AIR FORCE MAGAZINE

YF-16 vs. YF-17

Even the loser won big p. 59

Rebuilding the Missile Force p. 20

Jack Northrop's Flying Wing p. 68

More Airpower for the Pacific p. 36

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About the cover: Northrop's prototype of the YF-17 Cobra, tail No. 01569. See "Legacy of the Lightweight Fighter Competition," p. 59. Northrop Grumman photo.

AIR FORCE MAGAZINE

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ELECTRONIC SYSTEMS
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By Adam J. Hebert, Editor in Chief

Twelve Days in December

Dec. 12, 2016

On Dec. 1, Donald J. Trump announced he would nominate retired Marine Corps Gen. James N. Mattis to be Secretary of Defense. Mattis isn't a reliable airpower advocate but is generally well-regarded in defense circles.

One small catch, though: It is, technically, illegal for Mattis to be Defense Secretary. As a retired general, Mattis is statutorily barred from the job for at least seven years from his retirement, just three years ago. This law is in place to preserve civilian control of the military, a hallmark of American governance. Congress has only granted one exception to this rule—for Gen. George C. Marshall in 1950. Lawmakers intended that as a one-time only exemption.

This unconventional nomination was just the first item in a laundry list of defense-related controversies that emerged, large and small, over the first 12 days of December. Trump is clearly not bound by convention, so observers are left to wonder if this was an extraordinary series of events—or if EVERY 12 days will be this exciting.

On Dec. 3, the President-elect took a congratulatory phone call from Taiwan's President. Many China experts (and the Chinese government) took great offense at this, because this is just not done. Since President Richard M. Nixon shifted US recognition of China from Taipei to Beijing (both governments claim jurisdiction over the same territory), the US has performed a delicate dance. The US officially recognizes the communist Chinese government while at the same time trading heavily with democratic Taiwan, selling it arms and pledging to defend it.

The vagaries of the China/Taiwan situation could fill this entire magazine, but the status quo since 1979 has been that the US officially acts as if the Taiwanese government does not exist, while at the same working hard to prevent war. Trump was unimpressed by any of this and refused to accept a status quo where a communist nation would tell him who he is allowed to speak to. He took the call from President Tsai Ing-wen.

USAF photo by SMSgt. Kevin Wallace

The Air Force One airplanes are nearly 30 years old.

On Dec. 6, Trump took aim at the nascent Air Force One replacement program. He tweeted, "Cancel order!" writing, "Boeing is building a brand-new 747 Air Force One for future Presidents, but costs are out of control, more than $4 billion."

Boeing is "currently under contract for $170 million to help determine the capabilities of these complex military aircraft that serve the unique requirements of the President of the United States," read a Boeing statement in response.

The Air Force is working deliberately to avoid the cost growth that previously killed the Navy's Marine One helicopter replacement program. Building a secure transport for the President is inherently expensive. There will be much more to come on this, to be sure.

Take nothing for granted in the Trump administration.

On Dec. 11, Trump was disputing the CIA's assessment that Russian hackers attempted to swing the election in his favor.

"I think it's ridiculous," Trump said in a Fox News interview.

Fox's Chris Wallace noted, "You've said repeatedly you don't believe the Intelligence Community's analysis that the Russians were involved."

"Take a look. They're not sure," Trump replied. "They don't know and I don't know."

A healthy dose of skepticism is a good thing, but Trump is hopefully listening to what the Intelligence Community has to say and weighing the evidence before making up his mind. As President, he is guaranteed to be surprised by the complexity of the international crises that will pop up and suck him in.

Trump stated in the interview that the tri-service F-35 strike fighter program costs "hundreds of billions of dollars, and it's out of control." On Dec. 12, he added via Twitter that "billions of dollars can and will be saved on military (and other) purchases," after Inauguration Day, Jan. 20.

Details were not forthcoming, but there is very recent, Obama-administration precedent for strong-arming defense contractors. Just this fall, DOD unilaterally set the terms for a purchase of 57 F-35s at a price of $6.1 billion. "After 14 months of good-faith negotiations, it was clear that further negotiations" would go nowhere, said a program spokesman. The government unilaterally set a price it considered "fair and reasonable," the spokesman continued. Lockheed Martin did not like the contract, but the alternative was to reject it and walk away.

US voters elected Donald Trump in large part because he promised to shake up the Washington establishment. If the 1,460 days of his first term are anything like the first 12 days of December 2016, he will certainly do that. ✪

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Letters

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9/11 Vs. Pearl Harbor

I enjoyed John Correll's characteristically detailed and thought-provoking article on Pearl Harbor in the November/December issue ["Pearl Harbor Rides Again," p. 22]. Toward the end, on p. 29, one of the last paragraphs noted a poll of students from the University of New Hampshire. (Why that school was chosen was not given.) Correll [said] the poll "found limited interest and knowledge about Pearl Harbor among the millennials. To them, the 9/11 attacks were of far greater significance." This note reinforced my feeling over the years that schools are not emphasizing the importance of the world wars in the shaping of the world of the last half of the 20th century and their societies to a disinterested population that would inherit that world. However, the feeling that 9/11 was more important than Pearl Harbor is certainly worth discussing. Besides appearing almost in real time on TV, 9/11 obviously did affect us more recently and those effects are still being felt even as I write.

A few days after the attacks, I asked my mother how she felt. At the time, she was 79, born and bred in the Bronx, a 1943 graduate of Hunter College. Without a moment's hesitation, she declared the terrorists' attacks were far more important, perhaps because Hawaii and the war were distant to most of the American population at the time, and everyone had faith in President Franklin D. Roosevelt to guide the country. Like many others of her youthful generation, FDR was the only president—he was then into his third term—she and her friends had known. The 9/11 attacks were quickly splashed across television, magazines, and newspapers, thrusting a new, unknown enemy out to an unsuspecting America. Indeed, we all saw the towers fall as it happened. Unless we were there, we couldn't see the Japanese strafing and dropping their bombs and torpedoes as it happened.

George W. Bush had become president barely eight months before. Suddenly, we were in a world war again, a war we had generally not known was coming. The war came home to her more directly in late May 1945 as she peered from her mother's apartment window straining to catch the last glimpse of her Navy husband of 17 months, his seabag on his shoulder, headed for parts unknown, she about to give birth to their first child (me). For several months, she did not know where he was, although, in fact, he was in a top-secret specialized unit at Pearl Harbor producing invasion maps for the planned operation against Japan. She wrote to an FPO address, standing in for me to congratulate him on just making Father's Day that year.

My point is that everyone has his own collection of reference points by which he forms opinions as to the relative importance of specific events. Fifty years from now, will our grandchildren and great-grandchildren wonder what the fuss was all about after the seismic 2016 presidential election? By then, I suppose, we will have a better idea as to whether we made an 8.0 mistake, or whether we finally have met the unrelenting enemy of Sept. 11, 2001, and soundly beaten him, as we did the equally dangerous Axis countries of the 1940s. If we hadn't, I would not be here to write this letter! Hitler and his minions would have seen to that!

Cmdr. Peter B. Mersky,
USNR (Ret.)
Alexandria, Va.

The Real Offsets

When I first heard of the "Third Offset," I was disappointed in myself for not knowing of the first and second and wondered, "Offset from what?" ["The Third Offset, August, p. 24]. As I read more, I realized it wasn't offset as in "offset bombing," so I looked up several definitions, but none fit exactly. After a little thought, I concluded it was something that acts as counterbalance—not to equilibrium, but in our favor. Most agree that it was nuclear weapons that defined the First Offset, but I believe it's broader. It's nuclear prowess. Nuclear weapons did offset a long, drawn-out end to World War II in the Pacific, and later offset the imbalance in conventional forces in Europe as compared to the Soviet Union's, but it was nuclear propulsion that allowed us to have our most secure leg of the nuclear triad.

I thought I understood the Second Offset, precision guided weapons, when I first read about it, until I just heard three speakers at a symposium all couch it differently. So I looked for commonality and concluded it is not precision, it's accuracy. Yes, guidance makes weapons more precise at striking a point, but precisely striking the wrong point is an offset of another flavor in the wrong direction. To achieve accuracy, there's more to it. The invention of the laser target designator and laser guided bomb defines the start of this era. It later included: establishing and maintaining a constellation of satellites (GPS) so our military forces and weapons know more precisely where they are; updating myriad charts/maps and digital terrain elevation data; and making advances in intelligence, surveillance, and reconnaissance (ISR) to precisely know

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Index to Advertisers

where a target is relative to a common datum. When these precisions overlap, then we have the potential for the accuracy needed to consistently achieve the desired combat effects.

The Third Offset still sounds like a hodgepodge of capabilities, from hypersonic weapons and aircraft, to smart cell phones and a plethora of drones sharing data and orders on the battlefield, to networks that are self-forming and self-healing, to computers that have deep learning, to alternative positioning and timing (non-GPS), to an acquisition approach (Go Fast), and including various levels of weapon autonomy and cooperative actions among humans and networked mechanicals. As many observed, again it will be technological and operational innovation that is the key to achieving the Third Offset, whatever the boundaries of multidomain collaboration and integration. As I thought about it, trying to distill it to one concept, I could not, but I did observe that the defining characteristic of the Third Offset is speed.

When I was flying fighters, we had a phrase—born out of aerial combat—that applies now more than ever before: "Speed is life!" I laud the work on hypersonics and speed-of-light weapons (the flashy part of this offset). For millennia, warriors have won conflicts who observed, oriented, decided, and acted quicker than their enemy did/could. It will still be true in the next era, but "warriors" will include our cyber servants that obey orders and act with some level of autonomy for two basic reasons: because decentralized execution works for us, and the alternative is battle-losing lag. For example, a swarm of unmanned air vehicles with autonomy can fly optimized formations, react to ISR refinements and attrition, and strike the target(s) in the most effective manner. Controlling such actions requires speed not available in long-range, secure communications and requires more skilled humans than available. The rest of this offset is about getting the right information, recommendations, and/or orders to the every warfighter in the time each needs, which is no trivial task. Except for some pieces of cyber hardness, high speed is involved in all that is described as part of the Third Offset.

The First Offset's effects were four orders of magnitude larger than conventional bombs. The Second started at about two and also expanded the employment envelope to much larger than ever existed before. Assuming the analysis was done correctly to determine how much faster than our adversaries our capability needs to be for the Third Offset to be successful, one question remains. Do we have the national resolve to acquire it fast enough?

Col. Don Rupert,
USAF (Ret.)
Shalimar, Fla.

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CHIEF MASTER SERGEANT CHANGE: CMSgt. Kaleth O. **Wright,** to Chief Master Sergeant of the Air Force, USAF, Pentagon. ✪

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By Jennifer Hlad

CSAR Hercs leave Afghanistan; C-130Js for rescue; Speed saves ....

GOOD-BYE, HC-130S

As the US military has reduced the number of American troops in Afghanistan, it has also worked to close forward operating bases, return equipment to permanent bases, and reduce the overall footprint there. Part of the drawdown effort included pulling HC-130s—the combat search and rescue (CSAR) version of the C-130—from the country.

Still, more than 8,000 US troops remain in Afghanistan, and the loss of the HC-130 from the large and mountainous country left a void, making it significantly harder for pararescuemen to reach a downed pilot or other isolated service members quickly if necessary.

Normally, the rescue triad is made up of Guardian Angels (the specialized personnel recovery airmen), HH-60 Pave Hawks, and HC-130s. Losing the HC-130s led to a reduction in "range and speed," explained Lt. Col. Scott Nichols, commander of the 83rd Expeditionary Rescue Squadron.

HELLO, RESCUE VULTURES

To make up for that loss, the 83rd, the 774th Expeditionary Airlift Squadron, and the 455th Expeditionary Aeromedical Evacuation Squadron (EAES)—all from the 455th Air Expeditionary Wing—created something they call "Vulture Rescue."

Lt. Col. Sarah Santoro, commander of the 774th, told *Air Force Magazine* that the C-130 unit at Bagram Airfield, Afghanistan, is not trained in personnel recovery, but does provide airlift and airdrop of personnel and equipment as part of its core capabilities.

Airmen with the 455th Expeditionary Aeromedical Evacuation Squadron prepare to load medical equipment onto a C-130J at Bagram Airfield, Afghanistan, in May 2016.

USAF photo by SrA. Justyn M. Freeman

"We're very familiar with the airdrop mission," Santoro said, and although the squadron "is not trained in CSAR, we can help provide capability for that need"—namely, getting Guardian Angels to far-flung locations quickly.

Before Vulture Rescue, teams would need more time to get to an isolated person because they would have to fly the entire way in HH-60s, possibly needing to stop for fuel on the way, Nichols said.

Now, "they can load onto a C-130J along with an aeromedical evacuation team and fly faster and straight to the isolated person," he said.

Then, Guardian Angel pararescuemen and combat rescue officers can jump out of the C-130J, take care of the person, and put him or her on an HH-60 Pave Hawk that can meet up with the C-130J "at a nearby airstrip and transfer the person to the medical team's care if needed," he said.

Col. Ricky Sexton, commander of the 455th EAES, pointed out that if someone is stranded far from any US base, the pararescue team may be working on the ground for several hours to keep the person safe. By the time they get to the aircraft, they may be "smoked," but if they're using the C-130J, they can turn the patient over to the EAES team—which includes critical care personnel—for additional care.

THE SPEED OF J

The C-130J can also get patients back to Bagram more quickly, where they can receive more treatment at the hospital there or be flown to Germany. Using Vulture Rescue instead of just the helicopters could get service members the care they need hours earlier than they would otherwise, he said.

"The bottom line is that we found a unique way to improve our capabilities and have a higher chance of saving lives in search and rescue situations," Nichols said.

"It's all about getting American hands on American personnel and getting them to safety and to the medical care they need," he continued.

The idea began with the previous deployment rotation of airmen, and those units did a full mission rehearsal in the late summer.

Nichols's, Santoro's, and Sexton's units arrived around October and immediately started hammering out details and planned another mission rehearsal for December, so if the capability would be needed, they're ready. ✪

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

By John A. Tirpak, Editorial Director

More ground troops on the way?; No effects-based operations; Fun to kill some people; Nuke adjustments ....

Dec. 7, 2016

CHAOS THEORY

If President-elect Donald J. Trump's pick for Secretary of Defense—retired Marine Corps Gen. James N. Mattis—is confirmed by the Senate, he will likely advocate a very different approach to the conduct of the war on ISIS: one that is more intense, less air-centric, and more likely to involve a larger contingent of US ground troops.

Trump's choice, taken in the context of initially picking "surface warfare" service veterans for nearly all key national security posts, raises concerns that he may not receive balanced advice regarding the use of airpower in the anti-ISIS fight or other potential conflicts.

Mattis is also on record as suggesting that the composition of the nuclear arsenal be reviewed, saying that eliminating the ICBM element of the nuclear triad would reduce costs and the risk of accidental war. Though the first steps have been taken in the last year to modernize all three legs of the triad, all three programs are in their infancy and could be stopped or redirected early in the new administration.

While Trump and Mattis share a common view of many world challenges, they disagree on others. Trump has suggested a more conciliatory approach to Russia and has called NATO "obsolete," but Mattis would likely challenge those attitudes, having consistently painted Russia as a serious threat and voicing strong support for the Alliance. Mattis apparently agrees with Trump's concerns about Iran, having called that country the "single greatest" threat to stability in the Middle East.

Trump's choice, formally announced Dec. 6, was extraordinary in a number of ways. If confirmed by the Senate, Mattis, who used to go by the call sign Chaos (said to be an acronym from his O-6 days for Colonel Has An Outstanding Solution) would become the only recently retired general to hold the SecDef post since George C. Marshall during the Truman administration. Congress would have to pass special legislation waiving the 1947 federal law that demands that a general be retired at least seven years (originally 10 years, but amended in 2008) before taking a top defense post.

After Marshall's tenure ended, special legislation contained language that it is "the sense of the Congress that … no additional appointments of military men to that office shall be approved."

Sen. John McCain (R-Ariz.), who won reelection in November and thus retains his status as chairman of the Senate Armed Services Committee, praised the choice on Dec. 1, saying Mattis is "one of the finest military officers of his generation and an extraordinary leader who inspires a rare and special admiration of his troops." McCain said he hoped to move "forward with the confirmation process as soon as possible in the new Congress."

Nevertheless, Senate Republicans, who only have 54 seats, would need to round up six more votes to pass the waiver to allow Mattis to take the job. Sen. Kirsten Gillibrand (D-N.Y.) said that while she holds Mattis in high regard, she's concerned about civilian control of the military and wouldn't support a waiver.

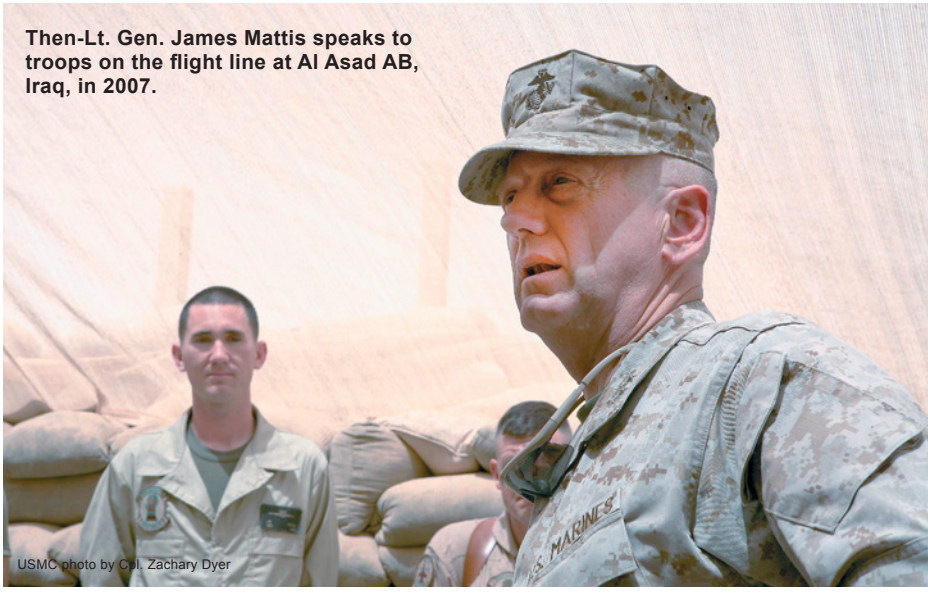
Trump said, "A lot of people are going to be very angry" if the waiver isn't granted.

Known by other nicknames, such as "Mad Dog"—the one Trump never fails to use—and "Warrior Monk" (a reference to Mattis' never-married status), Mattis retired in 2013 after a 41-year uniformed career. He led the 1st Marine Division in the 2003 Iraq War and presided over the protracted and casualty-heavy battle for Fallujah.

In his last post, he was head of US Central Command (CENTCOM), which has purview over most of the Middle East. Reportedly, there was friction between Mattis and the Obama White House over the handling of the war in Afghanistan, where Mattis wanted a more aggressive ground campaign.

EBO-NIX

In a previous assignment, Mattis was head of Joint Forces Command (JFCOM, abolished in 2011), and there voiced his disdain for effects-based operations (EBO),



Then-Lt. Gen. James Mattis speaks to troops on the flight line at Al Asad AB, Iraq, in 2007.

USMC photo by Cpl. Zachary Dyer

calling the concept, which had paved the way to victory in Desert Storm and subsequent wars in the Balkans, Afghanistan, and Iraq, "fundamentally flawed." Mattis, outlawing use of the term and concept in a 2008 directive, said he objected to the ideas of effects-based operations because they had "not delivered on their advertised benefits." Airpower advocates, however, saw Mattis' move as simply countering what he perceived as a threat to the primacy and funding of ground forces.

The EBO concept holds that it's more important to concentrate on desired outcomes—such as silencing a command and control network, cutting off power in the enemy capital, or blinding enemy leadership—rather than the specific tools used to achieve those ends or traditional, set-piece battles focusing on troops at the forward line of battle.

Despite Mattis' objections, EBO has become accepted doctrine by all the services, though under different names. The Air Force resurrected the term just a couple of years after Mattis left the JFCOM post.

As CENTCOM chief, Mattis pushed for an ever greater number of ground troops in Afghanistan and Iraq to carry out the counterinsurgency war.

While CENTCOM commander, Mattis pushed to keep more carrier battle groups on station near Iran to deter that country. He has been an opponent of the deal struck with Iran over its development of nuclear weapons, saying the agreement will only slow Iran's march to become a nuclear power. Speaking at the Center for Strategic and International Studies in April 2016, Mattis said the next President will "inherit a mess" because of the Iran deal. He also said US influence has been waning in the Middle East for decades, and he has complained about the Obama administration not taking a tougher stance against Chinese island-building in the Pacific and Russian aggression in Eastern Europe.

However, in remarks at the CSIS event, Mattis said there's "no going back" on the nuclear deal with Iran "absent a real violation" of Iran's obligations under that agreement. European allies, he said, wouldn't go along with new sanctions, and US sanctions alone would lack the necessary force to bring Iran to heel. Under the agreement, the US and other countries lifted a decades-long freeze on Iranian assets in exchange for Iran promising to limit certain kinds of nuclear research and uranium enrichment for a number of years. Critics—including Mattis—said the deal merely ensured that Iran would eventually—legally—obtain nuclear weapons, but on a longer timetable, funded with the windfall of its unfrozen assets.

Mattis is fond of nonpolitically correct comments, having famously said it's "fun to shoot some people" and "be polite, be professional, but have a plan to kill everybody you meet." There are Web pages devoted to Mattis quotes. In announcing his choice for the SecDef job, Trump compared Mattis to World War II Gen. George S. Patton, famous both for salty, intemperate language and a hard-charging attitude reveling in battle.

Mattis is known to have a military library of thousands of volumes and is considered by the Marine Corps and some others as a military visionary. He has written one book about the military, *Warriors and Citizens: American Views on Our Military,* published in 2016. In it he decried the growing gap between the citizenry of the US and its military, noting that fewer and fewer Americans have any firsthand knowledge of the military and warning that this disconnect may create problems.

DYAD IN THE WOOL

In 2015, Mattis testified before the Senate Armed Services Committee about the potential future of the nation's nuclear arsenal, saying "fundamental questions must be asked and answered" about how many nuclear weapons to maintain and their alert status. He suggested that if nuclear weapons are only for deterrence, "we should say so, and the resulting clarity will help to determine the number we need." Reducing the triad of ICBMs, bombers, and nuclear-armed submarines to a dyad of bombers and subs only "would reduce the false-alarm danger," Mattis said at the hearing.

GROUND-BASED PERSPECTIVE

Trump's early national security lineup features almost entirely retired generals and veterans from the Army and Marine Corps. For national security advisor, he tapped retired Army Lt. Gen. Michael T. Flynn; for CIA, Rep. Michael R. Pompeo (R-Calif.), a West Point graduate; for Homeland Security chief, retired Marine Corps Gen. John F. Kelly. Joint Chiefs of Staff Chairman Gen. Joseph F. Dunford Jr. is also a marine.

One retired Air Force general, who spoke about the Mattis nomination on background, said he was worried that with all the surface-service leadership on the Trump team, "you have no diversity of thought." He observed that most of those being tapped "are the people who created that counterinsurgency doctrine. So where's the innovation in thought? Where are the different options going to come from?"

The "fear is," the general said, Mattis "only sees airpower and the Air Force as aerial artillery to be used in support of ground forces."

The episode regarding Mattis and EBO was troubling, he continued, because "as head of Joint Forces Command, you shouldn't be closing your mind to any ideas. You should be opening your arms to the widest spectrum of ideas."

When all the people in the room fall back on their experience, and there is no champion of airpower, the default may well follow the thinking that led to "these long, drawn-out, indecisive outcomes in Iraq and Afghanistan."

The retired general acknowledged, though, that he believes Mattis will be able to manage the Pentagon bureaucracy, having experienced it himself, "operationally." His concern is only "aren't we a little lopsided here, with regard to perspective?"

Aerospace Industries Association President David F. Melcher, when asked if he's concerned about the ground-service-heavy makeup of the Trump national security team, said, "I'm really not." He explained, "Every one of those guys, like General Mattis, was responsible for the whole combined-arms team." Their experience in that respect means "they understand what everybody brings to the fight. And they're going to advocate for what's needed most, both short term—[the] combatant commander view—and longer term, department-wide. So I'm not concerned about that."

Melcher, himself, is a retired Army three-star general. ✪

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SrA. Brandon Thompson provides security during a recapture and recovery exercise at a North Dakota missile complex. In this scenario, defenders set up a security perimeter to watch for hostile forces.

USAF photo by SrA. Apryl Hall

By Wilson Brissett, Senior Editor

■ Air Force Names New Top Enlisted Leader

Air Force Chief of Staff Gen. David L. Goldfein announced on Nov. 16 that CMSgt. Kaleth O. Wright will serve as the 18th Chief Master Sergeant of the Air Force, taking over from CMSAF James A. Cody in February.

Wright joined the Air Force in 1989 and has most recently served as the command chief master sergeant of US Air Forces in Europe at Ramstein AB, Germany.

In 2014, he deployed to Afghanistan as command chief master sergeant of the 9th Air and Space Expeditionary Task Force-Afghanistan in Kabul.

Wright is the second African-American top enlisted leader for the service and the first since CMSAF Thomas N. Barnes held the position from 1973 to 1977. Goldfein announced Cody's retirement in September at AFA's Air, Space & Cyber Conference.

■ Silver Star Awarded for Valor in Afghanistan


USAF photo by Amn. Miranda A. Loera

Retired Air Force SSgt. Benjamin D. Hutchins received a Silver Star for his heroism in Afghanistan seven years earlier. The ceremony was at Fort Bragg, N.C., on Nov. 4, the *Fayetteville Observer* reported.

Hutchins, at the time an airman first class, risked his life in November 2009 by jumping into the Bala Murghab River in Afghanistan while under enemy fire in an attempt to save two soldiers who had fallen in.

According to the Silver Star citation, "Airman Hutchins, despite the onslaught of enemy fire, refused to leave the two soldiers and persisted in his recovery attempt until American forces arrived to repel the enemy and assist with the recovery." Hutchins is credited with helping friendly forces overwhelm the enemy stronghold.

He was medically retired in 2014 from wounds received in combat in 2012 and lives in Fayetteville, N.C., where he operates a construction business, according to the *Observer.*

■ Combat Controller Receives Silver Star

On Nov. 16, Air Force SSgt. Keaton Thiem received the Silver Star during a ceremony at JB Lewis-McChord, Wash. During an intense 14-hour battle on Feb. 22, 2016, in Afghanistan, Thiem, a combat controller with the 22nd Special Tactics Squadron, ventured into enemy fire to rescue four teammates and directed 22 aircraft to deliver 3,000 pounds of bombs.

"It's hard to say the fear goes away, because it's definitely nerve-wracking," Thiem said at the ceremony. "Having the weight of the situation on your shoulders, disregard for yourself takes over and you do what you have to do to make sure the rest of the team gets out of there."

Three Special Forces soldiers also received Silver Stars for their actions in the same fight. "What means the most is when my teammates on the Army side reach out and congratulate me because they were there with me," Thiem said. "I don't even have words to explain what I feel when some of them tell me I saved their lives. … It's humbling."


USAF photo by SrA. Ryan Conroy


USAF photo by SSgt. Matthew B. Fredericks

■ Boeing Receives Contract for F-15 Upgrade

The Air Force has awarded Boeing a $478.8 million contract to develop the Eagle Passive/Active Warning Survivability System (EPAWSS) electronics upgrade for the F-15 Eagle fighter aircraft.

In October 2015, Boeing received a $4 billion technology maturation and risk reduction contract to develop new self-defense and electronic warfare systems for the F-15 fleet. With this follow-on award, the program enters the engineering, manufacturing, and development phase for work on the F-15C and F-15E variants, according to Boeing. The work is expected to be completed in 2020 and is part of a series of upgrades intended to keep the F-15 operational through the 2030s and into the 2040s.

■ Vietnam-Era Defense Secretary Dies at 94

Melvin R. Laird, Defense Secretary under President Richard M. Nixon from January 1969 to January 1973, died at Fort Myers, Fla., Nov. 15 at age 94.

Laird was the architect of the all-volunteer US military, as well as the policy of "Vietnamization." Under that approach, the Nixon administration reduced US forces in Southeast Asia and shifted the main responsibility for fighting North Vietnam to the Saigon government. Laird's advocacy for prisoners of war held by North Vietnam was largely credited for their return. He played an important role in nuclear arms control. Laird also oversaw development of two Air Force fighters still in service today.

Laird was born in Nebraska and served as a Navy officer in World War II, wounded in action while serving on the destroyer USS *Maddox.*

After the war, Laird, 23, was elected to fill the seat in the Wisconsin senate left vacant by his father's death. At 29, he was elected to the House and served nine terms there, specializing in health issues and military affairs and serving as a highly influential member of the Appropriations Committee. He was responsible for expanding the capabilities of the CDC (Centers for Disease Control and Prevention). On defense matters, he frequently voiced the opinion that military superiority was the "best insurance" against attack.

Laird was Nixon's second choice to be Secretary of Defense (after Sen. Henry M. "Scoop" Jackson, a Democrat from Washington, declined) and the first serving member of Congress to be elevated to the post. He supervised the reduction of US forces from 550,000 to about 69,000 in Southeast Asia during his tenure and urged Nixon to negotiate an end to the war. He believed the money would be better spent on building up the nation's nuclear deterrent and general-purpose forces.

Laird coined the term and process of Vietnamization. It gave Nixon an out from the war under Nixon's sobriquet, "Peace With Honor."

He opposed Nixon's desire to keep secret a 1969 bombing campaign and then a ground incursion in Cambodia. He correctly predicted it would turn the public even more against the war when revealed.

Laird overhauled the military draft starting in 1969, eliminating the deferment policy that excused young men from service if they attended college. He created the lottery system, then shifted from the draft to call-ups of the Guard and Reserve to flesh out military forces overseas. Just before the end of his tenure in 1973, he announced the end of the draft and the beginning of the all-volunteer force. Laird supported the program that led to the F-16 and the one that led to the A-10 attack jet.

Though Nixon and Secretary of State Henry A. Kissinger preferred to decouple the issue of POWs from peace talks, Laird was a vocal supporter of the prisoners, publicizing their brutal treatment at the hands of the North Vietnamese. Conditions for the POWs improved after Laird held a news conference about their plight, and they were repatriated in 1973.

As SecDef, Laird allowed service Secretaries great autonomy in running their departments and he was well-regarded on Capitol Hill. He was considered instrumental in bringing about the 1972 SALT (Strategic Arms Limitation Talks) agreement with the Soviet Union, having convinced the Soviets that the US would, if necessary, outspend and outbuild them in nuclear arms.

After leaving the Pentagon, Laird succeeded John D. Ehrlichman as Nixon's domestic advisor and in that capacity urged Nixon to choose Gerald R. Ford as the replacement for Vice President Spiro T. Agnew after Agnew was forced to resign in a bribery scandal. Laird left the Nixon administration in early 1974.

Though offered senior positions in the White House when Ford became President, Laird remained in the private sector, serving as a member of the boards of *Reader's Digest* and Martin Marietta, a defense contractor, and as chairman of the board of Communications Satellite Corp. (COMSAT).

President Ford presented Laird with the Presidential Medal of Freedom in 1974.

■ USAF Releases Draft RFP for Huey Replacement

The Air Force on Dec. 2 released a draft request for proposal (RFP) to replace its UH-1N fleet, looking to buy 84 new helicopters to patrol missile fields. The draft RFP called for responses by Dec. 16. The Air Force has said it will have a "full and open" competition for the new helicopters. Air Force Materiel Command held its second Industry Day Dec. 12 to 13 to solicit input from contractors.

The service previously held an Industry Day in September, with representatives from Bell Helicopter, Airbus, Boeing, Northrop Grumman, Sikorsky, and GE Aviation, among others, attending. A contract is expected to be awarded in Fiscal 2018. The service wants off-the-shelf replacements that could be delivered quickly after the award is issued.

USAF photo by A1C Brandon Valle

■ Could Nighthawks Be Used as Red Air?

Air Combat Command has not ruled out bringing some retired F-117 Nighthawks out of flyable storage to serve as Red Air targets or adversaries for fifth generation F-22s and F-35s, ACC chief Gen. Herbert J. "Hawk" Carlisle told reporters at the Defense IQ International Fighter conference in London.

"I can't really go into specifics," Carlisle said, "but it makes sense if you think about it being out there." The F-117s are "the only other stealth" platform available for the job, he said, noting that flying F-22s or F-35s against each other is "counterproductive." In other symposia, Carlisle and several USAF leaders have said such engagements would provide poor training and waste precious flying hours for the two jets, already in short supply.

USAF photo by SSgt. Aaron D. Allmon II

Carlisle said that in his younger days, "you'd go out and fly F-15s against F-15s," but the Red Air pilots would restrain themselves from using their full capabilities and use enemy tactics. "Today, doing that in the F-22 is not only zero training, it's a little bit negative training" because the engagement would be a quick and almost effortless victory for the F-22.

At an AFA Mitchell Institute for Aerospace Studies program last June, then-Maj. Gen. Jeffrey L. Harrigian (now a lieutenant general), the F-35 Integration Office director at the time, said if F-22 pilots don't emerge from a practice battle "sweating," having taken on maybe more fighters than they could deal with, the engagement offered no value.

—Angus Batey

■ Lockheed Martin Receives $7.2 Billion for F-35 Lot 10

The Department of Defense awarded Lockheed Martin a contract for Lot 10 of F-35 production, not including engines, on Nov. 23. The undefinitized contract is for 90 aircraft and has a ceiling of $7.2 billion.

The F-35 Joint Program Office said the new contract demonstrates DOD's confidence in the F-35 program, but that troubled negotiations between the government and Lockheed Martin had not yet been resolved.

"With a complex production line and a dynamic supply chain, it was important to obligate funds," said JPO spokesman Joe DellaVedova, "so that no major delays would be seen in production. We are confident the finer terms of the LRIP 10 [Low Rate Initial Production Lot 10] contract will be settled over the next few months."

Lot 10 will produce 44 F-35As for the Air Force, nine F-35Bs for the Marine Corps, and two F-35Cs for the Navy by March 2020. First deliveries of Lot 10 aircraft will be in the first quarter of 2018. The contract also includes 35 aircraft produced for non-DOD customers and foreign military sales.

Lockheed Martin photo by Darin Russell

By the Numbers

400,000

The number of accounts Twitter has suspended for ISIS-related material in 2016, according to the State Department.

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

Casualties

By Dec. 16, a total of 33 Americans had died in Operation Freedom's Sentinel (Afghanistan), and 32 Americans had died in Operation Inherent Resolve (Iraq and Syria).

The total includes 62 troops and three Department of Defense civilians. Of these deaths, 29 were killed in action with the enemy while 36 died in noncombat incidents.

There have been 145 troops wounded in action during OFS and 21 troops in OIR.

US Aircraft in Afghanistan Have Busiest Month

US aircraft in Afghanistan had their busiest month of the year in October, dropping 205 bombs on Taliban and ISIS targets. The October tally brings the total for 2016 to 1,180, already 233 more than for all of 2015, according to Air Force statistics released Nov. 25.

Of the 4,500 total sorties flown by US aircraft, at least one weapon was dropped during 552 of those sorties—up from about 141 from 2015. The increase has coincided with more authorities to target both the Taliban and ISIS, as announced by the Obama administration in late 2015.

The number of weapons dropped in Afghanistan in October is just one-tenth of the overall effort in Iraq and Syria, where US and coalition aircraft dropped 3,038 weapons that month. Coalition aircraft in Operation Inherent Resolve have already eclipsed last year's number of sorties with at least one weapon released, with 9,958 flown by October in 2016 compared to 9,912 in all of 2015.

Carlisle Expects F-35 To Join Anti-ISIS Fight

Air Combat Command boss Gen. Herbert J. "Hawk" Carlisle said he has "absolutely no doubt" the F-35 will be deployed for Operation Inherent Resolve. Speaking Nov. 16 during the Defense IQ International Fighter conference in London, Carlisle emphasized that the stealth fighter's data fusion and ISR capabilities could be key attributes in the anti-ISIS fight.

"When you look at Iraq and Syria today, what's going on on the ground, the players that are in the airspace—it's like nothing we've fought before," he said. "It's incredibly complex. Airplanes like an F-22 or an F-35, because of the situational awareness that they provide, the information they relay, the real-time sensor suites they have, their ability to do things in airspace that other airplanes cannot do, makes them incredibly valuable in the fight. I see a very big place for the F-35 in that fight."

—Angus Batey

The Fight for Raqqa Is Underway

The Syrian Democratic Forces (SDF) began its advance toward Raqqa, Syria, on Nov. 6. "The effort to isolate, and ultimately liberate, Raqqa marks the next step in our coalition campaign plan," said Defense Secretary Ashton B. Carter in a statement released the same day. "As in Mosul, the fight will not be easy and there is hard work ahead, but it is necessary to end the fiction of [ISIS's] caliphate and disrupt the group's ability to carry out terror attacks against the United States, our allies, and our partners."

Pentagon spokesman Peter Cook said on Nov. 7 the SDF had "encountered resistance" so far, but they continue to receive support from coalition air strikes. He said the Syrian campaign will look different from the fight to retake Mosul, Iraq, because the United States does not have any "formal government forces or conventional military operating in Syria."

Iraqi Forces Find Mass Graves on Approach to Mosul

Iraqi forces on their approach into the ISIS-held city of Mosul discovered a mass grave containing about 100 bodies, another sign of the bloody rule the group has exerted over the country's second-largest city. The grave, found in an agricultural town, contained decapitated bodies, and Iraqi forensic experts did not know if they were security forces or civilians, according to the BBC.

Two more mass graves were found later that month.

Iraqi forces faced a tough fight as they worked to move farther inside the city, and ISIS on Nov. 8 fought back by abducting almost 300 former Iraqi Security Forces members and forcing 1,500 families to retreat with them, the United Nations reported, according to Reuters.

CENTCOM Releases Civilian Casualty Figures

Twenty-four US air strikes in Iraq and Syria may have killed 64 civilians and injured another eight, US Central Command announced on Nov. 9. The strikes took place between Nov. 20, 2015, and Sept. 10, 2016, and were intended for ISIS targets such as weapons storage facilities, fighting positions, headquarters buildings, and weapons systems.

In several of the strikes, CENTCOM said civilians had entered the target area after weapons were released. "It's a key tenant of the counter-[ISIS] air campaign that we do not want to add to the tragedy of the situation by inflicting additional suffering," Col. John J. Thomas, a CENTCOM spokesman, said in a news release. "Sometimes civilians bear the brunt of military action, but we do all we can to minimize those occurrences even at the cost of sometimes missing the chance to strike valid targets in real time."

The Department of Defense also announced on Dec. 1 that three air strikes in the month of October possibly resulted in civilian casualties in Iraq and Syria. As of mid-December it was still investigating those claims.

Planning for the Long Term in Iraq

Iraqi and US officials are planning for the next five years of security in that country, confident in the progress made against ISIS, the top uniformed officer said during a visit to Baghdad. Marine Corps Gen. Joseph F. Dunford Jr., Chairman of the Joint Chiefs of Staff, said in a troop talk Nov. 9 that Iraqi military leaders want to work with the US for a plan of operations over the long term.

"Last year we were talking about the next five days with uncertainty," Dunford said according to a DOD news release on the visit. "Now they are confident enough to talk about what they will do when [ISIS] is defeated to make sure they have security here in Iraq that is worth the sacrifice that marines, soldiers, airmen, sailors [have] made over the years."

■ Air Force Memorial's 10th Anniversary

AFA commemorated the 10th anniversary of the Air Force Memorial on Oct. 14 in Arlington, Va., with a distinguished group of guests. Secretary of the Air Force Deborah Lee James and Chief of Staff of the Air Force Gen. David L. Goldfein, among others, offered remarks at a ceremony led by television journalist and former airman Bob Schieffer.

The program featured a video message from former President George W. Bush, who had led the 2006 ceremony dedicating the memorial; a performance by "American Idol" alumna Melinda Doolittle; and a poetry reading by "Good Morning, Vietnam" radio personality Adrian Cronauer.

Schieffer called the memorial "a reminder of what is right about America, that Americans are a great and good people." Goldfein said the three arching spires of the memorial were built to commemorate "those who sacrificed everything so we can experience freedom." AFA President Larry O. Spencer offered a tribute to the Tuskegee Airmen, three of whom were in attendance. James was named an honorary Tuskegee Airman and received an iconic red jacket from the group.

In her remarks, James addressed the future of the Air Force, suggesting the memorial represents "the three domains in which we operate—air, space, and cyberspace." In his video statement, Bush said the memorial cost $53 million to build and had received over two million visitors in its first 10 years.

Staff photo by Mike Tsukamoto

USAF photo by A1C Emily A. Kenney

■ Holloman To House Interim F-16 Training Squadrons

The Air Force announced on Nov. 17 that Holloman AFB, N.M., is the preferred interim location for two new squadrons devoted to training F-16 pilots. The squadrons will be activated "to increase fighter pilot production as part of an effort to address a critical fighter pilot shortage," according to the Air Force.

Forty-five F-16s are slated to arrive from Hill AFB, Utah, to begin training this summer, and more instructor pilots and maintainers will be added to Holloman's manning.

The Air Force is evaluating 34 installations to select permanent homes for the squadrons. Candidate bases, to be identified early this year, must be in the continental US, must already have a fighter mission, and must have a runway at least 8,000 feet long.

■ US, Philippines Relations Begin to Thaw

After months of open criticism of the US by Philippines President Rodrigo Duterte and threats to withdraw military cooperation, the relationship between the two nations may be returning to normal.

On Nov. 7, the Philippines' defense minister walked back some recent claims by Duterte regarding US military relations, saying exercises would just be scaled back instead of completely canceled. Defense Minister Delfin Lorenzana said joint military options will become less combat-focused, and the already signed Enhanced Defense Cooperation Agreement would stay in place, Reuters reported. The Philippine government said the number of exercises would fall from more than a dozen to six or seven.

After the US presidential election on Nov. 8, Duterte struck a newly conciliatory tone toward the United States in a speech delivered to a Filipino audience Nov. 9 during a visit to Malaysia. "I would like to congratulate Mr. Donald Trump. Long live," Duterte said, according to Reuters. "I don't want to quarrel anymore, because Trump has won."

USAF photo by Capt. Mark Lazane

By Megan Scully

Ready, Aim, Fire

Congress took aim at the Pentagon bureaucracy in the massive Fiscal 2017 defense authorization bill, stuffing the legislation with significant changes to everything from combatant commands to the defense acquisition shop in an effort to streamline the department's operations.

Many of the changes, some of which have been years in the making, will take effect at or near the outset of the Trump administration.

Perhaps one of the most sweeping reforms in the extensive legislation is language establishing US Cyber Command as its own unified command, a move that elevates the increasingly important and highly technical mission. Since it stood up in 2010, Cyber Command has been a subsidiary of US Strategic Command.

The effort started last year, when Senate Armed Services Chairman John McCain (R-Ariz.) said he intended to use the bill to separate Cyber Command from the broader Strategic Command, a move he hopes will make the mission more efficient. But the language actually originated in the House-passed defense bill, which stated that the promotion would "provide greater military readiness and preparedness to carry out assigned missions."

The bill also thwarts internal efforts made by some officials in the Obama administration to end the so-called "dual-hat arrangement" in which the National Security Agency director also serves as the chief of Cyber Command. Specifically, the bill blocks the Pentagon from making any moves to separate those jobs until the Defense Secretary and Joint Chiefs of Staff Chairman certify to Congress that doing so would not pose unacceptable risks to operations at Cyber Command.

McCain, who championed the provision, has said that he did not want to act prematurely on the matter in the administration's final days. But those who supported the separation, including then-Director of National Intelligence James R. Clapper Jr., argued that it's simply too big a job for one person to hold.

Meanwhile, the bill makes significant changes to the structure of the Pentagon's powerful acquisition office. Effective February 2018, the bill divides the duties of the undersecretary of defense for acquisition, technology, and logistics into two new undersecretary positions—one that handles acquisition and sustainment and another charged with research and engineering.

The new structure could change the way the Pentagon buys weapons ranging from bullets to the B-21 bomber. It creates what lawmakers hope will be a healthy tension between the "chief technology officer," who is expected to take risks, and the "chief acquisition officer," whose primary responsibility is delivering programs and services in a timely and cost-effective way.

Meanwhile, the bill seeks to cut 110 general and flag officers from the military's Active Duty ranks by the end of 2022 and requires the Defense Secretary to study job descriptions to justify each senior military position in terms of overall force structure, scope of responsibility, command and control requirements, and force readiness execution.

Lawmakers on both sides of the aisle have expressed concerns that there are simply too many general and flag officers, creating a costly problem that has thrown the troops-to-leaders balance out of whack.

"Over the past 30 years, the end strength of the joint force has decreased 38 percent, but the ratio of four-star officers to the overall force has increased by 65 percent," according to a Senate Armed Services summary of the bill. "Especially at a time of constrained defense budgets, the military services must right-size their officer corps and shift as many personnel as possible from staff functions to operational and other vital roles."

The bill also seeks to cap the size of the National Security Council staff to 200 nonadministrative personnel, a move that lawmakers hope will rein in a White House organization that many on Capitol Hill believe has gained outsized importance in military decision-making as it has grown in the last 25 years.

Congress intended the NSC to be a small group of the President's close advisors, "focused on developing whole-of-government national security strategy and coordinating it across the interagency," according to the Senate Armed Services Committee summary of the bill. Some lawmakers, however, believe the NSC has become too involved in the Pentagon's daily operations and the chain of command.

Other bill highlights include:

- Prohibiting A-10 retirement until F-35 strike fighter initial operational testing and evaluation is complete.
- Boosting oversight of the follow-on F-35 modernization effort by imposing reporting requirements similar to major defense acquisition programs.
- Increasing reporting requirements on the B-21 bomber and establishing ongoing oversight by the Government Accountability Office, Congress' investigative arm.
- Limits the availability of funds for the Joint Surveillance Target Attack Radar System recapitalization program unless the contract for engineering and manufacturing development uses a firm fixed-price contract structure. ✪

Airmen work on cyber warfare operations at JBSA-Lackland, Texas.

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

USAF's Force Improvement Program is now repairing problems in the ICBM force that developed over many years.

REBUILDING THE MISSILE FORCE

By Wilson Brissett, Senior Editor

USAF photo

After the Cold War, the Air Force's nuclear mission had in many ways been pushed to the back burner by the pressing demands of hot wars in the Balkans, Afghanistan, Iraq, and elsewhere. Airmen assigned to the nation's nuclear missions generally performed with dedication and professionalism, but misguided policies and an overall lack of focus on the mission led to a series of serious failures and shortcomings.

In August 2007, a B-52 landed at Barksdale AFB, La., after a routine transport flight. Ground crews were later stunned to discover that instead of arriving with inert warheads, the bomber had carried six "live" AGM-129 nuclear cruise missiles from Minot AFB, N.D. No one on the bomber's crew or at Minot was aware of that fact.

The spectacular, headline-grabbing mistake was the first of a number of conspicuous signs that the Air Force's nuclear mission—arguably its most important function—had lost direction. The Minot incident eventually forced the resignations of a Secretary of the Air Force and a Chief of Staff, a major Air Force reorganization, and a program to tighten up the standards, but there was more to come.

The sense of a mission in crisis was reinforced in January 2014, when 92 nuclear missile officers at Malmstrom AFB, Mont., were caught cheating on their monthly nuclear proficiency exams. Within a month, then-Lt. Gen. Stephen W. Wilson (now the four-star vice chief of staff), commander of Air Force Global Strike Command at the time, announced a Force Improvement Program (FIP) to get to the bottom of the problem and make necessary changes.

Now—because of these embarrassments and because other nations have created and modernized their own nuclear systems—the Air Force is putting far more attention and money toward improving and strengthening its nuclear program.

BEST PRACTICES

The FIP was launched in 2014 by Lt. Col. Russell S. Williford, commander of the 320th Missile Squadron at F. E. Warren AFB, Wyo. At the time, Williford was a newly minted Ph.D. working at Global Strike Command. Leadership approved his methodology to lead an assessment of ICBM operations and put him in charge of it.

The FIP was driven by surveys and best practices. Airmen working in the ICBM career field were surveyed about their culture, support, demands, working conditions, and what led to the scandals of 2007 and 2014. Williford and his team came away from these surveys convinced of the need for "a cultural change" to place the nuclear mission more "in line" with the rest of the operational Air Force.

The FIP results made it clear to Williford that the nuclear field had entered a holding pattern. Without the Cold War sense of urgency for the mission, the missile career field had grown isolated. Its leadership had become geared toward mere survival, its infrastructure and equipment had become "outdated" and worn, and its evaluation regime had grown abstract and inflexible. What was needed was alignment with the changes that had taken place over the years elsewhere in the Air Force.

"We took the best practices across the operational Air Force and then adapted those and applied them to the ICBM operations career field," Williford said. The two key areas where the mission was out of sync with the larger service, according to the FIP findings, were mission focus and authority within the chain of command. Both problems have close connections to training.

Over the years, training and evaluation had taken on an out-of-proportion importance in the nuclear mission. There was too much training, the requirements were unrealistic and out of line with reality, and this drove an impractical pace and structure of operations.

While Air Force pilots are evaluated every 12 to 15 months, Williford found that missile crew members were being evaluated multiple times per year. This pace gave rise to widespread anxiety about performance on nuclear knowledge tests—what many in the nuclear missile community now talk about as an impossible-to-meet "culture of perfection."

Eventually, "mission drift" set in, Williford said.


USAF photo by A1C Dillon Johnston


USAF photo by Josh Aycock

First page: An unarmed Minuteman III ICBM blasts out of a silo during an operational test launch Feb. 25, 2012, at Vandenberg AFB, Calif. One change brought by the FIP is that nuclear mission officers now travel to Vandenberg to watch test launches. Above left: 1st Lt. Tony Onitsuka takes a test in 2015 at Malmstrom AFB, Mont. Missile crew members were being tested several times a year, unlike pilots who are evaluated every year-plus. Above: 2nd Lt. Wesley Griffith (l) and 1st Lt. Katie Grimley work in the launch control center in a missile alert facility at Malmstrom.

The ICBM work had "started to focus more on operations within the gate of the base," where training happens, "instead of where the mission is, which is in the field."

Airmen told Williford training was too rigid. Experience in a simulator was limited to a "singular, four-hour event," while evaluators relied too much on paper-based tests. This "standardized, one-size-fits-all" approach artificially separated the responsibility for safeguarding nuclear weapons systems from the authority of team leaders to tailor training to the needs of their crew.

To create a more realistic and sustainable training and evaluation culture, two of the most important FIP reforms are incentives to "reward the mission" in the field and a move to "align authority with responsibility," Williford explained. In terms of training and evaluation, this has meant closely pairing classroom instruction with the simulator and more complex and frequent simulator time. The new training standard for nuclear officers is a 12-hour simulator mission with six different crews. This model allows crew members to "bolster realism" by practicing the handoff of alert status from one crew to another.

There's more flexibility in training since the FIP. Because missile crews have different levels of knowledge and experience, Williford said simulator work "allows us to tailor the training to the needs of a crew" in a way that a standardized, paper-based test can't match. Williford sees an important point about empowerment here.

"Giving the squadrons back that authority to modify their training," he said, has produced "little pockets of innovation, and we start spreading them across the group."

The goal of the training and evaluation reforms is to shift the emphasis from knowledge to proficiency, Williford said. When the FIP team looked at the rest of the Air Force, they found a concentration on proficiency and currency in leadership development" that was lacking in the nuclear field. Using the simulator more and fostering flexibility and innovation in training would "reward the proficiency aspects of things."

The new approach is supposed to create well-rounded professionals in the nuclear mission instead of skilled test-takers.

GET OUT OF THE SILOS

In the hunt for nuclear proficiency, the FIP discovered that officers need to get out of the silos and off the northern tier bases more often. This involves "professional development opportunities," Williford said, in the form of continuing education, cross-service visits elsewhere within the US nuclear forces, or a trip to observe live ICBM test launches at Vandenberg AFB, Calif.

As important as training, evaluation, and education are to the nuclear mission, however, the FIP also took aim at patterns of leadership, career field structure, and funding levels.

For Capt. Kristin Selvidge, a flight commander in the 490th Missile Squadron at Malmstrom, the changes in leadership were the most noticeable outcomes of the FIP. Before the cheating scandal, said Selvidge—who has served at Malmstrom since 2011—senior leadership was "intimidating" to many junior officers. They often found themselves "afraid to ask a question." After the investigation, "they just completely changed all the leadership," to find leaders who were "more approachable."

Leadership changes weren't just about intangibles, according to Col. Stacy Jo Huser, commander of the 91st Operations Group at Minot AFB, N.D. The FIP determined that "everybody who is a 13N"—the Air Force specialty code for nuclear and missile operations—"will pull alert," Huser said.

"Prior to FIP, your squadron commanders didn't pull alert," and neither did wing commanders. "Now all those folks are pulling alert again with the crew members, and they're legitimate alerts. It's not a modified alert where they have a babysitter out there."

Pulling alert is the heart of the ICBM mission. It requires 24 hours of uninterrupted duty shared with a crew partner in a launch control center that can be a three-hour drive from the base. One of the two officers on alert has to be awake, monitoring the system, at all times.

For Selvidge, seeing commanders pulling alert has been crucial for morale.

"Seeing your leadership out in the field doing the work with the regular line crew members, I think [creates] more appreciation and respect."

Having more people pulling alerts spreads the duty around, creating a more sustainable operating tempo. A new requirement gives missile officers a day

USAF photo by A1C Malcolm Mayfield

USAF photo by SrA. Jason Wiese

Above left: 1st Lt. Krystal Wilder (l) and 1st Lt. Mary Vasta work in a launch control center during an alert in March. Above: 1st Lt. Pamela Blanco-Coca closes the blast door at a missile alert facility.

USAF photo by SrA. Jason Wiese

The remote conditions are made clear by this picture of an F. E. Warren AFB, Wyo., alert facility. The topside buildings house support and security forces, while missileers work underground in the launch control center.

off immediately after every 24-hour alert period. That's not bad for morale, either.

The FIP reforms are starting to pay off. More officers are staying in the nuclear missile career field. Previously, there simply weren't enough billets to retain officers in the middle of their careers. It was typical to do a three- or four-year tour at a nuclear base, then be forced to cross-train into another career altogether. A handful of high performers would stick around and eventually win staff positions, but "filling those middle gaps" created serious problems for mentoring and career-field continuity, Huser said.

"Starting with the FY17 accessions," Huser said, "13Ns are 13Ns for the rest of their careers." Additional billets have been created to make room for these midlevel leaders, and from now on there will be "two assistant directors of operations in each squadron," she said.

Supporting the manpower increase is a new "3+3" career-field structure, with young officers getting an initial crew tour to learn the mission, followed by a tour concentrating on leadership development.

The goal of many of these changes is to align the ICBM mission with standard practices across the rest of the Air Force. Because senior leadership also wants 13N airmen to understand the uniqueness of their mission, more money has been directed toward the career field since the early stages of the FIP.

In a speech at Minot on Sept. 26, 2016, Defense Secretary Ashton B. Carter said $10 billion has been invested in the nuclear career field over the last two years. The administration's budget also requests $108 billion more over the next five years to "sustain and recapitalize" the nuclear force.

How is the money making a difference? First, in January 2014, Air Force Secretary Deborah Lee James announced a new system of incentive pay for nuclear missile officers.

"Incentive pay is definitely a reality now," said 1st Lt. Yasmine Garcia-Smith. Crew members receive between $75 and $300 per month, depending on how many alerts they pull beyond the standard seven, she said. "It helps to show that our time is valuable," Garcia-Smith said, "and that the Air Force recognizes that."

New money for the nuclear mission has gone toward better gear for the security forces that protect the nuclear bases. They've gotten new uniforms, protective vests, and Advanced Combat Optical Gunsights for their weapons. The Air Force is also making progress on replacing the Vietnam-era UH-1N Huey helicopters used to patrol the vastly separated ICBM installations. A draft request for proposals for a new helicopter was released in December with a goal of fielding the system in 2021.

CHANGES OVERDUE

Improvements have come to facilities and to quality-of-life initiatives. Carter said Minot had received "a newly repaired runway, expanded childcare options, and fitness centers open 24/7." Nuclear officers said the changes were overdue. Selvidge was delighted when new amenities such as shelves, workout equipment, microwave ovens, and refrigerators began appearing in the underground capsules where crews sit alert at Malmstrom.

Huser said Minot now has an annual contract for "deep cleaning of our launch control centers." Despite the reality that "our elevators are decades old," though, the base has only recently moved "to get them refurbed and repaired."

Some of these quality-of-life changes, especially the infrastructure upgrades, go a long way toward catching the nuclear bases up to rest of the Air Force. "A lot of the stuff was outdated," Selvidge said. But others, like the pay raises, are to incentivize the mission and repair the professional culture to prevent future scandals.

So while funding has brought a number of positive changes, it's still a work in progress. Lt. Col. Jared Nelson, commander of the 742nd Missile Squadron at Minot, said that the chairs in the capsules where he and his crew pull alert are 50 years old.

Nonetheless, nuclear missile officers are genuinely proud of their work and even fiercely loyal to the remote bases where they are assigned.

"People who say, 'You don't want to go to Minot' have never been stationed at Minot," Huser said. She said a new indoor playground and splash pad was built to help parents endure the North Dakota cold with young children. Garcia-Smith said, "There's always something for you to get involved in" at the base. Williford, who began his career as a missileer there, agreed that "the sense of community" is foundational to life at Minot.

"I had never expected to have such a large group of peers in a similar operational environment with the same daily stressors that the ops tempo provides. And what happens is, you make friends for life," he said.

Williford described this attachment to the mission as a "culture of pride," in contrast to the unhealthy "culture of perfection" that produced the 2014 testing scandal at Malmstrom. Where the missile career field is healthiest, the culture connects the communities at each base to the strategic mission of nuclear deterrence.

"You have to understand why you do what you do," Williford said. "To have the Chief and the Secretary and our strategic documents state that this is the No. 1 mission area of the Air Force, that was … huge."

Carter reminded his audience at Minot that "America's nuclear deterrence is the bedrock of our security." But he also admitted, "I realize it feels at times that most people don't often think about your mission, which I know can be frustrating." He said that in a way, "it's a good thing. Because it means you're doing your job. … Whether they recognize it or not, our entire country and more depends on you." ✪

MILDENHALL, RACING TO THE FINISH

By John A. Tirpak, Editorial Director

A Swedish JAS-39 Gripen flies off the wing of an RAF Mildenhall, UK-based USAF KC-135 during air refueling familiarization training over Hungary. US, Swedish, and Hungarian airmen participated in the 2015 training, which certified the Hungarian Gripen for tanker operations.

USAF's big European tanker base is busier than ever, but slated to shut down for good.

USAF photo by SrA. Kate Thornton

DESPITE being busier than ever as the primary US aerial tanker capability for Europe, the 100th Air Refueling Wing at RAF Mildenhall, UK, is preparing to move permanently, ending what will be a 77-year US presence at the historic facility that began hosting American bombers just after World War II and a variety of missions ever since.

Mildenhall is one of the bases affected by the European Infrastructure Consolidation, announced by the Pentagon in 2015 as a way to save money by huddling military functions at fewer bases around the continent. Mildenhall's tankers will move to Ramstein AB, Germany; its 352nd Special Operations Wing MC-130s and CV-22s will go to Spangdahlem AB, Germany; and its other assorted missions will move piecemeal to other locations in Britain. Most will go to RAF Lakenheath, a mere five miles away—so close that the air traffic patterns practically overlap.

Lakenheath, by contrast, will grow considerably, as it prepares to receive the first contingent of F-35 fighters the US will deploy in Europe. Though Lakenheath's fence line will not expand, its contingent of US personnel is expected to swell by about 1,200 people and the base will host more than 100 American fighter aircraft.

Under the EIC agreement with Britain, though, Mildenhall's US missions won't be leaving until 2022, so the transition will happen gradually. Nothing irreversible has yet been done to begin the move.

"The locals cling to things like that," Col. Thomas D. Torkelson, 100th ARW commander, said in an interview last summer. Many British employees at Mildenhall who have made a career there are "nervously waiting out the time," hoping for a change in the plan, Torkelson said. But "this is not a US Air Force decision; this is a US government and UK government decision," and to all appearances, they plan "to see this through." Torkelson said he's "a big believer in institutional momentum, and there's a lot of momentum in both nations." The base will revert to British use after the US departs.

To soften the blow, "we're trying to transfer as many jobs as possible over to Lakenheath to support the new missions there," he said.

Site activation task forces are already figuring out how other facilities will absorb functions that will move under the EIC. Other noteworthy bases used by the US since before the Cold War, such as RAF Alconbury and RAF Molesworth, will also revert to British use or close.

Torkelson is keen to preserve the Mildenhall heritage. Many of the ivy-covered buildings on the base date back to World War II, bearing plaques noting the history of the facility.

"We are the only Active Duty Air Force unit" with World War II markings on its aircraft, he said. The KC-135s of the "Bloody 100th" wear the "Square

D" that emblazoned B-17s operating from Thorpe Abbotts, some 35 miles east of Mildenhall during the war with Germany. Air Force heraldry experts are trying to figure out a way to preserve the markings and unit history because the 100th will be folded into the 86th Wing when it moves to Ramstein.

Top USAF leaders in Europe "recognize the significance of that heritage," Torkelson said. "I've even made it part of the EIC working group" to ensure the lineage is kept alive in the transition.

That heritage forms a strong bond between the Air Force and the community. The British appreciate the "deep shared sacrifice" during World War II that has been a foundation of the "special relationship" between the US and Britain ever since, he said.

WITHER MILDENHALL?

The UK government is trying to decide what to do with Mildenhall. The government has committed to free up public land for use as public housing, and there is a tentative plan to build 4,000 houses on the Mildenhall tract. Other plans suggest light industry usage or a mix of industry and housing.

However, US Air Forces in Europe (USAFE) officials said in a background briefing for *Air Force Magazine* that any plans will have to wait until the British military services decide if any of them want the facility. The British Army is contemplating taking over the base, as there are nearby ranges it could use.

Despite the move of several hundred miles, US tanker capabilities in Europe should not appreciably change, 100th leaders said in interviews. Tankers will be an hour further away from aerial refueling missions in the Atlantic, but will be an hour closer to missions in the Middle East.

The European tanker operating tempo peaked in 2011, and it has scarcely re-

USAF photo by Capt. Jason Smith

USAF photo by SrA. Erin Babis

USAF photo

laxed since then. In 2011, the 100th supported operations Odyssey Dawn and Unified Protector, the air campaign in Libya. Mildenhall-based tankers were asked to provide "maximum effort," Torkelson said. The unit understood that to mean putting every one of its 14—now 15—KC-135s and aircrews into the fight.

"No other wing did that," he said, noting that other units flew, at most, 80 percent of their allocated aircraft.

The 100th flew "exceptionally long" missions from its home station at Mildenhall for three weeks during the Libya operations, he said, until some of the tankers were moved to Istres, France, to be closer to the action. The French air force also operates KC-135s from Istres, located in France's southeast coastal Mediterranean region, and there is now a two-ship detachment from the 100th stationed at the Istres base all the time, helping France's antiterrorism effort in Mali. The French call it Operation Serval, the US name is Operation Juniper Micron.

Mildenhall maintains a one-ship detachment at Incirlik AB, Turkey, for the air campaign against ISIS. Torkelson would like to conclude that open-ended detachment because the situation has changed. Where once the Incirlik duty represented a good way to rapidly build hours and season aircrew, "those hours are so generic now and so canned that I don't think they're as good an experience as what we do here" at Mildenhall, he asserted.

There was a dip in activity in 2012, but "every year since, … it's been a slow ramp-up in quantity" of missions, Torkelson said. "We are more max-tasked than we ever have been," now asked to fly every single asset on operational missions "35 to 40 percent of the time."

In Fiscal 2015 the unit overflew its budgeted program by 127 percent, he said. The wing is "routinely canceling" lower priority sorties "for higher priority missions because our percentage of priority ones has grown to 56 percent." Typically, those high priority missions come with "late notice" and the lower priority ones just don't get flown.

High priority missions can be anything from an emergency aerial tanking to supporting the transit of the President or Secretary of Defense into or through the European Theater.

To help, the Air National Guard or Air Force Reserve have started sporadically deploying a tanker to the base, and they will pick up some lower priority, nonkinetic missions, Torkelson said. At first, he feared the presence of the Guard or Reserve tanker would simply expand what was being asked of the wing, but "they help more than they hurt" in that regard.

"I would love to see more Guard and Reserve perpetual presence in this AOR [area of responsibility] that is so exceptionally busy."

Clockwise from upper left: A French Mirage takes on fuel from a Mildenhall-based KC-135 over Africa in 2013. French fighters have flown combat missions over Afghanistan, Libya, Syria, and Iraq. / A pair of KC-135s sports the 100th Air Refueling Wing's Square D on the ramp at Powidz AB, Poland. The refuelers were preparing for Baltops 2016, a multinational maritime exercise around the Baltic Sea. / SrA. Kendall Bryant, a refueling boom operator, peers from a window during Tonnerre Lightning, an interoperability exercise with the US, UK, and France. / A British Tornado links up with a USAF KC-135 during Unified Protector. The 100th ARW refueled 325 aircraft during 2011 operations in Libya.

Another big booster of activity has been supporting the European Reassurance Initiative (ERI), calling for frequent deployments to Europe of Stateside F-22, A-10, F-16, and B-52 units in theater security package missions. They alone account for 40 to 50 percent of the 100th's load, Torkelson said.

The ERI "shows of force and presence" are "on the backs of our KC-135s," he said. The deployments are typically for two weeks, so "we're refueling all the time."

The 100th is not the only tanker capability in Europe; Air Mobility Command (AMC) sends tankers through the AOR to destinations elsewhere all the time, and they pick up some of the load.

"All the desert swap-out tankers flow through here," Torkelson observed.

Another AMC KC-135 detachment at Geilenkirchen, Germany, is typically slaved to refueling the NATO Airborne Warning and Control System (AWACS) aircraft.

The European air refueling mission is attractive to tanker pilots because "it is really diverse," said 351st Air Refueling Squadron chief Lt. Col. Jason Barnes.

"We do a mix of everything," he said. Coronet missions are those that support fighters coming across the Atlantic from the States. The wing supports the F-15s of the 48th Fighter Wing at Lakenheath, and there is a steady array of allied aircraft that get their fuel from US tankers. A KC-135 crew could easily see, in a week, Rafales from France, Tornados from Germany, and even Gripens from Hungary or Sweden. (When a US tanker refuels a partner country, the US is reimbursed for the fuel passed and a percentage of the cost of the mission, Torkelson explained.)

The 100th is the only air refueling wing directly supporting Air Forces Africa, so in addition to tanking French fighters going to and from Mali, the wing refuels aircraft striking ISIS targets in Libya and other locations.

During the interview with Torkelson, he received a call from USAFE headquarters dictating a high priority mission to South Sudan. Asked what it was all about, he could only answer, "You can Google it."

The vast majority of European allies use the probe-and-drogue system of refueling, so the 100th crews are frequently tasked to configure with a basket on their booms, or use scarce wing pods—the Multipoint Refueling System—that deploy hoses and baskets. The 100th also refuels the 352nd SOW's MC-130s. Attempts to directly refuel the CV-22 tilt-rotors from KC-135s have proved technically challenging and are not yet a normal procedure.

"The procedures are aircraft-specific," Barnes said, so pilots and boom operators alike rarely get into a rut of doing the same old, same old. The European Theater requires diplomatic clearances needed for overflight of its many countries, Barnes said. The European airspace is dense with air traffic and is "challenging airspace to fly in," he said.

Even though there are always more tanking missions to do than there are tankers available, the unit still does some missions strictly for training. But a lot of the bread-and-butter training work is done in the base's simulator, run by contractors, Barnes said. France sends its KC-135 pilots to Mildenhall for simulator work, as does Turkey, also a Stratotanker operator. For pilot upgrades, most will go Stateside to the KC-135 schoolhouse at Altus AFB, Okla., he pointed out.

TIP O' THE HAT

For being a 50-plus-year-old platform, the KC-135s are holding up remarkably well, Barnes said.

"My hat's off to our maintainers. They do a very good job … and with a very high mission effectiveness rate." He said he is not seeing an increase in aborts or mechanical problems in the last few years, despite the higher operating tempo.

The KC-135 maintenance team helps with some of the back-shop maintenance needs of RC-135 Rivet Joint intelligence, surveillance, and reconnaissance aircraft that operate from the base, including one—called Airseeker—that belongs to Britain.

Torkelson said the Airseeker is visiting from RAF Waddington, where the runway is being rebuilt.

"The UK doesn't like Waddington as a long-term solution for their Rivet Joints, because the runway is too short and they require a tanker for every mission from there. And so they've been waiting for our basing decision [for the location of US Air Force RC-135s in Europe] to see if they might be able to potentially

USAF photo by SrA. Erin Trower

USAF photo by SSgt. Chad Warren

L-r: Airmen assigned to RAF Mildenhall review flight plans in 2016 at Istres-Le-Tubé AB, France. USAF supports French anti-terrorist operations in Mali and North Africa with airlift and air refueling. There is now a two-ship KC-135 detachment assigned to the Istres base at all times. SrA. Tyler Miller performs a preflight check on a KC-135 at Keflavik Airport in Iceland. The tanker provided air refueling to NATO fighters performing Icelandic air surveillance and policing missions in 2015. SrA. Daniel Lamey inspects a KC-135 in Istres. USAF has been supporting counterterrorism efforts there since 2013.

pile onto that and maybe put their UK Rivet Joints there," Torkelson explained.

As the principal engine of US aerial refueling in Europe, the 100th has been trying to build partnerships with other countries having a refueling capability, according to Maj. Steve Briones, the wing's chief of operations group plans, strategy, and exercises.

He helped organize the European Air Refueling Symposium, held at the base last spring. The conference drew air refueling practitioners from eight countries, he said, and they were not all NATO members.

"Everybody told their story of what they do and have been doing" since the 2014 meeting, he said.

tankers, "as proof of concept that we can do it."

Another "hot topic" of the symposium, Briones reported, was how to successfully bring new tanker capabilities into NATO and the European Union. New countries are "looking to get into the refueling business" and are buying aircraft like the Airbus A330 Multirole Tanker Transport (MRTT). In the "not-too-distant future" such aircraft will be in more European fleets, he said.

There was agreement to expand the conference from two days to two weeks, to have it annually instead of every other year, to include more countries, and to have live-fly exercises,

Though Mildenhall's closure will leave no resident US tanker capability in Britain, the Royal Air Force has its own robust refueling capability, fielding MRTTs at RAF Brize Norton, the RAF's mobility hub. There will be no tanker deficit after the Mildenhall closure.

Asked what the tanker mission in Europe needs that it doesn't have, Torkelson said that any wing commander would answer, "Manning."

"No one asks for better working or living conditions," Torkelson said. "Everyone asks for bodies," but he recognizes that even though USAFE is requesting more airmen, they may not arrive quickly. The better answer

USAF photo by SrA. Erin Trower

At Torkelson's direction the 100th is encouraging standard tactics, techniques, and procedures (TTPs) among the European countries that do air refueling. Some of their TTPs, Briones said, are quite different from US Air Force standards.

Other countries "fly really close to each other" when doing refueling operations, he said, and USAF doesn't see a good reason to do that. Although Briones didn't say the close formation tactic is unsafe, "we've actually had to cancel and say no to formation flying because their TTPs are not as conservative as ours."

One of the action items from the May meeting was to start doing mixed formation flights that the US can say yes to, and plans are being made to fly formation with German and Spanish

Briones said. There will be work done to better coordinate between USAF and European Air Transport Command and the Movement Coordination Center in Europe, both located in Eindhoven, Netherlands. Briones likened them to a European version of US Transportation Command and Air Mobility Command.

More cooperation will make it possible to better distribute available tanking assets and render assistance if a tanker is needed for an emergency.

Up until now, "the US has not been … heavily involved" in European tanking operations "on a tactical level," Briones said. On a strategic level, however, "that is happening."

All this partnership activity "is a critical step forward if we do end up doing something like [Operation Unified Protector] again in the future."

to the question is an ability "to bear the burden better. … Give us broader shoulders." He said that calls for fixing "internal processes, internal scheduling, to minimize waste, redundancy, minimize aircraft generation that doesn't lead to anything. That makes us able to bear the burden more."

Torkelson said he's "agnostic" about the relocation of the 100th to Ramstein, but feels strongly that a permanent US tanker presence is definitely needed in Europe.

"You're flying through all these different nations, … all the voices and accents on the radio, from here to Bulgaria, all … distinct. It's such a unique place to project and employ airpower." Helping the allies "be interoperable and more capable because of our routine presence is satisfying." ✪

THE DRO

It's a small world after all.

UNTIL recently, conducting surveillance and delivering munitions from the air was the sole province of nation-state air forces. Now, anyone with a drone can do the same.

Over the last decade, drones—or unmanned aircraft systems—have become cheaper, more capable, easier to fly, and ubiquitous. Even hobby machines can pose a military threat. Combined Joint Task Force-Operation Inherent Resolve Commander Army Lt. Gen. Stephen J. Townsend said ISIS has made extensive use of drones to observe bases and deliver explosives.

"It's not episodic or sporadic," he said during a press briefing in October. "It's relatively constant and creative." On one occasion, ISIS packed a drone with explosives and then detonated it after it was retrieved by coalition forces, killing four.

Speaking at the Unmanned Systems Defense forum in October, Air Force Brig. Gen. Brian M. Killough, the director of strategy, concepts, and assessments, said even though drones haven't yet posed a major military threat, they can still degrade mission performance. He compared their effectiveness to Germany's use of V-1 and V-2 rockets during World War II. Though "highly ineffective militarily," the rockets were nevertheless "incredibly effective psychologically." He likened drone assaults to mortar attacks on a forward operating base.

The Army had a more sobering assessment in a counter-unmanned aircraft system strategy extract that was released in October.

"Analysis of the future operational environment and recent military operations around the globe clearly illustrates the seriousness of the UAS threat," the report states. "As technology has progressed, both reconnaissance and attack capabilities have matured to the point where UAS represent a significant threat to Army operations from both state and nonstate actors."

Russia, for instance, has been honing its UAS capabilities and techniques since it saw Georgian forces effectively use drones for intelligence, surveillance, and reconnaissance during the 2008 war.

USAF photo by SSgt. Andrew Lee

NE WARS

By Will Skowronski, Senior Editor

To catch up, they implemented a massive development program that has paid off in the ongoing conflict in eastern Ukraine. There, Russian-backed separatists have used the latest UAS models—including Russia's Orlan-10, Granat-1, and Takhion and others from Israel, France, and China—to spot and monitor artillery targets, the report notes. One analyst considered UAS-guided artillery to be "the most significant difference-maker in a conflict between otherwise equal forces."

In short, ISIS isn't the only threat. Deployed troops and platforms also aren't the only vulnerabilities.

At AFA's Air, Space & Cyber Conference in September, Air Force Global Strike Command chief Gen. Robin Rand said UASs had flown in the US "over some of the areas that we don't particularly like them being over."

The threat will only grow. The Army report says that while between 80,000 and a half-million drones were operating in US airspace in 2016, some 700,000 new drones were expected to be sold by the end of that year.

Meanwhile, technology will make UASs smaller, cheaper, and more capable, Dan Stamm, Battelle's manager for counter-UAS programs and coinventor of a drone jammer, told *Air Force Magazine.*

"This is one of the very rare cases that I can think of where our adversar-

TSgt. Benjamin Hawkingson hand-launches an RQ-11B Raven unmanned aircraft system at Vandenberg AFB, Calif. Raven is equipped with a video camera that streams live footage to an operator on the ground.

ies are able to directly leverage the development that is in the best interests of industry and commerce," he said.

"In other words, everything that the drone manufacturers are doing to make their drones more appealing to commerce, to the market, is directly applicable to advancing the capability of the adversary: greater ranges, more robust communications, greater payloads, longer flight durations, just name it across the board—lighter, faster, better."

The Army strategy extract states that small UASs are particularly difficult to defeat and "less effectively countered by existing integrated air and missile defense capabilities" due to their proliferation and low/slow profile. They typically have smaller radar cross sections, infrared signatures, and electromagnetic footprints.

Though the military has used small UASs and the larger remotely piloted aircraft (RPA) for decades, the Defense Department is playing catch-up on countering the new threat posed by small drones.

The Pentagon's Joint Improvised-Threat Defeat Organization (JIDO)—the same group that developed counterimprovised explosive device capabilities—began following the drone threat in late 2013, but just began testing counter-drone technologies along with the Army Rapid Equipping Force last summer, a DOD spokeswoman said by email. JIDO is planning a Hard Kill Challenge to assess counter-UAS threats this spring.

BRINGING DOWN ISIS DRONES

Combatants are receiving new capabilities. During an October briefing, Air Force Col. John L. Dorrian, spokesman for Combined Joint Task Force-Operation Inherent Resolve, said the DroneDefender—and other, unidentified advanced systems that can detect, identify, track, and defeat UAS threats—has supplemented the services' in-theater capabilities.

Shortly after ISIS struck with its "Trojan Horse" drone, two Air Force remotely piloted vehicles brought down another ISIS drone that coalition forces spotted near Mosul, Iraq. Working together, the aircraft used electronic warfare capabilities to disable the drone in less than 15 minutes.

Air Force Secretary Deborah Lee James announced the successful downing during a Center for a New American Security event in October and called on the services' rapid capabilities office to come up with a solution to the "emerging danger."

The answer is "not necessarily the development of a new thing to defeat it," she said. "It could be taking what we've got already and packaging it in a different way to go after the threat. But we need to do that type of work rapidly."

At about the same time, the Air Staff stood up a working group to come up with a comprehensive plan.

"The working group cuts across functional areas and commands to integrate the Air Force's best experts who have been empowered to act rapidly so they can continue to outpace the evolution of the threat and quickly deliver capabilities to the warfighter," service spokeswoman Erika Yepsen said in an email. "While our airmen downrange innovate and act to defeat threats as they evolve, this cross-functional working group will build a strategy to anticipate and defend against current and future small unmanned aircraft systems."

In late October, the service released a request for proposal to acquire a portable drone defense system to protect AFGSC facilities. The RFP calls for a handheld device that must be able to disrupt or manage the radio frequency link between a commercial UAS and the pilot and be able to passively detect RF signatures to aid the user in detecting and locating UASs. The system should also be able to disrupt satellite navigation signals, the RFP said.

At the AFA conference, Rand said fielding any capability to protect US nuclear infrastructure will require extensive discussions between military commands, law enforcement agencies, and other federal agencies, including the Department of Energy. "These discussions are happening … but, you

The Battelle DroneDefender jammer system disrupts UAS operations using remote control interference and GPS disruption.

Battelle photo

USAF photo courtesy of Wright-Patterson AFB, Ohio

Airmen operate a Skate small unmanned aircraft system during field testing. The small aircraft offers real-time video streaming and infrared imagery. The Air Force is playing catch-up in this area, but is expected to put more emphasis on developing and fielding SUASs soon.

from either a proficiency or sufficiency standpoint, defeat the UAS threat."

Stamm said he and Alex Morrow, co-inventor of the DroneDefender jammer, considered a number of ideas, including the use of kinetic solutions—lasers, nets, even trained falcons—before settling on the jamming used by Battelle for its ease of use and safety. Any hard kill option, he said, causes the drones to fall out of the sky, risking injury or damage on whoever or whatever is below it.

know, it's not easy," Rand said. "You have to be very judicious and prudent about how you apply changes."

Neither the service or JIDO provided additional details on their counter-UAS efforts. In its report, the Army says more advanced sensors are needed so troops can reliably detect small UASs. The report suggests advanced identification technology should be used to enable forces to distinguish between friendly and adversary drones. To defeat the threat, the report calls for the integration of joint capabilities to destroy drones before and after they're launched using both kinetic and nonkinetic means.

"There is no single, comprehensive materiel solution that will make the UAS problem disappear," the Army report states, nor is there is an Army, joint, or multinational capability "that can,

Mi'raj Islamic News Agency

Kurdish Peshmerga forces with an ISIS drone shot down in March 2016 near Mosul, Iraq. The drone was used to observe and photograph Peshmerga troop positions.

Israeli Air Defense Forces photo

Pieces of a Hezbollah drone shot down by the Israeli air force in 2006.

DroneDefender resembles a rifle but with two antennas in place of a barrel. It allows the user to disable commercially available drones from up to about 400 yards away by severing the command and control link between the pilot and UAS, using complex disruption waveforms.

Once the link is broken, commercial drones will revert to a lost-link protocol. Generally, there are three: hover in place, land in place, or return

to the point of origin. A secondary DroneDefender capability can disrupt GPS signals, preventing the UAS from flying a waypoint mission or returning to its point of origin.

Stamm said interest in the DroneDefender has spiked alongside the recognized threat level.

"We have seen that shift just in the last few years, from kind of what is perceived as possibly harmless—or less harmful for sure—to, 'Holy cow, this is now a really cheap guided weapon,'" he said.

Since booking the first sale in early 2016, Battelle has sold 105 units to the Defense Department, Department of Homeland Security, and foreign militaries. Stamm said Battelle is developing expanded, larger, more capable jamming systems and is looking into other spaces along the counter-UAS response spectrum: detection, identification, tracking, and defeat.

The Russian-backed rebels in eastern Ukraine have proved adept at bringing down drones through a variety of means. The Army Counter-UAS strategy extract says the Russians have used electronic warfare systems to "effectively neutralize Ukrainian UAS." They've also grounded long-range surveillance aircraft controlled by the Organization for Security and Cooperation in Europe, the group tasked with monitoring the often-ignored cease-fire there. The OSCE report suggests several long-range drones have been disabled through a mix of surface-to-air missiles and signal jamming.

As potential adversaries pursue counter-UAS technologies, the US military will need to develop means for its RPAs to defend themselves.

The Air Force employs a mix of larger RPAs—the MQ-1 Predator, MQ-9 Reaper, RQ-4 Global Hawk, and stealthy RQ-170 Sentinel—and small UASs, including the RQ-11B Raven, RQ-20A Puma AE, Wasp III, and RQ-12A Wasp AE.

Until recently, USAF has used small UASs for limited tactical objectives, but the service's "Small Unmanned Aircraft Systems (SUAS) Flight Plan: 2016-2036," released last May, suggested the small drones can play a much larger role.

FOCUS ON THE FAMILY

"This intersection of unmanned technology maturation with widespread industry innovation" will drive the rapid advancement of a cheap, effective "family" of small UASs "focused on traditional Air Force roles and missions," the report states. In spite of this, "the Air Force finds itself behind the power curve, having forgone the opportunity to embrace and operationalize these developments through a dedicated acquisition program, let alone an independent line of funding. We have reached the point where SUAS applications are greatly outpacing strategy and policy."

The flight plan says small UASs will soon be capable of functions such as counter-UAS operations, security for large or strategic complexes, and even enhancement of anti-access, area-denial environments.

At the Unmanned Systems Defense forum in October, USAF Col. Brandon E. Baker, director of remotely piloted aircraft capabilities, said the development of technologies—including the areas of command and control, antenna and sensor miniaturization, processing power, and power capacity—will allow the service to employ small UASs globally.

"We anticipate we're going to be able to miniaturize more and more so that one day, we can—no kidding—darken the skies and apply mass against an enemy," he said. "That overwhelming mass has made us successful as a military as long as we've existed."

Baker said deploying large numbers of SUASs at one time is a protection in itself, but the service is also working to ensure communication links and reduce latency to allow its SUASs to operate in highly contested environments. Baker said such measures could include the use of new waveforms, aerial layer networking, and cognitive autonomy. The service's SUAS flight plan calls for requirements to ensure sufficient data encryption and anti-jamming technology.

UASs need to be able to operate untethered to a network in case those are disabled, Baker said.

"I don't want it to be a Hollywood movie, where if you can defeat the network, everything just drops out of the sky. That's not going to make a lot of sense for us," Baker asserted. "The platforms have to have a certain level of cognition: … the ability to sense the environment, learn from the environment, and then make decisions." ✪

A contractor recovers a Scan Eagle small unmanned aircraft system after a mission for Operation Inherent Resolve in Iraq. Advancing technology is making the UASs smaller, cheaper, more capable—and more dangerous in enemy hands.

USAF photo by SrA. Jordan Castelan

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PIVOT, PART

By Brian W. Everstine, Pentagon Editor

THE US IS PRESSING AHEAD WITH PLANS TO IMPROVE AIRPOWER CAPABILITIES IN THE CRITICAL PACIFIC REGION.

SSgt. Austin Hamilton prepares to marshal an F-15 onto the runway at JB Elmendorf, Alaska, during a Red Flag exercise.

DESPITE the war in the Middle East and the need to face down Russia in Europe, the US has not veered away from its "pivot" to the Pacific, announced five years ago. In fact, the focus on the Pacific is entering a new phase, which will see the most advanced US aircraft deployed in the region, to demonstrate American commitment and—if necessary—deter or defeat hostile actors.

"In this next phase," Defense Secretary Ashton B. Carter said in September in Coronado, Calif., the US "will continue to sharpen our military edge so we remain the most powerful military in the region and the security partner of choice." He added that the US is "already sending our best people and platforms into the region."

A planned pivot, phase three, would see even greater investments targeted at ensuring US capabilities in the Pacific region "stay the best," the SecDef said.

The US can't simply ignore North Korea's continued saber-rattling and march to nuclear-capable missiles, or turn a blind eye toward China's aggressive attempts to control trade routes through the South China Sea. This will be true no matter what happens in Syria, along Russia's periphery, or in other global hot spots.

"This region," Carter said, "with half of humanity, half of the world's economy, is the single most consequential region for America's future—and indeed for the world's."

As soon as practical, the US plans to send and deploy F-35 fighters and KC-46 tankers to the Pacific region. The continuous bomber presence in Guam, now in its 12th year, has become more intense and more public. Recently, all

USAF photo by A1C Kyle Johnson

three types of US strategic bombers were deployed to the theater at the same time.

The Defense Department is going to hone its partnerships in the Pacific "even as we qualitatively upgrade the United States' own force posture in the region and prioritize some big bet investments in advanced technologies," Carter said during a press conference after a recent Association of Southeast Asian Nations (ASEAN) meeting in Hawaii.

Underscoring Carter's remarks, the US put on a formidable display of military hardware for ASEAN defense ministers at JB Pearl Harbor-Hickam. On static display were a B-1 bomber and F-22 stealth fighter, an Army AH-64 Apache, and Navy P-8 and P-3 maritime patrol planes. Two F-22s—based at Hickam—roared overhead, and another B-1, deployed at the time to Andersen AFB, Guam, made a low pass over the base and the international visitors.

FIGHT TONIGHT

The aircraft represent the Air Force's commitment to put its most advanced fighters—F-22s and soon F-35s—and bombers on constant rotation to the region.

More than 46,000 airmen in the region are ready to "fight tonight" because, in the event of any contingency, "the first call will be for airpower," Pacific Air Forces Commander Gen. Terrence J. O'Shaughnessy told *Air Force Magazine.*

"Simply put, airpower's unique attributes offer commanders speed and the flexibility to effectively address the tyranny of distance," he said. He noted two recent missions: C-130s from the 374th Airlift Wing in April responding to an earthquake in Japan, and the September overflight of deployed B-1s

USAF photo by SSgt. Benjamin W. Stratton

These A-10s took part in an April 2016 exercise in the Philippines. USAF is stepping up its presence around the South China Sea because of China's actions there.

to South Korea in response to nuclear tests by North Korea.

Carter, in his Coronado speech, said the military is "ensuring our continued air superiority and global reach" through investments in the Air Force fleet and plans for future deployments of those aircraft. More than $12 billion will be spent on the new B-21 stealth bomber in the next five years, he said, while USAF will invest about $16 billion during the same period on the KC-46A tanker. It will see plenty of use "to help shrink the Asia-Pacific's vast distances," Carter said.

The US military is also spending more than $56 billion over the next five years to buy more than 400 F-35s for the Air Force, Navy, and Marine Corps. These investments come as partner nations, such as Australia, make their own investments in the F-35.

"The real story of fifth generation capability is that this is not just a US story," O'Shaughnessy said. "It is really a story about a coalition of partner nations that will operate this platform in the very near future."

PACAF is planning to base two F-35 squadrons at Eielson AFB, Alaska. That will double the service's fifth generation presence in the Pacific, when counted with F-22s assigned to JB Elmendorf-Richardson, Alaska. Aggressor F-16s will remain at Eielson to develop the skills of the fifth generation fighters and visiting air forces alike.

"We aren't replacing other aircraft—we're adding two squadrons of the world's premier fighter to send a clear message about how important the Pacific is to our future and to underscore that the rebalance is real," O'Shaughnessy said.

North Korea's recent testing of both ballistic missiles and nuclear materials has earned a number of responses from PACAF. Four times in 2016, PACAF flew "flexible response" missions, with F-22s, B-52s, B-1s, or F-16s flying alongside South Korean aircraft "to demonstrate

ANG photo by SSgt. Michael Hughes

A C-130, in storage at Davis-Monthan AFB, Ariz., for more than a year, was prepared for use by the Aerospace Maintenance and Regeneration Group for the Philippines, one of America's closest regional allies. The relationship between the US and the Philippines has hit a rocky patch, though.

USAF photo by Amn. Nathan H. Barbour

the ironclad US commitment to our allies in South Korea, in Japan, and to the defense of the American homeland," O'Shaughnessy said.

The response to North Korea's threats has not come from aircraft alone. The US and South Korea agreed this year to a new deployment of Terminal High Altitude Area Defense (THAAD) missiles to South Korea to deter or block North Korean action.

The US "remains committed to defending our allies against any threat with the full spectrum of American military might," Carter said during an Oct. 20 joint press appearance with South Korean Defense Minister Han Min-koo at the Pentagon. "That's why we're adapting our force structure on the peninsula."

L-r: MSgt. Davis Mills, SrA. Justin Mattoni, and SSgt. Devon Childress conduct a cross-load during Cope North, an exercise at Andersen AFB, Guam. The multinational Cope North promotes stability and security throughout the Pacific region.

The ASEAN ministerial meeting in late September came during a rocky episode between the US and one of its most stalwart Pacific allies: the Philippines.

"As it has been for decades, our alliance with the Philippines is ironclad," Carter said in September. He noted the recent signing of the Enhanced Defense Cooperation Agreement (EDCA) to modernize the Philippine armed forces, and the dispatch of Air Force C-130s and airmen to the country for joint training.

Shortly after the C-130s arrived, though, Philippine President Rodrigo Duterte visited China and said he planned to break off military relations with the US.

THE US HAS LOST

"In this venue, your honors, in this venue, I announce my separation from the United States," Duterte said. "Both in military, not maybe social, but economics also. America has lost."

A week later, he said the US could "forget" the EDCA and that he looks forward to a time when Filipino soldiers are the only military inside his country.

US officials maintain they will continue to cooperate with the Philippines, despite the conflicting messages.

Daniel R. Russel, the assistant secretary of state for East Asian and Pacific affairs, said in October that there is a lot of noise and uncertainty associated with cooperation with the Philippines at this moment, but the US is working through it. He added that "we've been through a lot worse in our 70-year history."

Though PACAF is troubled by this recent rhetoric, military-to-military relations remain "robust and multifaceted," O'Shaughnessy insisted.

China's actions in the South China Sea—from building up reefs into man-made islands, to restricting the freedom of other nations to sail in international waters—have prompted some of the strongest words and actions from Washington.

"Beijing sometimes appears to want to pick and choose which principles it wants to benefit from and which it prefers to try to undercut," Carter said in Coronado. "For example, the universal right to freedom of navigation that allows China's ships and aircraft to transit safely and peacefully is the same right that Beijing criticizes other countries for exercising in the region. But principles are not like that. They apply to everyone, and to every nation, equally."

To counter this, the Air Force has sent multiple deployments to conduct international patrols of the sea. Air Force A-10s from Clark AB in the Philippines patrolled the area, and future rotations in that region are expected to continue.

"We're working to train with our partners in the Indo-Asia-Pacific region and we're using our Air Force assets to conduct freedom of navigation operations in the South China Sea," service Secretary Deborah Lee James said at AFA's Air, Space & Cyber conference in September.

"On every corner of the map, our airmen are engaged with allies and partners to enhance global security and stand tall against aggression," highlighting that "more airpower" is needed in the area to protect freedom of navigation, she asserted.

At the ASEAN meeting in September, Carter pushed the other countries to raise their involvement in countering China.

"Any nation and any military—no matter its capability, budget, or experience—can contribute," Carter said as the meeting convened. "And that's important because, as we see at meetings like this one here today, every nation has a stake in ensuring this network's success and every military can make a vital contribution to regional security."

In 2017, US Pacific Command will convene ASEAN partner nations in a maritime exercise "to improve information sharing in the ... maritime domain," Carter announced. This exercise will be in addition to large-scale exercises with other nations in the area, includ-

An Indian Navy frigate arrives at JB Pearl Harbor-Hickam during Rim of the Pacific exercises in 2016. PACAF is engaging India in new ways.

Canadian Forces photo by Master Cpl. Mathieu Gaudreault

ing the Rim of the Pacific (RIMPAC) exercise, which has seen more Chinese involvement.

The US "will continue to stand with our allies and partners" and will continue to "fly, sail, and operate wherever international law allows," Carter said in Coronado. "With the military component of the rebalance," the US aims to "help the region to meet these challenges and to remain the primary mainstay of security in the Asia-Pacific."

ADVERSITY AND DANGER

China's island-building and North Korea's missile and nuclear tests have raised "collective concern" among Pacific nations, O'Shaughnessy said. "Adversity and danger are bonding our allies and partners ever closer" and have led to increases in engagements and training, he said.

In 2016, PACAF airmen participated in more than 200 engagements and exercises with partner nations. These have included large-scale events such as Cope North, Red Flag-Alaska, and Rim of the Pacific, as well as smaller operations such as a B-1 training mission with Royal Australian Air Force joint terminal attack controllers. This was the first such joint exercise in more than 10 years, O'Shaughnessy said.

There will be an even higher tempo of these exercises as more Air Force assets flow into the theater and interoperability with partners becomes even more important, he said.

"These engagements offer invaluable opportunities to train together, develop relationships, and become more interoperable as we assess how to best leverage and complement one another's capabilities in the event of a crisis or contingency," he said.

PACAF is concentrating on other, emerging powers such as India, Vietnam, and Indonesia, and engaging them in new ways. In November, PACAF and Indonesia launched Cope West, the first time in nearly two decades the US and Indonesian air forces have flown in fighter combat training.

It isn't just fighter training, either: PACAF has increased humanitarian assistance and disaster relief training alongside combat training to let those missions "kick off in high gear when the call comes," O'Shaughnessy said.

PACAF needs to be able to respond to possible aggression to its forces throughout the region, as its footprint increases, he continued. The service is reviewing its force posture, protection, agility, and command and control to be ready.

"With our posture, we are exploring opportunities to pre-position assets so we can shorten our logistics tail and reduce our response times in crisis or conflict," he said.

Though he would not mention specific locations, O'Shaughnessy said PACAF is looking at a number of bases, including "stand-in" forward bases that can offer quick access to hot spots in a contingency, even though they could face a high threat level. The command is reviewing its balance of the other "stand-off" bases that are removed from hot spots but can still be used to move combat power over vast distances, he said.

While the Air Force across the world has a history of being agile to project power in areas such as US Central Command and US European Command, the Pacific provides a unique challenge in its massive size.

"For this theater, we need to increase the scale and scope of those operations," O'Shaughnessy concluded. ✪

A USAF B-1B, escorted by USAF F-16s, flies over Osan AB, South Korea, in a show of force after North Korea's provocations.

USAF photo by SrA. Dillian Bamman

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THE RUSS

They aren't going anywhere.

Photos by Ministry of Defense of the Russian Federation
Text by Amy McCullough, News Editor

Russian Su-24 Fencers lined up at Hmeimim AB near Latakia, Syria, in December 2015. The Russian air force deployed 40 jets to Syria in late 2015 and immediately launched an air campaign against anti-regime forces that continues today. The swing-wing Su-24 is similar to USAF's retired F-111.

IANS IN SYRIA

Russia's military presence in Syria continues to grow despite Russian President Vladimir Putin's March announcement that he would begin to withdraw troops from the war-torn country.

Outgoing Director of National Intelligence James R. Clapper Jr. told House lawmakers on Nov. 17 that Russia has shown no signs of pulling out of Syria. "They have sustained a presence of their artillery and a deployment of a very advanced air defense system," Clapper told members of the House Select Intelligence Committee. "Clearly the Russians are there to stay."

The US and Russia had recently brokered a temporary cease-fire that took effect Sept. 12. It called for a break in Syrian government air strikes against opposition forces, so humanitarian aid could get through to the areas and people devastated by the conflict. US officials had said that if the cease-fire held for seven days, the US and Russia could begin collaborating on air strikes against ISIS.

Air Forces Central Command boss Lt. Gen. Jeffrey L. Harrigian told reporters in mid-September the command was in the preliminary stages of creating an integration center that would enable such joint operations. However, the cease-fire crumbled a few days later when an aid convoy was bombed, killing more than 20 people.

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State Department spokesman John F. Kirby said in an early October statement that the US government was suspending its efforts to bring about another cease-fire in Syria, and all US personnel dispatched to establish the joint implementation center would be withdrawn.

"This is not a decision that was taken lightly. The United States spared no effort in negotiating and attempting to implement an arrangement with Russia aimed at reducing violence, providing unhindered humanitarian access, and degrading terrorist organizations operating in Syria, including [ISIS] and al Qaeda in Syria," said Kirby in the statement.

Russia continued to bolster its airpower in Syria after the cease-fire ended. Although roughly a dozen Su-25 ground-attack jets that were initially deployed to Hmeimim AB, Syria, did return to Russia following Putin's March announcement, a recent satellite image published by IHS *Jane's* shows eight Russian Navy Su-33s and one MiG-29K from the aircraft carrier *Admiral Kuznetsov* parked alongside Russia's regular contingent of Su-34s, Su-35s, and Su-24s at Hmeimim.

Hmeimim officially became Russia's first permanent air base in the Middle East—its only permanent air base outside of the former Soviet Union, according to Clapper—after Russia ratified

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/1/ An Su-30SM taxiing for takeoff. This jet is armed with air-to-air weaponry, but anti-regime forces and ISIS have no aircraft, so these missiles are likely intended to deter US-led coalition air forces. /2/ An Su-25 Frogfoot close air support jet is checked soon after arriving in Syria in 2015. /3/ A Fencer lands with empty racks. /4/ A Russian technician removes the protective cover on a KAB-500KR electro-optically guided missile. /5/ A Frogfoot carrying unguided bombs takes off. /6/ An Su-30 crew straps in. This jet is comparable to the F-15E Eagle in the US Air Force. /7/ Russian S-300/400 air defense missiles (NATO code name SA-21 Growler) at Hmeimim. Similar to US Patriots, these missiles were clearly deployed to deter action against the base by the US-led air coalition.

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a treaty with Syria on Oct. 7. Russia has operated out of the base, located in Latakia province, since September 2015, so the move was largely symbolic. However, it is indicative of Russia's desire to project global military power. It came at a time when tensions with Washington were higher than any time since the Cold War.

The same day the air base treaty was signed, Secretary of State John F. Kerry called for an investigation of war crimes committed by Russia and Syrian President Bashar al-Assad's regime, following "yet another hospital" attack killing at least 20 people and wounding 100 more. "Those who commit these [acts] would and should be held accountable for these actions. They're beyond the accidental now—way beyond—years beyond the accidental," said Kerry. "This is a targeted strategy to terrorize civilians and to kill anybody and everybody who is in the way of their military objectives."

/1/ Russia's satellite-assisted inertial-guidance smart bomb is the KAB-500S, shown here being loaded on an Su-34 Fullback. It's roughly equivalent to the 1,000-pound Joint Direct Attack Munition in USAF service. Russia is using the Syria conflict to gain combat experience for its crews and in the use of various new munitions. /2/ Reportedly, the red stars painted on this Fullback each represent 10 bombing missions—120 raids for this jet. /3/ An Su-34 crew "walks through" the mission they're about to fly. The jet is equipped with a mix of unguided and thermobaric bombs. /4/ A static SA-22 Greyhound (Pantsir) air defense system at Hmeimim features both rockets and cannon. /5/ Russian troops in Syria parade during Russian Victory Day celebrations. /6/ An Il-76 cargo jet takes off after resupplying Russian forces in Syria. /7/ A Russian tech preps an R-73 (NATO AA-11 Archer) short-range air-to-air missile before a mission. /8/ An Su-30MK taking off with a load of air-to-air weapons, including R-73s and R-27 (NATO AA-10 Alamo) medium-range, radar guided air-to-air missiles.

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/1/ Ammunition belts piled up near a Russian Su-25. The Frogfoot was the Soviet Union's answer to the American A-10 and has seen extensive combat, especially during the Soviet occupation of Afghanistan. Like the A-10, it carries a 30 mm cannon, but not with the A-10's awesome rate of fire. /2/ An Su-30 with unguided bombs launches for a night mission. /3/ Russian air force techs use a diagnostic tool. /4/ A pair of aircrews walk out to their jets in November 2015, early in Russia's Syria air campaign. /5/ Russian troops unload an Il-76 full of supplies in January 2016 at Hmeimim. /6/ An Su-25 taxis in front of an Su-34 loaded with unguided and satellite guided bombs.

The Syrian army, aided by Russia, recaptured the devastated city of Aleppo in mid-December. At least 6,000 civilians and rebels were able to leave the city, but many thousands are stuck and fear repercussions from the Syrian regime. There even were reports of mass executions and women and children being burned alive as they tried to leave the war-torn city.

Clapper said Russia is "increasingly putting more pressure on oppositionists in Aleppo, indiscriminately bombing women, children, hospitals." He said the bombings are likely to continue and are negatively affecting those opposed to the Assad regime "in terms of morale and willingness to continue to fight."

Despite the overwhelming evidence to the contrary, Russia maintains that its presence in Syria is in reality focused on combating extremism. US officials have repeatedly said that although some of Russia's air strikes have targeted ISIS forces in Syria, many have benefited Assad's regime. And the fact that Russia does not regularly use precision guided munitions has led to immense civilian casualties, something the US-led coalition has taken great care to prevent.

Also, in early October, Syria moved an S-300 surface-to-air missile system to Tartus naval base, which Moscow leases from Syria, ringing alarm bells within the anti-ISIS coalition.

"Last I checked, the Russians said that their primary goal was to fight extremism, [ISIS], and [al] Nusra, in Syria. And neither one has an air force," said Pentagon spokesman Peter Cook on Oct. 4. "So I would question just what the purpose of the system is."

Russia quickly rebuked such concerns, saying the missile system was to protect the naval base. However, Russian Defense Ministry spokesman Maj. Gen. Igor Konashenkov admitted that crews operating the advanced air defense systems would not have to utilize the established line of communication between the US and Russia if they wished to use the missiles to protect Syrian troops, reported the Associated Press.

Cook said the line of communication, to reduce the risk to US/anti-ISIS coalition aircrew and Russian aircrews operating in the same areas, had been "effective" (at least up to that point).

During the November congressional hearing, Clapper said he expected Russia to expand its presence at Tartus "to support naval operations in the eastern [Mediterranean]." Russian state media affirmed this, reporting that paperwork had been filed to create a permanent naval base in Tartus. Leonid Slutsky, the chair of the Russian Duma Foreign Affairs Committee, said the naval base would not only have "docking facilities, but also a command and control system, an air defense system, and "anti-submarine defense capabilities," according to *Russia Today.*

Clapper's testimony came roughly one week after Russian state media announced the deployment of the country's only carrier, *Kuznetsov,* to the Mediterranean Sea. State media claimed sorties launched from the carrier "forced militants encircled in eastern Aleppo to search for possibilities to escape" and allegedly brought the anti-Assad rebels "to the negotiating table" to discuss a new cease-fire.

But the *Kuznetsov* has experienced its fair share of problems. Two Russian aircraft operating off the carrier have crashed within a month's time. A MiG-29 crashed in November, shortly after the carrier's arrival in advance of an expected Russian and Syrian assault on the city of Aleppo. A few weeks later, an Su-33 crashed into the Mediterranean Sea after attempting to land on the carrier following a sortie in Syria. ✪

USAF photo by SSgt. Katherine Spessa

SEPARATION ANXIETY

By Jennifer Hlad

USAF photo by Amn. Connor J. Marth

The effects of personnel shortages are being keenly felt in the Air Force, making it increasingly tough to retain experienced pilots and maintainers.

Manpower shortfalls in these two areas are by now a well-known problem. Air Force Secretary Deborah Lee James in August said the service faced a shortage of 700 fighter pilots by the end of 2016, and experts think it could take until 2019 just to start making headway against the deficit of 4,000 maintainers.

Service leaders are scrambling to correct the imbalance, but the effects of the shortages are already taking their toll on individual airmen.

Lt. Col. Thomas M. Bean, assistant director of operations for the 391st Fighter Squadron at Mountain Home AFB, Idaho, said he's heartened by the fact that service leaders have acknowledged the problem, but that does little to reduce the pressure on an individual to accomplish the mission.

"When you join the Air Force, … you usually do it for a myriad of personal reasons," including pride in one's country and work, Bean said. This means "you want to accomplish the duties to a certain standard."

Even when leadership says they understand that a unit is overtasked, the airmen don't want to let the mission fail. They'll accomplish the tasks assigned, even if it means longer hours, more stress, and work taken home that affects family and personal time, Bean said.

MSgt. Shannon J. Wadas, production superintendent for the 391st Aircraft Maintenance Unit at Mountain Home, said when he joined the Air Force more than 20 years ago, there were three crew chiefs assigned per aircraft. Now, he said, they're doing the same job and maintaining the same operating tempo with about a third fewer people.

Previously, if the unit was going to fly 10 missions, they would have about 16 crew chiefs available, Bean noted.

HARDER AND HARDER

"It takes X number of airmen to maintain, to fix the aircraft when they break, and to maintain the overall appearance, as well as the mission capability of these aircraft," Wadas told *Air Force Magazine*. "We find it harder and harder, as time goes on and we lose more and more people, to have the ability to have that touch time per aircraft."

The dwindling numbers of airmen who remain now expect to work 10 hours a day, five days a week, and some weekends—maintaining the same number of aircraft with no backup. Leaders like Wadas try to relieve the pressure and avoid 12-hour shifts by "creatively managing" people, but he said, "it's a constant battle every day."

Compounding the problem is the growing age of the F-15E Strike Eagles that Wadas works on. They "find new and better ways to break."

His unit is "seeing stresses on these airframes that we've never seen before."

According to Bean, the maintenance shortage becomes acutely apparent when a jet's mission is aborted.

"Now we're seeing right around 10, 11," he said. If an aircraft aborted, "it used to be that I would shake the crew chief's hand, salute, thank him for his hard work, and move on to the next jet. I would shake another crew chief's hand, get in the aircraft, start her up, take her to fly."

Instead, "I get out of the jet that I have aborted, I shake the crew chief's hand, I say, 'Thank you for your work,' and he says, 'Sir, I'll see you at the next jet.' And he is running next to me, going to the next jet."

Bean said the workload for the maintainers "is immense."

"It is amazing what they have been able to accomplish, given the limited resources that they have," he said.

Fewer pilots and maintainers also causes more frequent deployments for

USAF may find that personnel shortages lead to even more airmen leaving the force.

USAF photo by SrA. Cary Smith

Top left: SrA. Daniel Lasal performs a postflight inspection on an F-16 at Bagram Airfield, Afghanistan. The maintainer shortage has caused an increase in workload for those who remain. Left: A pilot signals a crew chief to pull chocks at Mountain Home AFB, Idaho, during a Gunfighter Flag exercise. USAF expected to see a shortage of 700 fighter pilots at the end of 2016. Right: SSgt. Brian Covert gathers communications cords at Aviano AB, Italy, during a stopover on a mission to Iraq.

those who remain, Bean and Wadas pointed out.

In the past, a pilot may have deployed once or twice in his or her first assignment, perhaps another time in the second assignment, and then gone to a staff or to school—a nonflying assignment. Now, because pilots are needed in the cockpit, they aren't doing those other assignments and end up doing more deployments over the course of their career, Bean explained.

Strike Eagles are routinely demanded by regional commanders "because of the capabilities we provide, so the frequency of the jets deploying I would not say has increased," Bean said. However, "it's a reduced pool of people having to meet the same deployment schedule, so … the overall effect to the individual is more deployments."

The deployment schedule is made more stressful by the permanent change of station timeline. It is often two years and eight months. If an operator does two six-month deployments during that time, he or she is only on-station for a year and eight months total, and even then will likely participate in several predeployment exercises that will take him or her away from home.

Bean asked rhetorically, "What is the effect on the quality of life for that individual" and his or her family?

Wadas—who has deployed 12 times and spent a year in Korea—said the deployment schedule hasn't changed, but because the pool of eligible specialists is so small, they simply can't choose not to deploy. People also are being turned around more quickly.

"Five or six people" he served in Korea with in 2013 and 2014 "have already been turned back around and are back in Korea," Wadas said.

"It's time away from family. You spend more time deployed or on an assignment, as opposed to home."

The Air Force is working hard to fix the problem: Col. Michelle Pryor, vice commander of the 47th Flying Training Wing, Laughlin AFB, Texas, said her unit is training about 300 pilots per year now but expects an increase to about 500 a year.

PRODUCING PILOTS

In Fiscal 2016, she said, the wing averaged 21 students per class, but expects that to increase to 29 per class by Fiscal 2019.

Training new pilots "takes a tremendous team effort," Pryor said. Instructors are flying extra sorties to graduate pilots, and leaders are working to come up with "innovative solutions to meet the increasing demand."

"We're working our hardest to produce more pilots" and to deliver airpower, Pryor said.

USAF is moving to boost the number of maintainers, but Wadas said that it takes seven to 10 years for a crew chief to become seasoned enough to "be a leader out there on the line."

An "influx of new people isn't going to solve the problem—they have to be trained. It's going to take time," he said.

A lack of money for parts forces maintainers to be more innovative in how they do maintenance, Wadas said. The "cannibalization process on other aircraft is higher."

In the pilot community, Bean said there is a perception that while fourth generation jets have been carrying most of the burden, they're not getting a commensurate level of funding or attention.

"It's the condition of the jets, how many I traditionally abort [versus] how many I'm aborting now. All that plays into a perception from an operator standpoint," Bean said.

As more civilian companies seek out military pilots and maintainers, exiting the Air Force is becoming more attractive for experienced operators.

In August, Air Force Chief of Staff Gen. David L. Goldfein said he's "extremely proud" of airmen "because regardless of how much strain there is, regardless of what they're asked to do, they step up time and time again."

Still, to retain them, quality of life and quality of service must improve, he acknowledged.

Bean said he volunteered for a yearlong deployment so his family would be able to stay at Mountain Home, but if that option hadn't been offered to him, he would have thought seriously about separating from the service.

"I have a lot of good friends, compatriots, … close buddies, who have decided to get out. And I've seen a lot of very good aviators … struggle with this decision," Bean said. He knows nine people who have left the force in the last year, including five instructors, so his own workload has increased.

"I don't see this getting better for a long time," he predicted. "I think we're near an all-time low of barrier to exit, and it's having an effect on everything." Bean said brand-new fliers are "already talking about what they're going to do when they get out of the Air Force. We can't have that. I think that mentality is what is hurting us systematically with the pilot shortage."

Fixing the problem will require innovative thinking, Bean said.

However, Wadas said he doesn't see any way forward "other than, we just plug along and do our job."

That's why, he said, "looking to get out is a possibility." ✪

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

A student pilot performs a touch-and-go in a T-6 Texan at Laughlin AFB, Texas. AETC expects to train 29 pilots per class by Fiscal 2019. Flight instructors are stressed by the heavy workload, but USAF needs new pilots since many are leaving.

USAF photo by A1C Brandon May

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While maintaining its neutrality, Sweden is growing its air force and pursuing greater interoperability with the US.

NORTHERN EXPOSURE

By John A. Tirpak, Editorial Director

A Saab Gripen takes off during an exercise.

Swedish Armed Forces photo by Louise Levin

After the Cold War ended, neutral Sweden relaxed its military posture, reduced its defense spending, conducted fewer exercises, and focused on domestic issues, anticipating a period of security calm. But as Russia flexes its military muscles—having annexed Crimea, invaded Georgia and Ukraine, and taken a highly aggressive posture toward its other European neighbors—Sweden is moving quickly to heighten its readiness and ability to deter a war—or fight one.

Its principal military instrument is its air force.

This is "the new operational environment," said Col. Lars Helmrich, Skaraborg wing commander for the Flygvapnet (Swedish air force) in an interview at F7 air base last year. Helmrich, who was designated to speak on behalf of the Swedish air force to *Air Force Magazine,* is a 26-year Flygvapnet veteran. He has held an array of operational, staff, materiel, and policy jobs and attended the US Air Force Air War College and participated in a Red Flag exercise. He said Sweden believes Russia will make good on its plan "to have 70 percent of their [military] materiel modernized" by 2020.

Stockholm has watched with growing concern as Russia made aggressive moves and cyber attacks on Baltic nations in recent years. A March 2013 incident galvanized public opinion to strengthen the military when Russian Tu-23M3 Backfire bombers and Su-27 Flanker fighters staged an unannounced mock nuclear attack toward Stockholm and other presumed targets in southern Sweden.

Russia's recent buzzing of US and NATO ships is mirrored by similarly dangerous incidents with the Swedish military, where surveillance and signals intelligence aircraft have been intercepted over international waters by Russian jets that sometimes fly just a few feet away. Russian military aircraft frequently fly over the Baltic Sea without transponders that identify them and demonstrate other "provocative behaviors," Helmrich said.

Moreover, "even though they have economic problems," Helmrich said of Russia, "they still prioritize their military buildup."

Such tensions, coupled with new competition in the Arctic for resources and sea routes, has put Sweden in the thick of things, he said. "The strategic importance of our area of interest—our neighborhood—is increasing."

Along with the European refugee crisis—hitting Sweden with a wave of unexpected immigrants—and terrorist bombings around Europe, the time was ripe for Sweden to step up its security posture. In 2015, a parliamentary white paper called for an increase in operational capability of the Swedish military, Helmrich said.

NEW CANDOR

"I can hardly remember when it was so … clearly stated" by the Swedish government that the country's military should boost its readiness, Helmrich said. According to him, the paper stated that while Sweden is neutral, "the new security policy doctrine is that we don't believe that we will fight alone; we will fight together with others." While the "national" focus of the new policy is pre-eminent, the "interoperability aspect is still as important," he said.

Since the end of the Cold War, he said, national defense was not prioritized, and that had consequences. "Everything from the base system to the personnel system—everything needs to be refocused now," Helmrich said.

The white paper—called the "Swedish Defense Bill, 2016-2020"—set a plan to "successively increase the defense spending over the next five years with an 11 percent increase," or 2.2 percent per year, a government website stated. The bill was described as being based on "broad political agreement" between Sweden's five main political parties and was developed "in light of the developments in Russia and specifically the Russian aggression towards Ukraine."

Summed up, the bill called for less theoretical planning and more specific planning for real-world scenarios; renewed investment in infrastructure and basic equipment (such as trucks); the creation of a new mechanized battalion; reestablishment of a military presence on Sweden's Baltic Sea island of Gotland; more armored vehicles, bridging gear, self-propelled artillery, and anti-tank weapons; two new corvettes; expansion of air defense capabilities; more anti-submarine warfare capacity; increased investment in recruiting and sustaining troops; and a modernized civil defense and "active" cyber defense.

The bill approved further investment in the JAS-39 Gripen indigenous family of fighters and equipping it with the multinational Meteor beyond-visual-range radar guided missile.

The bill specifically ruled out making a judgment about whether Sweden's neutrality continues to make sense, but called for an independent report gauging the value of Sweden's military relationships with other countries, organizations, and alliances, such as the European Union, NATO, and "the transatlantic link" with the US.

Swedish press outlets in September said the resulting report found that while NATO membership would add to Sweden's deterrence, so would strengthened ties with Finland, another nonaligned country. Though she would not comment on the report directly, Sweden's foreign minister, Margot E. Wallström, told journalists, "The answer is not Swedish NATO membership. Freedom from military alliances serves us well and contributes to stability and security in Northern Europe." She also said Sweden's security policy should be "long-term, stable, and protected from sharp fluctuations."

NATO Secretary General Jens Stoltenberg said at the alliance's meeting in Warsaw, Poland, last summer that he knows better than to encourage Sweden to join the group, saying it would not be taken kindly and that Sweden must make its choice internally.

Last June, US Defense Secretary Ashton B. Carter and Sweden's Defense Minister Peter Hultqvist signed a nonbinding statement of intent on military cooperation. It called for increased interoperability between the countries, more numerous joint training and exercises, more cooperation on armaments, research and development, and "meeting common challenges in multinational operations."

Saab, maker of the Gripen, is partnered with Boeing to offer a candidate for the US Air Force's T-X competition. Sweden, too, has a 50-year-old trainer—the Saab 105—and needs to replace it soon. The Erieye airborne warning

Swedish Armed Forces photo by Louise Levin

Swedish air force maintainers refuel and rearm a JAS-39 Gripen. The fighter is certified to carry many US munitions, and Sweden is seeking certification for more.

plane will also need replacement in the coming years.

There's already a good deal of partnership between the US and Sweden, particularly its air force. The Flygvapnet flies American C-130H transports, is a partner in the multinational C-17 Heavy Airlift Wing based in Hungary, and the Gripen uses a variant of the General Electric F404 engine flown on the American F/A-18 fighter. The Gripen is either certified or being certified to carry a wide array of US munitions, including air-to-air missiles, the Small Diameter Bomb, Joint Direct Attack Munition, Joint Standoff Weapon (JSOW), Joint Air-to-Surface-Standoff Missile, Maverick air-to-surface missile, Miniature Air Launched Decoy, Paveway laser guided bombs, and both the Litening and Sniper targeting pods.

Sweden has been heavily involved with international military operations in the last two decades, participating in 12 over the last five years alone, Helmrich said. It participated in peacekeeping in Kosovo, has flown resupply missions in Afghanistan—both in Enduring Freedom and Resolute Support—rescue missions in Chad and Mali, maritime missions in the Gulf of Aden, participates in the NATO Response Force, and flew combat in the 2011 air campaign to oust Muammar Qaddafi from power in Libya. In that conflict, Sweden flew 580 defensive counterair or reconnaissance missions with the Gripen.

USAF Lt. Gen. Ralph J. Jodice II, who ran the air portion of the Libya operation for NATO, said at the time he was greatly impressed with the product from the Swedish recce pods. It is a capability USAF has long since ceded to remotely piloted aircraft. Helmrich said the capability Sweden deployed was not just the tools to collect imagery but included the experts needed to interpret it.

The Flygvapnet has adopted a new slogan in light of the 2015 defense bill, Helmrich said. "We want to be a reliable partner, … a credible air force, and deliver security in the Baltic area."

Though NATO nations take turns performing Baltic air policing, Sweden performs the mission for its own national

Swedish soldiers gather their weapons and equipment on the flight line on Gotland, a Baltic Sea island, during an exercise in 2015. Sweden is re-establishing a military presence there.

Swedish Armed Forces photo by Mats Nyström

purposes, and closer to Russia than the NATO jets fly.

"We are not provocative" with the patrols, Helmrich asserted. "The aim is to be a stabilizing force, not to provoke incidents." Sweden flies around-the-clock surveillance and signals intelligence missions with its Erieye airborne warning and control system-type aircraft and a Gulfstream 4 equipped for reconnaissance. Helmrich said there's been a 50 percent increase in the numbers of such flights since 2012.

"Since the last 15 to 17 years," there has been a heavy push for interoperability with other air forces, Helmrich said. This goal was a big reason for the conversion from the Gripen JAS-39A to the JAS-39C. This included changes in communications—adding the Link 16 data link, for example—plus symbology and metrics in English, the international language of aviation.

"They were built mainly to be interoperable," Helmrich said of the JAS-39C fleet.

"We talk English in the air. We started that in the early 2000s," he said.

When he deployed with a Gripen force to Red Flag, "we were more interoperable than many NATO countries," he asserted. Though Helmrich did not fly in Operation Unified Protector—the Libyan campaign—"everything I've heard is that it was seamless. … We were in place 24 hours after the political decisions."

Helmrich said some old defensive measures are being revived in Sweden. During the Cold War, Sweden routinely operated its fighters from hundreds of roads and highways that were built straight and wide enough to serve as runways, so that if its air bases were destroyed, the Flygvapnet could continue to operate. Roadside turnoffs mark areas where the jets were serviced, fueled, and rearmed. The air force stopped using its highways as alternate runways back in the 1990s, in the defense lull after the Cold War ended, but has begun reviving this practice, Helmrich said.

A NEW CONCEPT

"All those skills" involved in field-turning fighters, he said, "have to be brought back again." The air force is working with agencies that maintain the roads, as well as those owning the adjacent forests, to reinvigorate the practice.

"It's not just materials and equipment, it's how to perform command and control, turnaround times, and so on. So not back to an old concept but a new concept that uses some of the ingredients from the past."

Under the new defense bill, he said, "we now have six fighter squadrons," counting two former training-only squadrons. Air battalions have been reorganized as wings.

The Flygvapnet counts about 4,000 "permanently employed and 700 on a contract basis." The rough breakdown is 900 officers, 1,400 noncommissioned officers, and 900 airmen.

Helmrich boasted that "there's about 20 personnel per platform." Compared with other air forces, "we are very personnel-effective—very efficient." Pilots typically get between 120 and 180 hours a year, up to 15 a month. While that may not sound like a lot, "the exercise area is here," Helmrich said, so there's no transit time to get to a training range. "When you're gear up, you're there. … You can train anywhere you want. The airspace is just great."

Sweden used to have a universal conscription program that brought in draftees for a two-year hitch (unless they volunteered to serve and enter a career path), but it was abandoned in 2010 in favor of an all-volunteer system. It's been "a challenge for us" to compete with the private sector for the most qualified youth, Helmrich said.

Sweden regularly hosts other countries for exercises, particularly with Finland—also neutral, but flying US F/A-18s—and Norway, a NATO member. These Arctic Challenge exercises and lesser, squadron-to-squadron, meets happen several times a year. American F-15s from RAF Lakenheath in the UK sometimes come up to Sweden for training, Helmrich said.

The Gripen is the centerpiece of Swedish defense, much as the Viggen before it and the Draken before that. All

Saab photo by Jamie Hunter

In formation over Linköping, Sweden, are JAS-39s from: Sweden, the Czech Republic, and Thailand (top row, l-r), Hungary and the UK (second row), and South Africa (foreground).

Saab photo by Svarteld

Sweden's Saab 340 Erieye airborne early warning and control aircraft, outfitted with an active electronically scanned array radar system, will need replacing soon.

three aircraft were ahead of their time, and the Viggen and Draken, painted gray, would look right at home on a modern runway even though their designs date back to the '50s and '60s.

The Gripen is used for point defense, offensive and defensive counterair, antishipping, close air support, reconnaissance, and interdiction. It was designed to be nimble and quick, without heavy fuel tanks because it would operate so close to home, and to be easily maintained.

"Turnaround time is between 10 and 20 minutes, depending on what kind of mission you're doing, and it can be done with two technicians," Helmrich said. At Red Flag in 2008, the Gripen achieved a 95 percent rate of launching planned sorties, he said.

The Gripen concept calls for "continuous upgrades," with a major addition to capabilities every third year and smaller block upgrades to existing systems every calendar year.

"Some countries," Helmrich said, "you have a big upgrade and you live with it a number of years. We do this continuously."

The most recent upgrade added capability for the Meteor missile, Small Diameter Bomb, night capability for the recce pod, Link 16, and digital close air support, Helmrich said, along with improved maintenance requirements, to increase availability.

The Meteor is "a game changer," he claimed. The air-breathing missile offers "a bigger no-escape zone" and greater range than the AIM-120 Advanced Medium-Range Air-to-Air Missile, Gripen's principal beyond-visual-range weapon. The motor allows the Meteor to retain propulsion all the way to the target, allowing it to "keep high speed until the very end. A traditional missile engine loses speed. So this is … really great."

Helmrich said, "I can't see that there's any fighter that can compete with Gripen in the air-to-air role at this moment."

SELLING THE GRIPEN

Sweden designed the Gripen not only for its own purposes but for export, to defray its own expense in fielding the jet. It touts the Gripen as an inexpensive alternative for nonaligned countries seeking an effective, easily maintained air defender. So far, the Gripen has logged sales to the Czech Republic, Hungary, South Africa, Thailand, the UK (where it is used in small numbers in the test pilot school), and recently to Brazil, which is buying the advanced JAS-39E and F model.

The newest model of the Gripen, the E version, is set for first flight this year. The JAS-39E concept was worked out over a period of several years, Helmrich said. During that time the Flygvapnet and Saab looked at options ranging from a modest upgrade of the C model up to a clean-sheet, stealth design. Planners determined that with new sensors, tweaks to the airframe, and a lot of new avionics, the existing Gripen could be affordably evolved into a world-class platform able to hold its own militarily and in the export market through 2040, he said.

The E model will have a more powerful version of the GE F414 engine as well as new weapons like the Meteor and Small Diameter Bomb, additional underfuselage hardpoints, an infrared search-and-track system, new air-to-surface missiles, greater internal fuel capacity, new data links, an active electronically scanned array radar, and sensor fusion throughout, Helmrich said. The jet is being developed to reduce workload and offer increased availability and potentially faster turn time.

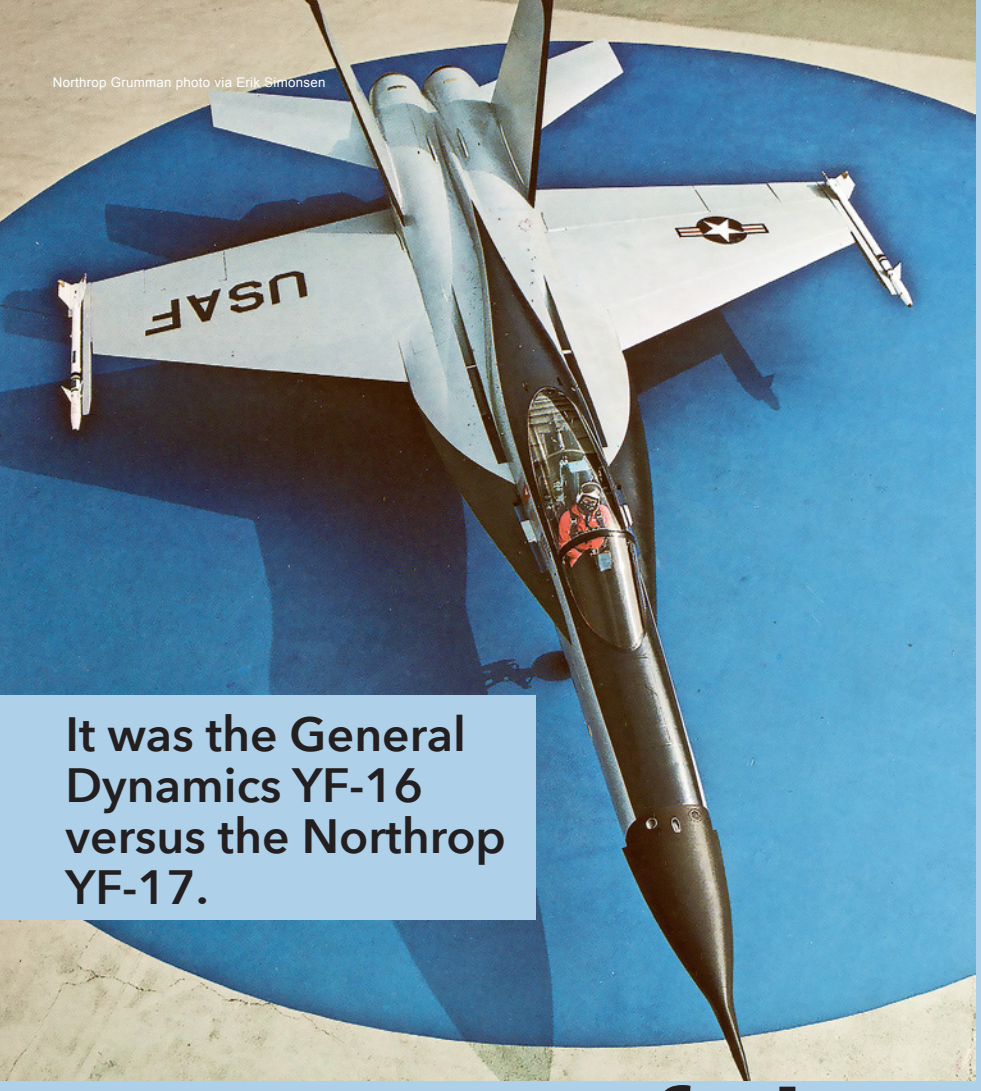
The first JAS-39Es will be delivered circa 2023 and notionally retire around 2042, he said. After that, it will be time for yet another ahead-of-its time design.

Implementing the defense bill is all about "shifting the mind-set" of the Flygvapnet, Helmrich stated.

"We are now turning to a more practical focus … on actions and skills," he said. "It's not what we are capable of, but what we can actually do. And that is really important to us. So we are once again on a war basis: We participate in more exercises. We train a lot more and … show that we do more air operation and also practice a lot of individual military skills."

Helmrich said the new ethos is: "What we do, not what we can do." Through these efforts—particularly the steady practicing of interoperability with the US, NATO, and others—the Flygvapnet increases capability, "and by doing that we are a stabilizing force in this area."

Because of Russian provocations, Sweden is in a more dangerous neighborhood than most would have anticipated 20 or even 10 years ago, but it is seeking the partnerships and equipment needed to secure its defense. ✪



Northrop Grumman photo via Erik Simonsen

It was the General Dynamics YF-16 versus the Northrop YF-17.

Legacy of the Lightweight Fighter Competition

By Erik Simonsen

When the Air Force F-15 and Navy F-14 were being developed in the early 1970s, their performance—especially their speed and radar detection range—was unprecedented, and so was their price. Congress shuddered at the idea of such expensive machines being the fighter mainstays of the two services and directed the Air Force to explore less costly aircraft that could complement the F-15 and, later, the F-14.

From that challenge eventually grew two of the most successful fighter programs in history, each now in service nearly 40 years: the F-16 and the F/A-18. Both have already achieved a combined production of more than 6,000 airframes.

The Air Force's Prototype Program Office at Wright-Patterson AFB, Ohio, launched the Lightweight Fighter (LWF) program in January 1972. The request for proposals specified a highly maneuverable fighter, with emphasis on reduced weight and cost. This was to be a technology exploration; the LWF program didn't commit to production, but to add some

Left: A prototype of Northrop's YF-17 offering, the Cobra, would go on to become the Navy's F/A-18. Below: General Dynamics' prototype YF-16. The design would become the Air Force's F-16.

Lockheed Martin photo

cost realism, USAF set a flyaway price goal of $3 million per aircraft in 1972 dollars, based on a notional production run of 300 aircraft at a rate of 100 a year. The whole structure was an answer to Congress' insistence on a fly-before-buy acquisition approach.

Contractors were given considerable latitude in their offerings—remarkable in an era when the Pentagon had a reputation for overspecifying solutions. Unlike previous competitive fly-offs, each company would conduct an independent, one-year test program beginning with their design's first flight.

Five major contractors competed for the LWF. They were Boeing, General Dynamics, Ling-Temco-Vought (LTV), Lockheed, and Northrop.

In April 1972 the Air Force picked its two finalists. General Dynamics and Northrop would each build two prototypes of their designs, called, respectively, the YF-16 and YF-17.

Both companies took full advantage of the freedom to innovate, producing two divergent and unconventional configurations. General Dynamics came up with a blended airframe featuring a single engine and a bubble canopy offering unparalleled visibility to the pilot. Northrop's design was a two-engine, twin-tail concept with a large leading edge extension suggesting a hooded cobra—hence its name Cobra.

In an attempt to reverse persistent cost increases for complex multimission fighters, in April 1974, Defense Secretary James R. Schlesinger ordered the services to explore a low-cost Air Combat Fighter, saying the ACF could possibly emerge from the successful development of one of the LWF prototypes. The LWF/ACF program results would also fit DOD's new strategy of a high-low fighter mix for the Air Force and Navy.

AN ICONIC CONFIGURATION

Although the F-16 design has evolved in many ways, its original configuration remains iconic. It combines a host of advanced technologies that had never been incorporated in previous operational fighters. To ensure success, the YF-16 design team utilized a secret weapon in the talent of Harry J. Hillaker, who became the deputy chief engineer. Hillaker was a member of the renowned "Fighter Mafia" group of aeronautical experts and was later referred to as "the father" of the F-16.

Hillaker's career began in 1941 at Consolidated Aircraft Corp. (later Convair) with the conceptual design of the B-36 Peacemaker. He also influenced the design of the supersonic B-58 Hustler and the variable-geometry wing F-111 Aardvark.

The YF-16 was an entirely new animal, with blended-fuselage variable-camber wings and forebody strakes that provided additional lift. The wingspan was 32 feet 10 inches with a length of 49 feet six inches. It would use the Pratt & Whitney F100 engine being used on the F-15. A fly-by-wire system would provide excellent response, simplify the electronics systems, and eliminate heavier hydraulic assemblies. Fly-by-wire controls allowed for an aircraft inherently unstable to have increased agility. The YF-16 featured a side-mounted control stick and a head-up display that presented flight information such that the pilot wouldn't have to look down into the cockpit and would potentially never take his eyes off the target. The pilot's seat would be reclined 30 degrees to help him absorb heavy G forces, and the large bubble canopy offered nearly 360 degrees of visibility. Although explored piecemeal in other aircraft types, as a package in the YF-16, these innovations offered unprecedented agility and situational awareness. The YF-16 conformed to the LWF strategy, weighing 14,023 pounds, equipped with two AIM-9 Sidewinder air-to-air missiles.

The first YF-16 rolled out of the General Dynamics plant at Fort Worth, Texas, on Dec. 13, 1973, its unique, futuristic shape accentuated by a colorful red, white, and blue color scheme. Media coverage was extensive, fostering intense interest in the new lightweight generation of fighters.

The airplane was eager; an unplanned first flight occurred on Jan. 20, 1974. General Dynamics test pilot Phil F. Oestricher was making a high-speed taxi test at Edwards AFB, Calif., when the YF-16 lifted off the runway, with the right horizontal stabilizer scraping the runway's surface. Quickly reacting, Oestricher increased thrust and continued the takeoff rather than aborting. The unexpected flight lasted about six minutes and the jet landed without incident. The YF-16 intentionally flew for the first time on Feb.

The two Lightweight Fighter offerings carry AIM-9 Sidewinder missiles near Edwards AFB, Calif., in December 1972.

USAF photo via Erik Simonsen

USAF photo

Two F-16s and two F-106s fly in formation. The F-16 was chosen by the Air Force to replace aging F-106 interceptors and F-4 multirole fighters.

2. Oestricher flew a flawless 90-minute sortie, cycling the gear and reaching 30,000 feet with an airspeed of 345 mph. The side-control stick performed well through three-axis maneuvers and turns limited to three Gs at 15,000 feet. Low-speed handling characteristics were tested at an equivalent altitude with the landing gear down.

During the debrief, Oestricher said the jet was responsive, and acceleration to maximum planned speed "was accomplished very quickly." He praised the "outstanding visibility" afforded by the single-piece canopy, something he said will "impress all fighter pilots."

After General Dynamics' company pilots put the YF-16 through its basic paces, USAF pilots began their evaluations. Eventually, test pilot groups were rotated between the competing YF-16 and YF-17. Their detailed reports on technical and performance merits would drive the Air Force's final decision on the winning contractor.

In November 1974, about a month before the competition's conclusion, the two YF-16s had amassed 376 flight hours, including 12 hours at supersonic speed, up to Mach 2. The jets topped out at just over 60,000 feet. Aerial gunnery with towed targets and strafing on the Edwards range resulted in the firing of over 12,500 20 mm rounds from the M61 Vulcan cannon. Live testing of the AIM-9 Sidewinder and Mk 84 bomb drops had been conducted, and air-to-air tactics and air combat maneuvering had been flown against contemporary fighters such as the F-4E Phantom II.

One tweak made after the evaluations was to the side-stick controller. Its force-sensing mechanism offered the pilot no movement, thus preventing a true feel for the flight controls. Eventually, it was modified with a little "give" to resolve the problem.

When the LWF program got underway, Northrop was already well along with a potential successor to its successful F-5 export fighter. Its P530 Cobra, then in development, made a fairly good match to the LWF specifications and gave Northrop a head start. Company leaders planned to pursue the LWF contract while marketing the P530 in the international arena. Refining the design to make an even better LWF match, Northrop designers came up with P600. Though Northrop marketed the P600 aggressively, it earned no sales. Eventually, the best attributes of the P600 were incorporated into the YF-17 prototype.

The 56-foot-long YF-17 featured an aerodynamically curved wing with a span of 35 feet and twin vertical tails canted outward. The wing and fuselage were joined by leading edge extensions

USAF F-16 pilots prepare for takeoff on the flight line at Camp Lemonnier, Djibouti, in November. The F-16 has been in service for almost 40 years.

USAF photo by SSgt. Kenneth W. Norman

(LEXs) that essentially doubled the main wing lifting capability and served to channel air directly into the intakes during high angle-of-attack maneuvering. Features transferred from the P600 included a two-dimensional fixed ramp inlet replacing the fixed cone inlet. The twin General Electric YJ101-GE-100 engines were rated at 15,000 pounds of thrust each in afterburner. The LEX contour was further refined according to the area rule, and the wing area was reduced to 350 square feet to improve transonic/supersonic performance. The overall jet weighed 23,000 pounds.

Northrop rolled its futuristic YF-17 Cobra out of its Hawthorne, Calif., plant on April 4, 1974. Describing the company's accomplishments producing the low-cost T-38 Talon, F-5A/B Freedom Fighter, and the F-5E Tiger II, Northrop President Thomas V. Jones remarked, "These aircraft demonstrate the successful 20-year evolution of Northrop's application of technology to design advanced fighters at a cost which has permitted procurement of the aircraft in necessary quantities."

A FIGHTER PILOT'S FIGHTER

The sleek YF-17, in overall silver paint, first flew on June 9, 1974, at Edwards. Northrop Chief Test Pilot Henry E. Chouteau was at the controls and flew the jet for 61 minutes. During the flight the YF-17 reached 610 mph at an altitude of 18,000 feet. During the debrief an enthusiastic Chouteau remarked, "When our designers said that in the YF-17 they were going to give the airplane back to the pilot, they meant it. It's a fighter pilot's fighter." Two days later, on June 11, Chouteau flew the YF-17 to Mach 1 in level flight at 30,000 feet without afterburner—a technique later to be known as supercruise.

By December 1974 the No. 1 prototype had logged more than 185 hours during 159 flights, and the second prototype about 91 hours during 71 test flights. Nine hours of supersonic flight time had been accrued, up to and exceeding Mach 2. YF-17 No. 1 verified the flight-control system, stability testing, and 20 mm cannon firing, while No. 2 was flown to 100 percent of design air loads, with the General Electric YJ101-GE-100 performing exceptionally throughout all flight parameters.

The Air Force wrapped up its flight evaluations of both competitors by late 1974, and on Jan. 13, 1975, Air Force Secretary John L. McLucas announced that the General Dynamics YF-16 was the winner.

During the Pentagon press conference, McLucas said the flight test program on the two types of jets "went extremely well," and he said there were "significant differences in the performance of these prototypes." The YF-16, he said, had performance advantages over the YF-17 in "agility, in acceleration, in turn rate, and endurance." The YF-16 "met all performance goals that we had established for it."

The Air Force statement was intended to confirm a clear winner. However, Northrop's loss of the LWF didn't spell the end of the Cobra. The Navy had a preference for twin-engine aircraft for carrier operations, to offer pilots a better chance to recover an aircraft if an engine was out. The Navy was already considering a lightweight fighter to complement the larger and more complex Grumman F-14 Tomcat in a high-low mix.

The new program was dubbed VFAX and the resulting jet would replace Navy/Marine Corps F-4 Phantoms, F-8 Crusaders, and A-7 Corsair IIs.

Although several contractors were working on proposals that fit naval aircraft carrier requirements, Congress

Two F-16s over the coast of southern Florida on their way to a deployment at NAS Key West, Fla., to train with Navy F/A-18 pilots.

USAF photo by TSgt. Jeffrey Allen

USN photo by Petty Officer 3rd Class Nathan T. Beard

An F/A-18F Super Hornet taxis across the flight deck of USS *Dwight D. Eisenhower* on a deployment for Operation Inherent Resolve in November. The Super Hornet first flew in 1995.

unexpectedly opted to reduce procurement costs and redundancy and canceled VFAX. In Congress' view, the YF-16/YF-17 LWF/ACF competition would yield a suitable aircraft.

Northrop entered discussions with McDonnell Douglas, a contractor with extensive experience building carrier aircraft. Under an agreement between the two companies, the YF-17 evolved into the NACF (Navy Air Combat Fighter), a jointly developed air combat fighter for the Navy. McDonnell Douglas would become the prime contractor to offer an aircraft to meet NACF requirements. Northrop, meanwhile, would be a partner on the NACF and the leader on a ground-based YF-17 variant to be offered to NATO nations and other allies.

At the same time, General Dynamics teamed with Vought (LTV) to navalize the YF-16. The YF-16's single engine was an issue, and other factors such as reduced landing approach speed and strengthened fuselage/landing gear all required modifications and added weight.

Both General Dynamics and Northrop presented NACF proposals to the Navy. In General Dynamics' case, it offered three separate variations of its navalized F-16.

THE US NAVY AND BEYOND

On May 2, 1975, the Navy announced it had chosen the F-17 variant as its new lightweight fighter.

The F-17 then evolved into the F/A-18A, the F/A designation coined by the McDonnell Douglas/Northrop team to suggest a multirole fighter/attack aircraft. Though it looked much like the YF-17 from a distance, the new jet was beefier, with bigger engines, a bigger nose, a fatter LEX, sawtooth wing leading edges, different intake geometry, heavier landing gear, and of course, an arresting hook system.

Though a planned "F-18L" land-based version didn't sell and never entered production, F/A-18As were sold to foreign air forces for land-based operations.

The General Dynamics F-16 transitioned from the prototype aircraft to a full-scale development (FSD) production aircraft. The Fort Worth production line was configured to produce the first eight FSD F-16As. During operational test, early FSD F-16As with black radomes were quickly detected at great distances by Aggressor pilots during dogfights. Subsequently, all F-16 radomes were coated with specially formulated gray paint to blend with the two-tone gray camouflage applied to the fleet.

The first F-16A Block 1 (serial No. 78-0001) was flown at Fort Worth in August 1978 and was delivered to the Air Force during the same month. Initial operational capability (IOC) was declared on Oct. 1, 1980. A rapidly paced program, the F-16 was officially named the Fighting Falcon, but pilots preferred the name "Viper" (borrowed from fighter spacecraft in the "Battlestar Galactica" TV show popular at the time), and it stuck, unofficially.

Meanwhile, the Navy/Marine Corps procured the F/A-18. Navy Secretary William Graham Claytor Jr. bestowed the name Hornet on the type in March 1977. With McDonnell Douglas test pilot Jack E. Krings in the cockpit, the No. 1 F/A -18A made its official maiden flight on Nov. 18, 1978. The type was later upgraded with new avionics and other changes that prompted production Hornets to be designated F/A-18C and D (for one- and two-seat versions).

The F-16 design proved so iconic and versatile that it spawned an extensive number of variants.

After being damaged in a landing accident on Rogers Dry Lake at Edwards, the No. 3 F-16 was modified with a two-seat cockpit and reconfigured with a cranked-arrow delta wing. Redesignated F-16XL, and joined by a single-seat version converted from the No. 5 jet, the new configuration competed with the F-15E Strike Eagle in the 1981 Air Force Enhanced Tactical Fighter (ETF) competition. The F-15E won that contest.

Photo by David Raykovitz

A United Arab Emirates F-16E takes off from NAS JB Fort Worth, Texas. The UAE operates some of the world's most advanced F-16s.

With a trapezoidal wing, the F-16XL was later resurrected as the Falcon 21 for an F-16 upgrade program that didn't materialize.

In 1978 the sixth FSD aircraft was converted into the Advanced Fighter Technology Integration (AFTI) F-16 testbed. The AFTI investigated several new ideas, including electric actuator technologies that would be used on the future F-35.

In 1984, General Dynamics offered the Agile Falcon variant, featuring a 25 percent increase in wing area and an innovative technology infusion. It was later proposed as a lower-cost alternative to the Advanced Tactical Fighter program, but when USAF rejected the idea, the Agile Falcon's technology was adapted and later incorporated into Japan's Mitsubishi/Lockheed Martin F-2 fighter.

After the Navy's failure with the A-12 Advanced Technical Aircraft stealth attack plane in 1991, the service needed a quick way to populate its flight decks with a credible strike platform. The service decided the fastest way to do the job—and save a lot of money on ground gear, spares, and training—was to grow the Hornet into a larger aircraft with more weapons-carrying ability, longer range, and better sensors.

MERGERS AND UPGRADES

Thus was born the Super Hornet. It first flew in November 1995. The F/A-18E was the single-seat version, and the F/A-18F was a two-seater with a weapon systems officer in back. The Super Hornet was a dramatic upgrade, with a 25 percent increase in wing area, a Multifunctional Information Distribution System (MIDS), APG-73 advanced radar, and Advanced Targeting Forward Looking Infrared (ATFLIR). The pilot was equipped with the Joint Helmet Mounted Cueing System (JHMCS). It allows pointing weapons without turning the aircraft. In addition, large trapezoidal intakes infused with radar-absorbing technology fed two uprated General Electric F414-GE-400 engines generating 22,000 pounds of thrust each. The Super Hornet offered a 40 percent increase in range and loiter time versus the earlier version. The first Super Hornet was delivered in December 1998, and IOC was achieved in September 2001.

The LWF's evolution into the ACF for the Air Force, and the NACF for the Navy, was truly exceptional. In a 1990 article written for the Society of Experimental Test Pilots, Northrop test pilot Paul Metz stated, "Both Northrop and General Dynamics were asked to build a new fighter unconstrained by conventional design criteria while using existing technology," and in that "the LWF program was successful."

Through various mergers and acquisitions the contractors' names have changed. General Dynamics sold its Fort Worth military aircraft division to Lockheed in 1993, and when the company merged with Martin Marietta, it became Lockheed Martin in 1995.

McDonnell Douglas's merger with Boeing in 1996 gave Boeing a heavy fighter presence with the F-15 and F/A-18.

More than 4,570 F-16 multirole fighters in blocks 10 through 60 have been produced for some 30 countries, and more than 1,550 Hornets and Super Hornets have been built, along with more than 100 EA-18G Growler electronic attack variants.

Lockheed Martin continues to upgrade the F-16 for all its customers. The latest F-16V took to the air in October 2015. This variant features a fifth generation APG-83 active electronically scanned array fire-control radar, advanced mission architecture, and numerous cockpit improvements.

Together, the YF-16 and YF-17 created the fourth generation of fighter aircraft that today are the most numerous examples of the class. The Lightweight Fighter competition gave rise to two winning aircraft designs that have each created an extraordinary legacy. ✪

Erik Simonsen is a freelance photographer and writer. His previous article for *Air Force Magazine*, "F-108 Rapier," appeared in September 2014. His latest book is *Complete History of US Combat Aircraft Fly Off Competitions Winners, Losers, and What Might Have Been.*

USAF's HISTORY WITH

As of Dec. 5 2016, more than a fifth of all of the Air Force's officers are women—the highest percentage in USAF's history.

We've been covering female demographics in the Air Force since the 1950s, when women made up just a little more than one percent of the force. Here, we give you a look at the last six decades of progress as women have gradually become a larger portion of USAF's serving airmen. The biggest jump came in the 1970s, and numbers have consistently been in the 19 percent to 20 percent range in recent years.

Today, there are fewer women in USAF (60,677) than there were in 1996 (64,176). But there's less of everyone else, too. According to the Air Force's most recent data, the Active Duty force itself is down to 312,275 service members (that's almost a fifth fewer than the 1996 force). So women clock in at 19.43 percent of the Active Duty force, or almost three percentage points higher than they did 20 years ago.

Since 2000, the number of female officers has continued to climb, but the number of women in the larger enlisted force has slightly declined.

Here's some other interesting facts:

☛ Women made up the largest percentage of Active Duty members in 2006: 19.91 percent, or 68,600 out of 344,529 members.

☛ There were more women in USAF in 2004 than in any other year in the last 20 years: 73,035, when they made up 19.61 percent of the force.

At right, we've charted the Active Duty from the 1950s to 2016, broken down by officer and enlisted forces.

We've charted our findings, broken down by total:

From the 1950s

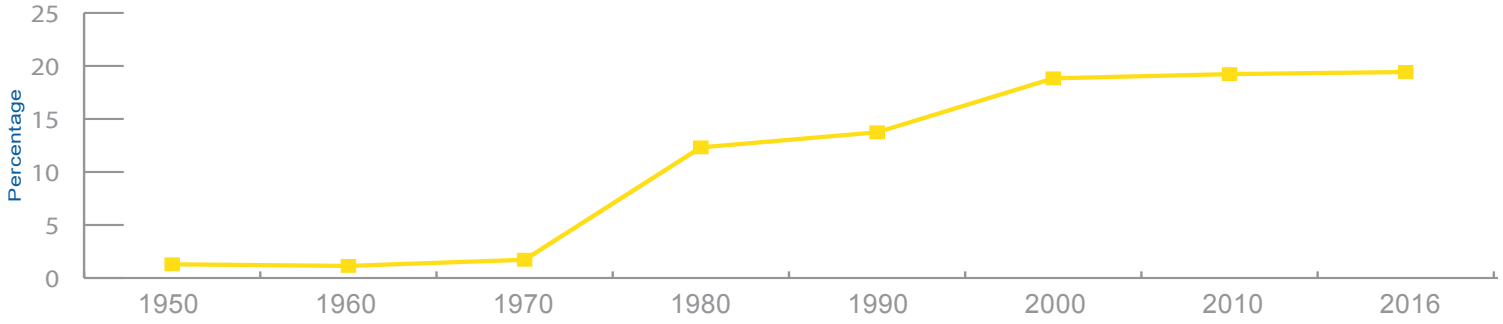
Percentage of women in the Active Duty force

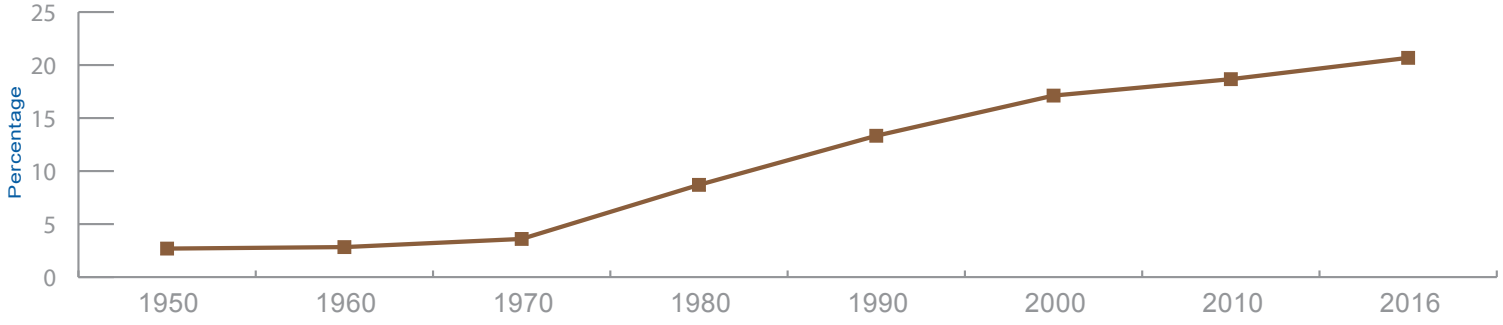
Percentage of women officers

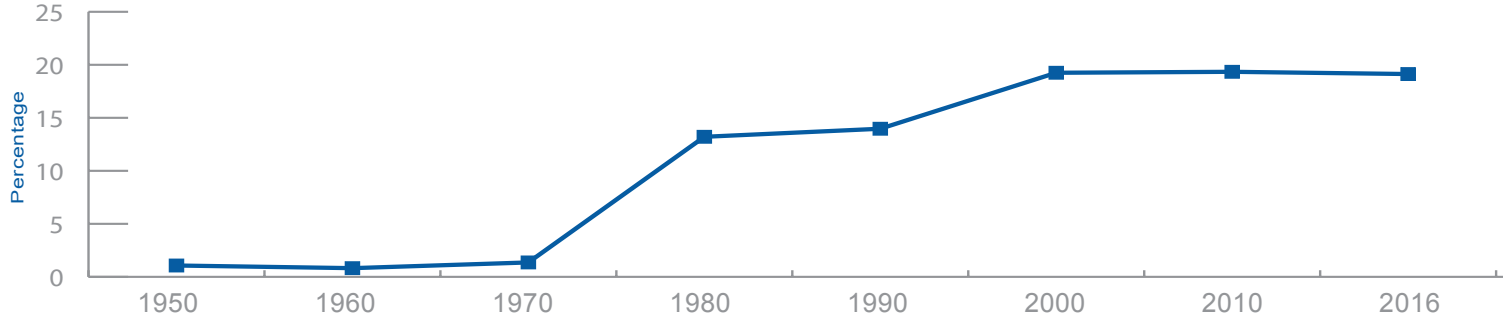
Percentage of women in enlisted force

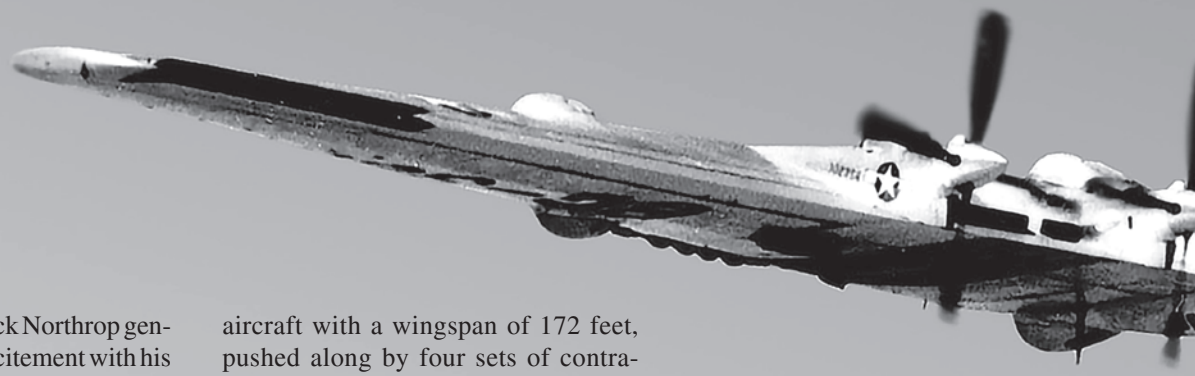
By **Gideon Grudo,** Digital Platforms Editor

WOMEN









Jack Northrop and the Flying Wing

In the 1940s, Jack Northrop generated great excitement with his amazing "Flying Wing," which flew like an airplane but didn't look like one, at least not in the traditional sense. It demonstrated that an aircraft did not need a tail or a fuselage to fly. The wing was enough.

In fact, Northrop's first true flying wing, the small-scale N-1M, took off on its own during a high-speed taxi test on a dry lake bed in the California desert in July 1940. It hit a rough spot, bounced 10 feet into the air, and flew several hundred feet before the pilot landed it.

Northrop was not the first to imagine an "all-wing" airplane, but he took the idea much further than anyone else did. In the middle 1940s, the Air Force regarded his XB-35 as a potential successor to its best bomber of World War II, the B-29.

The XB-35 flew for the first time in June 1946, a giant boomerang-shaped aircraft with a wingspan of 172 feet, pushed along by four sets of contra-rotating propellers mounted on the trailing edge. The YB-49, a jet-powered version of the XB-35, came in 1947.

Seen head-on, the Flying Wing looked like a flying saucer and was sometimes mistaken for one in UFO sighting reports. Public fascination was nurtured by its regular appearance in newsreels and photo spreads in popular magazines.

However, the Flying Wing had serious technical and operational problems. The contra-rotating propellers never worked well. Instability in flight was a constant struggle for the YB-49.

Controversy surrounds the cancellation of the YB-49 by the Air Force in 1949. Flying wing technology lay dormant and was presumed dead.

In the late 1970s, though, the flying wing was resurrected as a candidate for the Advanced Technology Bomber. "Fly-by-wire" technology had solved the instability problems and the flying wing offered an advantage that had become of critical importance: It was extremely difficult for radar to detect.

ELIMINATING THE TAIL

Interest in a flying wing dates from the early days of aviation. It was understood that a fuselage and a tail provided stability and control for an airplane—but that they also created drag, which reduced aerodynamic efficiency.

The first powered all-wing aircraft to fly was the D.4 in Britain in 1908. It was a V-shaped biplane, built by a British army officer, John William Dunne, who acknowledged that it was "more a hopper than a flyer."

More advanced flying wing aircraft were produced by others, notably Walter and Reimar Horten in Germany, but the concept was taken to

An XB-35 Flying Wing overtakes a B-17 bomber near Muroc Army Airfield in California.

its fullest by the innovation of John Knudsen Northrop.

"My grammar school and high school education, outside of the school of hard knocks, was the only education I ever had," Northrop said. "I didn't go to college. I didn't have any correspondence courses, or anything of this sort." Despite his lack of formal education, he went on to be recognized as one of the leading aircraft designers of the century.

He began as a draftsman for the Loughead brothers—who had not yet changed the spelling of their name to "Lockheed"—in Santa Barbara, Calif., in 1916. In the 1920s, he was the principal designer of the classic Lockheed Vega monoplane and worked with Ryan Aircraft on *Spirit of St. Louis,* the airplane that Charles Lindbergh flew to Paris.

In 1929, Northrop produced what aviation magazines of the day called a "flying wing." Indeed, the aircraft was built around a large thickened wing in which the pilot sat, but twin outrigger booms ran backward to a conventional tail assembly.

His first true flying wing was the N-1M—for "Northrop First Mockup"—in 1940, by which time he was the head of his own aircraft company. The N-1M was a small test bed with a wingspan of just 38 feet, constructed mostly of wood to allow easy changes to the configuration. The control surfaces, including the rudders, were embedded in the wing itself.

The N-1M test results were good enough to elicit a request in 1941 from the Air Corps for an aircraft design study. Northrop, along with Consolidated Aircraft and Boeing, was invited to submit a proposal for a bomber with a range of 6,000 miles and a top speed of 450 mph, improving on the expected performance of the B-29 then in development.

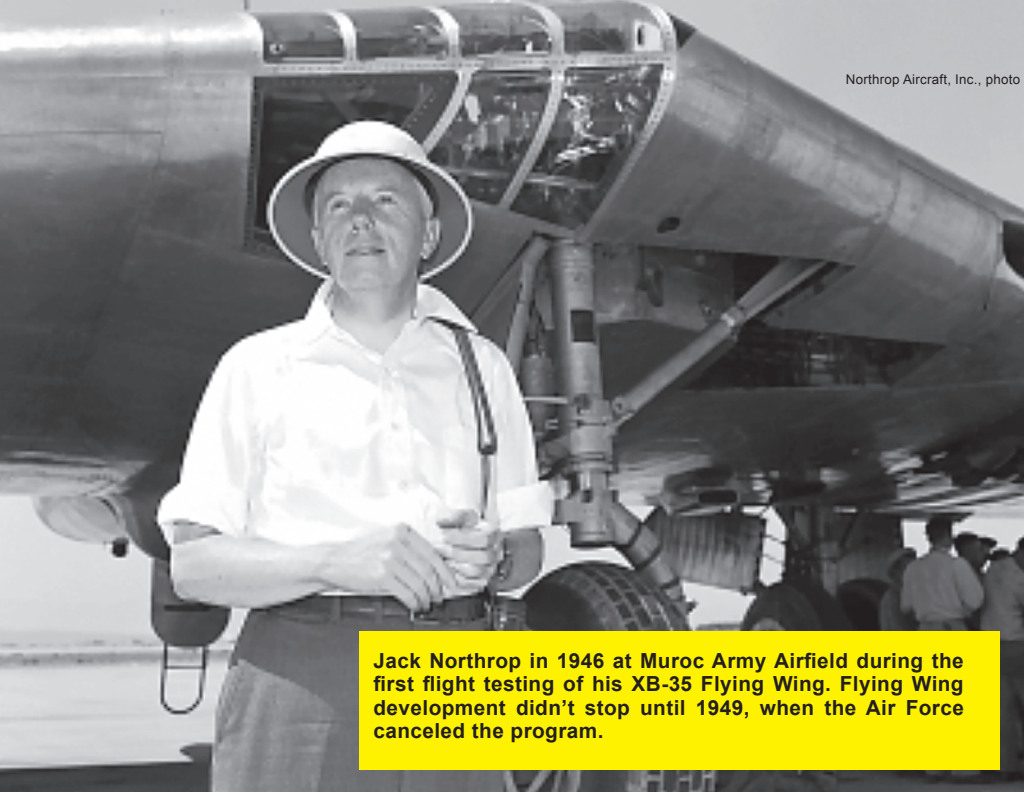
THE SPECTACULAR XB-35

Northrop's design for the prototype bomber, designated the XB-35, was

It wasn't killed quite as dead as they thought.

By John T. Correll

Northrop Aircraft, Inc., photo via Air Force Global Strike Command History Office



Northrop Aircraft, Inc., photo

Jack Northrop in 1946 at Muroc Army Airfield during the first flight testing of his XB-35 Flying Wing. Flying Wing development didn't stop until 1949, when the Air Force canceled the program.

Further good fortune came Northrop's way in 1942 when the Air Corps canceled the contract for 402 Martin B-33 bombers and split the revised order evenly between the XB-35 and Consolidated's XB-36. Since Northrop had no space for an assembly line at its plant in Hawthorne, Calif., XB-35 production would be handled by Martin.

Northrop forecast delivery of the first XB-35 in November 1943, but the program was hounded by production problems and disappointing range and speed test results. In May 1944, with the anticipated requirement for wartime bombers diminishing, the Air Corps canceled the XB-35 production contract but kept the Northrop Flying Wing alive for test purposes.

The XB-35 finally made its first flight in June 1946, three years late and 400 elegant and stunningly impressive, a great graceful sweep of polished aluminum. All of the flight controls, "elevons" that functioned as both elevators and ailerons, and flaps that acted as rudders, were mounted on the trailing edges of the wings.

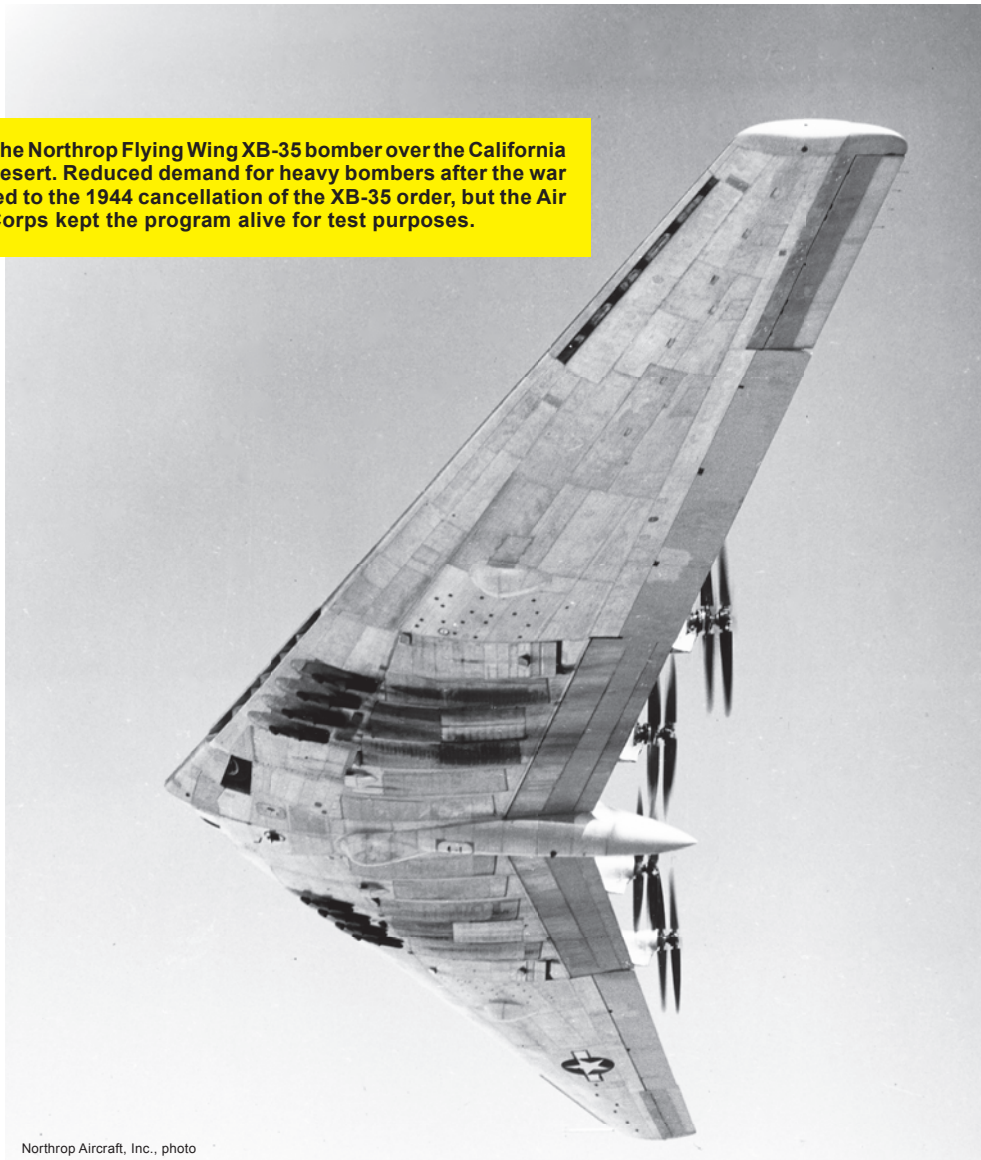
There were a few bumps and blisters on top—notably the plexiglass bubble above the pilot's position and a smaller one for the navigator to take sightings—but the crew nacelle, the fuel tanks, and bomb bays were inside the wing. It was thick enough, 85.5 inches at the root chord, to provide cramped cockpit space for a standard crew of nine.

Among the unusual features were contra-rotating propellers, two of them mounted, one behind the other, on each engine shaft and turning in opposite directions. (This was considerably more complicated than counter-rotating propellers, which also turned in opposite directions but with only one on each shaft.)

This radical propulsion system promised greater efficiency but it never worked as it should and was eventually dropped in favor of conventional single-rotation propellers.

In late 1941, the Air Corps ordered two XB-35s. The news reports were ecstatic. "Perhaps the day is not far distant when flying-wing types will dominate the entire field of military, commercial, and private flying," *The New York Times* gushed in November 1941.

The Northrop Flying Wing XB-35 bomber over the California desert. Reduced demand for heavy bombers after the war led to the 1944 cancellation of the XB-35 order, but the Air Corps kept the program alive for test purposes.



Northrop Aircraft, Inc., photo

Northrop Aviation, Inc., photo

The YB-49 rolls out from its hangar at Northrop Aircraft, Inc., in Hawthorne, Calif., on Sept. 29, 1947. The rollout is being filmed by two cameras mounted on the roofs of cars.

percent over budget. By then, it had another problem.

"The atomic bomb had dramatically changed the nature of strategic warfare," said Air Force historian Richard P. Hallion. "It would be increasingly important in the years ahead to develop bombardment aircraft capable of lugging the then-ponderous 10,000-pound atomic bomb. The XB-36 could do so; Northrop's XB-35 and later the YB-49 could not."

Cheerleaders were not substantially deterred. *The New York Times* proclaimed in June 1946 that the XB-35 could "carry more bombs farther and faster than any plane in history" and could "outspeed most of today's fighter planes."

Not to be outdone in enthusiasm, *Air Force Magazine* predicted in July 1946, "Compared to a conventional airplane of equal power, weight, and fuel load, the Flying Wing will 1) carry one-fourth more useful load, 2) travel one-fourth farther with an identical fuel load, 3) travel approximately 20 percent faster with the same thrust or applied horsepower."

JETS FOR THE YB-49

The XB-35 was not as futuristic as it looked. The design had been advanced for 1941 but, as Hallion said, it was "caught at a transition point in aeronautics: between the era of the propeller and the jet."

Northrop and the Air Force attempted to bridge the transition by replacing the propellers on several of the XB-35s with eight jet engines in a variant designated as the YB-49. It was easily the most handsome of the Northrop Flying Wings.

Four fixed vertical fins were mounted on the trailing edges for stability and four shallow "fences" or air dams ran from front to back to help channel the airflow. Northrop disliked the intruding fins but they added, in their way, to the sleek appearance of the aircraft.

The YB-49 first flew in October 1947. It achieved some gain in top speed, but the extra weight of the jet engines reduced the range and the bomb load significantly. It also had "mission-limiting stability problems that rendered it unsuitable for a bombing platform," Hallion said.

By then—and although its supporters were not ready to concede the point—the Flying Wing had been effectively eliminated as a bomber. The B-36, which performed much better, entered Air Force operational service in 1948 and would continue as the first-line bomber until supplanted by the B-52 in the 1950s.

The prospects for the Flying Wing were restructured in September 1948 with an Air Force contract for 30 YRB-49s in a reconnaissance variant called the RB-49A. Even in that the future was not secure, with the option of a reconnaissance version of the faster and more capable B-52, then moving along in development, looming in the 1950s.

The YB-49 was inspirational in flight but it "could not fulfill the promise given to it by jet propulsion," Hallion said. "Its aerodynamic planform remained that of a solidly subsonic 350 mph propeller-driven airplane. Structurally it was at best only marginally suited for the 500 mph environment since it constituted basically a 'lash-up' of jet engines replacing the B-35's piston ones."

On June 5, 1948, a YB-49 broke up in flight over the Mojave Desert near Muroc Dry Lake in California, killing all five members of the test crew. The cause of the mishap was disputed, but structural failure almost certainly figured into it.

CANCELLATION

The final blow came from deep cuts ordered by President Harry S. Truman to the Fiscal 1950 defense budget. A board of senior Air Force officers in December 1948 proposed the cancellation of six aircraft programs, 240 airplanes altogether, from four different contractors.

Among these were the 30 reconnaissance YRB-49s. Air Materiel Command sent Northrop a telegram in January 1949 to stop work on the YRB-49 except for testing, but the heyday of the Flying Wing was not quite finished.

The YB-49 was already scheduled to take part in a big air show at Andrews Air Force Base on the outskirts of Washington, D.C., in February. The show, according to *The Washington Post,* grew from a plan for the House Armed Services Committee to see "virtually every plane in the fighting fleet." That included what the newspaper described erroneously as "the flying wing jet bomber B-49."

The YB-49, flown in from California, was seen at Andrews by Truman, four members of the Cabinet, and 102 members of Congress. *The Post* reported that "the Northrop B-49, a flying wing, drew the most attention. Apparently, most of the members of Congress did not know that the order for the odd-looking plane had been canceled."

Truman liked it, too, and reportedly said, "This looks pretty damn good to me. I think we ought to buy some." At his instruction, the YB-49 was flown down Pennsylvania Avenue and past the Capitol, but the President's impressions were momentary and the budget cuts held.

The House Armed Services Committee held an inquiry that summer, ostensibly about malfeasance in procurement of the B-36 bomber. In actuality, it was an offshoot of the "Revolt of the Admirals," seeking to block the B-36, which the Navy regarded as a threat

The front landing gear of an XB-35. Note the copilot's window above the strut, to the right of the centerline.

USAF photo

to aircraft carriers in the long-range power-projection role. The hearings were orchestrated by Rep. James Van Zandt (R-Pa.), who was a member of the Navy reserve.

Several aircraft industry executives were called to testify, including Northrop who said there had been no dishonest influence in award of the bomber contracts or the cancellation of other contracts.

Of the 15 Northrop Flying Wing platforms produced, several crashed and a number of others, some of them stripped "shells," were destroyed as surplus. Two YB-49s survived the cancellation. One broke in two when a landing gear collapsed in a high speed taxi run test in 1950 and was destroyed.

The other was preserved for testing, flew 13 times, was put into storage, and finally scrapped in 1953. Jack Northrop retired in 1952 at the age of 57 and sold his holdings in the company.

From all appearances, the flying wing was dead, a footnote in history, although it popped up from time to time in popular culture. The 1953 movie "War of the Worlds" used Northrop YB-49 test footage to depict the dropping of an atomic bomb on Martian invaders, oblivious to the irony that the demise of the YB-49 was due in part to its inability to carry the atomic bomb.

"Raiders of the Lost Ark" in 1981 had a fight on the ramp around the fictitious "BV-38" flying wing. Indiana Jones backed his opponent into the spinning propellers with suitable bloodshed. The BV-38 was supposedly based on a Horten test bed from Germany but it also borrowed features from several Northrop prototypes.

NORTHROP'S CHARGE

After a silence of 30 years, Northrop reemerged in public with an accusation that the Air Force had killed the Flying Wing in retribution for his refusal to merge his company with Consolidated Vultee—also known as Convair—which had been formed by the earlier merger of Consolidated with Vultee in 1943.

The charges were made in an interview with Los Angeles public television station KCET in 1979 but the program, "The Flying Wing—What Happened to It?", was not broadcast until December 1980, by which time Northrop had suffered a series of strokes that left him unable to speak.

According to Northrop, he was summoned in July 1948 to a meeting with Secretary of the Air Force Stuart Symington, who demanded that Northrop agree to the merger with Consolidated Vultee, maker of the B-36 bomber.

He quoted Symington as saying, "You'll be goddamned sorry if you don't."

"I got a telephone call a few days later from Mr. Symington," Northrop said. "He said, 'I am canceling all your Flying Wing aircraft.'"

Northrop said he had perjured himself in his congressional testimony in 1949 in which he had joined in absolving the Air Force of impropriety in the bomber contracts. He did so, he said, out of fear that his company would otherwise be blackballed.

KCET reporter Clete Roberts then enlarged on the story, reporting that the YB-49 won a "flyoff" competition against the B-36 and "had been selected by the United States Air Force as the next generation bomber, the replacement for the B-29."

The Los Angeles Times, picking up on the story, said that in 1948, the Air Force had "awarded Northrop a contract to build 35 bombers with the possibility of ultimately producing 200 to 300 planes."

Variations on these accusations have persisted ever since. The best job of sorting out the facts has been by Francis J. "Bud" Baker, currently on the faculty of Wright State University, a former Air Force officer and manager in the B-2 program who investigated the Flying Wing cancellation for his Ph.D. thesis in 1984.

To begin with, it is fairly clear that the July 1948 meeting was requested by Northrop, not by Symington, to obtain clarification about several aspects of the program. There had never been a "flyoff," with the B-36, the YB-49 was not selected as "the next generation bomber," and there was no contract for 35 bombers with more to come. Northrop's contract was for 30 YRB-49 reconnaissance aircraft.

Symington denied that he had made any threats. "There was a tremendous

National Archive photo

President Harry Truman (left, with binoculars), military officers, and members of the press inspect a B-49 in 1949 during an air show at Andrews AFB, Md. Despite Truman's enthusiasm for the Flying Wing, the program was canceled.

overcapacity in the industry following World War II," he told Baker. "It was clear that many of the smaller companies could not survive. Northrop came to see me and said that unless he received his flying wing orders, his company would be in serious trouble. I knew at the time that the Air Force favored the B-36, built by Convair. I may very well have suggested that he merge his company with Convair, who we knew was going to get business."

Symington also pointed out that summary cancellation of the YB-49 was not within his authority. That decision came as a result of the senior officer board review five months later, and Northrop was not singled out for the cut. The biggest losses in the reduction were sustained by North American, not Northrop.

RETURN OF THE FLYING WING

Northrop died in 1981, but he lived long enough to see the reincarnation of his flying wing concept in a dramatic new application. Competition was underway for the Air Force's Advanced Technology Bomber, and by then, two big things had changed.

It was known in the 1940s that the all-wing configuration had a low radar cross section—registering a minimal image on the radar screen—but that had not been of much interest at the time. By the 1980s, the ability to evade radar was regarded as vitally important.

The technology of the 1940s could not resolve the Flying Wing's problem of instability in flight. The solution was developed by NASA and the Air Force Flight Dynamics Laboratory in the 1960s and 1970s with "digital fly-by-wire," which translated the pilot's actions into electronic signals and used computers to manipulate the flight controls.

Fly-by-wire, operating instantly and constantly, compensated for instability. It was sometimes said that given the right software and enough engine, it would be possible to fly a John Deere tractor.

The two companies contending in the Advanced Technology Bomber program were those with the most experience with radar low observables, Lockheed because of its development of the F-117 attack aircraft, and Northrop for its history with the Flying Wing.

"Northrop's design team and mine worked in total ignorance of what the other side was doing," said Ben Rich of the Lockheed Skunk Works. "But following the basic laws of physics, they came up with strikingly similar designs—a flying wing shape," concluding "that this unusual boomerang shape afforded the lowest radar return head-on and provided the favorable lift-over-drag ratio necessary for fuel efficiency in long-range flight."

Just before Northrop's death, he was given special permission by the Air Force to enter the Northrop development facilities and see the ATB design, which eventually became the phenomenal B-2 stealth bomber. It had a wingspan of 172 feet, just like the YB-49.

Northrop's original Flying Wing was "30 years ahead of its time," said E. T. Wooldridge when he was chairman of the Aeronautics Department at the National Air and Space Museum. Retired Brig. Gen. Robert L. Cardenas, who was the principal test pilot for the YB-49 in the 1940s, added that the airplane "had to wait for technology to catch up." ✪

John T. Correll was editor in chief of *Air Force Magazine* for 18 years and is now a contributor. His most recent article, "Maxwell Taylor's Trumpet," appeared in the January issue.

By Robert S. Dudney

Right Stuff, Revisited

"Roger. The clock is operating. We're underway. ... Zero G, and I feel fine."**—Laconic statement radioed to Earth by USMC Col. John H. Glenn Jr. at start of historic 1962 orbital spaceflight. Glenn, the last of America's original seven Project Mercury astronauts, passed away Dec. 8 at age 95.**

Russia's Landgrab

"Quite simply, Russia has launched a military landgrab in Ukraine that is unprecedented in modern European history. These actions in Crimea and other areas of eastern Ukraine dangerously upend well-established diplomatic, legal, and security norms. ... We believe it is in our vital national security interest to uphold these norms and values and prevent America's commitment to its allies and ideals from being called into question. ... We believe that Russia's illegal annexation of Crimea should never be accepted."**—Letter from bipartisan 27-member group of senators to President-elect Donald J. Trump, Dec. 8.**

Meanwhile, in Lithuania ...

"Spring will come, the cuckoo will sing, and we will pave our roads with the corpses of Russian soldiers."**—Rimvydas Matuzonis, Lithuanian who teaches guerrilla warfare courses for civilians, The Associated Press, Dec. 1.**

Affordability Quiz

"Do we go down the path of trying to recapitalize both nuclear and conventional [assets] at the same time? ... How do we as a nation ensure that we are appropriately modernizing both our conventional forces that have atrophied and our nuclear forces that have atrophied. And we've got to get at both. ... We tend to get the question, 'Can we afford this?' I would offer you a different question: 'Can we afford not to do this?'"**—Gen. David L. Goldfein, USAF Chief of Staff, *National Defense,* Dec. 6.**

"Dear Next SECAF ... "

"The first thing I would say is, 'You think you know everything, but beware the unknown unknowns.' You'll have an agenda of things you'll begin working on and boom! Real life will intervene."**—Secretary of the Air Force Deborah Lee James, interview with BreakingDefense.com, Dec. 1.**

Something of an Obstacle

"I don't give a damn what the president of the United States wants to do, or anybody else wants to do. We will not waterboard. We will not torture."**—Sen. John McCain (R-Ariz), quoted in *The New York Times,* Nov. 28.**

Raptor Tales I

"We've been focused on the high-end threat all along. ... In the F-22, I convert on guys, and they never even see you there. You roll up right behind them and go, 'Why waste a missile when you have a gun?'"**—Col. Peter M. Fesler, F-22 pilot and commander of USAF 1st Fighter Wing, quoted in *The National Interest,* Nov. 29.**

Raptor Tales II

"It [the Raptor] makes up for a lot of shortcomings in the pilot side. You can have a really bad day and [the] airplane will still do phenomenally well. ... In this airplane it is much easier to survive."**—F-22 pilot call sign Crash, *The National Interest,* Nov. 29.**

Occam's Razor

"Some people say you can't throw money at everything. You can! You absolutely can. If you said, the pilot bonus is now $500,000, single lump-sum payment, I guarantee you will solve your pilot shortage."**—Tom Hunt, former USAF fighter pilot who left the force in 2013, VOAnews.com, Nov. 28.**

The Pompeo Line

"The line is very clear. Are you with us or against us? If you're with us: God bless you, Godspeed, let's go get 'em. And if you're against us: Godspeed, I have a missile that is looking for you."**—Rep. Michael R. Pompeo (R-Kan.), tapped to be CIA director in Trump administration, quoted in DefenseOne.com, Nov. 30.**

Latest Sorcery

"We managed to fabricate very teeny tiny structures. Those magic structures are capable [of] changing the intensity of the light, change the shape of the light, and at the same time, change the color of the light. Our eyes are capable only of seeing light in the visible spectrum. If we can fabricate an area of nanostructures on flat surfaces like glass, ... we will be able to convert invisible light in the nighttime or dark areas into visible light."**—Mohsen Rahmani, Australian National University, on super night vision systems, DefenseOne.com, Dec. 7.**

A Certain Latin Flair

"One more three- or four-star general given a senior appointment, and we can start referring to a Trump junta rather than a Trump administration."**—Retired Army Lt. Col. Andrew Bacevich, commenting on prominence of flag officers in Trump administration, Time.com, Nov. 29.**

Vanishing Act

"He [ISIS chief Abu Bakr al-Baghdadi] is in deep hiding because we have eliminated nearly all of his deputies. We had their network mapped. If you look at all of his deputies and who he was relying on, they're all gone."**—Brett McGurk, US envoy to the global coalition fighting ISIS, *The Washington Post,* Nov. 28.**

Army, Navy, Air Force, Marines

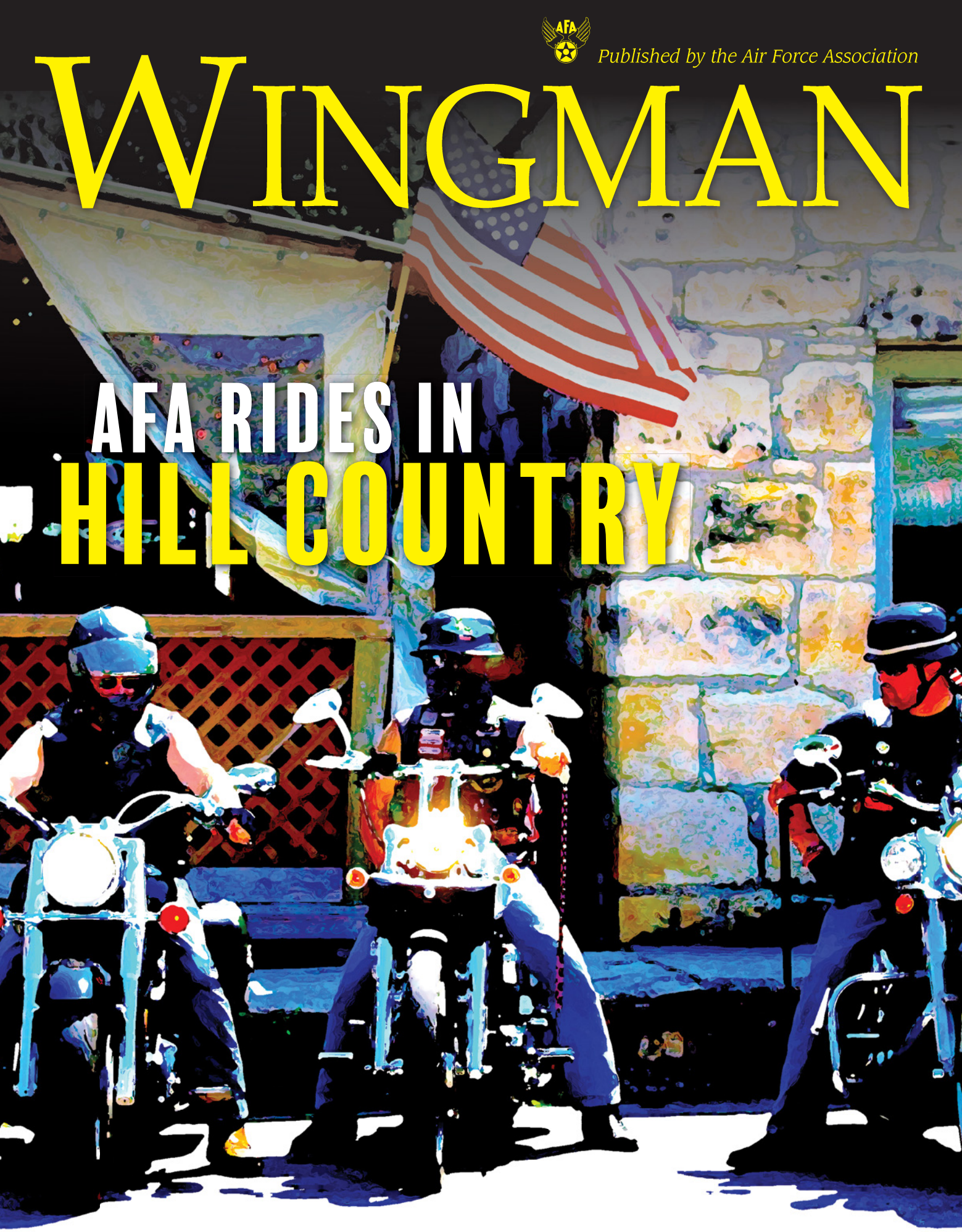
"The biggest challenge right now is the fact that only three in 10 can actually meet the requirements to actually join the military. We talk about it in terms of the cognitive, the physical, and the moral requirements to join the military, and it's tough. ... What the research tells us is that 50 percent of the youth today actually know very little about the military. They don't know the different types of services—the fact that there is an Army, a Navy, an Air Force, and a Marine Corps."**—Maj. Gen. Jeffrey J. Snow, commander US Army Recruiting Command, *The Arizona Republic,* Dec. 1.**

He's Back

"Rosalynn and I share our sympathies with the Castro family and the Cuban people on the death of Fidel Castro. We remember fondly our visits with him in Cuba and his love of his country."**—Former President Jimmy Carter, statement on death of Cuban thug president for life Fidel Castro, Nov. 26.**

Published by the Air Force Association

WINGMAN



AFA RIDES IN HILL COUNTRY

GET YOUR MOTOR RUNNING

By Steven Phillips, with photos by Vincent Harris

Photo by SMSgt. Chris McCool

AFA on Wheels

The idea came about during an outing among motorcycling friends in Texas: Wouldn't it be great to have an event combining motorcycles, support for enlisted airmen, and AFA?

That's how the Annual AFA Heritage Ride began.

In spring 2015, SMSgt. Christopher J. McCool and other Alamo Chapter members coordinated the first ride, designating it as a fund-raiser for JBSA-Lackland's Airman Heritage Museum—thus the "heritage" in the ride's name.

Before that inaugural event and again in 2016, McCool began by talking to the assembled riders about AFA's mission and—important for a group ride—gave a motorcycle safety briefing. Riders then wheeled through the Texas Hill Country region north of San Antonio.

That initial ride was such a hit that McCool created a team to plan the next one. The second Annual AFA Heritage Ride took place last June.

This outside-the-box AFA activity drew a wide-ranging group of participants, attracted by the opportunity to contribute to a good cause while doing something they enjoy.

The third annual ride is scheduled for this spring.

/1/ In 2016, the diverse crowd involved different types of bikes and riders of all experience levels. This group, photographed in Bandera, Texas, joined the AFA ride after it was underway. The event had already begun to gain a reputation as one of the best motorcycles rides in the area. **/2/** Some 45 people turned out in 2015. Nearly 60 took part the next year. Here, riders line up in 2016 at a stoplight, with chapter members TSgt. Steven Phillips bringing up the rear left and CMSgt. Edward Edgar at the rear right. **/3/** Part of the group that joined the ride for the stretch into Bandera. The complete ride took some seven hours. **/4/** Chris McCool, AFA National Director CMSgt. Kathleen McCool, and Edgar at a rest stop. **/5/** Drone's view of motorcycles pulling into Bandera. **/6/** The rides provide a chance to meet other members of the JBSA military community. ✪

Alamo Chapter member TSgt. Steven Phillips is an instructor at the Air Force Recruiting School, JBSA-Lackland, Texas. He rides a Harley-Davidson V-Rod. TSgt. Vincent Harris is a recruiter in Tacoma, Wash.

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CHAPTER NEWS

By June L. Kim, Associate Editor

Updates on AFA's activities, outreach, awards, and advocacy.

LANCE P. SIJAN CHAPTER

Last fall, the Lance P. Sijan Chapter honored 16 Vietnam War veterans from the Colorado Springs, Colo., area during a chapter meeting.

Colorado State President Timothy J. Tichawa and Sijan Chapter President Donald T. Kidd made opening remarks to a group of 75 people, which included members of a local Vietnam veterans organization, reported Sijan Chapter VP Linda S. Aldrich.

Maj. Michael D. Kennedy, course director for modern military history at the Air Force Academy, was guest speaker and gave a presentation about the Vietnam War.

Sijan Chapter VP for Veterans Affairs Paul Bailey organized the event and had reached out to the veterans, to invite them to the ceremony and receive a special pin, said Aldrich. The pin featured an eagle on the front and the message, "A grateful nation thanks and honors you," inscribed on the back.

Air Force JROTC cadets from Colorado Springs Academy High School presented the colors. At the end of the evening, cadet Anthony Mayes and Vietnam War veteran Gus Freyer, the youngest and oldest attendees, cut a cake to commemorate the Air Force's birthday in September.

Photo by Cody Nolen

Thomas Dowell, representing a Vietnam veterans group, presents a Vietnam War Commemoration lapel pin to Cordelia Kendall, as Sandy Koch looks on. Sijan Chapter VP for Veterans Affairs Paul Bailey assisted in the presentation.

Photo by Amy D. Gold

J. R. McDonald speaks to the Eglin Chapter about Lt. Gen. Lewis Brereton (in photos in the background), who was a pioneer in military aviation and commanded Third Air Force in Florida in 1941. McDonald received a chapter award named for Brereton.

EGLIN CHAPTER

The Eglin Chapter in Florida had much to celebrate at their annual awards luncheon in Shalimar.

The Brereton Award, named after Lt. Gen. Lewis H. Brereton, was awarded to J. R. McDonald, the VP of Air Force programs at Lockheed Martin, for outstanding civilian contributions to airpower, reported Amy D. Gold, chapter communications VP, and Eddie McAllister, chapter VP of awards.

The chapter's Exceptional Service Citation went to Steve Madley, who oversaw the annual golf tournament, hosted by the chapter's education foundation.

Chapter Sustained Service citations went to Bob Patterson, Shirley Pigott, Dave Miller, and Mike Boles.

The Chapter Member of the Year is Colleen Smith, VP for Community Partners. ✪

Got chapter news? Send the details to jkim@afa.org. Please include high-quality, visually interesting photos and the photographer's name.

AFA Emerging Leader

Gabrielle M. Kearney

Home State: New Mexico

Chapter: Langley Chapter (Va.)

Joined AFA: 2008

AFA Offices: VP for Communications for Langley Chapter and Ramstein Chapter (Germany)

Military Service: 2012-current, Active Duty

Occupation: F-22 maintenance officer

Education: B.A., Russian and IDS, Michigan State University; master's degree in education, University of Oklahoma

Gabbe Kearney on the flight line at Nellis AFB, Nev., during Red Flag in July 2016. She was promoted to captain on this day.

Photo via Gabrielle Kearney

How did you first hear of AFA?
I joined Arnold Air Society in college at Michigan State University when I was in ROTC and this is where I became an AFA member, too. So really I became a member at age 18. I was also the national commander of Arnold Air Society and was given a lifetime membership by AFA.

What compelled you to join?
It was how much they gave back and how involved they were with the community around them. Everyone also has a professional organization that helps grow and develop them, and this is mine.

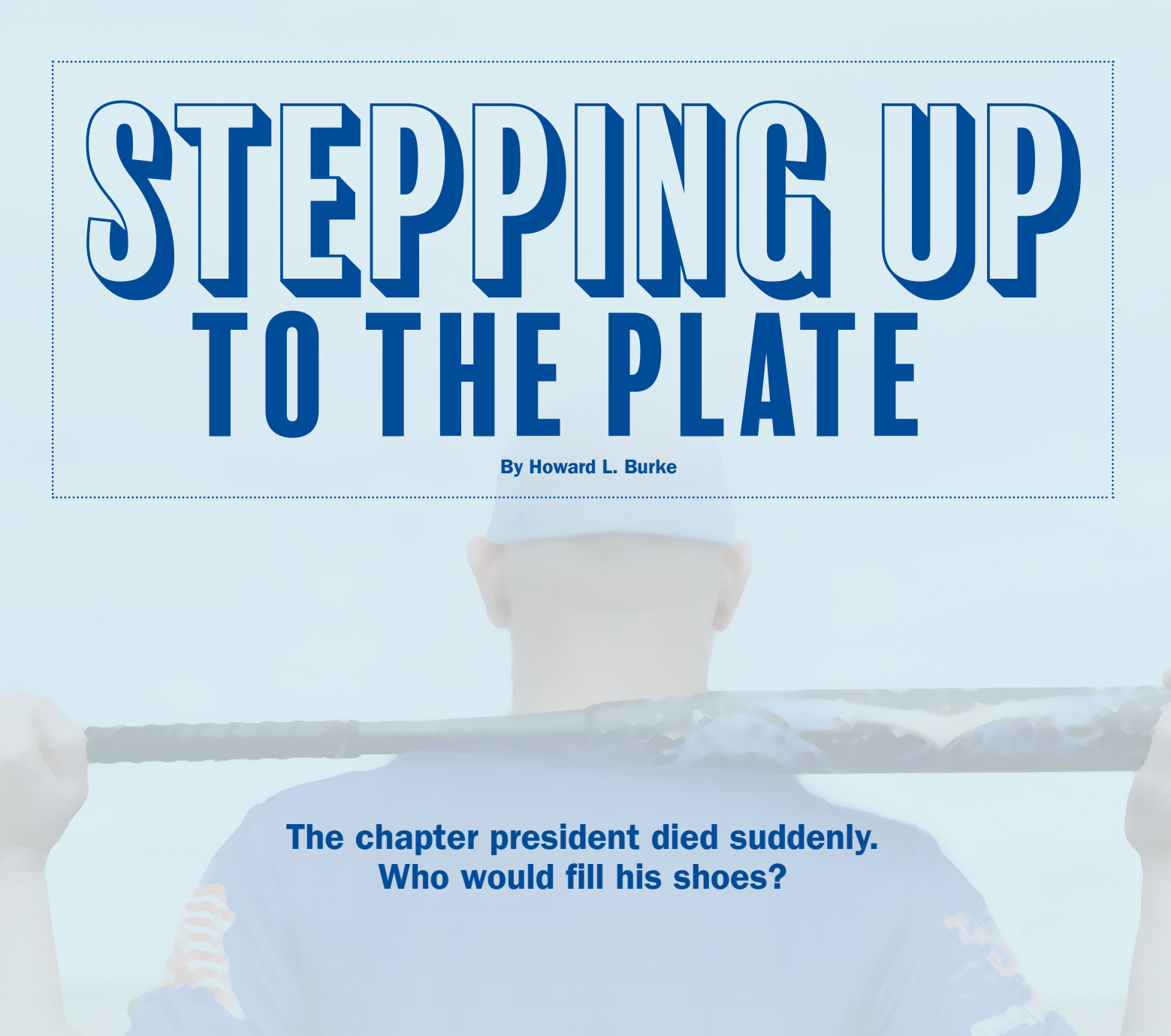
What do you enjoy about AFA membership?
What I enjoy is nothing that is tangible. I love who AFA has helped me become, the opportunities it has presented, and the people and mentors it has brought into my life. Without this organization I would not be where I am today, I would not have received such great professional development, or met my best friends, mentor, or husband.

What do you think AFA needs to improve?
AFA really needs to hit the next generation and get them to love it just like I did. You can get the 18-to-25-year-olds to love [AFA]; it's just selling it and really getting them to believe. Once they attend a conference or firsthand see the benefits they will be hooked. It's having all our current active members reach out and bring those people in and to the events.

How do we create more awareness about AFA and what it does for airmen and their families?
We need to promote and get our faces out there. There is so much good AFA does but no one ever hears about it. [Public Affairs] and advertising is what we need more of, especially with social media the way it is. And bringing in that younger generation will help with this and bring new innovative ways of thinking.

STEPPING UP TO THE PLATE

By Howard L. Burke



The chapter president died suddenly. Who would fill his shoes?

I received a phone call on the day after Thanksgiving in November 2014. Joan Emig, the wife of our Red Tail Memorial Chapter president, was calling to tell me that her husband, Michael H. Emig, had suffered a heart attack and had died in the hospital on Thanksgiving morning.

It floored me.

Emig was Air Force 24 hours a day. His car was painted Air Force blue. His cellphone ringtone was the Air Force Song. He had poured tremendous energy into AFA chapters both here and in his home state, Pennsylvania, and he had served as Florida state and region president, until his doctor advised cutting back on travel.

I DON'T WANT THE JOB

After getting over the shock of Emig's sudden death, I realized that as the vice president of the chapter, I was expected to take over as president.

At first I didn't want the job.

I have many other interests. One of them is building model airplanes, and I am kept busy with that activity alone, being invited by various groups to make presentations about the hobby and the aircraft.

But then I began to think: What would happen to our members? Plus I thought about our Community Partners who have supported us each year. I also thought about the AFJROTC cadets from the local high schools.

I decided to call an emergency meeting of our members and officers, and I phoned Florida State President Dann Mattiza. At the meeting I briefed everyone and asked for their help to keep the chapter going.

They all agreed.

I chose a new group of chapter officers, and the state president swore me in as chapter president.

A BIG COMMITMENT

My immediate concern was that our chapter had committed to hosting the 2015 Florida AFA state convention.

Florida, as you probably know, is its own region. Hosting the state convention is a huge task.

But the chapter officers all voted to carry on with the job, and committees were set up, including one to find a hotel with the best amenities, food menu, and room rates. We signed a contract with the Marriott in Ocala—and I convinced the sales manager to become a Community Partner.

I needed a guest speaker and I knew whom I wanted. I asked then-US Rep. Richard Nugent (R-Fla.), who was on the House Armed Services Committee. He is a former Air National Guardsman and an honorary member of our chapter. He said yes.

The AFJROTC cadets from Belleview High School were asked if they would present the colors at the convention. Their senior aerospace science instructor, retired Lt. Col. Terry L. Dickensheet, is a member of our chapter, and he said yes, too.

The convention was a big success, thanks to our members getting involved. Some 50 people attended it.

FOLLOW UP

Afterward, I made an effort to meet with local high schools that have AFJROTC units, to let them know we were here to help if we could. I invited their aerospace science instructors to become members of our chapter. Retired MSgt. Kevin Gunter joined AFA this past November.

We recruited US Rep. Ted Yoho (R-Fla.) as an honorary member in summer 2015.

The Arnold Air Society cadets from the University of Florida in Gainesville are members, as is their professor of aerospace science.

All in all, our membership averages around 500.

THINGS GOT EASIER

I started 2015 uncertain of whether I could do the job as chapter president. As the year went by, I relaxed more into what I was doing, and things got easier.

The year ended better than I had expected, with the help from the officers and members of our chapter.

A GOOD YEAR

2016 was a good year for us. We started by picking a chapter teacher of the year, chemistry instructor Timothy L. Byrne of Crystal River High School. He's now a chapter member.

The county Civil Air Patrol squadron placed first among Florida's CAP units—and 10th nationwide—in the CyberPatriot 2015-16 round. This was the team's first time in AFA's national youth cyber defense competition. The CAP advisor, Dale Katz, subsequently joined our chapter.

In all these endeavors, I had the backing of chapter officers committed to involving our group in activities. ✪

Howard L. Burke, a Vietnam War veteran, is president of the Red Tail Memorial Chapter in Ocala, Fla. He has been an AFA member for a decade.

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01-24929-001-E61011

EIELSON

Polar Pilot Extraordinaire

Carl Benjamin Eielson—"Ben" to all who knew him—became a world-famous pilot at age 30. Two years later, in 1929, he made his final flight, vanishing into a howling Siberian storm. He had in his short life established himself as the "Father of Alaskan Aviation." The US Air Force, by naming an Alaskan outpost Eielson Air Force Base, honored this pioneer, explorer, and hero.

Eielson, of Norwegian descent, grew up in Hatton, N.D. An honor student in high school, he completed two years of college but left in January 1917 as the US was about to enter World War I. He joined the Air Service, earned wings at Mather Field, Calif., and was ordered to Europe, but the war ended before he could leave. Discharged in March 1919, he returned to Hatton where he worked in his father's store, attended college, and barnstormed the Midwest in a beat-up biplane.

Eielson arrived in Alaska in 1922, having taken a job as a high school teacher in Fairbanks. When local businessmen learned of his flying background, they bought a war-surplus Jenny and formed Farthest North Aviation Co., with Eielson the sole pilot. He delivered machinery, transported engineers and doctors to remote camps, flew out miners, and carried mail. In short, he demonstrated the economic advantages of the airplane in the Arctic.

Eielson's reputation as a tough "bush pilot" attracted Sir George Hubert Wilkins, an Australian explorer. In 1926 he enlisted Eielson in an Arctic venture and Eielson became the first aviator to land on Alaska's north slope, to fly over the Arctic Ocean, and to land on Arctic drift ice. Another expedition came in 1927, but Eielson's greatest success came on his third venture.

On April 15, 1928, Eielson and Wilkins, as his navigator, took off from Point Barrow in a Lockheed Vega and flew 2,200 miles over the Arctic cap to Spitsbergen, an island off Norway, completing the world's first transarctic journey. Eielson was awarded a Distinguished Flying Cross (then available to civilians) and the Harmon Trophy for aviator of the year. Later in 1928, Eielson and Wilkins went to Antarctica, where Eielson became the first man to fly over both of the world's polar regions.

In summer 1929, Eielson returned to Alaska to set up Alaskan Airways, but he perished in an ill-fated rescue effort. He and his mechanic, Earl Borland, took off Nov. 9 in a blizzard, trying to reach a ship caught in ice off Siberia, but they crashed on a small Siberian island. It took searchers 79 days to find the wreckage, and the bodies were retrieved in February 1930. Eielson was buried in Hatton.

In 1948, the Air Force bestowed Eielson's name on its former "Mile 26 Field," south of Fairbanks. First used by Strategic Air Command's B-29, B-36, and B-47 bombers, Eielson Air Force Base has undergone many mission changes. Today, it is the center of Red Flag-Alaska, a premier operational training exercise.

CARL BENJAMIN EIELSON

Born: July 20, 1897, Hatton, N.D.
Died: Nov. 9, 1929, North Cape, Siberia, USSR
Colleges: University of North Dakota, University of Wisconsin, Georgetown University
Occupation: Aviator, bush pilot, polar explorer
Services: US Air Service, N.D. National Guard
Era: World War I
Years Active: 1917-19
Combat: None
Final Grade: 2nd Lieutenant (Air Service); Colonel (NDNG)
Honors: Distinguished Flying Cross, Harmon Trophy, Alaska Aviation Hall of Fame, National Aviation Hall of Fame
Famous Friends: Sir George Hubert Wilkins, Billy Mitchell, H. H. Arnold

EIELSON AIR FORCE BASE

State: Alaska
Nearest City: Fairbanks
Area: 30.9 sq mi / 19,790 acres
Status: Open, active
Opened: (by Air Corps) 1943
Original Name: Mile 26 Strip (Dec. 15, 1943)
Closed: (by Air Corps) 1945
Reopened: (by Air Corps) September 1946
Renamed: Mile 26 Field (Oct. 1, 1947)
Renamed: Eielson AFB (Jan. 13, 1948)
Home Of: 354th Fighter Wing

1. Ben Eielson circa 1927. **2.** Eielson before the 1926 expedition. **3.** A moose trots across the ramp at Eielson AFB, Alaska. **4.** Specially painted F-16 from Eielson in 2015. **5.** Sled dogs and an F-102 at Eielson.

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