health to the service's overall readiness.

Sarah Holshouser drills out rivets on a KC-135 aileron at the Oklahoma City Air Logistics center. The Pentagon's list of jobs exempt from the temporary hiring freeze includes those at USAF depots.

"I'd like to, if I can, highlight the magicians in our depots," Goldfein added later. "Quite frankly, there's only one reason we have aircraft still flying after 50 years. It's because of the quality of individuals we have at our depots that keep them flying."

While maintaining and expanding the skilled workforces at the Air Force depots has the support of senior service and Pentagon leaders, the implementation of the new provision hit a snag only a month after then-President Barack Obama signed the defense bill into law.

Just days after his inauguration, President Donald Trump signed a memorandum temporarily freezing the hiring of federal civilian employees, making good on a pledge he repeated often during the campaign to reduce the size and cost of the government. Initially, his action applied to all employees, including those at USAF's depots.

A week later, the Pentagon issued a long list of jobs exempt from the freeze, including those at the military depots.

That paves the way for the Air Force to seize on the new direct-hire authority to bring on hundreds of new personnel, including potentially 343 aircraft maintainers at Warner Robins who could benefit from the provision in the defense bill.

But the freeze could still slow efforts to recruit and quickly hire new workers at the depots.

In a Feb. 1 memo to Pentagon officials, Deputy Defense Secretary Robert O. Work instructed the Defense Department to apply the exemptions "sparingly," justify them on a "position-by-position basis," and submit biweekly reports to the Pentagon personnel chief.

"This is an opportunity for the Department to assess its most critical missions and requirements, ensuring that the civilian component of our force is assigned and capable of executing our highest priority work, while at the same time gaining full value from every taxpayer dollar we spend on defense," wrote Work, who is a holdover from the Obama administration. ✪

Megan Scully is a reporter for CQ Roll Call.

USAF photo by Greg L. Davis

By Robert S. Dudney

Killer Angels

"I say it's better to get along with Russia than not. And if Russia helps us in the fight against ISIS—which is a major fight—and Islamic terrorism all over the world, ... that's a good thing. Will I get along with him [Vladimir Putin]? I have no idea. ... There are a lot of killers [like Putin]. We've got a lot of killers. What, you think our country's so innocent?"**—President Donald Trump, interview with Bill O'Reilly, Feb. 5.**

Against the Day ....

"We have two of the three legs of the nuclear triad and, on our worst day as a nation, our job as the United States Air Force is to make sure you are where you need to be and make sure you remain connected to nuclear command and control."**—Gen. David L. Goldfein, USAF Chief of Staff, recounting what he told new President Donald Trump at Pentagon event, Jan. 27.**

Memo to Lil' Kim

"North Korea continues to launch missiles, develop its nuclear weapons program, and engage in threatening rhetoric and behavior. We stand with our peace-loving Republic of Korea ally to maintain stability on the peninsula and in the region. America's commitments to defending our allies and to upholding our extended deterrence guarantees remain ironclad: 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."**—Secretary of Defense James N. Mattis, explicit warning to Pyongyang during official visit to South Korea, Feb. 3.**

First Build, Then Balance

"A balanced budget is fine, but sometimes you have to fuel the well in order to really get the economy going. And we have to take care of our military. Our military is more important to me than a balanced budget. ... I want a balanced budget eventually, but I want to have a strong military. To me, that's much more important than anything."**—President Donald Trump, remarks to Sean Hannity, broadcast Jan. 26.**

Call and Raise

"I don't think China is prepared for confrontation [with President Trump], or that they have a good way to deal with this yet. ... Unlike Obama, [Chinese President] Xi [Jinping] seemed to like tension in US-China relations, and he seemed to thrive on it to some degree. Now we've got a guy in the US who likes tension a lot more than Xi. He is president partly because he created tension. ... The Chinese cannot up the ante and raise the tension, because Trump will raise even more tension somewhere else."**—Robert Sutter, China expert at George Washington University, *South China Morning Post*, Jan. 30.**

They've Hardly Bothered Us Since

"Desert Storm ... was a very successful operation. And the reason it was so successful is that the first President Bush gave us a very clear mission. ... [A] classic military theory says, 'Make sure you know what you're getting into.' ... When you've decided on that political objective, then you put decisive force in to achieve it. And that's what we did in Desert Storm. Some people argue that we ended the war too soon, and there are others who say we should have gone to Baghdad. We didn't end it too soon. We ended it when the President wanted to end it, because we were killing people that didn't need to be killed, because the mission had really been accomplished."**—Retired Army Gen. Colin L. Powell, Joint Chiefs of Staff Chairman in Gulf War, militarytimes.com, Jan. 31.**

For the Record

"President Donald J. Trump is determined to protect the rights of all Americans, including the LGBTQ community. President Trump continues to be respectful and supportive of LGBTQ rights, just as he was throughout the election. ... The executive order signed in 2014, which protects employees from anti-LGBTQ workplace discrimination while working for federal contractors, will remain intact at the direction of President Donald J. Trump."**—White House statement, Jan. 31. It refers to former President Barack Obama's Executive Order 13672, protecting lesbian, gay, bisexual, transgender, and questioning persons working for federal contractors.**

Mugged by Nuclear Reality

"That new world [of post-Cold War nuclear restraint] was short-lived. ... We are now playing catch-up as nuclear deterrence once again is identified as priority No. 1 by senior US civilian and military leaders. ... What happened? The supposed new world order and its corresponding nuclear policy line—so embraced by the West—were mugged by reality, particularly including Russia's and China's blatant drives to overturn existing orders and their expanding nuclear capabilities. These drives appear ultimately to have persuaded key folks in the Obama Administration that the new world order is not emerging; that nonproliferation is not the highest priority goal; and that robust US nuclear capabilities and threats remain critical for the deterrence of enemies and the assurance of allies."**—Keith B. Payne, defense analyst at National Institute for Public Policy, remarks at a conference on nuclear weapons, Jan. 26.**

Sanctions Stay

"We do want to better our relations with Russia. However, the dire situation in eastern Ukraine is one that demands clear and strong condemnation of Russian actions. ... Eastern Ukraine ... is not the only part of the country suffering because of Russia's aggressive actions. ... Crimea is a part of Ukraine. Our Crimea-related sanctions will remain in place until Russia returns control over the peninsula to Ukraine."**—UN Ambassador Nikki Haley, remarks to the UN Security Council, Feb. 2.**

Running Hot

"If I don't get more money, I'll stop flying in July or August. ... We're eight percent shy of what we need ... for our flight hours. We're flying to our plan right now. So I would say we're running hot on our budget for our flight hour goals."**—Lt. Gen. Jon M. Davis, Marine Corps deputy commandant for aviation, remarks to Defense Writers Group, Feb. 1.**

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A B-1 Lancer from Dyess AFB, Texas, a B-2 Spirit from Whiteman AFB, Mo., and a B-52 Stratofortress from Minot AFB, N.D., rehearse formations moments before performing a flyover at Barksdale AFB, La. The all-bomber pass commemorated 8th Air Force's 75th anniversary. "The Mighty Eighth" dates back to February 1942, when it was organized in Virginia before quickly moving to the United Kingdom to support the war effort.

USAF photo courtesy of Sagar Pathak

By Wilson Brissett, Senior Editor

The Air Force Cross will be presented to former SSgt. Christopher Baradat, left, and retired MSgt. Keary Miller. Baradat rescued 150 coalition members in Afghanistan, April 6, 2013. Miller was part of the team that tried to recover two US servicemen in Afghanistan in 2002 in a 17-hour fight.

■ Valor Awards Upgraded for Eight Airmen

Eight airmen have been selected to have their valor awards upgraded to two Air Force Crosses, Silver Stars, and Distinguished Flying Crosses with Valor.

Former SSgt. Christopher Baradat, who had separated from the service, and **retired MSgt. Keary Miller** were selected to receive the Air Force Cross, the highest award for valor behind the Medal of Honor. Baradat initially received a Silver Star for his 2013 actions calling in air support while under attack with US Army Special Forces in Afghanistan. Miller initially received the Silver Star for his actions as part of the 2002 Battle of Roberts Ridge on Takur Ghar mountain in Afghanistan.

Then-Air Force Secretary Deborah Lee James presented the first two of nine upgraded valor awards that were selected as part of a long Defense Department-wide review of medals earned in the wars in Iraq and Afghanistan. At Maxwell AFB, Ala., James presented **Col. Christopher Barnett** with two Silver Stars for two separate actions.

Retired Lt. Col. Gregory Thornton, **retired Lt. Col. Alan Botine**, and **retired MSgt. Kristopher Parker** were to receive Silver Stars under the review. **Lt. Col. James Holder** and **Col. David Kennedy** will be awarded the Distinguished Flying Cross with Valor, Kennedy posthumously.

Gen. Joseph F. Dunford Jr., Chairman of the Joint Chiefs of Staff, said the DOD award reviews, ordered by then-Secretary of Defense Ashton B. Carter in January 2016, are crucial. "It is really important to the force that we recognize heroism when it occurs," he said.

■ Boeing Awarded $2.1 Billion Lot 3 Tanker Contract

The Air Force awarded Boeing the third low-rate initial production lot contract for 15 KC-46A tankers and spare parts. The $2.1 billion contract follows the first two lots that were awarded in August 2016 for seven and 12 aircraft, respectively. "Placing an order for another 15 aircraft is another important milestone for the KC-46 program," said Col. John P. Newberry, Air Force KC-46 system program manager.

The first four test aircraft, built under the initial 2011 development contract, and the first production aircraft have completed nearly 1,500 flight hours. Boeing was originally expected to deliver the first 18 aircraft by this August, but that was delayed until January 2018, due to problems encountered during refueling trials. The company has since reworked the boom and successfully tested it on various aircraft.

Boeing photo

■ B-52 Engine Falls Off During Flight Near Minot

An engine fell off the wing of a B-52 Stratofortress during a training flight at Minot AFB, N.D., and the pilot was able to land the bomber without incident. The Pratt & Whitney TF33-P-3/103 turbofan engine, one of eight on the aircraft, fell off and crash-landed in an unpopulated area 25 nautical miles (29 miles) northeast of the base. There were five airmen on board, with no injuries reported.

USAF photo by MSgt. Lance Cheung

The incident happened as then-Air Force Secretary Deborah Lee James was visiting the base in part to highlight the need for modernization and improvements to the Air Force's nuclear community. The base launched an investigation into the incident.

Less than a week later, James broke with protocol, which usually demands that senior leaders refrain from discussing accidents until investigations are completed, and said the mishap doesn't signal that the Stratofortress fleet needs a quick re-engining.

She said that there were "more critical upgrades" needed to keep the B-52 combat-capable. Overall, the B-52's mission capable rate remains "excellent," she said, and there's no reason yet "to think this is a fleetwide problem," even though the B-52 is "one of our oldest aircraft."

■ Aerial Gunner Awarded DFC With Valor

An aerial gunner at Kirtland AFB, N.M., received the Distinguished Flying Cross with Valor for his role in a 2011 high-risk rescue mission in Afghanistan. MSgt. Gregory Gibbs, 512th Rescue Squadron operations superintendent, was a gunner on the rescue mission near the Pakistani border, where US Army soldiers from the 101st Airborne Division were dropped in an area covered in land mines.

The soldiers immediately began taking casualties. Gibbs and his Pedro 55 HH-60G Pave Hawk crew, flew to the area to rescue the soldiers. The aircrew needed to use a hoist recovery to retrieve the soldiers, who were near five remote-trigger improvised explosive devices, according to a Kirtland news release. During the final extraction, the helicopter lost power and began to fall. Gibbs provided the pilots with positioning and altitude calls, allowing the pilots to fly backward down a valley to avoid the minefield by two feet, the release states. The crew was able to recover the aircraft and fly back to Kandahar Airfield with just five minutes of fuel remaining.

USAF photo by SrA. Nigel Sandridge

"It gives me a huge sense of pride to be able to have aerial gunners, as well as enlisted, recognized for something like this," Gibbs said at the ceremony. "This is just one of several things that people in my community have done, so it feels good to tell the rescue story."

■ Heather Wilson To Be Nominated for USAF Secretary

President Donald Trump intends to nominate Heather Wilson to be the next Secretary of the Air Force. Wilson has been the president of the South Dakota School of Mines and Technology since 2013. She served from 1998 to 2009 in the US Congress, representing New Mexico's 1st District.

During her congressional career, Wilson served on the Energy and Commerce Committee, the Armed Services Committee, and the Permanent Select Committee on Intelligence.

Wilson graduated from the Air Force Academy in 1982 as a member of the third class graduating women. She was a Rhodes scholar, earning a master's and doctorate in international relations at Oxford University. She served in the Air Force until 1989, when she joined the National Security Council and worked on issues related to European defense. If confirmed, she will be the first academy graduate to serve as Secretary of the Air Force, according to the White House.

US Congress photo

"Heather Wilson is going to make an outstanding Secretary of the Air Force," Trump said. "Her distinguished military service, high level of knowledge, and success in so many different fields gives me great confidence that she will lead our nation's Air Force with the greatest competence and integrity."

USAF photo by A1C Kevin Tanenbaum

■ As Program Rolls On, F-35 Testing Delayed

The F-35 program probably won't enter initial operational test and evaluation on time by August, likely slipping a minimum of 16 months, Pentagon test director J. Michael Gilmore said in his final test report to Congress.

Gilmore said the program office "plans to reduce or truncate" developmental testing to "minimize delays and close out" the system development and demonstration phase as quickly as possible, but "even with this risky, schedule-driven approach" he doesn't see initial operational test and evaluation starting until late December 2018 or early 2019 "at the soonest."

The principal issues have to do with the Marine Corps' F-35B short takeoff and vertical landing variant and the Navy's F-35C carrier-capable version, the last to go through development. The Air Force's F-35A model has seen a "0.0 percent" increase in required test points in 2016, and has actually exceeded planned test points flown by 8.1 percent. The F-35A has 112 flight science test points to go, against a requirement for 12,327 test points.

Meanwhile, the 200th operational F-35, built for the Japan Air Self-Defense Force, was delivered to Luke AFB, Ariz. The jet brings the total number of F-35s at Luke, a training base for US and international pilots, to 46. Eventually the base will host 144 strike fighters in six F-35 fighter squadrons.

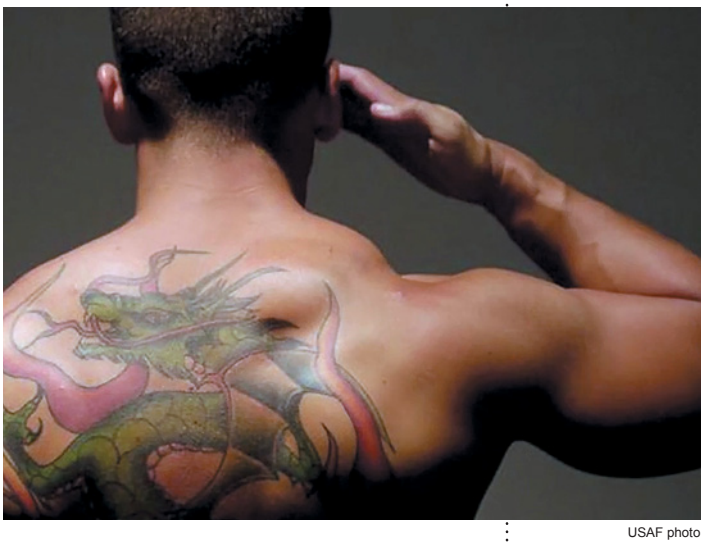
The Air Force has also selected Naval Air Station Joint Reserve Base Fort Worth, Texas, as the preferred location for the first Air Force Reserve F-35 base. The base is slated to begin receiving its strike fighters in the mid-2020s.

■ Looser Restrictions on Tattoos, Medical Standards

The Air Force announced it is removing regulations on tattoos on airmen and allowing tattoo sleeves and other large body markings. The new policy removes the "25 percent" rule that prohibited tattoos covering about one-quarter of an exposed body part. However, tattoos on the head, neck, face, tongue, lips, and scalp are still prohibited.

In addition to the tattoo changes, the Air Force has updated medical accession standards to reflect higher requests for waivers for eczema, asthma, and attention-deficit/hyperactivity disorder (ADHD). The changes streamline and loosen the waiver requirements for these conditions, including new tests for the history of asthma, loosened standards for ADHD, and more waivers for those with a "mild" form of eczema.

The Air Force also changed regulations governing pre-accession marijuana use. The policy removes the service-prescribed numerical limitations on prior use of marijuana, while a medical diagnosis of substance-related disorders or addiction remains medically disqualifying.



USAF photo

USAF photo by SrA. Christian Clausen

■ Shaw Preferred Location for New Reaper Group

Shaw AFB, S.C., has been selected as the preferred location for a new MQ-9 Reaper group and mission control elements. Davis-Monthan AFB, Ariz.; Moody AFB, Ga.; Mountain Home AFB, Idaho; and Offutt AFB, Neb., were named as reasonable alternatives. The first airmen assigned to the group will begin arriving in Fiscal 2018, but the base will not house any remotely piloted aircraft.

The Air Force is, however, considering another location to host an MQ-9 wing, including 24 Reapers, launch and recovery elements, a mission control element, a maintenance group, and support personnel. "Intelligence, surveillance, and reconnaissance continues to be our No. 1 most requested capability of combatant commanders and I believe adding additional RPA locations will help our efforts to retain experienced RPA operators that contribute to this vital mission," said then-Secretary of the Air Force Deborah Lee James.

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

Casualties

By Feb. 16, a total of 33 Americans had died in Operation Freedom's Sentinel (Afghanistan), and a total of 35 Americans had died in Operation Inherent Resolve (Iraq and Syria).

The total includes 65 troops and three Department of Defense civilians. Of these deaths, 30 were killed in action with the enemy while 38 died in noncombat incidents.

There have been 146 troops wounded in action during OFS and 31 troops in OIR.

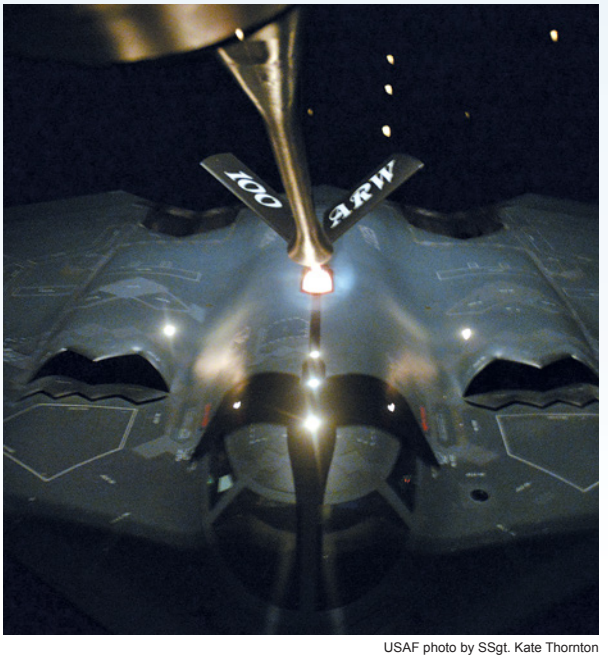
B-2s Hit ISIS Training Camps in Libya

Two B-2s from the 509th Bomb Wing at Whiteman AFB, Mo., flew a 34-hour round-trip mission to drop about 100 munitions on two ISIS training camps on Jan. 19, killing more than 80 fighters who had convened in the desert to train and plan future external operations.

The B-2s, supported by more than a dozen tankers and additional air strikes and surveillance by MQ-9 Reapers, hit the ISIS camps south of Sirte, where the fighters had fled after being routed by Libyan Government of National Accord fighters backed by the US in Operation Odyssey Lightning.

"We had 100 terrorists training south of Sirte, and in the United States view that was a risk we could not accept," Pentagon spokesman Peter Cook said during a briefing. The Pentagon showed video of ISIS fighters moving rocket-propelled grenades and other munitions from two trucks at one of the camps, and a video of one of the strikes destroying small structures in the desert.

Then-Defense Secretary Ashton B. Carter said commanders picked the B-2 for the mission because of its unique capabilities, including its armament and distance. The mission is a return to Libya for the B-2s. In March 2011, three B-2s conducted strikes on military targets under the command of then-dictator Muammar Qaddafi.



USAF photo by SSgt. Kate Thornton

A KC-135 Stratotanker from RAF Mildenhall, UK, refuels a B-2 Spirit from the 509th Bomb Wing, Whiteman AFB, Mo., in the late hours of Jan. 18, 2017, during a mission targeting ISIS training camps in Libya.

March to Raqqa Moving as Quickly as Possible

The US-led coalition's mission against ISIS is moving as fast as it can toward the so-called caliphate's capital of Raqqa, Syria, based on the abilities and pace of friendly ground forces, a senior Pentagon official said.

Elissa Slotkin, acting assistant secretary of defense for international security affairs, said coalition support is moving "as fast as local forces on the ground are able to move." US-backed Syrian Democratic Forces are in the "isolation" phase of the approach to Raqqa, and while it is "always good to be reflecting on what more we can do," there is no easy way to simply accelerate the campaign.

"All ideas are going to be on the table" to move the fight forward, she said. "They have a plan that I believe is pushing to the limit what we can do on intensifying that campaign." Slotkin's comments echo those made by then-Defense Secretary Ashton B. Carter. Carter would not provide a timeline for ISIS's defeat but said he is confident it will conclude "as soon as possible."

Liberation of Eastern Mosul

Iraqi Security Forces announced the liberation of the eastern part of Mosul from ISIS control after more than three months of fighting to retake the city. Iraqi forces, supported by US and coalition troops, gained control of all of the city east of the Tigris River.

The milestone in the battle for Mosul was achieved as a result of an "increase in the tempo" directed by Iraqi Security Forces, which also allowed coalition forces to conduct air strikes "at a significantly higher rate," said Army Maj. Gen. Joseph M. Martin, commander of coalition ground forces for Operation Inherent Resolve.

Martin said 100,000 buildings had been cleared by Iraqi forces and coalition partners in the eastern part of the city and that forces were "transitioning from clearance operations to hold force." ISIS fighters "burn and destroy infrastructure" as they abandon parts of the city, Martin said, including the destruction of all five bridges that cross the Tigris.

Iraqi Security Forces will have to rebuild the bridges before they can resume their assault in the western part of Mosul. Martin said the ISF "engineering regiment" is able to bridge the river without coalition assistance, an advance over previous capabilities.

USAF video image by SSgt. Staci Miller

■ USAF Wants To Add Five Fighter Squadrons

The Air Force wants to add five more fighter squadrons over the next five to 10 years, going from 55 to 60 total fighter squadrons. The service is also planning to build up its Active Duty end strength to 321,000 by the end of this year, up from 317,000 last year. By the end of 2018, it hopes to bring that number up to 324,000, USAF spokesman Col. Patrick Ryder said.

The plan to add five more squadrons will take place in the out-years of future budget planning—in the late 2020s—Ryder said. It is too early to say what type of aircraft the squadrons would fly, though the service is building up its F-16 squadrons and planning to field 1,763 F-35s.

The current number of fighter squadrons is enough to fly today's operational needs, such as the air war targeting ISIS in Iraq and Syria, though more would be needed to face high-end threats, said Ryder. For comparison, the Air Force had 134 combat-coded fighter squadrons in 1991 during the early days of Operation Desert Storm.

By the Numbers

Photo by Don McCullough

7,000,000

The number of unmanned aerial vehicles the FAA forecasts will be sold commercially in the US in the year 2020.

Source: "FAA Aerospace Forecast Fiscal Years 2016-2036."

■ Mattis Sworn In as 26th Secretary of Defense

DOD photo by PO2 Dominique Pinero

The Senate overwhelmingly approved the nomination of retired Marine Corps Gen. James N. Mattis as Secretary of Defense shortly after President Donald Trump's inauguration on Jan. 20. Vice President Michael Pence swore him in shortly after the 98-to-one Senate vote.

"Every action we take will be designed to ensure our military is ready to fight today and in the future," said Mattis in a message to Defense Department personnel. "Recognizing that no nation is secure without friends, we will work with the State Department to strengthen our alliances. Further, we are devoted to gaining full value from every taxpayer dollar spent on defense, thereby earning the trust of Congress and the American people. I am confident you will do your part. I pledge to you I'll do my best as your Secretary."

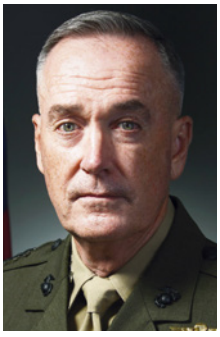
Previously, the House and Senate had voted to approve a waiver to allow Mattis to serve as Secretary even though he has not been separated from Active Duty service for seven years as federal law requires. ✪

DOD PHOTOCHART SPECIAL

Compiled by Chequita Wood, Media Research Editor

As of Feb. 17, 2017

Office of the Joint Chiefs Of Staff



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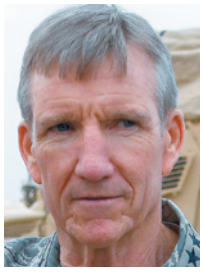
SAVING AIR SUPERIO

By John A. Tirpak, Editorial Director

The Air Force is racing the clock to preserve its ability to control the air. As new adversary fighters and air defenses develop—and are already challenging USAF's ability to go anywhere and strike any target—the service figures it has about 13 years to start introducing the new array of hardware and operational concepts needed to come out on top in future air combat.



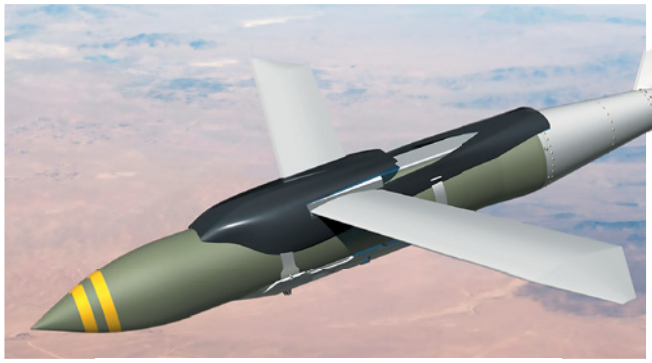
Gen. Hawk Carlisle, chief of Air Combat Command, says USAF needs to take action now.

Last year, the Air Force conducted a study, Air Superiority 2030, that defined the anticipated gaps in USAF's capabilities in the decade after next and some of the quickest ways to fill them. In January, it launched an analysis of alternatives (AOA) to seek the best all-around solution, summed up as a new, superstealthy combat airplane (called Penetrating Counterair, or PCA), able to operate deep within an enemy's toughest air defenses. To go with it, new classes of air-to-air and air-to-ground weapons

An F-16, F-15E, F-22, and F-35 (top to bottom) form up for a flyover at JB Langley-Eustis, Va., Jan. 19, 2017.

Far left: USAF photo by A1C Tristan Biese. Left: USAF photo by SrA. Andrew Park

RITY



Far left: A Northrop Grumman illustration of an aircraft-mounted directed energy system. Left: A Russian S400 missile launches during joint exercises in Buryatia, Russia, in 2016. Below: An artist's concept of a 2,000-pound Joint Direct Attack Munition-Extended Range. Boeing and Times Aerospace Korea will co-develop, test, and field a JDAM-ER wing kit.

Forget about a family of systems. Next-generation air dominance will require an aircraft with a family of advanced technologies.

are needed to guarantee that USAF can overcome superior numbers and get through to its targets.

In addition, the Air Force will be looking to create other enabler systems, such as a new class of stealth drones—highly capable but cheap enough to lose if necessary. These unmanned aircraft will perform reconnaissance, strike, and electronic warfare missions. A Penetrating Electronic Attack aircraft, to perform stand-in jamming, will also be required. Still undecided is whether it will be a variant of the PCA.

In parallel, USAF is conducting a Future Fighter Force Structure study to determine how many aircraft will be necessary to fill out the combat air forces in the 2030 to 2040 time frame. That study will define the specific structural and capability upgrades needed to keep some portion of the legacy fighter force relevant. Said to be nearly complete, it will evolve along with the Air Force's 2019 budget decisions, which look out five years.

The 13-year timetable is extremely ambitious, considering that both the F-22 and the F-35 took more than 20 years to go from the drawing board to operational service. Even if there are no further delays, the PCA won't become a program of record until late 2018."We don't have a lot of time," Air Combat Command (ACC) chief Gen. Herbert J. "Hawk" Carlisle said in a January interview with *Air Force Magazine*. "We're aiming for" 2030 to have the new air superiority laydown in place, he said, admitting that the target date is optimistic.

The PCA requirement will be shaped by money, current capability, the threat, and the "demand signal on the force" over the intervening years, he said.

The threat is twofold, Carlisle explained.

First, potential adversaries are deploying modern fighters that pose a real challenge to USAF fighters. China has been steadily developing the J-20 and J-31—the latter looking like a two-engine F-35 clone—and Russia is nearing operational capability with the T-50.

Though some have dismissed these fighters as merely stealthy-looking jets that may someday come close to the performance of fifth generation platforms like the F-22 and F-35, "I think they're here now," Carlisle said. "I don't think it's a futuristic discussion." He said the Chinese jets benefit from technical data stolen by China through cyber espionage, and that country and Russia are "moving faster than we thought" in progressing with modern aircraft.

Clockwise from top: Northrop Grumman illustration; Russian Federation Ministry of Defense; Boeing illustration

Fighter technology really isn't the problem, he continued. It's really about numbers.

Though "I'd take the F-22 over J-20 any day, … the question isn't 'one vs. one,'" Carlisle observed. In the South China Sea, he said, the threat might be "10 squadrons of J-20s, plus Su-35s—which they just picked up from Russia—and Su-30s and J-10s and J-11s," as well as J-15s flying from the *Liaoning,* the Russian-built aircraft carrier China bought and reworked for its own use.

Meanwhile, the US would initially be limited to the relative handful of aircraft forward deployed to the Western Pacific.

"It's an 'away game' for us; it's a 'home game' for them," Carlisle said, "and an away game has some serious limitations in terms of how we operate and where we operate from."

China, or really any adversary, can put up its whole air force at the scene of battle and turn aircraft more quickly than the US, which operates with just a portion of its fleet at the end of a very long supply chain.

Second, and more important, is the threat from ground-based air defenses. China and Russia have invested heavily in far-reaching surface-to-air missiles and detection and tracking radars that may be able to target fifth generation aircraft in the not-too-distant future. Those air defense systems are being made available to other countries today, and it's far less costly to buy and operate an advanced surface-to-air missile system than it is to maintain an advanced fleet of aircraft with seasoned pilots.

The PCA, then, will have to have "broadband, broad-spectrum stealth" as a primary design consideration, Carlisle said. The current state of stealth "is optimized for the X-band. So, we need to get broadband stealth" that can get past a variety of radar frequencies. Once that is obtained, "range, payload, and endurance" are the three major attributes needed, along with "broad-spectrum avionics," advanced electronic warfare, and "counter-countermeasures."

Such an aircraft doesn't sound like a traditional fighter such as the F-22 or F-35, and Carlisle said that will all be part of the trade-off studies.

"It may be bigger than we think," he said. "Maneuverability is one of those discussions—as in, if it's penetrating, what level of maneuverability does it need? We don't know the answer to that yet."

Carlisle has previously said the need for a deep magazine of weapons, long range, and extreme stealth suggests the PCA aircraft might turn out to be more like the B-21 bomber than the F-22, but the AOA has not yet had time to explore such an idea.

What does seem clear is that the PCA will be a single solution and not a family of new fighters or a "joint" aircraft program like the F-35. So said Col. Thomas Coglitore, ACC's chief of the Air Superiority Core Function Team and Next Generation Air Dominance.

The AOA is focused on "the high end of the operational environment," he said in a January interview, and a two-airplane solution is "exceptionally unlikely." He could not remember an AOA recommending two unique solutions.

The F-22 and F-35 will certainly be part of the mix. The Air Force intends to have the F-22 well into the 2040s; the F-35 considerably longer. Asked in a previous interview what he would most want in the way of a near-term improvement in the fighter force, Carlisle's simple answer was "more shots."

The F-22 is limited to six radar guided AIM-120 Advanced Medium-Range Air-to-Air Missiles (AMRAAM) and two AIM-9 Sidewinders internally—and thus stealthily—while the F-35 is limited to a mix of four air-to-air missiles internally. Both can carry more weapons externally, but at the price of their stealth.

Separately from the PCA, the Air Force is considering so-called arsenal planes that would carry extra munitions that the fifth generation F-22s and F-35s could designate targets for.

Coglitore said the Navy has a need for a new counterair platform, but its requirement—defense of the carrier battle group—is very different from the Air Force's mission of providing theaterwide air superiority. The services are sitting in on each other's programs—they have a joint working group—sharing knowledge but not building a joint program, he said. They will look for ways to have some commonality of engines, software, and weapons, as well as interoperability, but the two services' resulting aircraft are unlikely to be similar.

"Our gaps are different [from] the Navy's gaps" in the 2030-40 time frame, Coglitore said.

Carlisle said given its responsibilities for "theater-level airpower," USAF sees itself performing the "stand-in" electronic attack/electronic warfare mission in the future, while the Navy is migrating toward the "stand-off" EA/EW function—a reversal of the roles the services have played in the last two decades.

"There will be a synergy ... there," Carlisle said, as the services "marry those two together to make the greatest electronic attack capability we can."

How did the Air Force get so far behind in developing its air superiority capability, a fundamental mission?

Chinese J-10s fly in formation during a training exercise in 2016. China, through cyber espionage, and Russia are moving "faster than we thought" in developing modern aircraft, says ACC's Carlisle.

Version 2 of the active electronically scanned array, or v2 AESA, on an F-15. Eagles are getting the advanced radar to help keep them effective against advancing enemy threats.

Senior service officials said the Air Force found it politically tough to start talking about a follow-on for the F-22 at the time it really should have gotten the ball rolling. That was in 2009, when then-Defense Secretary Robert M. Gates terminated the F-22 buy at less than half USAF's planned and required number.

There was a raft of other big-ticket projects either in the works or getting underway, like the F-35, KC-46, B-21 bomber, and T-X trainer, so the decision was made to wait until the air superiority threat and requirement came into sharper focus. There was a sense, too, that the project would have to wait until Gates, highly skeptical of the high-end air-to-air mission, departed the job.

Moreover, Carlisle said, in that budget year, the Air Force undertook what was called the Combat Air Forces Redux.

CAF Redux cut more than 250 fighters from the fleet. This was done on the assumption that, with the wars in Afghanistan and Iraq supposedly winding down, the Air Force could "take a risk in the near term," reduce the fleet, and use the savings to quickly buy F-35 fifth generation fighters to rebuild capacity.

It didn't work out that way. The F-35 was late, and the combination of the budget sequester and unexpected challenges around the globe conspired to drain modernization accounts. The F-35 inventory is small and production rates are lagging.

The plan in 2010 called for USAF to be buying 110 F-35s a year by 2015. Instead, it is only now up to 48 a year. "So we took that risk, we never got to fifth gen, and by the way, the world changed and is significantly more challenging … than what we thought it was going to be in 2010," Carlisle asserted.

For now, the "buy rate in the near term is the most important thing to the Air Force. Get the numbers up," he said. That imperative is driven by the Air Force simply lacking the capacity to be in all the places it might need to be in a crisis. USAF needs airframes, and if the new administration follows through with its plan to add defense funds to Fiscal 2018, Carlisle said a bigger F-35 buy is at the top of the list.

He doesn't see a "wall" in the future where further buys of F-35s would be pointless, given the threat. The Air Force is well along in defining the Block 4 upgrades it wants to see in future production and refits of earlier blocks.

NOT SIXTH GEN

The Air Force has eschewed talk of the PCA as a "sixth generation" fighter.

"Anyone who uses … 'generation' will be shot," Coglitore joked. "We don't talk about it in terms of generations anymore." The reason, explained at the rollout of Air Superiority 2030, is that to be a true generational leap over the F-22, a fighter would have to incorporate such dramatic advances—hypersonic speed, perhaps, and directed-energy weapons—that it would take too long and cost too much to be built in the time and numbers needed. The Penetrating Combat Aircraft is to rely on technology already near at hand.

Carlisle has talked of creating new fifth generation missiles to go with fifth generation fighters.

"Sooner is better," he said of a replacement for the AMRAAM. "I needed it a couple of years ago." The Chinese counterpart missile, the PL-15, is expected to have excellent range and kinematics comparable to those of AMRAAM.

"We're having good luck with modernization of the AMRAAM," Carlisle said, but "it's got a range issue … that doesn't get us the advantage that we really need." Though the Air Force Research Lab and others are pushing hard on hypersonics and "we spend a lot of time talking about it," ACC isn't betting on such a weapon, but "I think we're getting close."

Coglitore said there are a number of concepts being explored for a new air-to-air missile. It's thought the platform

From left: China Ministry of National Defense photo by Cui Zhiwei; Boeing courtesy photo

A Chinese J-15 fighter lands on the flight deck of *Liaoning* during a training exercise in the Yellow Sea on Dec. 23, 2016.

and its main weapon will each be designed with the other in mind. A similar approach was taken with the Navy's Phoenix missile and F-14 Tomcat and its radar in the 1970s.

He said USAF may economize by using existing seeker heads on a new missile body, likely to be smaller so that more missiles can be carried by all the combat aircraft USAF fields. A smaller missile in any case could increase the number of shots available, and the PCA may have a larger weapons bay than the F-22. The larger the airplane, though, the more it will probably cost.

The Air Force feels it has a solid grasp of the missile and sensor technology that will be available in 2030, Coglitore said. The new weapon is called the Small Advanced Capability Missile, or SACM, but Coglitore said he thinks the "A" in the acronym should be changed to "affordable," because the Air Force will have to buy a lot of them.

Raytheon has a contract to pursue the concept, but other companies are also studying it, he said. Lockheed Martin has displayed a concept half the size of AMRAAM, called the Cuda, which it says would have longer range and similar sensor performance.

MISSILES ABLE TO KNOCK OUT THE ELECTRONICS OF A PARTICULAR BUILDING HAVE ALREADY BEEN SUCCESSFULLY TESTED AND WILL BE PART OF THE FUTURE PORTFOLIO.

Asked if the AMRAAM and Sidewinder are in their sunset years, Coglitore noted they are numerous and will certainly be used, whether they can "cover … 25 or 75 percent of … what we need in the future, we'll let it cover that" and use the new missiles to fill in the gaps.

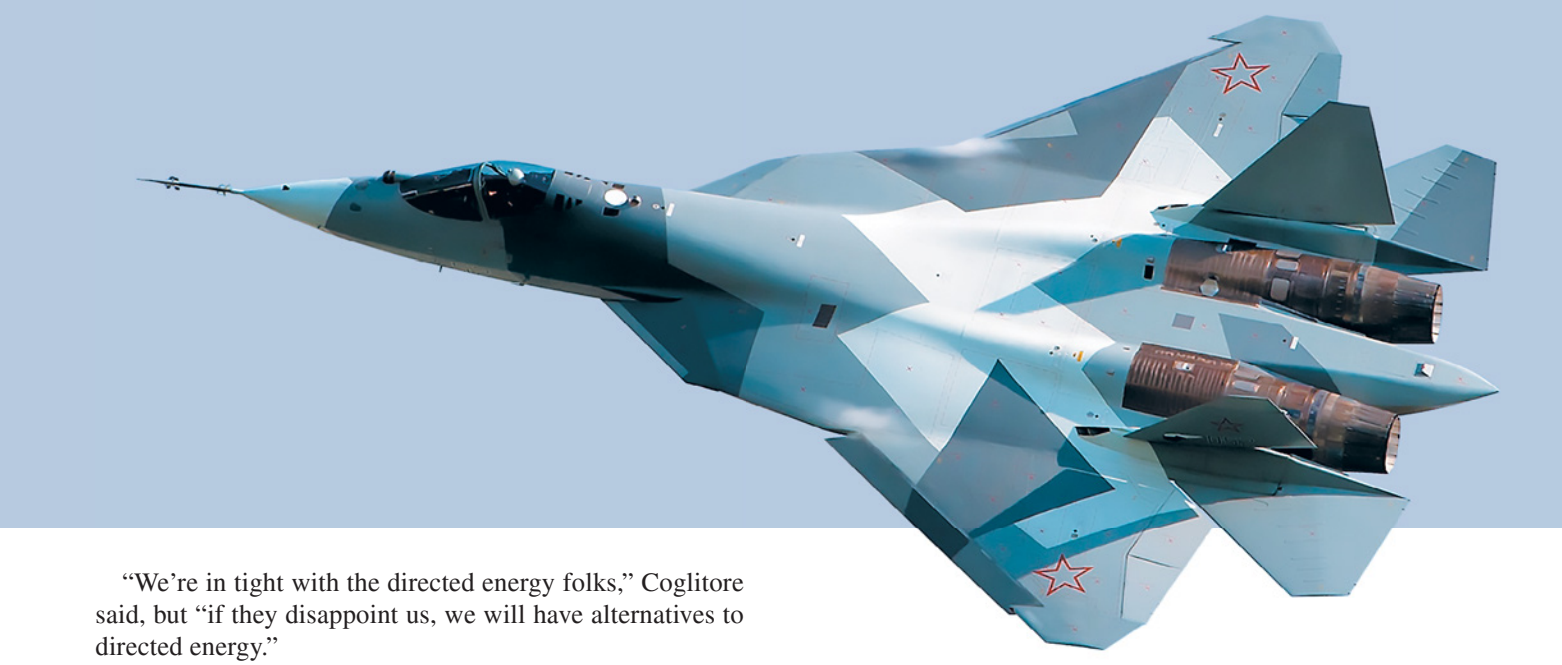
"A mixed loadout might end up being the most optimum, but who knows?" he said. "We need to let the analysis play itself out."

It's not going to be enough for the PCA to simply get close to enemy targets. The Air Force wants to develop a new direct attack munition—a successor to the JDAM—because the air defenses of the 2030s will "have the ability to take that weapon out before it impacts the target," Carlisle reported.

This new munition, known as the Survivable Strike Weapon, would be maneuvering, have reduced signature, "broadband acquisition and tracking" of mobile targets, and "longer standoff range," he said. Here again, hypersonics will be "part of the dialogue," but a vexing technical challenge is the sensors, because hypersonic speed generates tremendous heat.

Lasers and directed energy weapons also hold great promise, but the Air Force is not betting they will be available as a major kinetic capability in 2030 time frame. Carlisle said, however, that missiles able to knock out the electronics of a particular building have already been successfully tested and will be part of the future portfolio of weapons.

A Chinese J-20 makes its first public appearance at Air Show China on Nov. 1, 2016.



A Russian prototype of the Sukhoi T-50 in Russia in August 2011. The T-50 is nearing operational capability.

"We're in tight with the directed energy folks," Coglitore said, but "if they disappoint us, we will have alternatives to directed energy."

Carlisle said the PCA will probably be manned. While "I do believe that the mix" of manned and unmanned aircraft "may change pretty significantly over time," he doesn't foresee a near-term future where "we're going to take ejection seats out of every manned platform."

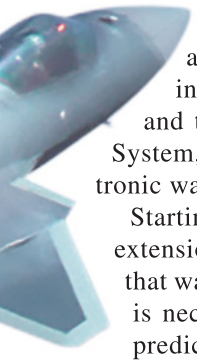
More likely is that manned aircraft will supervise or control unmanned platforms as they collaboratively accomplish a mission.

Asked if the PCA will be able to function if space connectivity is denied, Coglitore said the aircraft is one way to guarantee space will *not* be denied.

"It's almost like SEAD [suppression of enemy air defenses] for space," he said. A system that can survive getting in close to an enemy's most valued targets is a system that can blow up anti-satellite rockets on the pad, or uplink or downlink stations, or satellite jammers.

"Potential adversaries today or in the future could be engaging our space assets kinetically or nonkinetically," he pointed out. "If we have air superiority, we can deny that pretty easily."

To help bridge to the PCA, the F-15 Eagle fleets—both air superiority F-15Cs and ground attack F-15Es—are getting a package of capability upgrades, including active electronically scanned array (AESA) radars, an infrared search and track system to help detect increasingly radar-stealthy aircraft, new processors, and the Eagle Passive Active Warning Survivability System, or EPAWSS, which replaces its obsolete electronic warfare suite.



Starting in 2020, the Eagles will get a service life extension program concentrating on replacing structure that was expected to last for the life of the airframe, but is necessary since the aircraft have flown past those predicted hours. Among the parts needing replacement are longerons holding the front and back of the airframe together.

Later F-16s—Blocks 40/42 and 50/52—are already receiving a number of processing, computer and display improvements, new radios, software, the automatic ground collision avoidance system, and an AESA radar. The Air Force doesn't plan to retire any more F-16s until 2022 at the earliest. A service life extension program is planned for up to 300 F-16s that will extend their service from 8,000 to 13,856 equivalent flight hours. This could carry them into the 2040s.

The F-22 fleet of about 180 aircraft has a well-laid out upgrade plan that is largely classified; it's focused on steadily improving the F-22's sensors, stealth, stealth maintainability, and ability to communicate both with F-35s and fourth gen fighters.

USAF is on the hook to provide Congress with a report on how much it would cost to upgrade to full combat capability the 60 or so F-22s used for training. Senior service officials say they like the idea, but as a practical matter, it would be difficult to implement and costly to maintain.

Another participant in the PCA analysis of alternatives is Air Mobility Command. Gen. Carlton D. Everhart III, AMC commander, said last fall that a future aerial tanker may not look like the traditional converted airliners, but may instead be a stealthy platform that can go into denied airspace to refuel fifth gen aircraft and the PCA.

"I think we'll go first and figure out what we need … as it pertains to air superiority," Coglitore said, and the result "could drive [AMC's] requirement for any future tanker." It may not, if the PCA ends up having sufficient range to not need tanker support. It also may not be technically feasible.

"Normally, when you drop a boom down, it's not very stealthy," he said.

"We obviously need air superiority" to fulfill the Air Force's primary mission, Coglitore asserted. "I think we've got the permissive and contested" environments "nailed down." But USAF needs new platforms to be able to go where current aircraft "may not be able to go in the future."

The Air Force is highlighting the mission because "no one's really lived in a time" when the US didn't have air superiority in a conflict, and they may not realize that it doesn't simply happen, automatically, and that it is being challenged today.

"We know air superiority is a prerequisite" for all other military operations and is "the great enabler," Coglitore said. It's not a birthright, he said. It's "something that you have to earn." ✪

Clockwise from top: China Ministry of National Defense photo by Mo Xiaoliang; Alex Beltyukov; Jim Woodward

CONTINUOUS SANDBOX PRESENCE

B-52s returned to the Middle East for the first time in 25 years so the Air Force could set up regular bomber rotations.

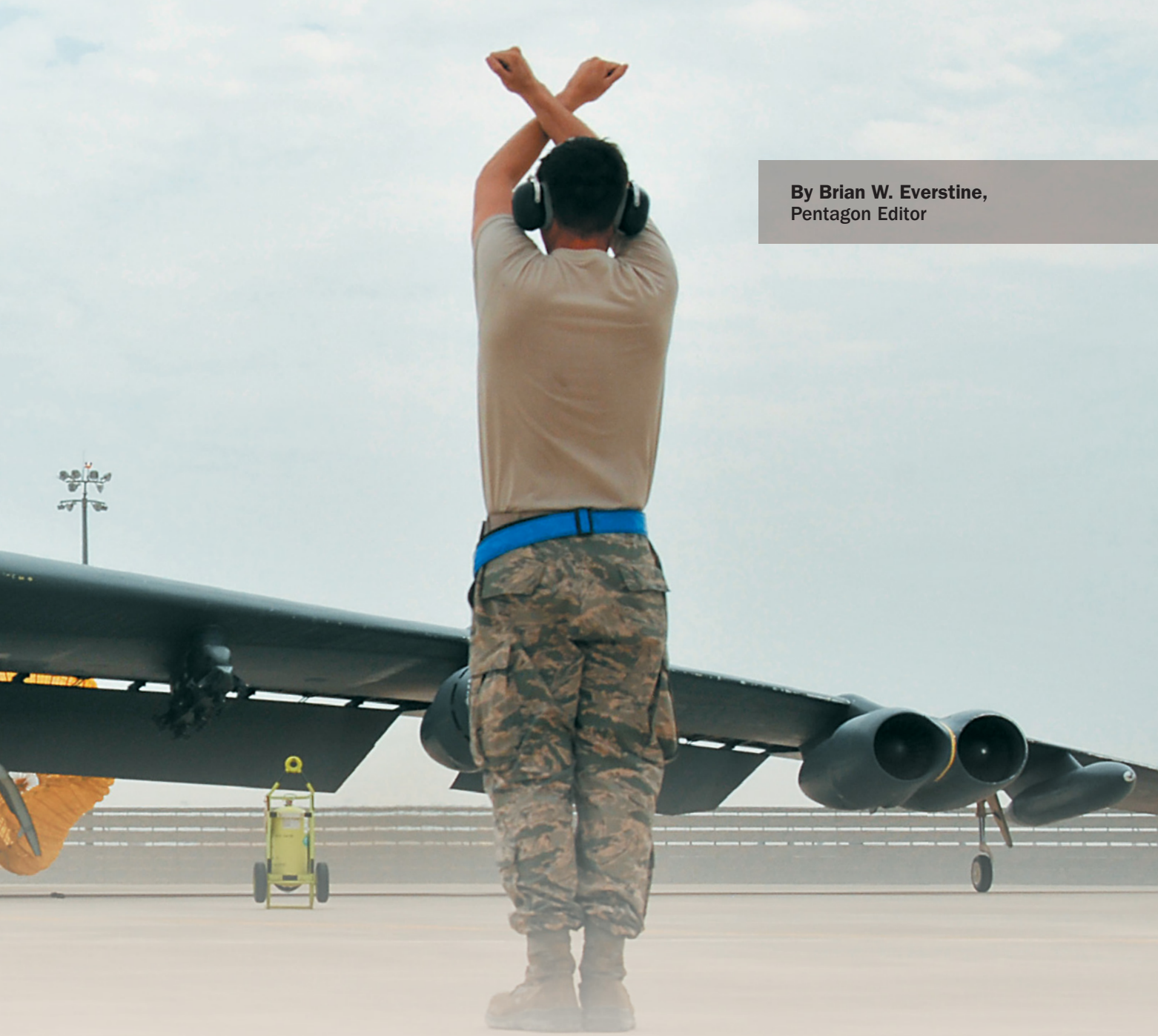
Under a nearly full moon last Sept. 12, a small fleet of US aircraft joined up over Iraq, headed toward an industrial facility in Mosul. Led by a B-52, the armada included F-15Es, A-10s, F-16s, and F/A-18Ds.

Intelligence and surveillance showed a massive pharmaceutical plant had been retooled by ISIS to produce chemical weapons, including chlorine or mustard gas.

When the task force left the area, more than 50 targets in the plant complex lay destroyed. Every bit of the fleet's payload capability, especially the massive 70,000-pound load of the Stratofortress, was needed to deal this crushing blow to ISIS. Black and white video of the strike showed the massive plant light up with dozens of explosions, precisely on target.

There was "a pretty significant number" of points of interest in the complex, Lt. Gen. Jeffrey L. Harrigian, head of US Air Forces Central Command (AFCENT), said of the Sept. 12 strike, and most required specific kinds of weapons,

USAF photo by TSgt. Terrica Y. Jones



By Brian W. Everstine,
Pentagon Editor

A crew chief marshals a B-52 at Al Udeid AB, Qatar. The US is part of a 19-nation airpower coalition fighting ISIS in the Middle East.

delivered by specific platforms. "We needed that many jets to be able to take out the breadth [of] that facility."

Air Force B-52s, often called BUFFs—for Big Ugly Fat [Fellas]—returned to the US Central Command (CENTCOM) area of responsibility for an extended deployment in April 2016. It was the B-52's first such deployment in 25 years.

The deployment with bombers from Barksdale AFB, La., replacing B-1B Lancers that had been in CENTCOM since 2001, represents a new initiative by the Air Force. Much like the continuous bomber presence mission in the Pacific, the Air Force has set up a new permanent bomber rotation to the Middle East.

"Our plan … is to continue having a bomber presence, and it will be a combination of a B-1 and B-52 rotation," Air Force Chief of Staff Gen. David L. Goldfein said in announcing the initiative during a "state of the force" briefing last August. The Air Force's overall bomber inventory will be managed to sustain a forward bomber presence in CENTCOM and the Pacific, he said.

BONE HOME

Since the beginning of Operation Inherent Resolve in 2014, Air Force B-1Bs—called by their crews "Bones," for B-Ones—have carried the load. The swept-wing bombers, with their massive weapons payload, set records

USAF photo by SrA. Miles Wilson

At top, Joint Direct Attack Munitions in a warehouse at Al Udeid Air Base. Here, an airman inspects a JDAM before it is loaded onto an aircraft for Operation Inherent Resolve.

for the amount of bombs they dropped on ISIS.

In one six-month deployment, B-1Bs from Ellsworth AFB, S.D., flew 490 sorties and dropped 4,850 bombs.

In one month, they dropped 2,224 bombs—the most of any B-1B unit that had deployed to CENTCOM. The previous record was less than half that amount.

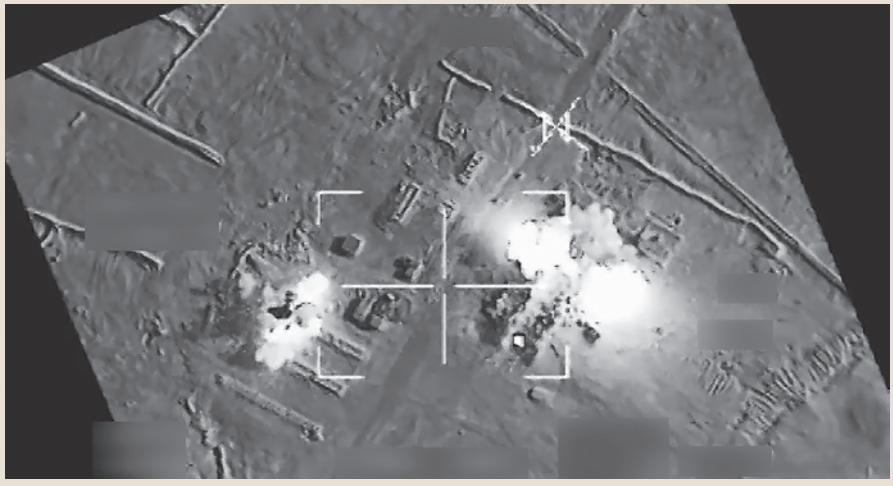
Starting in January 2016, the B-1s had to go home to receive a much-needed modernization package. Air Force Global Strike Command (AFGSC) is installing the Integrated Battle Station upgrade on the sleek bombers, one of the most comprehensive improvements in the Lancer's history. The program upgrades the aircraft's avionics and data links and adds a self-diagnostic test system. The project is about 40 percent complete, according to AFGSC.

The rapid pace of air strikes on ISIS meant heavy bombers were still needed, though, and that's where the B-52 came

USAF photo by TSgt. James Hodgman

USAF photo by TSgt. Nathan Lipscomb

A maintainer inspects a B-52 from Barksdale AFB, La., at Al Udeid. B-52s based there have been in the fight against ISIS for a year.



AFCENT graphic

A flight camera records the destruction of an ISIS improvised weapons facility near Al Haditha, Iraq, in October 2016. The strike package on this mission included B-52s and aircraft from other coalition members.

in. Global Strike boss Gen. Robin Rand worked with the CENTCOM chief, Army Gen. Joseph L. Votel, to ensure a continuous presence, Goldfein said. That meant changes to the flight line at Al Udeid AB, Qatar.

Air Forces Central Command needed to do extensive work to get the base ready for B-52 operations, causing a slow start to their deployment, said Lt. Gen. Charles Q. Brown Jr., AFCENT chief at the time. The runway at the base had to be extended to allow the B-52 to take off and land normally. Other logistics support had to be upgraded to "make sure they've got everything they need," he said.

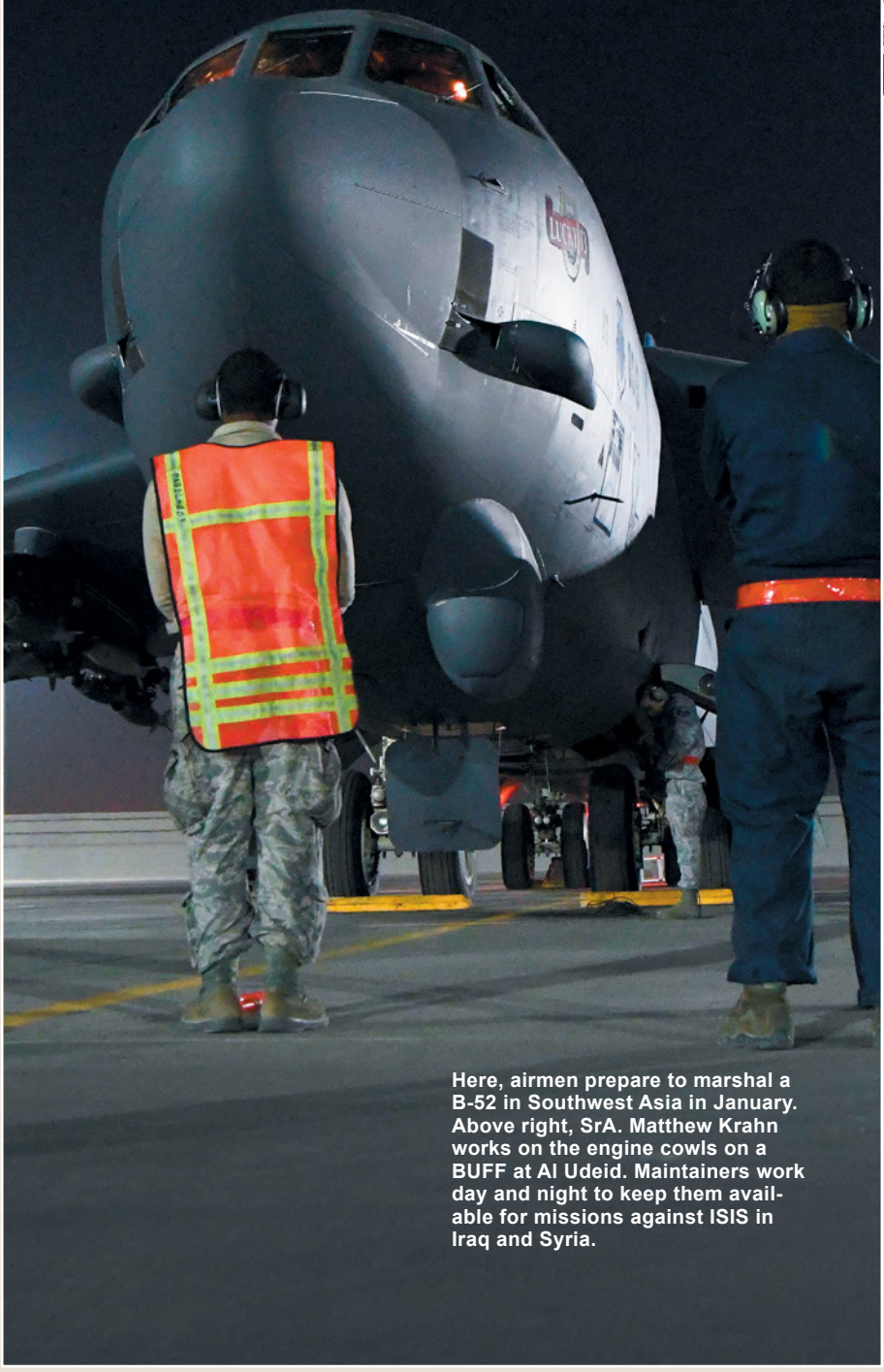
The first B-52s touched down at the base on April 9, 2016, deploying their drag chutes. Just nine days later, a B-52 conducted its first strike inside Iraq, hitting an ISIS facility near Qayyarah.

While the BUFF is nuclear-capable and known for massive carpet-bombing campaigns such as the legendary Linebacker II missions in Vietnam, the aircraft have been heavily upgraded over the years. Rather than just the biggest bombs, they can now carry smaller munitions with adjustable yields such as laser guided GBU-12s and satellite guided GBU-31s.

"My father … flew B-52s in the late 1960s and early 1970s," said Maj. Gen. Peter E. Gersten, then deputy commander of operations and intelligence for Combined Joint Task Force-Operation Inherent Resolve, in a briefing. "I'd also like … to clean up any misperceptions about what the B-52 is capable of. ... This is not my father's B-52. It's a highly upgraded B-52, [an]

"THE B-52 IS A PRECISION STRIKE WEAPON SYSTEM. ... IT WILL CONDUCT THE SAME TYPE OF PRECISION STRIKES THAT WE'VE SEEN FOR THE LAST 20 MONTHS."

MAJ. GEN. PETER E. GERSTEN
Then-deputy commander of operations and intelligence
for Combined Joint Task Force-Operation Inherent Resolve



Here, airmen prepare to marshal a B-52 in Southwest Asia in January. Above right, SrA. Matthew Krahn works on the engine cowls on a BUFF at Al Udeid. Maintainers work day and night to keep them available for missions against ISIS in Iraq and Syria.

USAF photo by SrA. Miles Wilson

extraordinary platform that strikes with the same accuracy and precision that every other coalition asset has struck [with] in the recent past."

During the B-52's first mission in April, the bomber attacked a weapons storage facility as part of Operation Valley Wolf, an effort by Iraq to clear ISIS terrorists from villages south of Mosul. Video of this strike shows the facility being destroyed, while nearby structures remained intact.

"There are memories ... in the collective [consciousness] of B-52s decades ago doing … less discriminate, arguably indiscriminate, bombings," then-coalition spokesman Army Col. Steve Warren said at the time. "I guess that's where the phrase 'carpet bombing' originally came from, back in the Linebacker days."

"Those days," Warren said, "are long gone. The B-52 is a precision strike weapon system. ... It will conduct the same type of precision strikes that we've seen for the last 20 months here in this theater. So it is simply a replacement for the B-1. Obviously, the B-52 does have a long and very illustrious history. So we do like to talk about it. But really, it's ... simply another platform from which we can launch our precision strikes."

The pace has definitely picked up since. As of late December, B-52s had flown 430 sorties and dropped 2,565 weapons against ISIS targets. They've provided a large portion of the air support to Iraqi forces as they moved on the ISIS-held city of Mosul and have flown

USAF photo by TSgt. Carlos J. Treviño

A B-1B banks away after refueling from a KC-135 over Southwest Asia. B-52s replaced the B-1s in theater as the Bones underwent badly needed upgrades.

alongside a wide variety of coalition aircraft, including Marine Corps EA-6B Prowlers, a French Dassault Rafale, and Royal Danish Air Force F-16s.

"We got the B-52 back into the fight in Afghanistan and Iraq," Goldfein said during a visit to CENTCOM in August. "We have the B-52 contributing to a significant ground effort and employing weapons in close proximity of friendly troops who are under attack." The B-52s are "preparing the battlefield in new ways."

The mission against ISIS is not expected to slow as the fight moves farther into Mosul and the group's main capital of Raqqa, Syria. Coalition aircraft dropped 30,743 bombs in 2016, up from 28,696 the year before.

B-52s have also contributed to the ongoing fight in Afghanistan, flying four sorties and dropping 51 bombs in that theater, according to AFCENT.

YEAR OF THE B-52

The B-52s are slated to continue fighting in Iraq and Syria for all of 2017 as the B-1B upgrade progresses, while the Bones are projected to return to CENTCOM in 2018. However, the first upgraded B-1B is scheduled to deploy to the Pacific in the near future. A specific date for that deployment hasn't been set, according to Global Strike Command.

"This period of B-52 support to CENTCOM, their first extended presence there since 2005, has shown to be very positive both for the B-52 community executing their mission and for the B-1 community currently undergoing significant upgrades," AFGSC spokeswoman Linda Frost said.

In addition to operational missions in the region, B-52s are conducting training while deployed. In May 2016, just about a month after arriving in theater, B-52s flew alongside Royal Jordanian Air Force F-16s in Exercise Eager Lion 2016 and dropped live ordnance in close air support training.

While maintaining two continuous bomber presence missions seems like it would tax Global Strike crews with more deployments, it has had the opposite effect so far, Frost said.

"It allows us to bring more aircraft to support the CENTCOM area of operations," she said. "Instead of one airframe and two bases providing forces, we can now look across our entire B-1 and B-52 fleet to determine who's right for the job required and who needs to rest and recoup."

Sharing the load between the two bomber fleets and their seven operational squadrons evens out the deployment time among crews "as well as the cycling of aircraft through upgrades," Frost said. ✪

USAF photo by SSgt. Sandra Welch

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Go Air Force!

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WOUNDED AIRMAN PROGRAM

Airmen board an aircraft to deploy from Barksdale AFB, La., to Al Udeid AB, Qatar, last September. More than 350 Barksdale airmen deployed for Operation Inherent Resolve.

THE NEW AND IMPROVED AEF
BUT NOT YET PERFECT

By Amy McCullough,
News Editor

USAF continues to refine its deployment model in the face of uncertainty.

The Air Force went to war in Iraq in 1991, soon after the Cold War ended, and there was a sense that the dual victories could allow a reduction in the force and signal a decline in the service's operational tempo.

Both assumptions proved wrong. The Air Force has been at war nonstop for over 25 years—in Iraq, the Balkans, Afghanistan, Iraq again, Libya, Iraq again, and Syria—and force reductions during that time have made it a necessity that those in uniform deploy more often and for longer periods. The service has repeatedly had to make tough choices during those 25 years of combat—between readiness for nonstop combat and investments for tomorrow.

No one expects the pace of operations to decline anytime soon.

An airman embraces his wife on his return from a deployment to Al Udeid Air Base, as part of the expeditionary Air Force.

To cope with the pace of deployments, and to ensure that the burden of operations is spread as fairly as possible around the force, the Air Force created the Air and Space Expeditionary Force concept, known as the AEF. It scheduled roughly comparable groups of combat and other forces for deployment at regular intervals, with a known dwell time. The idea was that USAF people would know when they would be away, and for how long, so they could properly prepare for deployments and get their professional military schooling and training accomplished during their time at home station.

Left: USAF photo by A1C Dennis Hoffman. Top: USAF photo by SrA. Curt Beach

SSgt. Michael Finney marshals an F-16 on a runway in Southwest Asia in November. Air Force Chief of Staff Gen. David Goldfein wants USAF to work its way back to deploying teams of airmen, not individuals.

USAF photo by SSgt. Kenneth McCann

SrA. Rhea Flambeau (l) and SrA. Grayson Bryant (r) guard a base security zone in Southwest Asia.

The relentless operating tempo, though, has meant that sticking to AEF timelines was frequently impossible, and the system has had to evolve over the years. It will do so again.

"Squadrons have been asked to bear the brunt of an incredible deployment tempo and manpower shortages, which have had a direct impact on readiness and our warfighting missions," said Chief of Staff Gen. David L. Goldfein, in an August 2016 white paper.

He pointed out that manpower levels often hover between 60 to 70 percent of that required at Stateside bases, "with many key supervisors and leaders deployed or dual-hatted." The remaining airmen work overtime, and units struggle to manage parts and equipment shortages. As a result, he said, "we have degraded the core fighting unit of our Air Force."

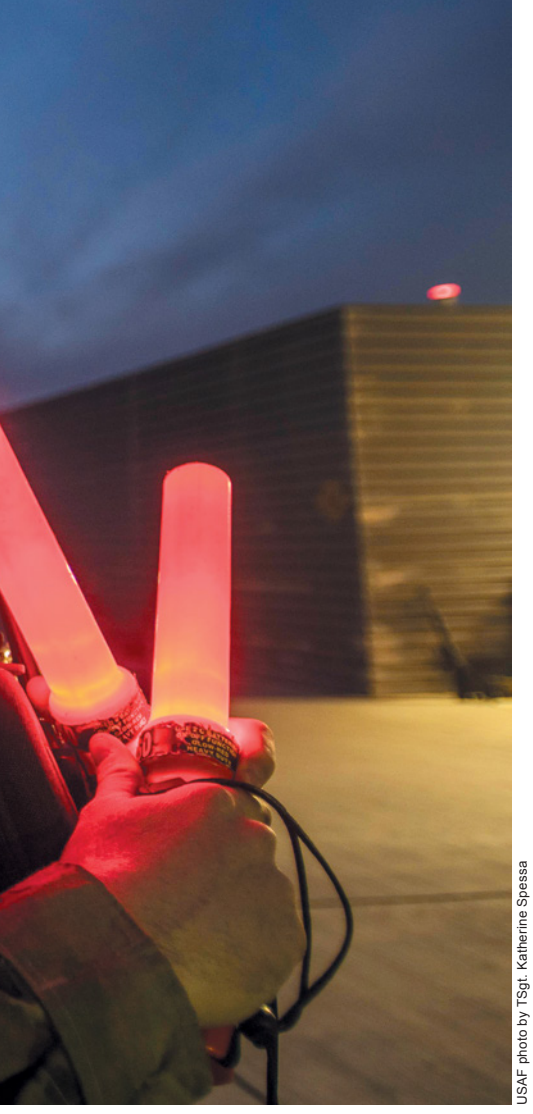
It's time for "a reset," Goldfein told reporters at AFA's Air, Space & Cyber conference last September. He outlined his top three focus areas. Over the next four years, Goldfein wants the service to 1) revitalize the squadrons, 2) strengthen joint teams and leaders, and 3) advance multidomain, multifunction command and control.

Part of what Goldfein wants to do is ensure USAF can simultaneously maintain the current operational tempo while improving the training mission at home.

Brig. Gen. Brian M. Killough, director of strategy, concepts, and assessments, has been tapped to lead a team that will spend the next four years trying to figure out how the Air Force can better develop joint leaders. The way USAF presents forces to combatant commanders will be one piece of that puzzle.

"We need to reset how we deploy airmen to a fight," said Goldfein in another white paper, released in October 2016.

"Over the past 15 years, we migrated away from deploying as teams to often deploying as individual airmen," he wrote, noting the service does its "best work" when "training, deploying, employing, and redeploying as teams."



USAF photo by TSgt. Katherine Spessa

OVER THE NEXT FOUR YEARS, GOLDFEIN WANTS THE SERVICE TO:

1. **REVITALIZE THE SQUADRONS**
2. **STRENGTHEN JOINT TEAMS AND LEADERS**
3. **ADVANCE MULTIDOMAIN, MULTIFUNCTION COMMAND AND CONTROL**

USAF photo by SrA. Tyler Woodward

An F-22 Raptor in Southwest Asia. F-22s are providing close air support and have performed more than half of all Operation Inherent Resolve escort missions.

USAF will "never be the component that sticks rigidly to a fixed team size for deployment" because the nation needs the service to be flexible, he said. "However, over the last few years, more airmen have deployed into combat as individuals at the expense of airmen and unit readiness."

Goldfein has purposely "resisted forward movement" on any of his three focus areas until leaders have built up their teams and created a plan of action. As of early January, Killough and his team were still finalizing that plan, but it was expected to be sent to Goldfein for review "in the near future," USAF spokeswoman Erika Yepsen said.

"Our approach to strengthening joint leaders and teams is an evolution, not a revolution," Killough told *Air Force Magazine* in a written statement. The current AEF construct has evolved "to the point where our airmen are training as teams at home station. Now the next step is to ensure they also deploy as teams, which is a key line of effort for the Chief of Staff's second focus area."

SAY YOU WANT AN EVOLUTION

Almost from the outset, the AEF was forced to evolve, as demands outstripped the available manpower. In the first version, there were 10 "buckets" of capability, such as fighters or support, all under a single wing commander. Those AEFs were paired in groups of two, which deployed nose-to-tail in 90-day increments. Although they were created "almost simultaneously," it took nearly two years for the Air Force to adjust the training pipeline to match the battle rhythm, said Bradley Higginbotham, chief of the AEF operations and readiness division.

After more than a decade of fighting wars in Iraq and Afghanistan, the process evolved, moving away from the original AEF construct, which focused on unit-based deployments.

The standard 90-day deployment was extended to 120 days in 2004 and then again to six months in 2010, with varying lengths of time between deployments.

The Air Force had hoped to return to those 90-day deployments without having to surge, but continuous combat operations made that impossible. The solution at the time was the tempo banding system, which Donald Cohen, the global force management branch chief, referred to as the "second evolution of the AEF construct."

The complicated system included five bands for Active Duty—all at different deploy-to-dwell ratios—and two separate bands for the reserve component. Under the tempo band system, the deployment of small elements, sometimes even a single airman, from a squadron, became the norm.

The demand-driven system was designed to be flexible, but the battle rhythm was quickly thrown out of whack and many Air Force specialty codes found themselves in a continuous cycle of one-to-one deployments,

USAF photo by SrA. Miles Wilson

Airmen run through a postflight check on an E-8C JSTARS aircraft at Al Udeid. Aviation units, including maintainers, make up about half of airmen deployed at any given time.

meaning airmen were spending just as much time at forward locations as they did at their nominal home stations.

"Under the band system, if the demand increased, we changed the battle rhythm," said Cohen.

The result, said Col. Clarence Lukes Jr., the war planning and policy division chief, was an "unpredictable" and "very volatile" system that made it nearly impossible for airmen to know when they would next deploy or when they'd get back.

The service recognized this "perturbation" to the AEF construct and decided it was time to get back to the business of deploying as teams, said Higginbotham.

Then-Chief of Staff Gen. Mark A. Welsh III approved the new model, dubbed AEF Next, in April 2013. The goal was to create a more cohesive deployment cycle and get the majority of the Active Duty force back to a one-to-two deployment-to-dwell cycle.

That meant an airman would deploy for six months and then spend 12 months at home, allowing wings to meet combatant commander requirements while maintaining a proper pace of training at home station.

The concept was based on the assumption that after combat operations stopped in Afghanistan, forces would withdraw and the Air Force would finally get a break from the unremitting operational tempo.

That relief never came, but AEF Next went ahead anyway, in October 2014. USAF has made progress since then thanks in large part to the contributions of the Guard and Reserve, which have been integrated more thoroughly into the rotational system.

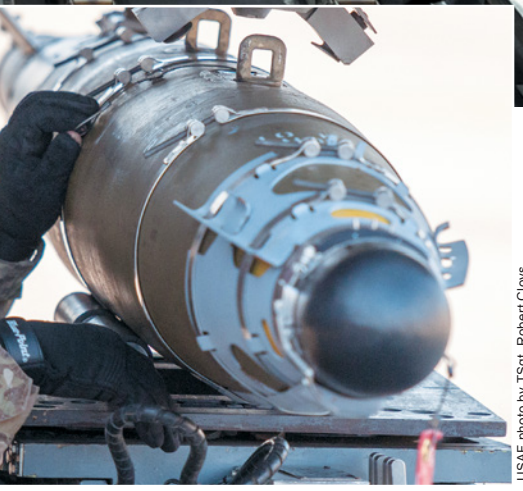
According to Higginbotham, the Air National Guard and Air Force Reserve now own about 45 percent of the USAF force structure. About a third of that consists of agile combat support career fields such as security forces, civil engineering, medical, and logistics—basically any base function not directly connected to the flying units. The rest of the reserve component's force structure centers around aircraft.

"When we look at our taskings since 2014, … the Guard and Reserve typically picked up between 10 to 15 percent of the taskings. They now fill about 30 percent of the taskings," Higginbotham said. The reserve component also has a unique deployment model—members deploy for six months and then have a 42-month reset period before deploying again.

USAF has consistently deployed about eight percent of its force over

USAF photo by SrA. Miles Wilson

Airmen load cargo onto a C-17 at Al Udeid.



USAF photo by TSgt. Robert Cloys

SSgt. Chris White, a weapons load crew chief, loads a GBU-54 on an F-16 at Bagram Airfield, Afghanistan.

the last decade. "We're still deploying about 25,000 airmen. The tempo is about the same, but the complexion of the force is different," he noted. Instead of mostly "pointy-nosed airplanes" and ISR platforms deploying to the US Central Command area of operations, the force structure is shifting more toward nonlethal assets that can help rebuild the Afghan military and economy.

Just like the initial AEF implementation, it's taken some time to synchronize training with the new system.

Nearly two years into the new process, "we're beginning to see the training line up to six-month deployments with a 12-month interim between them," Higginbotham said. "We can get the proper training links at the right time" so airmen can get upgrades to the 3-, 5-, and 7-levels in a more orderly fashion (various skill levels within an Air Force specialty code).

"It all means airmen are more prepared when they deploy today than they were five years ago," he said.

The problem before was that not only had tempo banding thrown the battle rhythm into flux, but the Air Force was going through a significant force-shaping effort at the same time, drawing down to the smallest end strength in its history.

"When you do a force-shaping exercise like we did, you tend to take [out] people who are toward the end of [their] career, who also are some of your most experienced trainers," said Higginbotham.

The service was left with a choice: Send the most experienced airmen downrange, or leave them at home to train the next group of airmen set to deploy. The more urgent need was to send the experience to the fight, so the home station often lost out.

Higginbotham said the switch from tempo banding has allowed the Air Force to "stabilize the experience level at home station, so we can complete that readiness training for the airmen."

Though a large portion of the force now meets the one-to-two goal—such as in agile combat support, tankers, and airlifters—there are some specialties that are showing improvement but still struggling.

Special operations forces, for example, which operated at a dwell of one-to-one for many years, are only now "approaching one-to-two," said Higginbotham.

The construct looks very different for the service's multirole fighters, many of them at a one-to-four or one-to-five deploy-to-dwell, depending on how many missions the type flies.

Higginbotham, a former F-111 pilot, said, "When I was young," USAF had multiple variants of the same plane, but the aircrew only had to learn one basic mission. "Now you take an F-22 or an F-35 and they do all of that." Fifth generation fighters perform air superiority, ground attack, electronic warfare, intelligence, surveillance, and reconnaissance, and other missions all on the same aircraft.

"The training spin-up to do all of that in one wing, with one person, is incredibly difficult to sustain when you go downrange to a fight and you don't use any of those skill sets," Higginbotham explained. That's why it takes longer at home station to make sure combat air forces remain combat ready, not just for the current fight, but for whatever the next requirement might be.

Lukes said before he was assigned to the Pentagon, he served as a vice commander and then commander of a wing where many of the airmen were forward deployed. The predictability made possible by the AEF Next model was "not only a positive sign for the airmen, but a positive sign for the wing itself, because it allowed us to plan out some of the things we needed to get done from an organize, train, and equip perspective," he said. "As a deployed commander, I knew how long I was going to be deployed and how long I would be at home. It was a win-win situation from my perspective."

THE ARMY RECIPROCATES

Officials initially were hesitant to implement the new deployment model until the operational tempo eased up a bit. When it became clear that wasn't going to happen, though, the Air Force started looking to the Army for help.

Two F-15E Strike Eagles fly near Mosul, Iraq. Coalition forces have flown thousands of combat sorties using a wide range of aircraft, striking enemy headquarters buildings, fighting positions, and other high-value targets.

An F-16 at Bagram Airfield, Afghanistan. In the current AEF construct, many of USAF's multirole fighter units deploy at a one-to-four or one-to-five deploy-to-dwell rate.

"Frankly, … we were being stressed … because the Army had used up all of their deployment capability for their Guard and Reserve," said Higginbotham. Without any Army reserve component soldiers available to perform deployment logistics, the Air Force had put on more of its own people to cope with moving large numbers of Army personnel through forward air bases. Because of USAF's speed, it was often the first service in when Special Forces, Army, or Marine Corps units deployed to a new location.

The delay in getting the ground services to pick up forward sustainment functions taxed the pool of USAF personnel.

"Now, after five years, they have reset their force and they have access to their Guard and Reserve," Higginbotham said. When the Air Force butts up against a one-to-two deployed limit on security forces, for example, it has the authority to request backfill from the other services or get contractors if necessary in order to prevent disruption of home-station training.

Of the 29 command force teams, Higginbotham said roughly half can be moved into the six AEF periods, allowing them to transition to the one-to-two deployment rate.

"We're pretty close," he said. Soon, "the way we upgrade people to do the organize, train, and equip sustainment will fall in line" with the battle rhythm.

The goal then shifts to sustaining the rhythm. Of the roughly 25,000 airmen USAF deploys, about half are aviation units, including maintainers. The other half is made up of agile combat support.

The half that is aviation units and organic maintenance already deploy as teams. "That's the way they are structured," Higginbotham said. As for the agile combat support, about 14 percent are still deployed as single airmen or pairs of airmen from a given unit.

Goldfein said he's still not quite sure exactly what a "team" will look like, but his initial direction was to look at a minimum three-person group, including a team lead, which could be either an officer or an enlisted airman. The most important part, he said, is that the team stays together through deployment and reintegration.

The Air Force will "leverage all the work we've done with AEF Next" and incorporate those lessons learned into the reset, added Goldfein.

"This is an effort that will evolve over time," he said. "We'll continue to look at team sizes and make sure we never lose sight of the end game, which is [to] support the combatant commanders … but [to] equally support airmen and their families through reintegration." ✪

USAF photo by Capt. Korey Fratini. Top: USAF photo by SSgt. R. Alex Durbin

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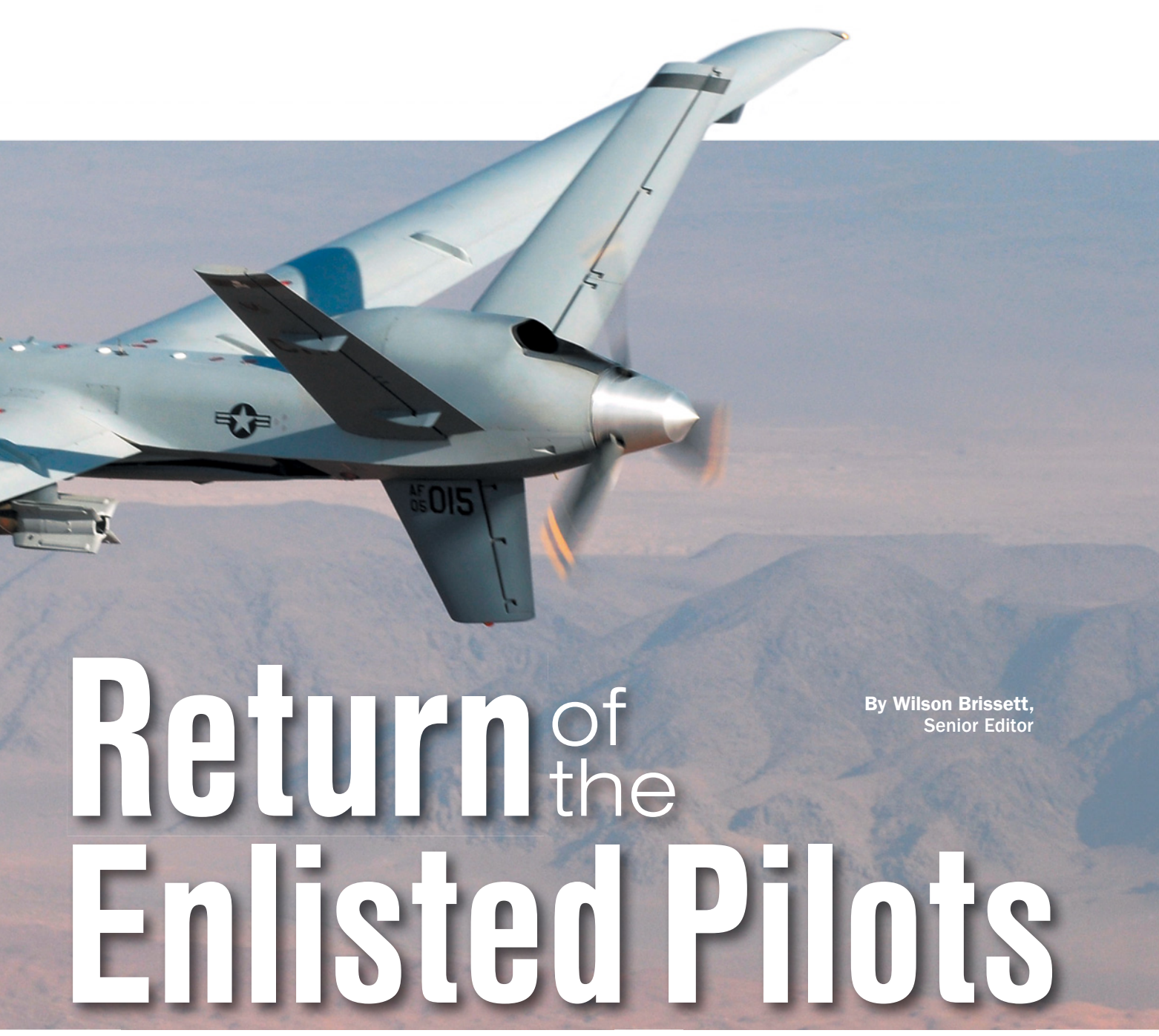
An MQ-9 Reaper, armed with GBU-12 laser guided bombs and AGM-114 Hellfire missiles, flies a combat mission over Afghanistan. High demand for RPAs led to an acute shortage of operators, and USAF decided to tap enlisted airmen to fill the gap.

Then-SECAF Deborah Lee James and the first four enlisted pilot students at Pueblo Memorial Arpt., Colo. Names of the training airmen were withheld per Air Force policy. By the end of this year, these airmen should be flying live missions with the RQ-4 Global Hawk.

USAF photo by Randy Martin



Return of the Enlisted Pilots

By Wilson Brissett,
Senior Editor

For the first time in decades, the Air Force has "flying sergeants."

The need for pilots was so acute as World War I and later World War II began that enlisted aviators were brought into the service.

It was a stopgap measure. Now, 60 years after USAF's last "flying sergeant" retired, the Air Force is again short of pilots and is, again, turning to its enlisted corps to fill the gap.

As remotely piloted aircraft (RPA) use has grown almost exponentially over the last 20 years—since USAF began deploying the MQ-1 Predator—the Air Force has struggled to keep up, frequently tapping veteran fighter pilots from a field where there's also a shortage. They have taken up RPA operations for aircraft such as the MQ-1 and MQ-9 Reaper scout and strike aircraft.

With no letup in demand, these temporary RPA pilots were often not allowed to return to their primary aircraft. As workweeks crowded out weekends, duty days lengthened, and morale plummeted among RPA operators, the Air Force sought solutions.

The first fix was setting up a special pilot training track that would send officers with no previous flying experience directly to RPAs. It wasn't enough. After long deliberation, the Air Force in 2015 decided to reintroduce enlisted pilots. On Oct. 12, 2016, four enlisted airmen began pilot training.

The first element of the Enlisted Pilot Initial Class entered the undergraduate pilot training program with the 1st Flying Training Squadron in Pueblo, Colo. In early November, two EPIC trainees completed their first solo flights. By the end of 2017, these four airmen should be flying live missions with the RQ-4 Global Hawk RPA.

USAF photo by Lt. Col. Leslie Pratt

The Air Force is not naming the pilots and trainees, citing security concerns.

EPIC is only one initiative aimed at overhauling the RPA program. Its initial goal is to produce 100 enlisted pilots for the RQ-4 by the end of 2020. These airmen are training alongside officers learning to fly the same platforms, and they are completing the same training program used by the Air Force to produce RPA pilots.

By all accounts, there'll be no reduction in the call for intelligence, surveillance, and reconnaissance (ISR), especially that delivered by the MQ-9 and the Global Hawk.

There's an "insatiable" demand for ISR, CMSgt. Christopher King told *Air Force Magazine.* He is the career field manager for Career Enlisted Aviators (CEAs).

To meet the demand, Air Education and Training Command (AETC) already doubled its planned 2016 RPA pilot production, from 192 to 384.

It's been clear for a while that the need for RPA operators would outstrip the requirement because of "the end strength where it is" and the existing ratio of officers to enlisted, King said. Therefore this "is the perfect time to posture ourselves to have a ready model for increased capabilities for the future."

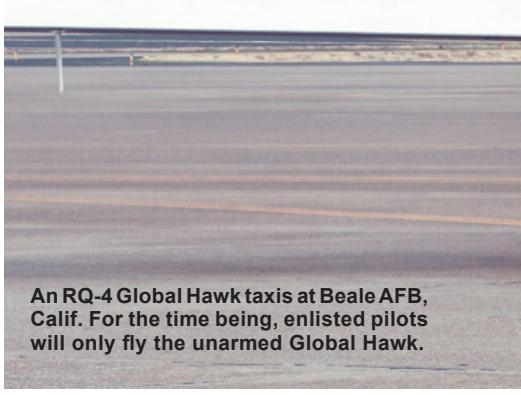
The Air Force is taking a deliberate approach to building its cadre of enlisted pilots. Beyond the first group of four, only eight more enlisted pilot trainees have been chosen. Those first dozen EPIC trainees were handpicked, though.

"We wanted some folks that had some aviation background," said Col. David S. Drichta, chief of undergraduate flying training for the Air Force. Most of the initial group are Career Enlisted Aviators, he said. Such airmen operate electronics equipment in the back of airborne warning and control system or Compass Call aircraft, are air refueling boom operators, or are cargo aircraft loadmasters, to name a few specialties. "There's a common vocabulary and a training mindset there that was helpful to us," Drichta said.

The go-slow pace was ordered from the top. Lt. Gen. Darryl L. Roberson, commander of AETC, told *Air Force Magazine* that he wants the EPIC program to be "a very deliberate training process." He said AETC is "working closely with Air Combat Command to ensure we forge RPA airmen ready to support the long-term ISR needs of combatant commanders."

USAF photo by SrA. Christian Clausen

This enlisted sensor operator (foreground) follows a target, with the MQ-1 pilot (back) alongside him. The sensor operator says that during his first weapons-strike mission supporting ground forces, he felt nervous and cold.



An RQ-4 Global Hawk taxis at Beale AFB, Calif. For the time being, enlisted pilots will only fly the unarmed Global Hawk.

At the same time, the initiative is being launched with an eye toward future expansion and evolution. King said it's important to note that two of the first 12 enlisted trainees aren't CEAs and have no previous flying experience. This mix is by design, Drichta said. The Air Force wants to "normalize a training pipeline that will accept enlisted folks from all backgrounds," he explained.

Indeed, the next selection board for enlisted pilot trainees, which was slated to meet in February, was to be open "to every enlisted member in the Air Force," according to King.

There's already been a surge of applications. More than 800 airmen put in for an enlisted pilot slot before the July 2016 deadline, a number that was narrowed to 305 in November.

Clearly, many airmen recognize what Drichta said is the intention of the program: to produce greater "opportunities for our enlisted force."

The Air Force wants to train 32 enlisted pilots per year under the initial plan, Drichta pointed out, but how much the program grows will be driven by future requirements.

The Air Force is also unsure of how the program might evolve. For now, enlisted pilots will train only to fly ISR missions with the RQ-4 Global Hawk, a largely autonomous aircraft that requires supervision more than active piloting—and that doesn't carry any weapons. The MQ-1 Predator and MQ-9 Reaper, both able to carry munitions, will continue to be piloted only by officers for the time being.

Drichta said it's still to be determined whether the Predator and Reaper will be opened to enlisted pilots, though "anything's possible." He believes the current policy isn't intended to restrict enlisted pilots from conducting strike missions.

The relative stability of the RQ-4 mission makes it the right airframe to introduce enlisted airmen to flying, King said. "There's not a shortage" in the RQ-4 pilot community, he said; Global Hawk pilots haven't faced the same operating tempo pressures that have plagued the MQ-1 and MQ-9 communities. Still, moving these newly

> THE EXCITEMENT IN THE PROGRAM AMONG NEW RPA PILOTS IS AN INDICATOR OF THE "UNTAPPED POTENTIAL" OF AN ENLISTED FLYING FORCE.

minted enlisted pilots into the RQ-4 community will allow the service to assign more officer pilots to the Predator and Reaper communities.

An RPA get-well plan, called the Culture and Process Improvement Program (CPIP), was launched in December 2015 and implemented a variety of policies—fewer combat air patrols, more pilots and aircraft, and quality-of-life improvements—to address the overworked MQ-1/9 pilot pool.

While the Air Force is optimistic that CPIP's changes are answering the core problems of the MQ-1/9 community, the service is reluctant to introduce enlisted pilots to a mission still climbing out of a period of great instability. The RQ-4 is "the perfect place to start this off in, to train without creating any kind of waves in the other programs," King observed.

EPIC will parallel efforts to solve shortages and instabilities elsewhere in the RPA field. Program leaders said training enlisted airmen to fly takes the long-term approach of deepening future Air Force ISR capacity and developing the enlisted force. "Growing enlisted pilots in the RQ-4 Global Hawk is the first step in developing future operating concepts within the ISR enterprise," Roberson said.

Drichta explained that his training program is about "creating … pipelines and paths for enlisted career progression, both professionally and technically, as we grow this enterprise." It's just one more new avenue for enlisted careers to follow.

He said the excitement in the program among new RPA pilots is an indicator of the "untapped potential" of an enlisted flying force. With the explosive growth in the applications of RPAs showing no signs of waning, "over the next 20 to 30 years, it's difficult to even wrap your mind around … [what's] possible" in the enlisted flying field.

King is likewise optimistic about where the program could go, saying there's no way to know yet what it could lead to.

"That's the exciting piece: ... How far are we going to go with this, and what new airframes are going to be developed, and are we going to use enlisted pilots for their deployment? It could be incredible," he said. ✪

USAF photo by SSgt. Bobby Cummings

IN AFGHANISTAN, A SERIES OF SMALL ERRORS AND BAD LUCK KILLED FIVE IN A HELICOPTER CRASH.

NO ROUTINE FLIGHT

By Brian W. Everstine,
Pentagon Editor

US Air Force Academy photo

MAJ. PHYLLIS PELKY

Courtesy photo

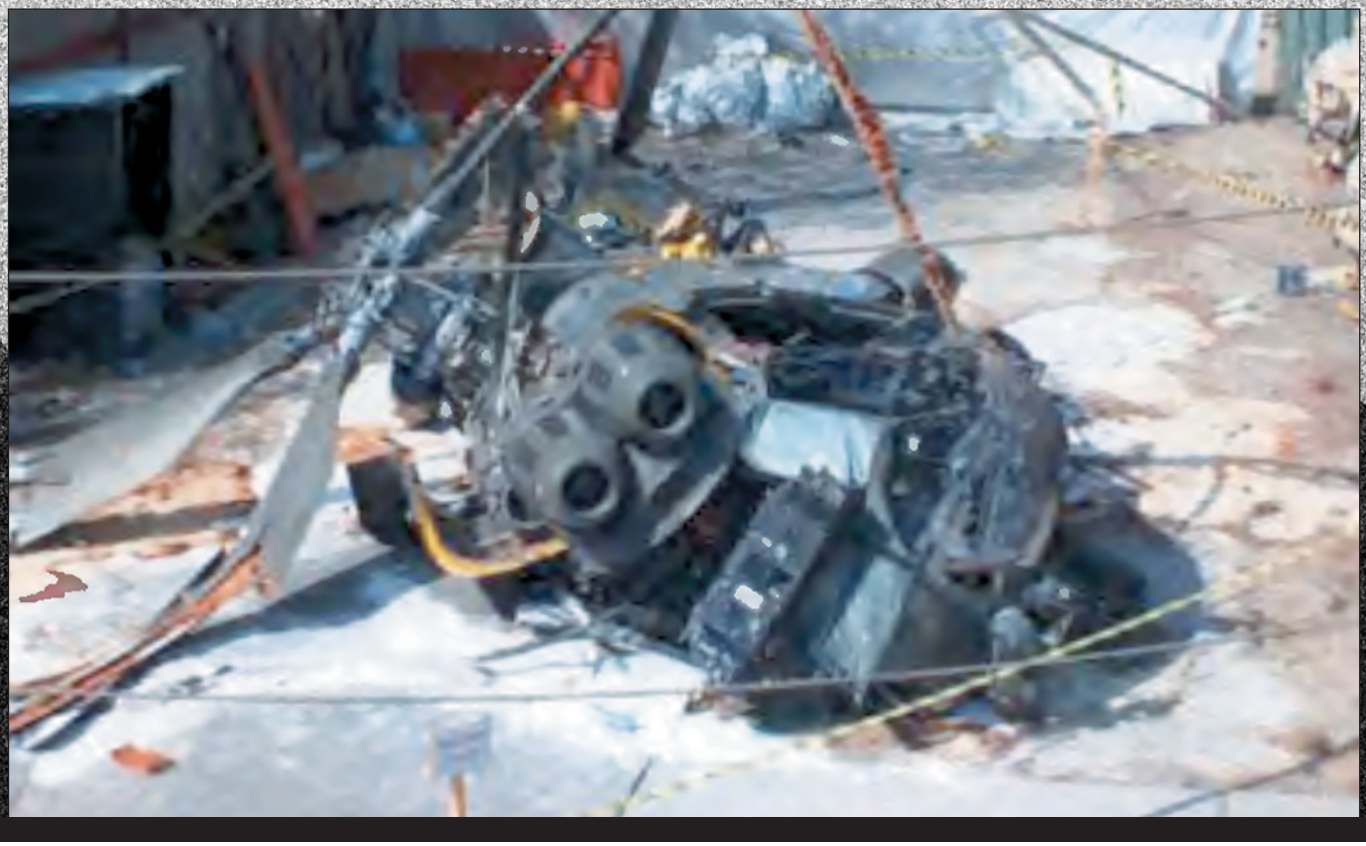
MSGT. GREGORY KUHSE

For those working at the headquarters of Operation Resolute Support in Afghanistan, the five-minute helicopter flight from Kabul Airport to the NATO headquarters in Afghanistan was as regular as a subway ride.

That all changed on Oct. 11, 2015, when a series of miscalculations, bad luck, inaccurate assumptions, and a soccer game caused a Royal Air Force Puma transport helicopter to crash, killing five of the nine people onboard, including two US airmen.

That day, Air Force Col. Laurel M. Burkel, the chief of Air Mobility Command's Fuel Efficiency Division—one of four survivors of the Puma crash—was preparing for a routine meeting with an Afghan colonel. Burkel, who at the time was assigned to an international exchange position in Ottawa, Canada, deployed to Afghanistan in late 2015 as part of the training mission to set up the Afghan air force's personnel system.

During her meeting, the two leaders were planning to discuss revisions to a manning document that would help form the force structure of the AAF's A-29 light attack air-



Background photo: An RAF Puma in Afghanistan. Inset: The Puma helicopter that crashed in October 2015. Because of DOD regulations, those in the crash are not eligible for a Purple Heart. Col. Laurel Burkel (left) is working to clarify those regulations.

USAF photo by Amn. Chad Gorecki

Col. Laurel Burkel

craft, MD-530 helicopters, and mobility aircrews.

Normally, she would have taken an American UH-60 Black Hawk or contractor helicopter, but this time Burkel and five other passengers piled into one of two British Puma Mk2 transport helicopters.

"I thought it was really cool, to get into a British helo," Burkel said in an interview with *Air Force Magazine.*

There were four flights planned for the helos throughout the day, and this trip was toward the end of their schedule. The prior flights had no problems, and at 4:17 p.m. local time the two-ship, each helicopter loaded with six passengers, took off and headed toward the headquarters' makeshift landing zone: a soccer field.

On approach, the pilots realized a game was being played on their landing zone, and about 40 people were gathered on the field, so the choppers first tried a go-around. A minute later, the game was still going. A soldier was sent out to try to clear the field, but it was taking too long.

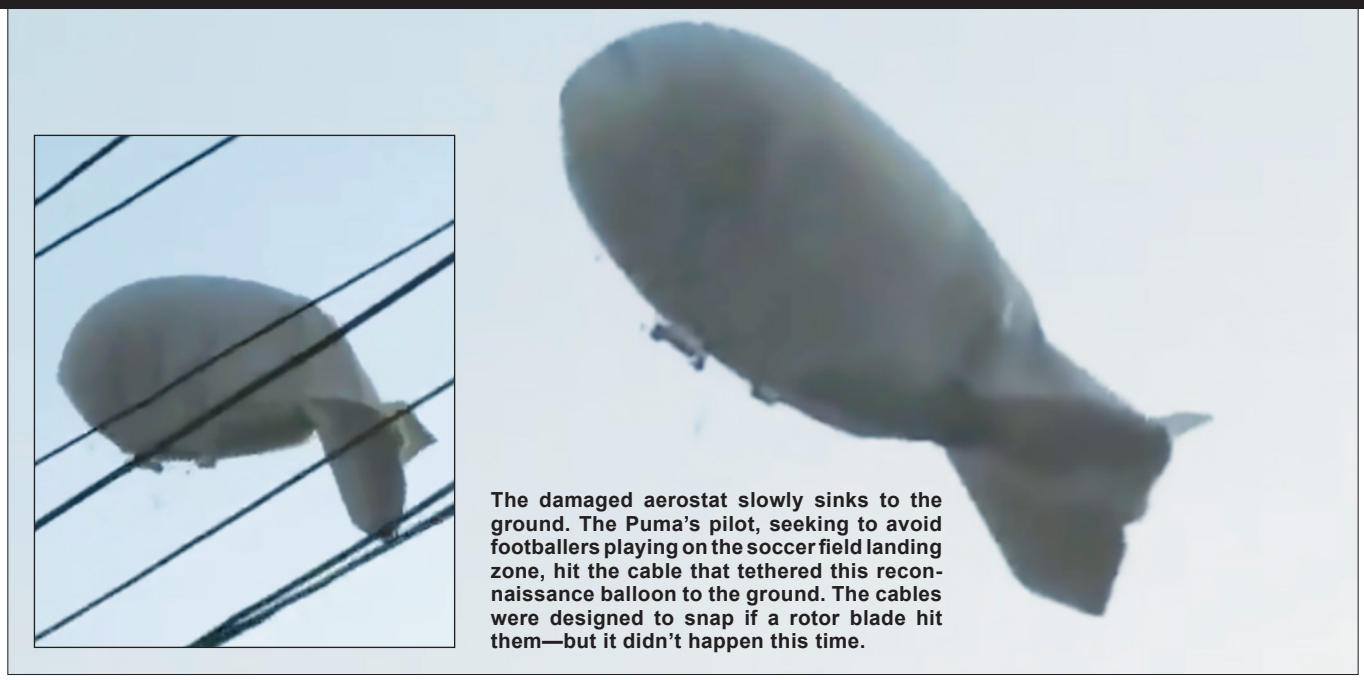
"Doesn't look like those footballers are getting out of the way. Can you just confirm that they will be doing that?" the first aircraft radioed.

"[Operations is] sending someone as we speak," the second responded.

The helos entered an orbit and the pilots worked to avoid certain airspace, such as that around the Afghan presidential palace and the Ministry of Defense. As the helicopters approached the Ministry of Defense building, their flight paths diverged and the second helicopter lost sight of the first. The second helicopter, carrying Burkel, made a hard right turn to regain the visual, and its tail rotor hit a large tether used to hold down a Persistent Threat Detection System aerostat floating 2,500 feet above the base.

Aerostats—blimps tethered to the ground that are set up to detect incoming threats and carry communications

Background: British Ministry of Defense photo by Cpl. Alex Scott. Inset: British Defense Safety Authority photo



The damaged aerostat slowly sinks to the ground. The Puma's pilot, seeking to avoid footballers playing on the soccer field landing zone, hit the cable that tethered this reconnaissance balloon to the ground. The cables were designed to snap if a rotor blade hit them—but it didn't happen this time.

Screenshots from video by Abu Moslim Shirzad

equipment—are posted around the base and are a constant, stationary threat to aircraft. Even though the tether has flags to show its position to aircraft, the closest ones were 30 feet below the helo and 170 feet above. The pilot couldn't see the aerostat in his position at the time of the strike, the official investigation into the mishap states.

The aircrews and operations center officials knew that although hitting a tether is a large, potentially harmful mistake, the line is designed to break off and not severely damage what hit it.

But this time, the damage was severe.

SIX-SECOND FALL

The long tether is just .58 inches in diameter, with rubber encasing fiber-optics and copper power cables. It has to be strong enough to hold the aerostat to its position but not unbreakable. During a prior near miss at the same base, pilots inspected the cable to make sure they wouldn't be in danger.

"The crews were assured that the tether was frangible and designed to break in the event of a rotor blade strike," the British Defense Safety Authority service inquiry report states.

Several NATO helicopters had hit these tethers before, and in each case the tether broke and the helicopter landed safely. In one instance, the crew didn't even know it hit the tether, the report says.

But when Burkel's helicopter hit the tether, the line hit both sides of the Puma's tail cone, the tail rotor drive shaft, and the helicopter's high frequency radio antenna. One passenger reported hearing a pop and feeling a jerk, the report states. The crew tried for some 17 seconds to regain control, but the rotor stopped moving, and the Puma started to roll. It took six seconds for the Puma to fall. In that time the pilots were able to shut down the engines and avoid crashing into any nearby structures.

"Miraculously" there was not more damage on the ground, Burkel said. "It's amazing we didn't hit a building."

The helicopter crashed between buildings in the middle of the Resolute Support compound. Two USAF airmen—Maj. Phyllis J. Pelky, of Rio Rancho, N.M., and MSgt. Gregory T. Kuhse, of Kalamazoo, Mich., were killed. Pelky had been permanently assigned to the US Air Force Academy in Colorado Springs, Colo., while Kuhse had been deployed from the 3rd Manpower Requirements Squadron at Scott AFB, Ill.

RAF pilots Flight Lt. Alan Scott, of 33 Squadron RAF, and Flight Lt. Geraint Roberts, of 230 Squadron were also killed. Gordon Emin, a French civilian contractor, also died in the crash.

Burkel suffered a broken neck.

The base has erected a small marble memorial honoring those who died at the scene of the crash.

Rescue forces came immediately, while the other Puma stayed above the scene. The pilots' quick thinking to turn off the engines meant there was no immediate postcrash fire. The situation could have been worse, and more people would have died "had we ignited," Burkel said.

Within 15 seconds, rescuers went into the wreckage to pull out the survivors. For an hour-and-a-half, rescuers worked to extricate everyone from the helicopter.

"None of us could have pulled ourselves out," Burkel said.

The fuel bladder ruptured, causing 350 kilograms (771 pounds) of fuel to spill through the helicopter and across the scene. Rescuers said they worked in ankle-deep puddles next to the wreckage.

Though Burkel has little memory of the crash, she said she can still smell fuel on her uniform, which had to be cut off of her, and even on the passport she carried.

The dozens of troops and civilians that immediately responded faced trauma themselves, including some who

British Defense Safety Authority photo

The crash site. Highlighted are the three areas used to extract the occupants, including one in the tail cone, cut after the crash.

were treated for heavy exposure to particulates from fire extinguishers. A team of airmen, including Maj. Gen. Scott D. West, ran out of their offices once they heard the crash. West even grabbed his sidearm because at first he thought the base was under attack. At the time, West was commander of the 9th Air and Space Expeditionary Task Force-Afghanistan and deputy commander of air for US Forces-Afghanistan.

The airmen who responded were awarded the Joint Service Commendation Medal. Two Marines, Capt. Trey Kennedy and Gunnery Sgt. Geann Pereira, have been awarded the Navy and Marine Corps Medal.

However, those who died or were injured in the crash have not received recognition, Burkel said. Through the process of recovering from injuries in the crash, she was shocked to learn that because of Defense Department regulations, the passengers of the aircraft are not eligible to receive the Purple Heart. These are regulations she is still working to clarify, for both this crash and other incidents, such as the 2015 C-130 crash in Afghanistan that killed 11, including six US airmen.

Courtesy photo

A marble memorial plaque at Kabul Arpt., Afghanistan, is dedicated to the five people killed in the crash.

SAFETY RECOMMENDATIONS

The official Royal Air Force report determined that the catastrophic failure of the tail rotor drive shaft was the main cause of the crash, stemming from the impact of the tether. The pilots' loss of situational awareness caused the tether strike and contributed to the crash, the report states.

To this day, when Burkel thinks about the crash, she always goes back to the initial decision of where to land.

"Why the hell are we landing in a soccer field?" she asks.

Following the crash and subsequent investigation, the RAF made a long list of recommendations to the Resolute Support leadership, to prevent another crash from occurring. The suggestions include reviewing the wisdom of using a soccer field as a landing zone.

The Defense Safety Authority is "certain that the recommendations for NATO Headquarters Resolute Support will make helicopter operations in this part of Afghanistan safer," the report states. "The accident serves as a salutary reminder to all aircrew of the importance of lookout, crew resource management, communication, and formation discipline."

The recommendations call on NATO to study the feasibility of using the field as the main landing zone, and ensure in the future that there are "robust deconfliction measures" in place.

Even after the crash and the extended review, however, helicopters flying toward the NATO headquarters still use the field and need to look out for people playing soccer before they can land.

Burkel has largely recovered, but is still receiving physical therapy for her injuries. ✪

Behind the Scenes Against ISIS

By Jennifer Hlad

UNDISCLOSED LOCATION, SOUTHWEST ASIA

Airpower has played a pivotal role in the battle against ISIS since 2014, but while coalition air strikes have gotten most of the attention, airmen of the 386th Air Expeditionary Wing (AEW) provide critical support to the fight, with airlift, electronic jamming, and intelligence, surveillance, and reconnaissance operations.

The 386th AEW moves some 8,000 passengers and about 8,000 tons of cargo each month for Operation Inherent Resolve (OIR), and that "has risen dramatically since 2014, when we stood the operation up," wing commander Col. Charles D. Bolton told *Air Force Magazine.*

The unit became "the throughput for all of the logistics support starting in 2014, and it's just steadily increased since then," Bolton said. "We're the ones behind the scenes, resupplying those troops … and carrying cargo for the other countries that are involved in that war as well."

The wing's mission is to deliver decisive airpower, through mobility airlift, providing theater basing and logistics support, and building strategic partnerships, Bolton said.

The wing also boasts electronic attack assets and remotely piloted aircraft (RPA) to provide intelligence, surveillance, and reconnaissance and persistent attack.

The 386th AEW "played a major part" in staging Iraqi forces for the battle for Mosul, and as the fight shifts to Syria, "we're supporting everybody in that effort as well," Bolton said.

The 737th Expeditionary Airlift Squadron (EAS)—in December made up of Air National Guardsmen deployed from Peoria, Ill., and Great Falls, Mont.—provides the airlift piece of the puzzle.

Airmen of the 386th AEW provide the logistical, electronic warfare, and RPA support needed to prosecute the war on terror.

SMSgt. Mike Donahue, a flight engineer, said he likes being part of the counterterrorism effort against ISIS, because taking the fight to the enemy is "doing what we train for."

The Montana unit Donahue deployed from previously flew F-15s and had been in conversion status from 2013 to Oct. 1, 2016, so being back in the fight is "awesome," he said.

SrA. Matt Hronek, a loadmaster also deployed from Montana, said he has enjoyed going from "just doing training all the time to coming here and doing the actual thing."

Seeing the cargo they are moving "and who you're actually supporting, that really helps you feel like you're accomplishing something," Hronek said.

Air Force Magazine rode along on a cargo flight into Camp Taji, Iraq, with a C-130 crew deployed from Illinois. The plane was loaded with passengers, luggage, blood for transfusions, ammunition, and generators.

It flew within a stone's throw of Iran, passing over the lights and oil refinery fires of Iraq, before landing for a quick unload and reload. The flight was "about as normal as it gets," crew members said.

Some of the passengers to and from Iraq appeared to be US Army soldiers and contractors, and Capt. Brian Nanko, copilot for the flight, said the 737th EAS transports "anybody who needs a ride, for the most part."

At top: The sun sets on the runway of an air base in Southwest Asia. The fight can't happen without logistical support. Here: C-130s from the Montana Air National Guard stage missions at a base in Southwest Asia.

Top: USAF photo by SrA. Andrew Park. Bottom: photo by Jennifer Hlad

Air Guardsmen from Illinois load a C-130 bound for Camp Taji, Iraq, in December.

SrA. Jake Dawson, flight engineer, said he enjoys seeing what cargo the crew will be transporting.

"It's kind of exciting to see what you're taking to these dudes to help out," he said. "It's a pretty good feeling."

Nanko agreed with Dawson.

"Especially when we're taking a bunch of ammo up there," he said, it's rewarding to know "those guys are getting the stuff they need."

Donahue said he'd never realized how important some simple staples could be until this deployment.

"We'll go to some of these bases, and you bring them a thing of cereal, and they are so happy," he said. "I mean, one guy was almost hugging us because we brought them cereal. They don't get that stuff."

Though Dawson and Nanko were with an all-Peoria crew at the time of the Taji flight, both said they would be flying with Montana crews for the second part of their deployment.

The two Guard units trained together before they arrived in theater, Dawson said, and they occasionally swap aircraft, though Montana's are 15 to 20 years older than Peoria's, prompting some good-natured ribbing from the Illinois airmen.

The flight to Taji was the first of two trips to the same location in one night and is one of the shortest duty "days" the unit regularly flies, Nanko said. The longest, he said, is a night trip from the Southwest Asia base to al-Taqaddum, Iraq, with stops at Baghdad, Taji, and Irbil before returning. The airmen call it the "pain train."

FROM CEREAL TO ELECTRONS

Across the airfield, the war against ISIS is keeping the 43rd Expeditionary Electronic Combat Squadron in high demand.

Capt. Tim West, director of operations for the 43rd EECS, explained that in any fighting force, such as ISIS, there's always a chain of command and a "boss" who needs to get orders and information out to his troops.

The squadron's EC-130 Compass Call aircraft prevent "the information from getting to the boss" and "prevents the boss from ever being able to direct his forces."

The result, West said, is "a force that can't coordinate, can't communicate, and really, they're rendered obsolete in the battlespace."

The airmen and aircraft come from Davis-Monthan AFB, Ariz., and when they're not deployed, they train "every day on fighting an enemy like this," West said.

"You have to think about what the enemy is likely to do," he explained. "It's not like I'm going to blow a building up and I know the effect. I'm denying information from being passed from one entity to another."

For OIR, the jamming aircraft are "there for Iraqi forces, so if they need support," the Compass Calls will be requested.

West said this is his second deployment to the theater for the anti-ISIS

Photos by Jennifer Hlad

SrA. Jake Dawson, a flight engineer, walks the wing of a C-130 before a cargo flight to Iraq in December.

campaign. Last year, "they struggled," West said of the Iraqi forces.

"They weren't getting even the food they needed, they weren't getting the weapons, ammunition. It was a difficult fight, and they weren't super well trained."

But "fast forward … a year-and-a-half, and they're doing … as well as you can expect them to. They're doing a great job."

The EC-130s are a low-density, high-demand asset. Keeping the aircraft available and ready is particularly challenging, aircraft maintenance officer in charge 1st Lt. John Karim said, because the break rate for the highly specialized aircraft is significantly higher than for other C-130s.

The aircraft date back to 1964. They have old engines and are quite heavy but "still kicking," he said.

The insides—rows and rows of electronics and computers—are far more up-to-date than the airframe itself.

"We're doing wonderful, amazing things" with the aircraft, West said. The heavy pace of activity is bearable because "we're all supporting [the Iraqi forces] and it really is … rewarding to see the impact that we have."

West tells his airmen that the Iraqi troops are fighting for their "God and country. They're not paid a lot; they're not well-equipped; … they're just trying to remove what I like to call 'absolute evil' from their home."

PREDATOR POSITIONING

The airmen of the 46th Expeditionary Reconnaissance Squadron (ERS) also provide critical support to Inherent Resolve operations by launching and landing remotely piloted aircraft.

First Lieutenant Matthew, an MQ-1 pilot, said he and his fellow airmen perform takeoffs and landings every day for operators based in the US. (The Air Force does not release the full names of RPA operators for security reasons.)

Though Stateside pilots fly the missions, it is crucial to have specially trained pilots in theater as well.

While the Stateside operators communicate with the RPAs via satellite, "When you're flying from here, we're just using straight, line-of-sight frequencies," creating a quicker and more reliable control link, Matthew said.

"It just comes down to a delay, and when you're taking off and landing a plane, you can't have a delay, because you're going to crash the plane," he explained.

Lieutenant Colonel Troy, commander of the 46th ERS, commented that the takeoffs and landings all assist OIR and is "a great mission for the RPA guys."

"We're leading the edge on the battlefield, and the guys are supporting that, so it's very exciting for them," Troy said. "They get very motivated, and the way that we've been able to push our flexibility has been pretty awesome."

Matthew said he thinks "everyone here would agree that we feel great about [the mission], because without us it doesn't happen, so we feel like the tip of the spear," and when the airmen "have a purpose, it's amazing what they'll do. And it's amazing what they'll do when you just say, 'I need you to go do this,' and just let them go do it."

The wing is about a 60/40 mix of Active Duty to Guard and Reserve, from all over the US.

"We've accomplished a lot in the six months that I've been here," he said. "To be forward deployed and working side by side for six months is unique and interesting, and it just shows you how far our Air Force has come."

Iraqi forces have also come a long way, he said, with what the airmen describe as support—but not hand-holding—from the US wing.

"We're providing the bulk of the air support for them, but they have a pretty robust army aviation force as well as their air force. They're flying every day as well," said Bolton, the 386th wing commander.

"What gives me hope for the future is that they will get to the point where they can sustain themselves and do this on their own, and we're seeing it now," Bolton said. "I mean, we really are a very small, small force on the ground with them, … behind the scenes, just helping them, but they're the ones planning it, executing it." ✪

Jennifer Hlad is a freelance journalist based in the Middle East. Her most recent article for *Air Force Magazine* was "Undeclared War," in the March issue.

NORAD's Next Evolution

Air defense was focused on the Russians. Then it was terrorists. Now it is both.

NORAD's mission fundamentally shifted after Sept. 11, 2001, to address the threat of asymmetric terrorist attacks aimed at North America. But now North American Aerospace Defense Command is changing its focus once again, re-emphasizing advanced threats from outside the homeland.

While the internal terrorism threat endures and continues to change, the last five years have seen NORAD attune itself to an increasingly capable and expeditionary Russian military.

This latest evolution of the NORAD mission also marks a return of sorts. In May 1958, the first NORAD agreement established a binational command that would allow Canada and the United States to better coordinate a common air defense of North America. "There was one threat, which was the Soviet threat, at that point," Canadian Lt.-Gen. Pierre St-Amand, deputy commander of NORAD, told *Air Force Magazine.*

In the early years, NORAD was forced to "evolve with evolving capabilities," but for decades the raison d'être of a combined air defense remained fixed on the Soviet Union. It's no surprise, then, that the end of the Cold War brought with it a relaxation of NORAD's posture.

One of the key findings of the 9/11 Commission Report was that the dwindling of NORAD's once-expansive array of alert sites—there were 26 at the height of the Cold War, but only seven on the eve of 9/11—left the command inadequately prepared to respond to the attacks.

After the shock of the successful 2001 attacks on the commercial airline system, the World Trade Center, and the Pentagon, "NORAD started looking in," said a NORAD official.

The new focus was on how to defend North America against a recurrence of similar attacks, and "we kind of relaxed our vigilance" on peer adversaries after 9/11, said St-Amand. Operation Noble Eagle and the expansion of NORAD's alert sites and related air missions were focused on the terrorist threat, not necessarily on the threat posed by Russia or other nations with advanced air forces. These changes were defined by the threat of the moment.

Now the pendulum is swinging back.

NORAD is no longer in a post-9/11 posture. While the terrorist threat persists, in the last five years Russia is back at the top of NORAD's list of dangers to the homeland. "Since 2008, we've seen the external threat return," said the NORAD official.

St-Amand confirmed that NORAD has become "concerned about capabilities that have long range," those that "can reach out and touch North America" from abroad, especially those demonstrated by Russia.

NORAD commander US Air Force Gen. Lori J. Robinson, in an interview with *Air Force Magazine,* simply declared Russia to be "one of our primary air domain threats." The focus of the threat is "long-range aviation," according to Col. Jeremy Sloane, vice director of operations at NORAD. He is concerned by "the

By Wilson Brissett, Senior Editor

NORAD launched F-15s (top) on Sept. 28, 2006, in response to the incursion of Russian Tu-95 Bear bombers into North America's Air Defense Identification Zone.

increase in the number of flights that we've seen, specifically starting back in the 2007 to 2008 time frame, and then highlighted by an uptick over the past couple of years."

In response, NORAD fighters have—over the past five years—conducted "an average of five intercepts per year of Russian military aircraft" in the US or Canadian Air Defense Identification Zones, according to NORAD. The ADIZ/CADIZ is defined as a zone of airspace that extends approximately 200 miles from the coastline of Canada and the US and is mainly within international airspace.

Robinson

But it's not just the "expeditionary" long-range aviation (LRA, or bombers) that worries NORAD. Russia's willingness to fly closer to North America must be viewed within the context of "an increasing Russian willingness to use force—and to use force in unexpected ways in Georgia, Ukraine, Syria," the NORAD official insisted.

These Russian military excursions in other parts of the world are concerning to Sloane not just as adventurism, but also as showing off. "The types of operations they're doing in combat now," he said, are a kind of "messaging test, if you will, on what they're capable of—and perhaps willing to do"—in a North American theater.

That the Russian message is aimed primarily at the United States is clear to NORAD, but much else about Russian intentions is hard to ascertain. Steve Armstrong, chief of strategic engagement at NORAD, cautioned that Russia's "legacy cruise missiles and their legacy tactics, techniques, and procedures were very predictable. Now they have become very unpredictable." The evolution of Russia's capabilities is marked by advanced cruise missiles and advanced GPS capabilities. "They don't have to fly to a certain piece of sky or a place on a map … to update their initial navigation systems," he explained.

As a result, Armstrong said, "now our swath of what we have to cover is huge." The emergence of Russia as a threat to North America is measured for Sloane by "how far north we have to engage in order to ensure protection of the homelands."

EAGLE VISION

It's no wonder then that Robinson said one of NORAD's greatest priorities going forward is "to be able to detect at range, to track at range, ID at range, because things have changed with Russian long-range aviation."

The key to this sort of advanced tracking is persistent, over-the-horizon (OTH) radar. While advanced fighters and intelligence, surveillance, and reconnaissance aircraft can perform OTH tracking, the cost of the 24/7 patrol flights to provide a persistent view with these systems is prohibitive. NORAD needs something that can stay in one place and watch the horizon.

Enter the Army's JLENS (Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System) program. In 2015 it deployed a helium-filled aerostat, tethered near the Maryland coastline to provide airspace defense for the National Capitol Region (NCR) through persistent, OTH radar.

Less than a year into its initial three-year test period, and before subsequent aerostats in the system could be deployed, JLENS slipped its tether in rough weather. It had to be chased down by F-16s after it floated to Pennsylvania, where the aerostat cut power lines and caused outages.

In 2005, the Army planned to develop 16 aerostats. In 2009, however,

Top: USAF photo. Left: USCG photo by PO2 Patrick Kelley

the Government Accountability Office reported design problems with the mooring system and delays related to integration with other Army systems. In 2010, an accident resulted in the destruction of a program aerostat, and the program incurred a Nunn-McCurdy breach for cost overruns in 2013. By 2015, the Army was only planning for two JLENS balloons.

Navy Capt. Scott Miller, director of NORAD public affairs, said, "The program has been boxed up, put into storage." Despite the unlikely return of JLENS, given its troubled history, "persistent, OTH radar is something that we certainly require," Miller said. "And so while we certainly have OTH targeting capability, it's not as persistent as we would like. And so there is an ongoing effort to identify a replacement for a JLENS-type program" that could provide it.

NORAD faces modernization challenges, too. The North Warning System (NWS), an array of air defense radars in the northern US and Canada that NORAD relies heavily on for its view of airspace traffic, is aging.

St-Amand said the system, built in the 1980s, "is coming to the end of its useful life." NWS radars are "scheduled to become not sustainable, unless we invest in them, around 2025."

NORAD has not decided whether to upgrade or replace the system, St-Amand said, but whatever emerges will be "a binational effort" that will include "an agreement for cost sharing."

Attention will need to be given to the fighters that fly NORAD missions. "Both in the United States and in Canada our fleets are getting old," St-Amand acknowledged. In the US, F-16s do the heavy lifting for NORAD combat air patrols and alert missions. To keep the fleet current, Air Combat Command is planning to upgrade 52 F-16s with active electronically scanned array (AESA) radars specifically to improve their performance in Noble Eagle air defense missions.

In Canada, the need to find a CF-18 replacement is more urgent. While Canada was a partner nation in the F-35 development program, Ottawa's intention to buy 65 of the fifth generation fighters was thrown into serious doubt after Prime Minister Justin Trudeau was elected in October 2015 on a platform that included a promise to cancel the F-35 purchase. The Department of National Defense is scheduled to release a long-awaited defense policy review in 2017, and that document may settle the question.

TSgt. Alex Gaviria, a senior system controller, takes a call at the 721st Communications Squadron's systems center in the Cheyenne Mountain Complex in Colorado Springs, Colo.

In the meantime, Canada is contemplating the purchase of 18 F/A-18 Super Hornets to fill the capability gap on a temporary basis until a long-term decision can be reached on replacing the CF-18.

For its part, NORAD is more willing to talk about capabilities than platforms. "We try to stay away from dictating the platforms," St-Amand said, because that's a "decision for governments" to make. "The command really is agnostic about the platform," the NORAD official commented. "As long as it has the radar and engagement capabilities we require, we really don't care if it's an F-16 or an F-18 or an F-22 or an F-35."

On the US side, Sloane is similarly cautious but sees a definite future role for the F-35. "There's no immediate plan … to replace the ACA [Aerospace Control Alert] fighters," he said, "but certainly that is something that is not just within the realm of possibility but is in the future for the platform." For NORAD's mission, he said the F-35 would bring "a significant increase" in capability "from an interconnectivity, data link, info-sharing infusion standpoint."

SMALL AIRCRAFT, BIG PROBLEMS

In addition to the ongoing terrorist threat and a resurgent Russia, NORAD is focused on emerging threats. Command historian Lance Blyth thinks NORAD today faces "a greater proliferation of threats than we have in the past." Primary among new capabilities is the use of low-profile aircraft that fly slowly at a low altitude, making them difficult to detect on radar. For the previous NORAD commander, Adm. William E. Gortney, this threat was demonstrated alarmingly on April 15, 2015, when a manned gyrocopter was flown from Gettysburg, Pa., to Washington, D.C., and landed on the Capitol grounds.

In testimony before the Senate Armed Service Committee, Gortney said the aircraft was not detected because its "speed, altitude, and radar cross-section fell below the thresholds necessary to differentiate it from surrounding objects, including weather, terrain, and birds." The lesson he drew from this event was that "detecting and tracking low-altitude and slow-speed aerial vehicles is a significant technical challenge."

Photo by SSgt. Andrew Lee

NORAD now says it has made progress in this area. Armstrong said they held a tabletop exercise recently where they "reflew the gyrocopter event exactly the way it played out on the 15th of April." This time, "we were able to track that thing … with enough fidelity that we were able to know where he was pretty much all the time." This sort of exercise has led NORAD to make "some adjustments" to the way low-profile aircraft are tracked, especially in the NCR.

The changes involve collaboration between the FAA and military radar data, in terms of what feeds the air picture. Getting a view that is clearer and more detailed is crucial for the low and slow threat partly because of the sheer numbers involved in air traffic. In 2016, there were 55 million domestic commercial flights in the US, the FAA's senior advisor at NORAD Eugene Jiggitts Jr. said. "It's a complex task to filter all those things out" and isolate the tiny bit of significant data on the airspace map.

Another "leading-edge technology that causes us concern," according to St-Amand, are drones or unmanned aerial vehicles (UAVs). They present another low-profile threat, but one that is becoming more widely available and is potentially more dangerous. What worries Sloane is "the proliferation of it, just the sheer amount of availability to the private sector." At a time when "just any old civilian off the street" can walk into a Best Buy and come out with a UAV, "it's really, really hard to police that."

The problem is only going to get more complicated. The FAA expects commercial and hobbyist UAV sales to nearly double in 2017, and in 2020 the FAA forecasts that seven million drones will be sold in the US.

"We know the capabilities are there to weaponize those," Armstrong warned. "We have entire teams that are working with interagency on it."

A remaining area of concern with UAVs, however, is the law. "Everything we do has to be supported by legal authority," the NORAD official said, and the rules surrounding private drone use are a brave new world. Jiggitts said it is "now legal to fly [UAVs] in the United States," and the air traffic system is straining to accommodate the new presence, especially along the East Coast of the US, which is already "saturated with airplanes." Congress has some work to do, Jiggitts said, to "integrate [UAVs] into the national airspace system."

Counter-action against a dangerous UAV in North American airspace is the key question NORAD faces. "If we got to the point where we had to do some type of engagement, be it kinetic or other engagement," Armstrong admitted, "the authorities are not fully vetted right now." The legal problem is particularly challenging because so many agencies have a role in the issue.

Armstrong said NORAD is working with the Joint Staff, FAA, Department of Justice, FCC, and National Telecommunications and Information Administration to gain authorization for an adequate response to the threat. Also, "Congress has stepped up and is helping significantly, making some adjustments to the [National Defense Authorization Act] language that helps us." But because the situation is new and the legal framework is in development, the NORAD official said, "it's obviously going to be slower for the government of Canada and the government of the United States to respond" to UAVs.

The proliferation of unmanned aircraft presents a budgetary concern for NORAD. "Having airspace violators [creates] a money issue," Jiggitts said. "It costs money when there's somebody breaking our airspace." The cost of intercept flights hits NORAD in terms of fuel for fighters, tankers, and airborne warning and control system (E-3 AWACS) aircraft. But it's expensive in other ways too, Armstrong said, like when NORAD detects an errant aircraft and has to "sanitize airspace." That involves "vectoring United and American and everybody else and it becomes a cost issue for the airlines."

NORAD said that between 9/11 and this January, it had flown 5,000 flights in response to aircraft operating outside of flight plan activity—an average of just over 300 per year, or nearly one per day. All of those flights have fallen under Noble Eagle, now numbering more than 68,000 sorties for all missions and all platforms.

The operations tempo of this mission has been challenging, and Air National Guard units carry the bulk of the burden. The ANG "provides the preponderance of our fighter force," Sloane said, including all NORAD missions in the continental US. Only the F-22s in the Alaskan NORAD region are flown by Active Duty airmen for the Noble Eagle mission.

GUARD DUTY

The Air National Guard brings more than just numbers to the NORAD fight, though. Col. Gregor J. Leist, commander of NORAD's Western Air Defense Sector, said Guard units bring to the mission "continuity" and "length of service," as well as "specialized skill sets." Their ANG status allows these airmen to stay in the same mission for years, or even decades, getting to know the equipment, procedures, and challenges associated with NORAD's work.

One of three NORAD regions is Continental US NORAD Region (CONR), which also serves as 1st Air Force (Air Forces Northern), at Tyndall AFB, Fla., one of three numbered air forces assigned to Air Combat Command. The concept of Total Force is central to CONR, encompassing Active Duty, ANG, Air Force Reserve, and Civil Air Patrol members.

"First Air Force has been a Total Force since Day One," CONR Chief of Staff John O. Griffin said. Lt. Gen. R. Scott Williams, commander of 1st Air Force/CONR, told *Air Force Magazine,* "Total Force is a great strength."

For homeland defense missions, Total Force involvement makes particular sense. "Your Guard units keep and retain their experience," Sloane said. Guardsmen have "grown up with the mission." Because Active Duty pilots rotate through a wide variety of mission sets, "they won't have necessarily the kind of experience flying low, slow intercepts" that ANG pilots perform regularly. "They can train to it," but they don't live and breathe it like the Guard units.

These ANG units have been hard hit by tightening military budgets

and force drawdowns in recent years. "Over time the number of fighter units … available to [fly Noble Eagle] has decreased," Robinson said. "So what that has done is put an optempo on the guys that are still doing it."

With budgets tight across the board, one of the primary ways NORAD works to keep costs down is through outreach programs. For national security events like the Super Bowl or the Democratic and Republican national conventions, NORAD provides dedicated security. One of the first things it does is send an advance team to the location of the event to educate private pilots. They go 200—or in some cases 500—miles in every direction, briefing the local aviation community on how the upcoming situation will alter the airspace rules. In this way they hope to cut down on the number of accidental airspace violations and therefore on the need to spend money intercepting errant aircraft.

Facilitating the security mission in these cases is the DEN, for Domestic Event Network. NORAD says this communications device is the single most important change since 9/11 that has enabled faster coordination and response in case of a national airspace emergency. DEN is a little black box that looks like an audio speaker. But it's actually a phone line, said Jiggitts, that was "created the day of 9/11" and that has "never been hung up" since. NORAD uses it not just for national security events, but to coordinate response to asymmetric threats on a daily basis. Jiggitts said the DEN could "possibly" be useful in the case of a symmetric threat as well.

More than 200 government entities have access to the line, and "NORAD is one of the permanent parties on that phone line now," Jiggitts said. "Any air incident, emergency, change of destination, … bad guy on board—whatever you can think of—is reported on that line initially so that NORAD knows what's going on."

DEN also connects NORAD with its Alaskan, Canadian, and CONR air component commands, as well as the Eastern and Western air defense sectors. Because it allows instantaneous collaboration on real-time airspace threats, Jiggitts calls it "the tip of the spear" for the NORAD mission.

How that mission will develop in the future is difficult to tell. One possibility is that NORAD may take a more active role in the cyber defense of North America. Currently, the command focuses its cyber energies on defending its own systems from attack, and the leadership defers to US Cyber Command on matters of strategy. But St-Amand and Robinson both left the door open for an evolution in this domain. Both Canada and the US "have been touched by cyber," St-Amand said, and he sees how "combining our capabilities" and "integrating our efforts" to prevent cyber attacks could make sense.

The possibility of NORAD taking on more of the cyberdefense portfolio, he said, is "maybe a good idea," but it's a decision for the governments to make in the end. "We're talking a little bit about cyber," Robinson conceded. "I don't know where we'll come down with that." In 2012, however, NORAD and US Northern Command stood up a Joint Cyber Center that liaises with USCYBERCOM "in both directions," according to Steven Rose, deputy director of Cheyenne Mountain AFS, Colo., which houses NORAD's alternate command center and its Integrated Tactical Warning and Attack Assessment system. One might take this as a sign of future directions for NORAD, but that path remains unsure at this time.

Either way, when the mission is homeland defense, there's always plenty to do. Robinson said it's "an away game." What that means is "the more we can take care of things overseas, the less we have to worry about things coming to NORAD, Canada, and the United States." For its part, NORAD "can also be considered a catcher's mitt," she said. "If something isn't taken care of [in] the away game, at the end of the day, from a defense of Canada and the United States, NORAD's responsible in the air domain."

THE EERIE SILENCE

The significance of this "sacred responsibility" was brought home to Robinson long before she became NORAD commander. On Sept. 11, 2001, she was living in downtown Washington, D.C., about four miles from the Pentagon.

After the terrible events of the day unfolded, Robinson remembers trying to drift off to sleep. "As Washington, D.C., emptied out that night," she recalled, there was "utter, sheer silence. It was so silent that I could hear in the middle of the night when the E-3s would swap out overhead and the fighters would swap out overhead."

The silence following the day's attacks had created space within the usual bustle of the city for her to hear the typically unnoticeable sounds of the ongoing mission in the air. That mission continues, now with Robinson in charge. And while it has evolved many times, and again even since 9/11, what doesn't change is that "the mission is defending the homeland," as Sloane said. There's no end in sight of the need for that vigilance. ✪

F-15 Eagles arrive in Yellowknife, Northwest Territories, Canada, for Exercise Vigilant Shield 2017. The exercise is an opportunity for Canada and the US to hone their bilateral skills.

ANG photo by SMSgt. Shelly Davison

By Gideon Grudo, Digital Platforms Editor

The Israeli F-35s

With stealth and electronic capabilities far surpassing Israel's other aircraft, the F-35 will introduce massive advances for the IAF.

In December, Israel took delivery, through the foreign military sales program, of its first two of a planned 50 F-35s. It was nearly 14 years after the Middle Eastern democracy first got involved in the fifth generation fighter program.

What exactly this advanced aircraft is going to do for the Israeli Air Force (IAF) is, well, open to speculation. Some things are obvious. The F-35 will be expected to secure Israeli airspace and accurately attack ground targets, for example. But according to defense experts and the IAF officer in charge of the F-35 program, the fighter's capability and capacity are so new and untested in the region (or elsewhere, really) that time will show exactly what else the F-35 is able to offer.

IAF is certain the F-35's impact will be mighty. So much so, in fact, that the Israelis named the F-35I (for Israel) Adir. It translates as "mighty" from Hebrew and is derived from the biblical book of Psalms. Accordingly, when the first two aircraft landed Dec. 12, 2016, at Nevatim Air Base, Israeli Prime Minister Benjamin Netanyahu proclaimed, "Our long arm has now become longer and mightier."

In a January interview with *Air Force Magazine,* IAF Major Moti (the Israeli Air Force does not typically release the last names of its airmen), the air force's program officer for the F-35, explained the service's mood regarding the F-35: "There's a lot of excitement."

While the IAF flies an arsenal of advanced fourth gen F-15s and F-16s, "this is the first fighter [that will offer Israel] stealth capability," Moti said, and F-15s and F-16s simply don't have the type of sensors the F-35s have.

Compared to legacy fighters, F-35s will be able to safely enter threat arenas guarded by more advanced defenses and weapons. Moti said, "We need the advantage," a reasonable necessity considering dangers such as those lurking to Israel's north and east, including Hezbollah and Russian-armed Syria and Iran.

Left: Maj. Gen. Amir Eshel, Israeli Air Force commander, flew the F-35I Adir on Dec. 26, 2016. Israel expects the F-35I to give it an enormous advantage.

Below: Israeli Prime Minister Benjamin Netanyahu (r) attaches the Israeli Air Force roundel onto F-35I No. 1, welcoming it into service.

There are 12 national customers of the F-35. Nine original partner nations had a role in setting up the specifications and procurement policies: Australia, Canada, Denmark, Italy, the Netherlands, Norway, Turkey, the UK, and the US. The three foreign military sales partners so far are Israel, Japan, and South Korea.

Of the 12, some observers say Israel is the only country whose variant is unique.

According to Lockheed Martin spokesperson Eric Schnaible, the company modified the F-35 for Israel in three main areas: command, control, communications, computers, and intelligence (C4I), electronic warfare, and weapons integration.

Initially, the US refused to allow Israeli modifications to the F-35. The compromise reached involved not changing anything inside the aircraft, but allowing the Israelis to add capabilities on top of the existing infrastructure.

State-run Israel Aerospace Industries, for example, is working on a C4I overlay for the F-35, with Lockheed Martin.

"It's open architecture, which sits on the F-35's central system, much like an application on your iPhone," Benni Cohen, general manager of IAI's Lahav Division, told *Defense News* last year.

"The F-35 Adir aircraft has also been provisioned to allow updates to EW and weapons interfaces," Schnaible said. "The design of aircraft installations, power, and cooling have been modified to provide IAF the ability to incorporate indigenous weapons."

The types of weapons Israel will be adding to the F-35 are either classified or not yet known, and Moti wouldn't confirm either.

"It's like a view to the future. We know we want to fly with Israeli weapons in this aircraft," he said. "Because it's so complex, we started working today on understanding how we can integrate future weapons."

The same goes for communications, the challenge being figuring out a way for the F-35 to communicate with the F-15s and F-16s it's going to fly alongside.

"We need to have Israeli communications," Moti said. "The aircraft are supposed to speak in the same proto-

WHAT'S IN A NAME?

The Israelis named the F-35I (for Israel) Adir, translated as "mighty" from Hebrew and derived from the biblical book of Psalms.

The Israeli Air Force's Major Moti explained how the name was chosen.

In 2013, the military asked the public for ideas on what to name the variant. Officers took the approximately 1,700 suggestions they got and categorized them under headers such as "nature, animals, objects, and others. 'Adir' was in 'others,'" Moti said.

Once the list of names were whittled down, IAF commanders considered final possibilities, among them words—but not necessarily actual names, Moti emphasized. These included "storm, power, boulder, lion."

From such finalists, Adir came out on top because "of the strength [the F-35] brings with it," as Moti put it. And so a name was born.

Israeli Air Force photos by Celia Garion

cols." As the F-35 is akin to "a flying computer," Moti explained, "if you're not speaking the same language as this computer, you cannot do anything."

Maintenance of the aircraft is going to be performed in Israel, at the Nevatim base. According to the *Jerusalem Post,* "Other countries that purchased the aircraft will have their maintenance done at regional centers, often outside their borders."

AHEAD OF THE THREATS

In an August 2016 American Enterprise Institute study titled "The Strategic Impact of the S-300 in Iran," author Christopher Harmer writes in the synopsis: "The deployment of S-300 [air defense system] components to Iran is a strategic game changer in the Middle East, giving Iran a significant strategic advantage against regional states and significantly complicating US air operations." He adds: "Deployment of the S-300 in Iran means the US will need to recalibrate its current mix of airframes in the Middle East."

Harmer considers the S-300 "the most advanced surface-to-air missile system available for export to potential enemies of the United States."

The threat posed by advanced Russian S-300 series, surface-to-air missile systems applies equally to US allies such as Israel. For that reason, retired USAF Lt. Gen. David A. Deptula, dean of the Air Force Association's Mitchell Institute for Aerospace Studies, called the F-35's stealth an "enormous advantage." This is because, with it, Israel "will be the only nation to be able to deal with some of the advanced surface-to-air and air-to-air dangers being introduced directly to the north," he told *Air Force Magazine.*

But stealth is "only one part" of what the F-35 offers, Deptula argued.

The aircraft "needs to be thought of as a sensor-shooter," he said. The F-35 should actually be thought of as an "F-B-E/A-RC-E-AWACS-35," as it will integrate capabilities seen in traditional fighters, bombers, electronic warfare aircraft, reconnaissance planes, and special electronic and airborne warning and control system platforms.

If a missile is shot at it, for example, the F-35 can automatically detect where it came from and the pilot can automatically target that location. Communications links on the aircraft will allow it to gather information on hostiles even while it's still on the ground. After it takes off, it learns more.

"No other aircraft that the Israelis possess enables this," Deptula said. This presents a "paradigm shift" in IAF's situational awareness.

After sensing danger, the F-35 will then be able to synthesize the information, applying it and sharing it with ground, naval, and air units outside that specific aircraft.

In other words, an airborne F-35 isn't an isolated capability, but a pair of eyes the entire Israel Defense Forces (IDF) will now have to equip the given theater.

This type of knowledge advantage is essential for a country having "no depth to fall back on" in war, according to Deptula, and a potential Iranian conflict is real.

"We have to pay very close attention and hold Iran to the letter of agreement," he said of the recent deal governing Iran's nuclear weapons research. "History indicates they will take every advantage to break out of the current agreement or, as soon as it expires, to bring rapid production of nuclear weapons," Deptula said. "Iran is an existential threat to Israel."

REINVENTING THE AIR FORCE

The introduction of a unique aircraft like the F-35 will affect the nature of communication and war planning within the IDF.

"Now we are going to have a mixed fleet," said retired IAF Brig. Gen. Ephraim Segoli. He served in IAF for 25 years and in 1997 studied as a fellow at the School of Advanced Air and Space Studies, Maxwell AFB, Ala. In Israel, he eventually joined the Fisher Institute for Air and Space Strategic Studies, where he heads the Airpower and Asymmetric Conflict Research Center.

"The F-35 is bringing a new culture. It is a big challenge. Not just a technical challenge, like how we talk," but also how airmen and other branches of the military will use information, in what order, and with what aims.

Like everything else with the F-35, "time and experience" will reveal the potential advantages and limitations of the aircraft, he said.

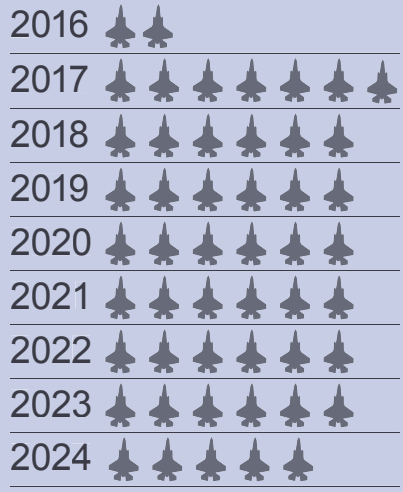
The dichotomy within IAF on the new aircraft is a conflict between efficiency and operational capability, the former necessarily detracting from the reality of the latter. The longer you test, the longer it takes to bring an aircraft to operational status.

Nine F-35Is are expected to reach initial operational capability in 2017, according to Brig. Gen. Tal Kelman, IAF's chief of staff, which will make

A Russian S-300 surface-to-air missile fires during a training exercise in Russia on Sept. 8, 2016. The missile system was recently deployed in Iran, posing a danger to Israel.

FIFTY F-35Is BY 2024

The Israeli Air Force is scheduled to receive its 50 F-35 strike fighters on the following schedule:



Source: Lockheed Martin

On its debut flight in Israel on Dec. 13, 2016, an Adir (top) flies above an IAF F-16I Sufa.

From left: Russian Federation Ministry of Defense photo; Israel Air Force photo by Maj. Ofer Berkovich

Israel the first country outside the US to have operational F-35s.

"The level of uncertainty is very high," Segoli said. "It's very difficult to understand the real potential of this system."

The amount of information the F-35 is designed to gather and disseminate to the rest of IAF and IDF may also change the way IAF operates within the IDF. "In my opinion, the air force has a very unique part in any campaign planning," said Segoli.

"It was not done and it is not done," he told *Air Force Magazine* in a January interview, referring to IAF's role in holistically advising on military campaigns. "The air force must understand [the F-35] is not just there to improve one, two, or three capabilities."

While the F-35 can allow IAF to penetrate threats now being developed, Segoli emphasized he sees no current threats the F-35 is capable of attacking alone. Rather, he emphasized the role of the aircraft in deterring those rising threats. If Iran is considering rolling out nuclear capabilities, the F-35's ability to fly past the country's surface-to-air defense system may affect such plans.

THE COST QUESTION

US President Donald Trump implied in a December 2016 tweet he may reduce the number of US F-35 purchases, and if that happens, Segoli explained, the value of the F-35 will be further scrutinized in Israel.

"If you sell less, there will be an effect on the price," Segoli said. If cost increases, this might become a problem. Some Israeli experts are already questioning the purchase, not seeing an immediate need for the deep capabilities of the F-35 when considering asymmetric opponents like Hamas and Hezbollah.

Lockheed Martin plans to bring down the cost of the F-35 to around $85 million per unit by 2019. If that happens, Israel may save $435 million on 29 F-35s.

"Before [an F-35I] even shoots a missile or drops a bomb," Deptula said, the F-35 program is bringing nations together. This he termed "the greatest strategic value of the F-35."

Many countries operating common equipment such as the F-35 "engenders common defense strategies" that then encourage those nations to partner and work closer together, Deptula noted. He called this an "enormous value" and an intangible—but said that if he had to think of it in dollars, it'd be in the trillions.

Still, at nearly $100 million a pop, the $5 billion price tag for 50 aircraft is a sticking point for many Israeli civilians. The populace is aware that the agreements in place to allow Israel to perform its own maintenance on the aircraft will raise Israeli sustainment costs.

It may be years before the F-35 program settles into enough of a routine for today's questions about unit costs and planned inventories to be resolved. But whatever quantities and capabilities the F-35 ends up offering later, within the IAF there is considerable agreement that it'll be "adir." ✪

USAF's AGGRESSORS

By John A. Tirpak, Editorial Director
Photos by USAF and DOD photographers

For 45 years, fighter pilots have learned to survive by getting beaten up by "Red Air."

Almost continuously since 1972, the Aggressors have been the Air Force's in-house sparring partners. These pilots, expert in both US and adversary tactics, give the service's fighter units a heavy dose of realism in air exercises. Their success is indisputable: Since their founding, no USAF aircraft has lost a dogfight, in dozens of real-world engagements.

Thousands of aviators, from USAF and scores of guest countries, have tangled with the Aggressors and emerged as better pilots, having received from them a graduate course in basic fighter maneuvers and dissimilar air combat training (DACT). Before ever engaging in a real dogfight, these students have been stressed by the best. Knowing the sights, sounds, and sensations of a thoroughly realistic engagement, the younger pilots emerge seasoned enough to avoid beginner's mistakes in real war, and with newfound lethal proficiency.

The Aggressors were an answer to the dismal results of air-to-air combat in Vietnam, where the service lost almost as many fights as it won. The track record was a big step down from USAF's performance in the Korean War, where it had enjoyed a kill ratio of 10 to one—and even higher by some counts.

A study called Red Baron was ordered to find out why the Air Force edge had slipped so badly. In multiple volumes, it scrutinized every air-to-air experience in Vietnam, considering everything from rules of engagement to the combat loads being carried by the fighters to tactics and the training pilots had received.

What it all boiled down to was that USAF fighter pilots had not been prepared for the kind of air combat they encountered in Vietnam. They had practiced for missile warfare at long distances, but the rules of engagement often dictated visual target identification, forcing combat at close range. At that proximity, heavy Air Force F-105s and F-4s struggled against quick and light Soviet-built MiG-17s and MiG-21s.

Moreover, fighter training in the 1960s had often emphasized not only bombing but, in some cases, nuclear attack. The machines had been shaped by the nuclear mission, offering limited agility, and the pilots usually trained against squadron mates flying nearly identical aircraft. Given that the aircraft and tactics in these practice dogfights were the same, the value of the train-

USAF photo by SrA. Peter Reft

An F-16 from the 18th Aggressor Squadron lifts off on afterburner at Eielson AFB, Alaska. KC-135 tankers are lined up in the background.

USAF photo by SSgt. Shawn Nickel 1

ing was limited. In real air-to-air warfare over Vietnam, pilots had labored to maximize the advantages of their own jets while exploiting the shortcomings of their adversaries' machines. The enemy also closely coordinated his aircraft and surface-based anti-aircraft guns and missiles, creating a layered and complex environment in which to fight.

The Navy, similarly smarting from a poor showing in Vietnam, did its own study and came up with a program called Top Gun. It emphasized a return to close-in dogfight training—against dissimilar aircraft—and was taught by pilots who'd had the most success in modern jet combat. Top Gun started in 1969, and in the few years remaining in the Vietnam conflict, the Navy saw a sharp uptick in the dogfight kill ratio. Red Baron came to a similar conclusion, and the Air Force launched its own Aggressor squadron in 1972.

The first of these was the 64th Aggressor Squadron (AGRS), based at Nellis AFB, Nev. It was equipped with the T-38 Talon. Although almost every fighter pilot in the Air Force had trained

3 USAF photo by MSgt. Kevin J. Gruenwald

/1/ SrA. Michelle Park of the 354th Aircraft Maintenance Squadron readies an 18th Aggressor Squadron F-16 and its pilot for a mission from Eielson AFB, Alaska, in April 2015. /2/ A 2007 shot of a 65th AGRS F-15C. /3/ A flight of Aggressor F-15s and F-16s in 2008 over Nevada. Aggressor paint schemes change regularly, often mimicking the markings of foreign air forces. This group shows schemes from Russia, South America, and South Asia. /4/ From 1977 to 1988, the Constant Peg program acquired and flew Soviet-designed fighters so US pilots could wring them out and teach their colleagues the best ways to defeat them. Here, a MiG-17 (lead) and a MiG-21 (trail) of the Red Eagles squadron are flanked by two F-5Es. /5/ A MiG-21 acquired under the Have Doughnut program. The jet was used to verify and expand data available on the MiG-21, widespread in Soviet-Bloc air forces. /6/ A Red Eagles MiG-23 on the ramp at Tonopah Test Range, Nev., in 1988. Air Combat Command chief Gen. Hawk Carlisle flew with the unit in the late 1980s and ejected from this aircraft.

2 USAF photo by Capt. Tana R. H. Stevenson

4 USAF photo

5 National Air and Space Intelligence Center photo

6 USAF photo

on the T-38, it was chosen because of its small size, different handling qualities from the big fighters then in service, and the fact that it was already in the inventory, making it an affordable platform. Hard to see and similar in performance to the small Soviet fighters, the T-38 made a good adversary.

A few years later, after the fall of Saigon, F-5E Tiger IIs that had been meant to serve with the South Vietnamese air force were redirected to the Aggressors. Agile, difficult to spot, and relatively inexpensive to operate, the F-5Es were a good choice for the Aggressors, with performance not unlike that of the MiG-21, then the most ubiquitous fighter in Soviet Bloc air forces.

The Aggressor program arrived too late to make much difference in the Air Force's performance in Vietnam, but pilots who came up against the Aggressors swore by the experience,

1 USAF photo

4 USAF photo by SrA. Ashley Nicole Taylor

/1/ A Red Eagles MiG-23 forms up with two A-10s in the 1980s. /2/ An F-16 wearing a new Splinter scheme used on Russia's T-50 and Su-35 makes a backdrop at a 57th Adversary Tactics Group change of command ceremony in 2016. /3/ SSgt. Wesley Ott, 57th Aircraft Maintenance Squadron, snaps a salute as F-16 Aggressors launch during a Red Flag exercise in 2014. /4/ On a walk-around of his F-16, Capt. A. J. Roper of the 18th Aggressor Squadron checks an Air Combat Maneuvering Instrumentation pod. The ACMI looks like a missile and tracks and records engagements so they can be replayed during the debrief. /5/ A Red Flag-Alaska F-16 wearing an Arctic scheme in a 2011 photo. /6/ An F-15 parked on the Eielson tarmac during a 2007 Red Flag-Alaska. The F-15s were added as Aggressors to simulate high-end threat aircraft such as the Su-27 Flanker family, which has comparable performance. /7/ A mixed flight of Aggressor F-15s and F-16s in 2008. /8/ SrA. Demonte Outlaw of the 354th Operations Support Squadron checks 18th AGRS helmets in 2016. Red Air pilots are experts in adversary tactics and assume the personae of the opposition.

7 USAF photo by MSgt. Kevin J. Gruenwald

2 USAF photo by A1C Kevin Tanenbaum

3 USAF photo by Lorenz Crespo

5 USAF photo by SSgt. Christopher Boitz

6 USAF photo by A1C Christopher Griffin

8 USAF photo by SSgt. Shawn Nicke

1 USAF photo by A1C Peter Reft

2 DOD photo by SSgt. D. Perez via National Archives

3 USAF photo by A1C Joshua Kleinholz

4 USAF photo by SSgt. Shawn Nickel

6 USAF photo by SSgt. Shawn Nickel

5 USAF photo by SSgt. Shawn Nickel

and the program was expanded. In 1975, a second squadron was added—the 65th Aggressor Squadron, also based at Nellis—and in 1976, two more units were stood up. These were at Clark AB, Philippines (the 26th AGRS), and at RAF Alconbury, UK (the 527th AS). The latter two units did "road shows," traveling around their respective theaters to tangle with frontline units.

Aggressors adopted Soviet-style tactics and procedures, becoming experts in how the Soviet Union and its client states (such as Iraq) used their fighters in collaboration with ground control units. They carried this impersonation to the point of adopting Soviet-style name badges and helmets, their squadron ready rooms festooned with Russian propaganda posters labeled with Cyrillic lettering.

The jets themselves were painted to mimic Soviet aircraft and those of Soviet Bloc countries, wearing schemes known as "Flogger" and, later, "Flanker." Some schemes were generic and went by names such as "Lizard," "Pumpkin," and "Grape," but

/1/ A1C Kierrea Clary updates the hallway monitor at the 18th AGRS headquarters at Eielson. The digital bulletin board tracks pilot training, maintenance, and schedules. /2/ For many years, USAF Aggressors flew the F-5E Tiger II to simulate the MiG-21, as seen in this 1984 photo. Navy and Marine Corps Aggressor units still fly this fighter, among others. /3/ 757th Aircraft Maintenance Squadron techs ready an F-16 during a 2014 Red Flag at Nellis. /4/ Sgt. William Heines of the 18th AGRS holds up the unit's Red Star patch, symbolizing the Soviet air force, USAF's Cold War adversary. /5/ 18th AGRS F-16s tank up over Alaska from a KC-135. /6/ Maj. Brian Bragg, 18th AGRS assistant director of operations, keeps his hands off the controls while crew chiefs ready his F-16 at Eielson in June 2016. /7/ A rare two-seat F-16D Aggressor over Alaska in 2011.

7 USAF photo by SSgt. Christopher Boitz

1 USAF photo via National Archives

3 USAF photo by A1C Kevin Tanenbaum

4 DOD photo by SSgt. David Nolan via National Archives

6 USAF photo by A1C Renishia Richardson

7 USAF photo by MSgt. Burt Traynor

2 USAF photo by SSgt. Shawn Nickel

5 USAF photo by MSgt. Kevin J. Gruenwald

8 DOD photo by TSgt. Jose Lopez via National Archives

others were clearly meant to suggest specific aircraft of the air arms of dozens of adversary and nonaligned countries.

Three years after the Aggressors first stood up, the Air Force—again relying on Red Baron and subsequent studies—launched the Red Flag series of exercises, aimed at giving combat pilots experience participating in a large-scale air operation with many elements. Red Baron had concluded that once a pilot had survived 10 combat missions, his life expectancy increased sharply. Red Flag simulated those first 10 missions in a controlled environment before the pilots flew their first real-world combat mission.

So effective were the Aggressors, even against vastly superior aircraft like the F-15, that for a time in the 1970s Congress dallied with the idea of buying vast numbers of inexpensive F-5Es rather than pricey F-15s. Air Force leaders patiently explained that the F-15s lost early engagements with the Aggressors because Eagle pilots were not yet proficient in DACT.

After training with the Aggressors and in Red Flag, the F-15 pilots became unbeatable, however. The F-15, in fact, was de-

/1/ A formation of F-16C aircraft from the 64th AGRS returns to Tyndall AFB, Fla., during a William Tell aerial gunnery exercise in 2004. /2/ Maj. Michael Kuzmuk (left) of the 18th AGRS prepares to give an orientation ride to electronic and environmental systems journeyman A1C Victoria Ortaleza of the 354th Aircraft Maintenance Squadron. Such flights help techs understand how the equipment they maintain on the ground works in the air. /3/ The 64th AGRS unit badge on an F-16. /4/ Road show F-5Es from RAF Alconbury, UK, during a 1987 exercise. The outlined digits on the side of the nose are called "bort" numbers; they mimic markings on Russian jets. /5/ An F-15 breaks right over Nellis in 2008. /6/ SSgt. Darryl Bowie, 57th Aircraft Maintenance Squadron, checks write-ups on a 64th AGRS F-16 in a 2009 Gunfighter Flag exercise at Mountain Home AFB, Idaho. /7/ A 64th AGRS F-16 disconnects from a KC-135 refueling boom in 2016. /8/ An F-5E from Alconbury in the Grape camouflage scheme, in 1983. Increasingly, USAF turns to contractors to provide supplemental Red Air for training and exercises.

USAF photo by Lorenz Crespo

The hammer and sickle and red star of this 64th AGRS pilot's helmet identifies a special breed of pilot.

signed around lessons learned from the Red Baron study: It was a machine designed exclusively to achieve air superiority, with excellent maneuverability, speed, acceleration, radar range, and visibility for the pilot. In US and foreign service, the F-15 has racked up more than 100 dogfight victories over nearly 40 years, without any losses.

USAF's heavily one-sided victory during the first Gulf War in 1991 validated the success of the Aggressors and Red Flag. Many pilots even reported that the reality of combat did not quite match the stress and challenge they had faced during training in Red Flag.

Red Eagles

In parallel with the Aggressor program, the Air Force wanted more information about the aircraft it would face in combat. In the 1970s, USAF began secretly acquiring Soviet-designed fighters from Israel—which had captured them in wars with Egypt and other Middle East adversaries—and from Soviet client states willing to either sell or lend aircraft to the US for evaluation. This was not a new idea: During the Korean War, a North Korean pilot had defected with his MiG-15, and none other than Chuck Yeager, the pilot who first flew faster than sound, was chosen to fly it and discover its secrets.

The first MiG-21 was acquired under a program called Have Doughnut, and what was learned from this aircraft was translated into how Aggressor F-5E pilots would maneuver their aircraft in mock dogfights with USAF fighters. Other aircraft followed, including MiG-23s and MiG-27s.

A secret squadron, dubbed the Red Eagles, was charged with obtaining these aircraft, learning their capabilities, and flying them against frontline USAF fighters to find the best tactics to defeat them. The overall program, declassified in 2006, was known as Constant Peg, and thousands of USAF, Navy, and Marine Corps fighter pilots were exposed to real Soviet-designed aircraft in secret drills over restricted areas of USAF's Nevada test ranges.

As the threat posed by the Soviet Union declined in the late 1980s, and the F-5Es began to suffer from structural stress due to heavy usage, the 65th Aggressor Squadron was stood down in 1989. However, as Russia began to restore its air force in the early 2000s and field a growing number of combat-capable aircraft in the Su-27 Flanker family, the 65th was reactivated in 2005 and equipped with F-15 Eagles. These aircraft simulated top-line Russian and Chinese aircraft, as China had bought and license-built variants of the Flanker. As opponents, these F-15s also helped evaluate and refine the capabilities of the F-22 and F-35.

Meanwhile, F-16s were brought in as Aggressors to replace the F-5E starting in 1988. The initial aircraft were F-16As drawn from existing squadrons but units were later equipped with newer F-16C/Ds.

Red Flag Goes North

Together, the F-15s and F-16s form the core of opposition forces in Red Flag wargames. In 2006, Red Flag was franchised, and the regular Cope Thunder exercise held in Alaska was renamed Red Flag-Alaska.

The 18th Aggressor Squadron and its F-16s became the resident Red Air at Eielson AFB, Alaska, while the 64th AGRS flew F-16s at Nellis.

In recent years, budget cuts and the evolution of Red Flag brought more churn to the Aggressor community. In the wake of the 2013 budgetary debacle of sequester that grounded many USAF fighter squadrons, the 65th inactivated on Sept. 26, 2015, giving up its F-15s to Air National Guard units.

At the same time, Air Combat Command was beginning to envision a new kind of Red Flag—one still having a substantial live-fly element, but heavily supplemented with virtual elements and simulation. Though F-22s and (as of January) F-35s participate in Red Flags, the true scope of what they can do must be hidden from potential opponents closely monitoring the wargames. As a result, Red Flag will move increasingly into the virtual realm.

For the moment, however, no one has forecast a time when the live-fly Aggressors will disappear, completely replaced by phantom digital aircraft on a virtual battlefield. Exposing fighter pilots to the physical experience of skilled "bad guys" in real aircraft will likely remain an Air Force priority. ✪

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THE DOOLITTLE RAID

SEVENTY-FIVE YEARS AGO THIS MONTH, 80 AIRMEN DELIVERED A MUCH-NEEDED STRIKE AGAINST JAPAN.

By Robert B. Kane

On April 18, 1942, at approximately 8:20 a.m., 16 B-25 bombers under the command of Lt. Col. James H. "Jimmy" Doolittle began taking off from USS *Hornet,* about 750 miles east of Japan. About noon, local time, they struck factories and other industrial targets in six Japanese cities.

The attack had minimal effect on Japan's military or industrial capabilities and was carried out at the cost of all the bombers in the raid. Seven airmen died or were killed after being captured. Four spent the duration of the war as POWs.

Still, the mission had a profound effect on Americans, Japanese military leaders, and the Japanese people during the ensuing months. Seventy-five years later, the Doolittle Raid still has important lessons to teach.

Two weeks after Japan's Dec. 7, 1941, attack on Pearl Harbor, President Franklin D. Roosevelt asked the Chiefs of the Army, Navy, and Army Air Forces (AAF) to plan a retaliatory strike on Japan to boost American morale. He repeated that request over the following weeks. Since the bulk of the US Pacific Fleet's battleships lay on the bottom of Pearl Harbor and American aircraft of the time could not reach Japan from the closest American land base, the service Chiefs wondered how they could carry out the President's request.

On Jan. 10, 1942, Navy Capt. Francis S. Low, assistant chief of staff for anti-submarine warfare on the staff of Adm. Ernest J. King—head of the US Fleet and soon to become Chief of Naval Operations—watched two Army pilots conducting mock bombing passes on an outline of a carrier deck painted on the airfield at Norfolk Naval Base, Va. The drill gave him the idea to launch Army bombers from an aircraft carrier.

At Low's direction, troops loaded two Army B-25s onto *Hornet,* the Navy's newest carrier, at Norfolk. The carrier sailed about 100 miles into the Atlantic and launched the two aircraft from its deck without difficulty.

Meanwhile, Doolittle, a military test pilot, famed civilian aviator, and aeronautical engineer of the interwar years, was now special assistant to Lt. Gen. Henry H. "Hap" Arnold, Chief of the Army Air Forces. Doolittle was already trying to figure out which bombers could carry out an attack on Japan.

The needed aircraft had to have a 2,400-mile cruising range, a 2,000-pound bomb load, and be small enough that a reasonable number would fit on an aircraft carrier deck. Doolittle decided on the B-25B, then the Army's newest aircraft. It would be modified to carry double its normal fuel load and, thus, extend its range.

A B-25, piloted by Lt. Col. James Doolittle, takes off from the deck of USS *Hornet* on April 18, 1942, for a daring raid against mainland Japan.

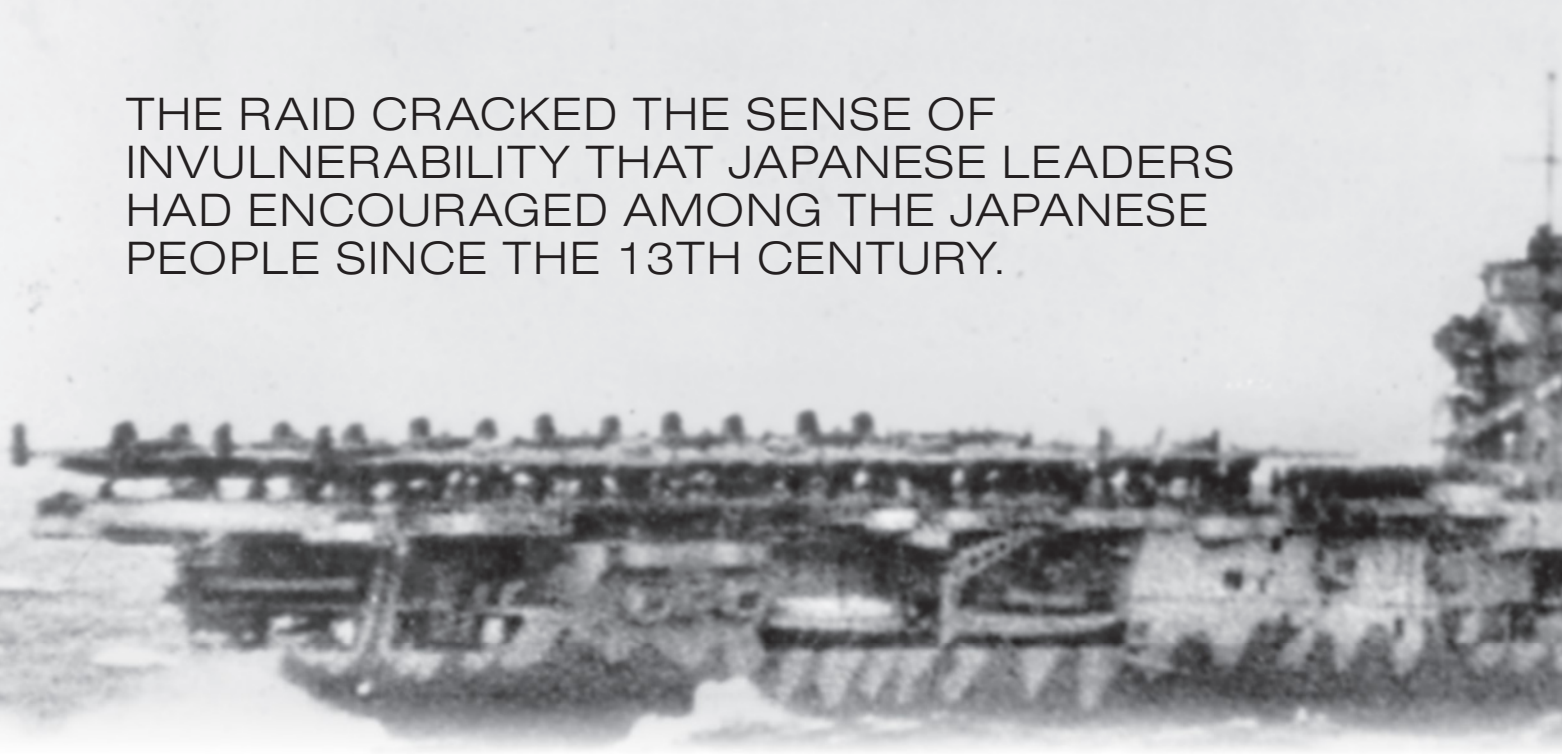
US Navy photo

Once Roosevelt and the service Chiefs approved the concept for the retaliatory raid, Doolittle chose the 17th Bomb Group (Medium), assigned to Pendleton AAF, Ore., to provide aircraft and crews. He picked the unit because it was the first group to fly B-25s.

On Feb. 3, the War Department ordered the 17th BG to Columbia Army Air Base, near Columbia, S.C., ostensibly to conduct anti-submarine patrols off the American East Coast. Doolittle diverted 24 of the group's aircraft to Mid-Continent Airlines of Minneapolis, where they would get additional fuel tanks and other modifications.

The 17th Bomb Group began arriving at Columbia on Feb. 9, followed by Doolittle himself a few days later. He informed only Lt. Col. William C. Mills, the group commander, about the upcoming mission. Addressing the crews, Doolittle said he was looking for volunteers for a highly dangerous and

THE RAID CRACKED THE SENSE OF INVULNERABILITY THAT JAPANESE LEADERS HAD ENCOURAGED AMONG THE JAPANESE PEOPLE SINCE THE 13TH CENTURY.



Top: Doolittle's aircraft launches from USS *Hornet's* flight deck.

Below: The deck of *Hornet* lined with B-25 bombers on the way to the mission's launching point. In the distance is USS *Vincennes.* The bombers were modified for the special mission, including the removal of the belly turret and a tactical radio and the addition of a collapsible fuel tank.

secret mission that would contribute to America's war effort, but he gave no other details. When the entire group volunteered, Doolittle and the group's squadron commanders selected the best 24 crews for the mission.

The chosen men picked up the modified B-25s at Minneapolis and flew them to Eglin Field, Fla., arriving between Feb. 27 and March 1. With them came 60 enlisted personnel. During the next three weeks, the crews practiced carrier takeoffs, low-level and night flying, over-water navigation, and low-altitude bombing at various Eglin auxiliary fields and over the Gulf of Mexico. The Navy provided Lt. Henry L. Miller, a flight instructor from nearby NAS Pensacola, to supervise the short-takeoff training. (See "The Raiders at Eglin," April 2015, p. 71.)

Between training missions, the bomb group's enlisted men and Eglin technicians made additional changes to the aircraft. They installed a collapsible fuel tank and more fuel cells in the fuselage, de-icers and anti-icers in the wings, steel blast plates around the upper turret, and mock gun barrels in the tail. They removed the belly turret and a heavy tactical radio. The mechanics also fine-tuned new carburetors for the aircraft engines to obtain the best possible engine performance and fuel consumption rate for low-altitude cruising.

Doolittle had the top-secret Norden bombsights on the aircraft removed. They wouldn't be of much value at the medium altitudes from which the raiders would strike, and it was too great a risk that they would fall into enemy hands.

US Naval History and Heritage Command photo

US Navy photo

Instead, Capt. Charles R. Greening, pilot and armament officer, created an aiming sight dubbed the "Mark Twain." The sights were built in Eglin's sheet-metal workshops for about 20 cents each, and Doolittle later said that they were relatively accurate in the actual attack.

Early on March 23, Arnold called Doolittle at Eglin Field and informed him that it was time to move the secret operation to McClellan Field, Calif., for final inspections and modifications to the aircraft. They would then fly to NAS Alameda for loading onto *Hornet.* Though bad weather and installation of the modifications had reduced the planned training time (about 50 hours total) by 50 percent, Doolittle said in his postraid report to Arnold that the crews had attained a "safely operational" level.

Between March 31 and April 1 at Alameda, the Navy loaded 16 of Doolittle's B-25s onto *Hornet's* flight deck. This left about 450 feet of deck for the aircraft to make their takeoffs.

Commanded by Navy Capt. Marc A. Mitscher, *Hornet* left San Francisco on the morning of April 1, with 71 Army Air Forces officers and 130 enlisted-men aboard, escorted by supply ships. A few days later, the task force met up with the carrier USS *Enterprise* and its escorts, commanded by Vice Adm. William F. Halsey Jr., north of Hawaii. Because *Hornet's* fighters were below on the hangar deck, *Enterprise's* aircraft would protect the task force in case of a Japanese attack. By early April 18, the combined task force was about 750 miles east of Japan.

At about that moment, Navy scout planes detected a Japanese picket boat, and USS *Nashville* sank it by gunfire. The picket boat had sent Japan a message of the sighting but didn't confirm the message before it was sunk. Faced with the potential loss of surprise, Doolittle and Mitscher decided to launch the B-25s immediately, fully 10 hours and some 250 miles farther east than they had planned. All 16 aircraft took to the air safely, but a sailor lost an arm when he stepped back into the prop wash of an aircraft.

Wave-hopping as they approached the coast, the planes were seen by Japanese fishing boats. Six hours after takeoff, the B-25s arrived over Japan. Climbing to 1,500 feet, the American bombers started their runs on targets in Tokyo, Yokohama, Yokosuka, Nagoya, Kobe, and Osaka.

None of the B-25s were lost to enemy anti-aircraft fire or fighters, and two of the crews shot down three Japanese aircraft between them.

After dropping their bombs, 15 B-25s turned southwesterly across the East China Sea toward friendly airfields in eastern China. Unfortunately, the early launch took its toll and all of the raider aircraft were running low on fuel as they approached the Chinese coast. It was now night and 15 crews were forced to ditch along the coast or bail out over eastern China.

The pilot of the 16th aircraft, Capt. Edward J. York, realized within hours of launching from *Hornet* that his engines were burning fuel at an unexpectedly high rate. (Civilian technicians at McClellan Field had incorrectly changed the settings of his aircraft's carburetors.) York, realizing that his aircraft would not reach China, turned northwesterly toward Vladivostok, in the Soviet Union.

The Soviet Union, allied with the US against Nazi Germany, was not at war with Japan, however, and it imprisoned the crew and confiscated the aircraft. It took 13 months of persistent US government efforts and three relocations to get the crew to Ashgabat, 20 miles north of the Iranian border. There, the Soviet secret police arranged to smuggle York's crew into Iran.

Back in China, Chinese soldiers and guerrillas—and Japanese soldiers—searched for the Americans. Two Doolittle Raiders drowned when their aircraft crashed off the Chinese coast, and one died after bailing out. Most of the raiders found their way into friendly hands, but the Japanese army captured eight of them and executed three as war criminals. One of the remaining five died as a prisoner of war, and in August 1945, Office of Strategic Services agents rescued the remaining four from a Shanghai military prison.

In retaliation for Chinese help in rescuing 69 raiders, the Japanese army destroyed numerous villages and killed up to 250,000 Chinese.

Doolittle (left foreground) and *Hornet* commander Capt. Marc Mitscher (right foreground) with some of the raiders on the deck of the carrier during the mission.

Courtesy of US Navy

Surveying his own wrecked aircraft, Doolittle mused to SSgt. Paul J. Leonard, his engineer-gunner, that he would probably be court-martialed. The raid, he said, had caused little actual damage to Japan's ability to make war, he'd lost all 16 aircraft, and at the time, didn't know where the other aviators from the mission were.

Rather, unbeknownst to Doolittle, Roosevelt promoted him to brigadier general and awarded him the Medal of Honor. All 80 raiders received the Distinguished Flying Cross and other decorations from the Chinese government. Those killed or wounded received the Purple Heart.

Despite Doolittle's pessimism about the effects of the raid, it did have significant and long-term implications. First, it provided a tremendous boost to American morale. Newspaper headlines and radio journalists proclaimed "Tokyo Bombed"—the first bit of good war news after a litany of evil tidings from the Pacific. There had been four months of American defeats since Pearl Harbor, including the surrender of about 12,000 Americans and 65,000 Filipino soldiers in the Bataan Peninsula—the worst defeat in American history. The raid gave Americans hope for eventual victory.

Roosevelt told reporters the American aircraft had come from Shangri-La, the fictional land of James Hilton's novel, *Lost Horizon,* but the Japanese leadership figured out that the bombers had come from an aircraft carrier.

The raid cracked the sense of invulnerability that Japanese leaders had encouraged among the Japanese people since the 13th century, when Mongol fleets foundered in the last attempt by outsiders to invade Japan. The Allied victories in the Southwest Pacific and Central Pacific after mid-1942 served to widen this growing sense of insecurity. The Japanese military felt compelled to withdraw some fighter squadrons to the home islands for home defense.

The attack confirmed the decision of the Japanese military leaders to shift their strategy away from an advance toward India and instead toward Hawaii and the seizure of Midway Island. They hoped such an operation would draw out the US carriers—absent at Pearl Harbor on Dec. 7—and give them a chance to destroy America's remaining offensive power in the Pacific.

The ensuing Battle of Midway, June 5-7, 1942, was a resounding American naval victory. It cost the Japanese navy four carriers, 275 aircraft, and 2,400 men. Worse, the casualties included Japan's most experienced naval pilots and aircraft mechanics. The US Navy, meanwhile, lost much less: one carrier, 150 aircraft, and 307 men. The Battle of Midway stopped Japan's advance to the east and soon put it on the defensive.

The Doolittle Raid is a lesson for officers and enlisted alike about decision-making, innovative thinking, and risk-taking. Low and Doolittle independently developed an unconventional plan to answer Roosevelt's request for a retaliatory strike. Arnold also demonstrated his leadership by giving the go-ahead for an unusual idea.

During the three weeks at Eglin Field, weather and aircraft rework cut Doolittle's training time by half, but he judged the crews adequately prepared.

On launch day, Doolittle and Mitscher both knew that launching the bombers early would mean they'd be nearly out of fuel by the time they reached the China coast, but they took the risk to accomplish the mission.

Finally, the raid, known as Special Aviation Project No. 1, was the first major joint operation since the Civil War, when Gen. Ulysses S. Grant, using Army and the Navy units, captured Vicksburg, Miss., in 1863 after a two-week siege.

Throughout the concept development to the launch off *Hornet,* Navy and Army Air Forces members worked together to achieve something unprecedented.

The Doolittle raid showed the value of approaching threats with new thinking when the conventional approach won't work. It demonstrated that military leaders must be willing to accept innovative solutions to modern problems—by creating an atmosphere that will produce such ideas and people willing to provide them—and accept a degree of calculated risk. ✪

Robert B. Kane retired from the US Air Force as a lieutenant colonel in July 2014 and serves as director of history for Air University, Maxwell AFB, Ala. His most recent article for *Air Force Magazine* was "The Raiders at Eglin" in the April 2015 issue.

Yokosuka Naval Base, Japan. This photograph is one of only a few taken during the raid that made it through the aircraft crashes.

US Army Air Forces photo

SPOUSE OF THE YEAR

TALES FROM THREE DECADES.

By Whitney Distaso

May 12 is National Military Spouse Appreciation Day, a timely reminder that the Air Force Association sponsors the Joan Orr Spouse of the Year Award.

Named for the wife of Secretary of the Air Force Verne Orr, the award honors a USAF member's spouse and has been presented annually at the AFA National Convention since 1987—making this year its 30th anniversary.

Here's a look at an award recipient from each decade—and the most recent winner—telling her best Air Force-spouse story.

1987 ANN TRIPLETT

SPOUSE: Lt. Col. Hank Triplett, Personnel Division, 21st Combat Support Group, Elmendorf AFB, Alaska.

Courtesy of Ann Triplett

Spouse award candidates used to submit an 8X10 black-and-white full-length photo, like Ann Triplett's here, with their nomination package.

As a couple, Hank and I made sure to do most activities together and included [son] Tres whenever possible—from church to sports to Jaycees to Special Olympics, Officers Wives' Club, USO functions, even Women's Club. Tres was such a cool kid—I still remember him making thousands of San Antonio Cinco de Mayo fiesta paper flowers with me for the celebration at Randolph AFB in '87. He once told me that was my reward for hanging in there for eight years as his Boy Scouts den mother.

MOVE IT: Ann Triplett's son attended three high schools.

1998 ORA SPENCER

SPOUSE: Col. Larry Spencer, 72nd Support Group, Tinker AFB, Okla. (later that year, commander, 75th Air Base Wing, Hill AFB, Utah).

CHOPPED LIVER: Larry Spencer says that after his wife received the award, "they started referring to me as Ora's husband, even though I was the wing commander."

Courtesy of Ora Spencer

To be honest, I did not want to be nominated. I tend to work in the background and don't really like being in the limelight. The commander of Tinker noticed my work around the base and with organizations like the thrift shop and childcare center and insisted that I be nominated.

2003 TAMMIE BOCOOK

SPOUSE: MSgt. Ray Bocook, 78th Mission Support Squadron, Robins AFB, Ga.

When Mount Pinatubo blew in the Philippines in June 1991, we lost everything, and it was tough to be stranded in a national disaster with two small children. First, the children and I evacuated to Manila, Philippines, because the Air Force thought Clark Air Base was going to get hit the worst.

Ora Spencer receives her award from AFA Board Chairman Doyle Larson in 1998. "Ora's husband," retired Gen. Larry Spencer, became AFA's president in 2015.

Orr in 1985

DOD photo via National Archives

JOAN ORR: DANCING ALL THE WAY

In his last speech to the AFA National Convention in September 1985, Secretary of the Air Force Verne Orr said, "When the President appointed me to this position nearly five years ago, Mrs. Orr and I took it on as a partnership." He had visited more than 200 USAF bases during his tenure, he told the audience. "When I go out on the flight line," he said, "she looks at parts of the base I don't see."

Joan Orr had a longtime interest in dance, even as a student at Scripps College in Claremont, Calif. According to the *Los Angeles Times,* she taught dance classes even from a wheelchair, after a 1985 diagnosis of the neuromuscular disorder commonly called Lou Gehrig's Disease. She died seven months after her daughter presented the first Joan Orr Spouse of the Year Award.

AGAIN?
After fleeing from Mount Pinatubo, the Bocooks were stationed at Tacoma, Wash., near the active volcano Mount St. Helens. Tammie Bocook writes, "I cried the first week every day, knowing there was a volcano" there.

From Manila, while I was on the phone with Ray, I heard the sirens going off, and the phone line dropped. I was in a panic for days not hearing from him, and he was in a panic hearing Manila was hit hard after Clark and he knew we had no shelter.

The volcano blew and Typhoon [Yunya] all hit at once. I did drive my car to Manila, but it was destroyed, so we couldn't even seek shelter in it. Everywhere I tried was overpacked or having issues like caving in or major flooding. We finally got into an AAFES store and finished riding out the storm.

USAF photo by Sue Sapp

Bocook

We had no food, drinks, no phone service, and nowhere to go. We couldn't stay in the store even, because it had major structural damage.

The Air Force did bring us MREs and water as soon as they could but we still had no place to stay, no clothes. I had one child in diapers and I couldn't get more.

Finally, after days, we got on a Navy ship. What a blessing it was to see that ship.

Courtesy photo

Maj. Gen. Garry Dean, operations director at NATO JFC Naples congratulates Sonya Cage in 2013. Cage adapted her volunteer work for leadership and management experience for her résumé.

2013 SONYA CAGE

SPOUSE: Maj. Ernest Cage, NATO Allied Joint Forces Command, Naples, Italy.

When I first found out my husband was going to deploy to Afghanistan, I looked for some deployment preparation briefing for Air Force families, and there wasn't one. So I created one. When I saw a need, I did my best to meet that need. From one need to the next, I found myself winning this prestigious award.

DID IT MAKE A DIFFERENCE?
Sonya Cage reflects, "This award encouraged me to ... continue helping others and making a difference. There is no need too small or too great."

2016 NICOLE BRIDGE

Courtesy photo

Bridge

SPOUSE: TSgt. Matthew Bridge, 86th Security Forces Squadron, Ramstein AB, Germany.

With two little ones at home, family life always seemed hectic. But I had an incredible "village" that I surrounded myself with, and they were always so willing to jump in and lend a helping hand. I have always kept myself busy, so hectic is something I am used to. But my village definitely has helped me maintain that at a manageable level of hectic. ✪

NICOLE BY THE NUMBERS:

1,200+ Hours of volunteer work

125 Events organized

$250,000 Funds generated for community organizations.

Whitney Distaso, AFA's coordinator for the Wounded Airman Program and Scholarships, is the spouse of Air Force Lt. Col. Doug Distaso.

CHAPTER NEWS

By June L. Kim, Associate Editor

GENESEE VALLEY CHAPTER

Even after being named the Genesee Valley Chapter Teacher of the Year in 2014, Logan Newman is still making impressive contributions in the name of science, technology, engineering, and math education.

Newman is an optics teacher at East High School in Rochester, N.Y., and was recently featured in a local newspaper highlighting his vision program.

Photo courtesy of Logan Newman

Kendrick Martin, right, a junior at East High School, N.Y., uses a pupillometer to prescreen a patient before a doctor's visit.

Genesee Valley Chapter President Alfred E. Smith found the newspaper article and got back in touch with Newman to congratulate him on the recognition and for the work he's doing in the community. Because of the East Vision Care Program, high school students have discovered a newfound interest in majors they never dreamed they'd have, such as microbiology, said Smith.

Developed in 2010, the East Vision Care Program has provided more than 1,200 students in the Rochester County school district with free eyeglasses, according to the *Democrat and Chronicle.*

This year alone, "I'm expecting to provide close to 800 pairs total," Newman told *Air Force Magazine.*

Doctors volunteer at the program and perform the "actual refractions and obtain prescriptions," he said in an email. "My students prescreen the patients using autorefractors," which measure the curvature of a person's eye in order to obtain a prescription that would correct vision issues. His students "take measurements, fit [patients] for frames, and then make and—if possible—dispense them to the patient," he said.

Newman was an optician in the Navy before becoming a teacher.

EVERETT R. COOK CHAPTER

The Air Force Association's Tennessee State VP Daniel Callahan III recently awarded the president of the Everett R. Cook Chapter for his contributions to the chapter.

During a quarterly meeting in January, Callahan presented Randy Witt with an AFA Medal of Merit for his efforts to breathe new life into the chapter, said Chapter Secretary Joseph C. Bryant.

Witt became chapter president in 2014 and since then, "his leadership has revitalized the chapter," said Bryant. He forged a relationship with the 164th Airlift Wing at Memphis ANGB, leading to the wing hosting their meetings for the past two years; spearheaded a strategic vision plan for the chapter; and engaged with local congressmen and their staff about Air Force issues, he said. Under Witt's leadership, the Cook Chapter "hosted a very successful Tennessee AFA convention last April," Bryant added.

The meeting also hosted guest speaker James Bowman, a senior executive at FedEx Express, who spoke on the contributions of former and current Air Force and military pilots to FedEx, said Bryant. About 40 people attended the event.

LANCE P. SIJAN CHAPTER

The Lance P. Sijan Chapter sponsored the Gen. Bernard A. Schriever Memorial Essay Contest for the third year in a row last fall.

Held in partnership with Air Force Space Command (AFSPC), the essays were based on the idea: "A contested space environment will require a warfighter mindset in our airmen. What are the immediate and long-term challenges and solutions to adapt to a warfighter mindset?"

Out of 20 submissions, four essays were chosen. Their authors summed up their essays during a November ceremony, said Linda Aldrich, Sijan Chapter VP. Winners were Lt. Col. Mark G. Reith, Capt. Justin Thornton, SSgt. Kesa Wood, and A1C Brandon Kessler and A1C Cameron Mosley. The chapter awarded them with more than $2,500 in prizes and plaques, and the Air and Space Power Journal will publish two of the essays in an upcoming issue, said Aldrich.

At the suggestion of Gen. John E. Hyten, then commander of AFSPC and current commander of US Strategic Command, the competition had two divisions, one for Total Force and civilian personnel and another for airmen E-1 to E-6, said Aldrich.

Judges were senior leaders from AFSPC, Air University, industry, and AFA, led by retired Gen. Lance W. Lord, former commander of AFSPC.

Chapter President Kristen Christy and AFSPC Vice Commander Maj. Gen.

David D. Thompson presided over the ceremony.

CENTRAL INDIANA CHAPTER

AFA Vice Chairman of the Board for Aerospace Education Richard Bundy and AFA's 2016 National Teacher of the Year Greg Ennis were recently invited to attend the opening of the Rolls-Royce aerospace and STEM exhibition center in Indianapolis in January.

Central Indiana Chapter member George McLaren, the Rolls-Royce communications manager, reported that Bundy and Ennis attended the debut of the James A. Allison Exhibition Center, located at the company's building downtown.

The center holds a collection of jet engines and other equipment, according to a company press release. This includes engines from a C-130J, V-22 Osprey, Global Hawk, and F-35B, and historic engines that powered the P-51 Mustang.

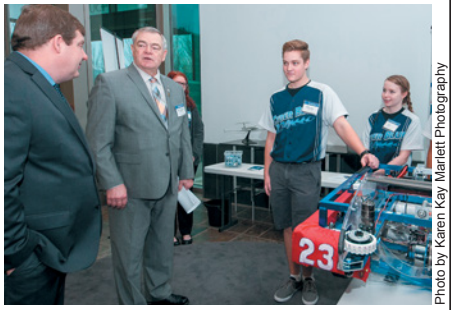


Photo by Karen Kay Mariett Photography

2016 AFA Teacher of the Year Greg Ennis (left) and AFA Vice Chairman of the Board for Aerospace Education Dick Bundy meet members of Cyber Blue 234, a youth robotics program, during a visit to Rolls-Royce's exhibition center in Indianapolis.

Bundy was a guest speaker and both he and Ennis, a member of the Tennessee Valley Chapter (Ala.), participated in the ribbon-cutting ceremony, said McLaren.

Bundy and Ennis met with company employees and a representative from Project Lead the Way to discuss "potential synergy" for future opportunities, said McLaren. Project Lead the Way is a nonprofit organization that develops STEM programs for schools, according to its website.

Rolls-Royce became a sponsor for AFA's National Teacher of the Year program last fall and the company is "genuinely excited to ... help ... further STEM education and interest," said McLaren.

GEN. E. W. RAWLINGS CHAPTER

As president of the Gen. E. W. Rawlings Chapter (Minn.), Dan Murphy and his wife, Jane, attended the Minnesota Medal of Honor Convention last fall in Minneapolis-St. Paul. There, they met Leo K. Thorsness and his wife, Gayle, said Minnesota State President Lawrence Sagstetter.

The four were at a community leaders dinner, which was part of the MOH convention.

Thorsness, author of *Surviving Hell,* was a prisoner during the Vietnam War until he was repatriated in 1973. ✪

AFA EMERGING LEADER

Hannah M. Richmond
Home State: Michigan
Chapter: Langley Chapter (Va.)
Joined AFA: 2009
AFA Office: Executive Vice President, Langley Chapter
Military Service: 2012-current, Active Duty
Occupation: Logistics Readiness Officer
Education: B.S., Nutritional Sciences, Michigan State University

Photo courtesy of Hannah Richmond

Hannah Richmond at Kandahar Airfield, Afghanistan, in December 2016. She is currently deployed there.

How did you first hear of AFA?
I first heard about the Air Force Association while I was a cadet in ROTC. I was lucky enough to attend several conferences and listen to AFA members speak on the programs they provide to airmen and their families. After graduation, it only made sense to continue my membership while on Active Duty.

What do you enjoy most about your AFA membership?
Honestly? The people I meet and the relationships I make through AFA are the best benefits. On Active Duty it can be difficult moving every few years, but it's comforting to know that there'll (most likely) be a chapter wherever I end up. ... There aren't a lot of organizations out there that allow you to make these lasting relationships while giving back to our airmen.

What does AFA need to improve most to increase exposure and draw in more members?
The Air Force has several professional organizations for our airmen to be involved in, and that pulls memberships away from AFA. Exposing the benefits of AFA to our younger airmen early will compel them to join and remain involved. At Langley, we brief [Airmen Leadership School] students about our chapter and invite them to participate in a chapter meeting or special event, allowing them to see firsthand what we do for them. AFA has so much to offer, but we need to showcase that to our younger airmen.

How do we build awareness about AFA?
Educating our younger airmen and local community members by getting them involved in the local chapters is the best way to bring awareness to what we do and what we can provide. Additionally, having a strong presence on social media (Instagram, Twitter, Facebook, etc.) on a chapter level helps showcase programs and events to potential members.

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JOE FOSS

Dakota Ace

"Sioux Falls Regional Airport" is one of the two official names given to the home base of South Dakota's Air National Guard. Local Air Guardsmen, however, uniformly refer to the site by its second official name: "Joe Foss Field." Little wonder.

Tall, cigar-chomping, curly haired Joseph Jacob Foss was without question one of America's greatest warriors. Born in 1915 on a farm in Minnehaha County, S.D., Foss joined the Marine Corps in 1940, earned pilot's wings in 1941, became an ace in 1942, and received the Medal of Honor in 1943.

In the desperate World War II battle for Guadalcanal, Foss commanded a small band of fighter pilots—"Joe's Flying Circus"—who defended the island. The circus scored an eye-watering 72 aerial victories in mere weeks.

Foss himself, flying an F4F Wildcat, shot down five Japanese Zeros in a day, Oct. 25, 1942, bringing his total to 14. He went on to bag another 12 to top out at 26 victories—the most of any pilot to that point. On Nov. 7, 1942, Foss was hit, landed in the Pacific, and spent hours in shark-infested waters before being rescued.

Foss returned home a true national hero, the "ace of aces." His Medal of Honor citation praised his "remarkable flying skill, inspiring leadership, and indomitable fighting spirit."

In 1946, Major Foss left USMC, but his martial career wasn't over. He was commissioned a lieutenant colonel in the newly created Air National Guard and helped organize South Dakota's ANG unit.

Foss was recalled to Active Duty, as an Air Force colonel, during the Korean War. Later he became chief of staff of the South Dakota ANG and retired as a brigadier general in 1975.

Foss was a restless person who, after World War II, posted a nearly unbelievable record of civilian achievement. First, he became a successful businessman. Then Foss moved into politics, was elected to South Dakota legislature, and served two terms—1955-59—as a popular governor.

Foss worked with Dallas oil man Lamar Hunt in 1960 to found the upstart American Football League; he served as commissioner for six years. At the same time, Foss served as the National President and Board Chairman of the Air Force Association and hosted the ABC TV show, "The American Sportsman."

Later, Foss became president of the National Rifle Association; president of National Society of Crippled Children and Adults; executive of KLM Royal Dutch Airlines; and inductee into the National Aviation Hall of Fame.

In 1955, Sioux Falls gave the local airport its second title. Today, Joe Foss Field is home to the South Dakota Air National Guard's 114th Fighter Wing, an F-16 unit. A statue of Foss can be found in the main lobby.

JOSEPH JACOB FOSS

Born: April 17, 1915, Minnehaha County, S.D.
Died: Jan. 1, 2003, Scottsdale, Ariz.
Occupation: US military officer, businessman, political figure, philanthropist
Services: South Dakota National Guard, US Marine Corps, Air National Guard
Era: World War II
Years of service: 1939-75 (Active, Reserve, and Guard)
Final Grade: Major (USMC) and Brigadier General (USAF)
Combat: Guadalcanal
Military Awards: Medal of Honor, Distinguished Flying Cross, Silver Star, Bronze Star, Purple Heart
Nicknames: Smokey Joe, Old Foos, Ace of Aces
College: University of South Dakota
Famous Friends: John Wayne, Lamar Hunt, Tom Brokaw, Marion Carl, Charles Lindbergh, Ted Nugent, Charlton Heston, Gregory Boyington, Oliver North, Dick Cheney

JOE FOSS FIELD

State: South Dakota
Nearest City: Sioux Falls
Alternate Name: Sioux Falls Regional Airport
Area: 2.5 sq mi / 1,570 acres
Status: Open, ANG base
Opened: 1937 as civil airport
Leased: (by Army)1942
Original Name: Sioux Falls Army Base
Renamed: (1955) Joe Foss Field
Former Owner: US Army
Current Owner: South Dakota ANG
Home Of: 114th Fighter Wing

1. Foss at Guadalcanal. **2.** F-16 of SDANG's 114th Fighter Wing—the "Lobos"—stationed at Joe Foss Field. **3.** Foss (c) with Lamar Hunt (l), owner of the AFL's Dallas Texans, and Don Rossi, Texans general manager. **4.** Joe Foss Field, S. D.

Photos: 2: ANG photo by SMSgt. Nancy Ausland; 4: Google Map data imagery 2017

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