

August 2016/\$10

Journal of the Air Force Association

# AIR FORCE

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## MAGAZINE

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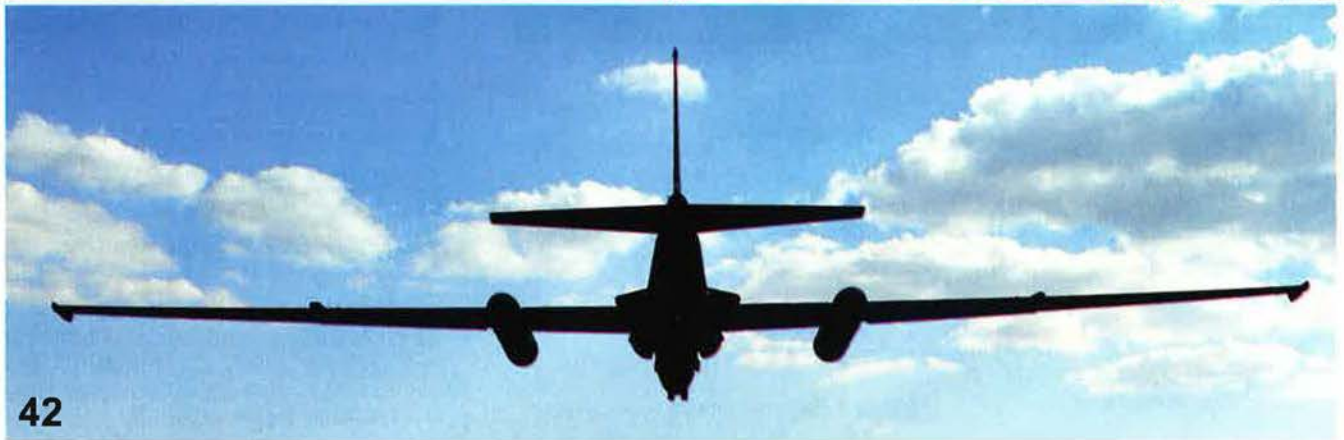




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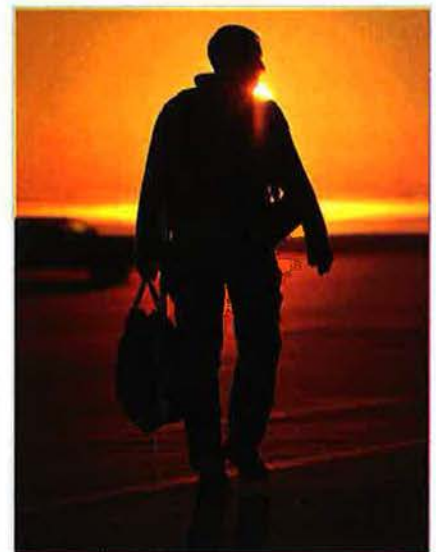
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**About the cover:** An F-16 pilot from Shaw AFB, S.C., walks down the flight line at Tyndall AFB, Fla., during an exercise. See "Pilot Shortage," p. 36. USAF photo by SrA. Sergio Gamboa.





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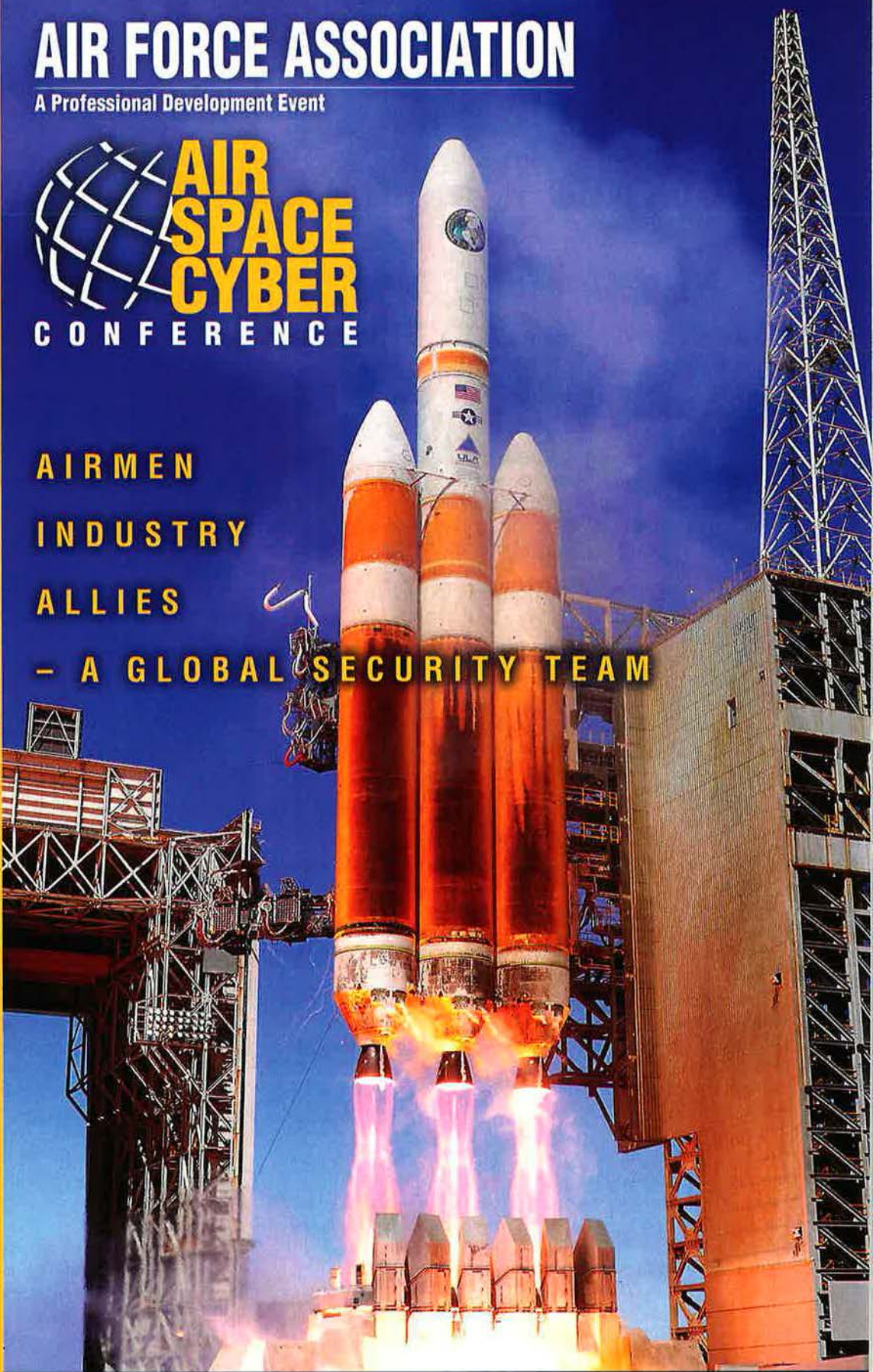
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# Meet the People Behind the Bases

**T**HIS issue marks the end of a long-running and much-loved monthly feature in *Air Force Magazine*. A new feature will rise in its place next month. The last time we made a change like this was a little more than a decade ago, in February 2006, when the "Aerospace World" (now "Air Force World") department contained a series of news items still of interest. That month, we informed you, dear reader, that:

- USAF changed the designation of its premier fighter from F/A-22 to F-22A. The unloved F/A-22 nomenclature had been in place for four years (before 2006 the jet was just the F-22). The temporary designation mimicked Navy F/A-18 naming and was an attempt to shore up support for the beleaguered Raptor production program by highlighting the fighter's ground attack ability.

- USAF declared that same F-22 was, for the first time, ready for combat. This meant the Air Force had enough Raptors, maintainers, spare parts, and pilots to take the jet to war if needed. The F-22 actually saw combat for the first time in late 2014, over Syria.

- The Air Force added cyber operations to its mission statement, placing missions in cyberspace in the same category as those conducted in air and space. USAF's new mission statement declared the Air Force must "fly and fight in air, space, and cyberspace." A decade later, the mission statement has only been modestly altered.

February 2006 also brought major changes for *Air Force Magazine*:

- The magazine launched its daily news column in conjunction with the Air Force Association's Air Warfare Symposium in Orlando, Fla. We quaintly announced that airpower news would now be "available online through our new web-based 'Daily Report.'" Perhaps you've heard of it. If not, you should immediately stop what you are doing, proceed to [www.airforcemag.com](http://www.airforcemag.com), bookmark the page, and sign up to receive the Daily Report.

- Our final declaration from more than 10 years ago was that we would have a new back page feature: "Airpower Classics."

The back page is a big deal, as magazine readers typically look to the page for something engaging, distinctive, and bite-sized. Many readers actually turn to the back page of a magazine first before proceeding to the front. This is only the third time *Air Force Magazine* has launched a new back page feature in the past half-century.

The popular "There I Was ..." cartoon by Bob Stevens presented humorous portrayals of Air Force life and idiosyncrasies from the airmen's perspective. It debuted in 1965 and ran for a full 28 years.

"Pieces of History," featuring the photography of Paul Kennedy, took over the back page in January 1994. The page used equipment and artifacts to illustrate USAF's complex history and ran for 12 years.

"Airpower Classics" first appeared in February 2006 and was the brainchild of former Photo Editor Zaur Eylanbekov and former Editor in Chief Robert S. Dudney, with text by Walter J. Boyne. It featured a different military aircraft every month for 128 months, beginning with the B-17 and ending this month with the F-22. Each page was built around a high-quality, historically accurate artwork. Eylanbekov drew 94 percent of the aircraft featured on the page, through last December's F-15. But no matter how popular the page was, we knew "Airpower Classics" would eventually come to an end. Which brings us to this month's announcement.

Beginning next month, "Airpower Classics" will be succeeded by a new back-page feature we hope you will find just as interesting and informative for the years ahead.

Our new back-page feature is "Namesakes." Every month it will profile the person or people after whom an Air Force facility was named.

Some are Air Force legends, such as Hap Arnold, Bud Day, and Frank Luke.

Some were from long ago, such as Frank Patterson, Eric Ellington, and Lachlan Stewart.

Some are much more recent, such as Bernie Schriever, Wilbur Creech, and Ellison Onizuka.

All have interesting stories and indelible connections to the Air Force of yesterday and today. In the coming years, you will have the opportunity to learn about these airmen, troops, airpower visionaries, and politicians, and about the bases named in their honor.

What airman had two different Air Force bases, in two different states, named after him?

Who inspired the character of "Col. Vince Casey" in Milton Caniff's "Terry and the Pirates" comic strip?

Who was the airman killed at Fort Myer, Va., when the airplane Orville Wright was flying crashed?

What airman was a Medal of Honor recipient, college football national champion, and buried six times?

What Medal of Honor recipient was the last Civil War veteran to serve in the US Senate?

What other Medal of Honor recipient, a Marine Corps aviator, helped start the Air National Guard?

What friend of Buffalo Bill Cody and Ulysses S. Grant used camels as pack animals?

The answers to all these questions and more will be found in the coming editions of "Namesakes."

For all of its technological prowess and unmatched training, the Air Force is built upon a foundation of people. "Namesakes" will introduce you to those who have influenced the service, especially in its formative years, and the places USAF calls home. Keep watch on the back page and you will learn about these figures—both the famous and the obscure. ★

## **Air Force Magazine bids a fond farewell to "Airpower Classics" and launches "Namesakes."**





# CORPORATE MEMBER SPOTLIGHT



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## Costly Requirements

The editorial by Adam Hebert was interesting if not very flawed and certainly biased [*"Too Many Bases, Not Enough Air Force," June, p.4*]. It was clear from the beginning that Hebert, almost line and verse, took Secretary of the Air Force Deborah Lee James' position to arbitrarily support BRAC and close additional bases based simply on cost considerations. And it's also evident that James and other leaders, including the members of Congress [from districts where] many of the identified Air Force bases are located appear to focus solely on either cost considerations (operating under budget constraints) or the economic impact those installations have on local economies. While both factors are extremely important, I believe those considerations take a back seat to even higher priorities such as those the Heritage Foundation identified back in 2011. Specifically, and as was stated in the Heritage Foundation report: "The US military force structure envisioned by the 2010 Quadrennial Defense Review and the President's

FY 2012 budget request is inadequate to protect vital US national interests. After the 'procurement holiday' during the 1990s and the wear and tear of the long war against terrorism' in Iraq and Afghanistan, all military services urgently need to recapitalize and modernize their inventories. Over the long term, failure to invest the funds needed to rebuild the US military in the near term will increase not only the costs, but also the risks to the nation and endanger US allies and friends."

Nothing has appreciably changed from the above policy statement made in 2011. Our defense budget is even more woefully inadequate today than it was five years ago! We're still engaged in both Iraq and Afghanistan with no end in sight. But also now add Syria and other satellite Middle Eastern countries where terrorist extremists continue to operate freely. In addition, our USAF infrastructure and inventories ARE in worse shape today than at any time in the past (prior to World War II?). But yet, Secretary James and other leaders continue to call for a mass closing of US military installations to further shrink US military presence based solely on cost? That's bad math at best, and totally irresponsible behavior at worst. Why? Because "requirements determine costs"—NOT the other way around. For far too long I've read article after article regarding how we don't have the budget dollars to adequately man our military services, that Congress or the President hasn't approved the necessary budget money to modernize our weapons systems or infrastructure, etc. etc., ad nauseam. [The articles did not show] much regard for nor an understanding of the priorities of our "national interests." Americans are not only tired of hearing the same

old platitudes, more importantly, they'll go to the polls in November angrier at their elected officials than at any point in modern US history for allowing this systematic decay of our forces' ability to fly and fight.

And, as a reminder to those who may forgotten what our national priorities are (in all the rhetoric coming out of Washington nowadays): The Heritage Foundation report said, "Our US national interests have remained remarkably consistent since WWII, despite the changing threat environment. They include:

1. Safeguarding US national security
2. Preventing a major power threat to Europe, East Asia, or the Persian Gulf
3. Maintainin access to foreign trade
4. Protecting Americans against threats to their lives and well being; and
5. Maintaining access to resources."

Lastly, as the foundation stated: "National security challenges drive force structure requirements: how many brigades, wings, carrier groups, and other military assets are needed; where they are deployed; and how they are used."

And, we haven't even factored in the possibility of a new President in

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November who does, in fact, recognize the urgent need for a strong US military (peace through strength). That "major" call for mobilization will require real estate, personnel, and equipment to successfully implement. That means more military installations, *not* fewer. Again, the requirements determine the costs, not the other way around.

MSgt. Randolph E. Whitmire,  
USAF (Ret.)  
Rochester Hills, Mich.

I saw the title of the June 2016 editorial in *Air Force Magazine* and was greatly hopeful—hopeful that your editorial would be a balanced

discussion of overcapacity and the need for a significantly increased size of the Air Force. However, the balance never showed. The article was, once again a plea to reduce the number of Air Force bases. I have a number of concerns about another reduction in our base infrastructure. First, given the increase in the number of nations with nuclear capability now versus 30 and 50-plus years ago, I would consider the dispersion of our air forces more critical today than those past decades. Since one nuke can destroy a base and all its assets, fewer bases in the future greatly increases the risk that an enemy can neutralize our capability



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

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

*Advocate for aerospace power and STEM education.*

*Support the Total Air Force family and promote aerospace education.*



to retaliate with fewer nukes. This, to me, significantly raises the specter of a larger number of enemy countries being able to cripple us. Second, I hope that the Air Force has not given up hope for a significant increase in our force structure size in the future. It seems to me that the Air Force as with the other services has more mission than we have assets to adequately cover them all. If this is true, and the Air Force prematurely reduces our infrastructure, then what would the cost be in the future to re-establish a base? After all, the historical tradition has been for the Air Force to place closed bases on the sales block rather than mothball them. If the Air Force chooses to close a base and quickly sell the assets, the cost of bringing a new base into fruition would be both costly and time-consuming. Finally, the quantity of major missions of the Air Force seems to have grown during the last three decades. Although we have fewer mission assets and fewer people, conglomerating missions at a single base may seem doable. However, during the decades since the end of WWII, many companies who increased their size through conglomeration of product centers at a single geographical area have found time and again that the anticipated economies of scale not only failed to occur, but product quantity and quality diminished because common core maintenance and support functions of greatly diverse facilities, equipment, and people skills at a central location often diminished the specializations needed in each of those resource areas which ultimately downgraded the output (quality and quantity). In my view, downsizing bases today incurs greater risk than [closures] done 10 through 20 years ago because excess capacity today reflects mission capability unexecutable in the future.

Lt. Col. John Bredfeldt,  
USAF (Ret.)  
Dawsonville, Ga.

**Faint Praise for Stalin**

In his essay "Operation Barbarossa Stalls Out," John T. Correll ably documented the war on the Eastern Front that became, as he noted, "Hitler's biggest military mistake" [June, p. 62]. Perhaps because of space limitations, a number of crucial aspects were omitted in what Stalin called the "Great Patriotic War" that made Soviet Russia an ally of the Western-led, warfighting United

Nations. It should be recalled that the war on the Eastern Front tied up nearly half of the German armed forces. These forces could have been deployed against the Allied invasion of Hitler's Festung Europa in spring 1944 when Operation Overlord was begun on D-Day.

A number of Russian historians together with various memoirists that include Stalin's top aide, Vyacheslav Molotov, and informed spies like Zoya Voskresenskaya, note that:

■ Stalin was fully aware of the German threat of invasion. Indeed, in spring 1941, he sharply augmented defenses on the front facing the Wehrmacht's buildup (as Correll acknowledged) when his agents in Tokyo informed him that Japan would strike against other enemies in the Pacific, not its adversary, the USSR;

■ Stalin erred tactically, not strategically, on the matter of the exact date of the expected invasion, which was, as he told aides, "inevitable." According to some sources, Molotov included, Stalin was bluffing in assuming a defensive posture toward Hitler in the preceding months before Barbarossa. Stalin had decided that the Soviet Union must not be perceived as the aggressor in this "world-historical" war, that the USSR should occupy the high moral ground of being the "victim of Fascist aggression." This would assure an alliance with the West as America loomed as the decisive factor in the defeat of the Axis (Lend-Lease Aid to Britain was already established by late winter 1941, aid that Stalin later urgently requested immediately after the German attack of June 22). Soviet counterintelligence worked overtime directly via agents in Washington (as we now know from decrypts of "Operation White") to instigate a diversionary war between the US and Japan and thus hasten US entry into the war;

■ The date of the German attack had to be postponed several crucial weeks because of the Wehrmacht's operations against a pro-Nazi regime in Yugoslavia in spring 1941; this was an effort that ironically ran parallel to Britain's own effort to keep Yugoslavia on the Allied side; this delay meant that the Germans would find themselves bogged down in an unusually brutal Russian winter;

■ Stalin, a cruel and hated dictator, should nevertheless be appraised as a leader who assured a Soviet victory in a war with Germany on the Eastern

Front and who brought Russia into a warfighting alliance with the West. Marshal Georgy Zhukov, no friend of Stalin's, notes in his memoirs that it was Stalin who had readied the USSR for war beginning in the early 1930s and who took a personal hand in the many-sided military and paramilitary buildup in the USSR; Stalin always kept diplomatic channels open to America.

■ The biggest surprise—for Hitler—was how energetically and effectively the Soviet warfighting machine became a match for the combat-experienced Wehrmacht. As Correll writes: "Stalin and the Russians were not as clumsy or as dull-witted as they may have seemed earlier. To the utter surprise of the Germans and the rest of the world they managed an astounding recovery in a very short time. ... Stalin [had rebuilt the Red Army] in record time through redeployments and mobilization."

Albert L. Weeks  
Sarasota, Fla.

**Wait, Wait**

I enjoyed the article "Remembering Those Who Served" [June, p. 44]. Having lived in the Capitol Region for several years, I visited the memorials on several occasions. Those who have not had the same opportunity were able to see what our nation has done to pay tribute to those who served, through your article. I was, however, disappointed when I came to the last page only to see [the logo] of the Air Force Memorial. I would have thought that when photographing the Pentagon Memorial, the photographers could have traveled the short distance up the hill and provided photos of the impressive Honor Guard Statue and the spires.

CMSgt. Stephen Talbot,  
USAF (Ret.)  
Hardeeville, S.C.

■ *As mentioned in the article, we will be running extensive coverage of the Air Force Memorial in our October issue, in celebration of its 10th anniversary.—THE EDITORS*

I want to comment on your article "Remembering Those Who Served," which appears to have a misleading statement. The article states "list the names of 58,307 service members who were wounded in the Vietnam War between 1956 and 1975 and died of those wounds." I was under the impression that



number (58,307) was all deaths including illnesses, accidents, suicides, etc.

Regardless of cause of death, all names of those having died in the Vietnam War are most deserving to be inscribed on this memorial. Let us never forget their service during such a difficult war. Thank you for including a story of the war memorials in *Air Force Magazine*.

Harold Boone  
Harrisburg, N.C.

### Bubbles? Well, That's Perfect

The following comments are offered [*"Flashback: Where's Up, Pussycat?" June, p. 61*].

The cat's name was Bubbles and the owner was Dr. Siegfried J. Gerathewohl, a member of the USAF School of Aviation Medicine. The purpose of the weightless flight was to see how the cat's labyrinthine righting reflex would respond to the weightless environment and how the cat would right itself after being held upside down and then released. The animal was confused and panicky and tumbled or righted itself in the wrong direction. When the resultant of the forces involved (gravity and inertia) was zero, the otoliths were not simulated at all. This caused complete disorientation.

Lt. Col. Otto Vaughn,  
USAF (Ret.)  
Huntsville, Ala.

### Oops

I'm sure it was just a typo, but we have to keep you guys on your toes. On p. 58 of the June issue, it was stated that the B-47 Stratojet had eight engines [*"The First Offset"*]. As any jet aircraft buff knows, the B-47 only had six engines. This fact is also verified by the photo of a B-47 on p. 60. The B-47 may have been confused with the B-52 which does indeed have eight engines.

I look forward to each issue of *Air Force Magazine*. It always contains many interesting and informative articles. Keep up the great work!!!

Charlie Friend  
Alamogordo, N.M.

You write that the E-8C depicted on the back page of the June issue was "assigned to the 461st Air Control Wing" in 2004. This is wrong.

In 2004, I was wing historian of the 116th ACW. This was one of our jets and had been since 2002, when the 116th ACW was formed from the 116th Bomb Wing of the Georgia ANG with jets from the disbanded 93rd ACW at

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## Senior Staff Changes

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**RETIREMENTS:** Lt. Gen. William H. Etter, Maj. Gen. Michael J. Kingsley, Brig Gen. David B. Been.

**CONFIRMATIONS: To be General:** Terrence J. O'Shaughnessy, Stephen W. "Seve" Wilson. **To be Lieutenant General:** Thomas W. Bergeson, Richard M. Clark, VeraLinn "Dash" Jamieson. **To be Major General:** Thomas W. Geary.

**NOMINATIONS: To be Lieutenant General:** Jerry D. Harris Jr., Jerry P. Martinez, Steven M. Shepro.

**CHANGES:** Maj. Gen. (sel.) Steven L. Basham, from Dep. Dir., Rqmts., Jt. Staff, Pentagon, to Dir., LL, OSAF, Pentagon ... Lt. Gen. (sel.) Thomas W. Bergeson, from Dir., LL, OSAF, Pentagon, to Cmdr., 7th AF, PACAF, Osan AB, South Korea ... Maj. Gen. Thomas A. Bussiere, from Dep. Dir., Nuclear, Homeland Defense, & Current Ops., Jt. Staff, Pentagon, to Cmdr., 8th AF, AFGSC, Barksdale AFB, La. ... Lt. Gen. (sel.) Richard M. Clark, from Cmdr., 8th AF, AFGSC, Barksdale AFB, La., to Cmdr., 3rd AF, USAF, Ramstein AB, Germany ... Maj. Gen. (sel.) James C. Dawkins Jr., from Dir., Strat. Capabilities Policy, Natl. Security Council, Executive Office to the President, Washington, D.C., to Dep. Dir. for Nuclear, Homeland Defense and Current Ops., Jt. Staff, Pentagon ... Lt. Gen. John L. Dolan, from Cmdr., 5th AF, PACAF, Yokota AB, Japan, to Dir., Ops., Jt. Staff, Pentagon ... Maj. Gen. (sel.) Thomas W. Geary, from Dir., ISR, Strategy, Plans, Policy, & Force Dev., DCS, ISR, Pentagon, to Asst. DCS, ISR, DCS, ISR, USAF, Pentagon ... Brig. Gen. Gerald V. Goodfellow, from Cmdr., Squadron Officer School, AU, AETC, Maxwell AFB, Ala., to Dir., Nuclear Enterprise Spt. Directorate, Defense Threat Reduction Agency, Fort Belvoir, Va. ... Brig. Gen. Gregory M. Guillot, from Dir., Strat. Plans, Rqmts., & Prgms., PACAF, JB Pearl Harbor-Hickam, Hawaii, to C/S, PACAF, JB Pearl Harbor-Hickam, Hawaii ... Maj. Gen. John P. Horner, from Dep. Dir., Defense Threat Reduction Agency, OSD, Fort Belvoir, Va., to Dir., DOD Spec. Access Prgm. Central Office, OSD, Pentagon ... Lt. Gen. (sel.) VeraLinn "Dash" Jamieson, from Dep. Cmdr., Jt. Functional Component Command, ISR, STRATCOM, JB Anacosta-Bolling, D.C., to DCS, ISR, USAF, Pentagon ... Brig. Gen. David A. Krumm, from Spec. Asst. to the C/S, USAF, Pentagon, to Dep. Dir., Rqmts., Jt. Staff, Pentagon ... Brig. Gen. (sel.) Richard G. Moore Jr., from Chief, Prgm. Integration Div., Office of the Asst. SECAF for Financial Mgmt. & Comptroller, OSAF, Pentagon, to Cmdr., 86th AW, USAF, Ramstein AB, Germany ... Gen. (sel.) Terrence J. O'Shaughnessy, from Cmdr., 7th AF, PACAF, Osan AB, Korea, to Cmdr., PACAF, JB Pearl Harbor-Hickam, Hawaii ... Brig. Gen. Aaron M. Prupas, from Dep. Dir., Intel., US Forces-Afghanistan, Kabul, Afghanistan, to Dir., ISR Strategy, Plans, Policy, & Force Dev., DCS, ISR, USAF, Pentagon ... Maj. Gen. Kevin B. Schneider, from C/S, PACAF, JB Pearl Harbor-Hickam, Hawaii, to C/S, PACOM, Camp H. M. Smith, Hawaii ... Maj. Gen. Thomas J. Sharpy, from Dir., Strat. Plans, Rqmts., & Prgms., AMC, Scott AFB, Ill., to Vice Cmdr., AMC, Scott AFB, Ill. ... Lt. Gen. (sel.) Steven M. Shepro, from Vice Dir., Strat. Plans & Policy, Jt. Staff, Pentagon, to Dep. Chairman, NATO Mil. Committee, Brussels, Belgium ... Brig. Gen. (sel.) Robert S. Spalding III, from Chief, China, Taiwan, & Mongolia Div., Jt. Staff, Pentagon, to Defense Attaché, China, Defense Intel. Agency, US Embassy, China ... Maj. Gen. (sel.) Jon T. Thomas, from Cmdr., 86th AW, USAF, Ramstein AB, Germany, to Dir., Strat. Plans, Rqmts. & Prgms., AMC, Scott AFB, Ill. ... Maj. Gen. Linda R. Urrutia-Varhall, from Asst. DCS, ISR, DCS, ISR, USAF, Pentagon, to Dir., Ops. & Mil. Dep., Natl. Geospatial-Intel. Agency, Springfield, Va. ... Brig. Gen. Craig D. Wills, from Exec. to the Cmdr., PACAF, JB Pearl Harbor-Hickam, Hawaii, to Dir., Strat. Plans, Rqmts., & Prgms., PACAF, JB Pearl Harbor-Hickam, Hawaii ... Gen. (sel.) Stephen W. "Seve" Wilson, from Dep. Cmdr., STRATCOM, Offutt AFB, Neb., to Vice C/S, USAF, Pentagon.

**SENIOR EXECUTIVE SERVICE CHANGES:** Diana Banks, to Dep. Asst. SECDEF for Mil. Education, USD (Personnel & Readiness), Washington, D.C. ... Glenn A. Fogg, to Dep. Dir., Prototyping & Experimentation, USD (AT&L), Washington, D.C. ... Sylana A. Tramble, to Dep. Dir., Human Resources Directorate, Washington Headquarters Svcs., Arlington, Va. ... Daryl B. Witherspoon, to General Counsel, Defense Contract Audit Agency, Fort Belvoir, Va.

Robins AFB, Ga. The 116th was the first "blended wing" of Active Duty and ANG airmen, along with some US Army soldiers who were assigned (the Joint in Joint STARS). It remained thus until 2011, which is when the 461st ACW

was formed to serve alongside the now all-ANG 116th.

There was no 461st ACW in 2004.  
MSgt. Bill Brockman,  
ANG (Ret.)  
Atlanta



## Stopping the Streak

The annual Pentagon policy bill has been enacted annually for 54 straight years, an undeniably impressive track record that no other major piece of legislation can claim. But this year—thanks to partisan rancor and a compressed congressional calendar—that streak might come to an abrupt end.

To be sure, the leaders of the House and Senate Armed Services committees are pushing hard to get the Fiscal 2017 defense authorization bill through Congress before the clock ticks down to the end of the year. The lengthy summer and fall recesses, a feature of any election year, aren't helping their efforts.

Both chambers have already passed their versions of the measure, overcoming divisive spats ranging from funding levels to the fate of the military's detention facility at Guantanamo Bay, Cuba. Now, Armed Services leaders are trying to resolve dozens of substantial policy differences in the two bills and draft a compromise measure.

While some of those negotiations, such as whether to require women to register for the Selective Service, will certainly be contentious, the two chambers will no doubt come to an agreement. After all, they do so every year.

But a wide-ranging veto threat hangs over the bill, and lawmakers seem almost certain to run headlong into it.

President Barack Obama demonstrated last year he isn't afraid to veto the defense bill, which was saved thanks to a last-minute budget agreement raising spending levels that ultimately paved the way for an authorization measure the White House could accept.

No such budget agreement is likely in the postelection lame-duck session. And with little time left in his presidency, Obama has nothing to lose.

The bill expires at the end of this congressional session, and it's unlikely the next Congress and the next Administration would want to restart work on the bill when they have Fiscal 2018 to worry about.

So what happens if the must-pass measure isn't enacted? The bill itself doesn't actually contain any funding—it just prescribes spending levels. But it is chock-full of policy provisions, some more important to the Pentagon than others.

President Obama has previously asserted he has the authority under current law to give the military a pay raise, but the department still needs Congress to authorize combat pay, hardship duty pay, special pay for nuclear-qualified

members of the military, and many bonuses and incentive payments for members of the military.

Without the policy bill, the military would be lacking necessary authorizations for new military construction projects—something lawmakers with military installations in their districts take seriously—as well as cost-saving multiyear procurement contracts for several large weapons programs.

For Fiscal 2017, that would affect Army efforts to buy new Black Hawk and Apache helicopters at reduced prices.

Meanwhile, school districts across the country rely on the

authorization bill to ensure they receive supplemental aid for educating the children of military personnel. Other potentially affected areas include any expiring authorizations that the bill extends, including the Commanders' Emergency Response Program.

The House and Senate Armed Services committees would perhaps be the biggest losers, in the event the authorization bill lapses this year. The


Republican chairmen of both committees—Sen. John McCain of Arizona and Rep. Mac Thornberry of Texas—have touted their legislation to make wholesale revisions to how the Pentagon is organized and how it buys goods and services.

Provisions, including those that stand down the Pentagon acquisition, technology, and logistics office and would eventually eliminate the joint program office for the F-35 strike fighter, would simply fall by the wayside.

But the panels would lose more than those provisions. Much of their power stems from their ability to get the bill done, so they risk losing their clout on Capitol Hill and within the Pentagon if they fail.

And if the military survives a year without a defense authorization bill without too much heartache, the must-pass nature of the legislation, and the considerable amount of floor time it consumes, particularly in the Senate each year, will almost certainly be called into question.

For his part, McCain insists the committee's streak will not be broken on his watch without a fight. The two panels will resolve their differences and get to a final bill, he says. McCain acknowledged the looming veto threat, saying he would be "greatly surprised" if this was the year the bill didn't get done, but he left the door open to it.

"I wouldn't discount any possibility," he said. 



Goodbye to the F-35 joint program office?

Megan Scully is a reporter for CQ Roll Call.



## Fifth gen vacuum cleaners; Two vs. two yawners; F-35s in Oz; ALIS in wonderland ....

### FIFTH GEN: NOW WHAT?

The Air Force should declare the multirole F-35 operational this month, making it the second “fifth generation” fighter—jets with stealth, high situational awareness, integrated avionics, and sensors—in the service’s arsenal. The F-22 was declared war-ready 11 years ago and has been flying combat missions in Syria for nearly two years.

The Air Force has long anticipated the day when it would have the dynamic duo in service and has spent countless simulator and computer modeling hours figuring out how best to employ it in real-world conflicts.

So now what?

Answer: “We have a lot of work to do.”

That was the summary from Maj. Gen. Jeffrey L. Harrigian, director of the Air Force F-35 Integration Office at the Pentagon, presenting a paper about the advanced fighters for AFA’s Mitchell Institute in early July. Harrigian, who was about to pin on a third star and take command of US Air Forces Central Command forces battling ISIS, said all the wargaming, exercises, and real-world combat have shown conclusively that fifth gen aircraft “make everyone better.” Moreover, fourth gen fighters—like the F-15, F-16, and F/A-18—can’t survive the modern and anticipated battlefield of lethal anti-access, area-denial defensive systems.

“You put a fourth [gen] in there, they’re going to die,” Harrigian said flatly.

Modern air defenses are powerful and highly mobile, he said, and the capabilities of fifth gen aircraft are essential to finding and destroying the elements of an enemy’s air defenses so the rest of the force can then get in the fight.

“It comes down to the ability to survive,” he said.

The paper, “Fifth Generation Air Combat: Maintaining the Joint Force Advantage,” was cowritten with Col. Max M. Marosko III, deputy director of air and space operations at Pacific Air Forces headquarters in Hawaii. Both authors are veteran F-22 pilots.

Harrigian said the center of the integration effort acknowledges that the fifth gen force is simply not going to be as numerous as USAF planned when it began developing the fighters 30 years ago. A lot of tactics, techniques, and procedures must be developed to exploit the capabilities of fifth gen, especially to help the fourth gen fighters USAF has to keep in service useful and relevant. It also means developing ways that the fifth gen jets, which are essentially vacuum cleaners that suck up vast amounts of information about an enemy’s forces, can stealthily communicate with each other and share data with the rest of the joint and coalition force.

In the near future, “we’ll use Link 16,” the generic data link that now connects USAF aircraft, but something more advanced and hack-proof is needed, Harrigian said.

In addition, USAF is going to have to figure out a way that it can, with extreme fidelity, create simulated air battles that pit the F-22 and F-35 against vastly superior numbers of enemy aircraft working in concert with super-lethal enemy air defense systems.

Right now, simulated air combat between fifth gen aircraft and small numbers of fourth gen foes are ho-hum, Harrigian said. A two vs. two battle, he said, is a “yawner” and almost useless training. Meanwhile, USAF can’t regularly afford to launch enough aircraft to make a scenario authentic. The F-22’s great speed also causes it to rapidly run out of restricted practice-area airspace.

Not only that; live-fly battles can be observed by adversaries, who could deduce tactics and capabilities from what they see.

All this means USAF will “have to invest” in extremely good live, virtual and constructive (LVC) simulations that look completely authentic to the pilots, whether they are flying a real jet or a simulator. Simulators will have to be able to simulate G forces, and virtual constructs piped into real cockpits will have to be convincing in their depiction of enemies fighting and things blowing up.

Harrigian said a fifth gen pilot “has to be sweating when he comes out” of the simulator. If the training isn’t authentic, the pilots will reject it, he said.

“We have to figure out how you’ll train like you fight” and not give anything away about fifth gen’s unique capabilities, he added.

### PACIFIC OVERTURES

Harrigian and Marosko’s paper posited a 2026 war with a vaguely described Pacific enemy. The scenarios showed USAF dispersing fighters widely around the Pacific, shifting them around so no one base made too tempting of a target—and so USAF could stay in the fight even if a number of bases were knocked out by an enemy’s tactical ballistic missiles.

Marosko, participating in the presentation by telecon, acknowledged to one questioner from the audience that aerial tankers will be key to traversing the great distances of the region. “We will protect the tankers,” Harrigian said.

He also said the F-35 will be a force multiplier because of the great interoperability available with US allies who also field the F-35. In the scenario, he said an F-35 could land at an Australian air base and could be rearmed, refueled, and relaunched back into battle because the ground handling procedures will be identical to those of the US services. This will be accomplished with a minimal ground footprint, as well, which will sharply expand the number of potential operating locations for US fighters.

Australia, Japan, South Korea, and likely Singapore are Pacific nations that will have F-35s in 10 years.



The fifth gen fighters will carve out “pockets of safe airspace” for fourth gen fighters and the rest of the fleet—ranging from cargo aircraft to intelligence, surveillance, and reconnaissance craft—to move in and strike targets, Harrigian explained. The fifth gen jets will be able to take off “with a minimum of information” about where to find, say, a mobile target, and be updated en route.

The ISR fleet “needs fifth gen” aircraft to relay information about what’s going on deep in enemy airspace, beyond the sensor range of the rest of the ISR enterprise, Marosko said. But this requires fifth gen pilots to be on hand in air operations centers to help explain the new fighters’ capabilities. That could be difficult, Marosko noted, because at present USAF has a growing fighter pilot shortage.

“One of the things we need to do ... is educate people about what these aircraft can do,” Harrigian said, so realistic rules of engagement can be developed, fully exploiting fifth gen capabilities.

One trouble spot Harrigian mentioned is that for the concept of employment to work, all F-35 pilots have to see the same overall view of the battlespace, and in testing so far, that has proved to not always be the case.

“We’ve got to see the same picture,” Harrigian said. “The mission data files have to agree.”

The mission data files are a database of all the potential threats in a geographic area—ranging from fixed surface-to-air missile sites to mobile radars to air bases and the unique signatures of particular threat aircraft. Harrigian allowed that there are four such geographic areas worldwide, but the computer systems of the F-35 can only be loaded with two at a time. For now, only a lab at Eglin AFB, Fla., is developing the mission data files, and this is slowing things down. Other countries will soon develop their own data files, and that will complicate things, Harrigian said, because many countries cannot accept intelligence that they can’t independently verify by source, and the US cannot share all its intel sources.

“Sovereign sources” are another area where “we have a lot of work to do,” he said. Marosko said it will require establishing a “new level of trust” with allies and coalition partners. This must happen, because the databases “must be synchronized.” Harrigian worried, though, that this goal may be unobtainable.

## MOUNTAIN HOME COMPANION

The F-35A performed “phenomenally” during an 11-day deployment from Hill AFB, Utah—the jet’s first operational base—to Mountain Home AFB, Idaho, checking off a major last test before the jet can be declared war-ready, 388th Fighter Wing Commander Col. David B. Lyons reported.

Air Combat Command chief Gen. Herbert J. “Hawk” Carlisle is expected to announce initial operational capability for the F-35 this month.

Speaking in a telecon with defense reporters in late June, Lyons said, “We flew 88 of 88 scheduled sorties” during the June 6-17 deployment, which saw the seven F-35As flying both alongside and against F-15Es and F-16s, in a simulated “dense” air defense environment. The jets performed air-to-air missions, ground attack missions, suppression of enemy air defenses, and destruction of enemy air defenses, scoring hits with 39 of 40 GBU-12 and GBU-31 inert bombs released on training ranges. The bomb that missed failed

due to a problem with the bomb, not the F-35A, Lyons said. The F-35As defeated all comers in air-to-air combat, and missions were flown both day and night.

At the same time, the F-35As demonstrated a 92.3 percent mission capable rate—well above the standard even for mature Air Force aircraft. Only two ground aborts were recorded, and one was merely precautionary.

Lyons said he would be able to recommend to Carlisle that the F-35A is ready for IOC “very soon,” but that he still needed to get a full complement of jets at Hill. Twelve, all configured with the 3i software, are required to meet the operational standard. Before recommending IOC, Lyons also needed to check off some other prerequisites, such as an eight-ship generation and making sure the initial cadre of operational pilots has all their certifications in the many missions the F-35A will perform. Asked, though, if he thought the F-35A is ready for real-world combat, he answered, “Yes.”

Two items that were expected to be problematic proved to be non-issues. The F-35A software, which has had a history of needing to be rebooted, was stable, and the deployed jets suffered “zero” problems with the software, Lyons said. Also, the Autonomic Logistics Information System, or ALIS, “performed the way it was supposed to,” he said.

The F-35 program director, Lt. Gen. Christopher C. Bogdan, has said that the “full” capability with ALIS is the only roadblock to declaring IOC this month, suggesting that milestone might not happen until October or November, but Lyons said he sees no hindrance to declaring IOC “on time.” The declaration was predicted for this month several years ago.

The deployment included pilots from both the 388th and the 419th Reserve fighter wings. One hundred and eighty-one flying and support personnel deployed as if they were going to an overseas location equipped with basic amenities to host the contingent. A small number of tech reps from Lockheed Martin, maker of the F-35, deployed with the group, as they would in a real-world situation.

Pilots in the deployment reported no issues with the F-35A’s helmet, which displays flight data and targeting information.

Hill will eventually field three F-35 squadrons totaling 78 aircraft. Receiving new aircraft at the rate of about two per month, the base should be fully equipped with the fighters by December 2019. The all-up 3F version of the F-35’s software is to be operational in 2018.

“This was really the capstone event in our preparations to reach IOC and it was a resounding success,” Lyons asserted.

Separately, the Air Force deployed three F-35As from Luke AFB, Ariz., to the United Kingdom in early July to participate in the Royal International Air Tattoo. Pilots on that flight reported no difficulties in making the journey from JB Langley-Eustis, Va., during which the jets made seven aerial tankings from a KC-10 and KC-135 tanker.

The high number of tankings was required because the aircraft are new to trans-Atlantic deployments, and for safety the jets were to maintain fuel levels permitting an emergency divert, which proved unnecessary. A software issue that has previously prevented F-35As from rapidly taking on a full complement of fuel from a tanker did not manifest during the mission, participating pilots said. ✪



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# AIR FORCE

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*On a test flight, a KC-46A Pegasus refuels a C-17 Globemaster III from JB Lewis-McChord, Wash., as an F-16 flies nearby. This mission successfully tested the hydraulic pressure relief valves installed on the tanker to correct axial loads in the boom that had been higher than expected. See "Air Force World: Boeing's Boom Solution," p. 20.*







## ■ Goldfein Sworn in as 21st Chief of Staff

Gen. David L. Goldfein, the Air Force's 21st Chief of Staff, was officially sworn in during a July 1 ceremony at the Pentagon.

"My commitment to you as your Chief, the 21st Chief, in the 21st century, is that I will work every day to be a leader of character," Goldfein said in a video message to airmen. "I'll leave nothing on the table. I'll look for the opportunity in every challenge. I'll treat team building as a contact sport, and I'll remain laser focused on warfighting excellence."

Former CSAF Gen. Mark A. Welsh III retired June 24 during a ceremony at JB Andrews, Md. "Our Air Force is always focused on moving forward," Welsh said. "We're always headed to a greater place. ... It has been the honor of my life to represent you." Welsh now moves on to be the dean of the Bush School of Government and Public Service at Texas A&M University.

**Put 'er There, Partner:** SrA. Tariq Russell shakes the paw of his military working dog, Ppaul. Assigned to the 21st Security Forces Squadron, Russell and his canine partner will serve together at Peterson AFB, Colo., for the handler's entire tour. "I've been told a few different times that Ppaul and I work extremely well together and that we are a great fit," Russell said, according to a news release. Security forces airmen have responsibility for a range of tasks—from law enforcement to missile security to air base defense.

"Under General Welsh's leadership, [airmen] have innovated, they've adapted, they've built up on the best traditions and core values of our Air Force," Defense Secretary Ashton B. Carter said at the ceremony.

## ■ Pilots Safe After F-16s Collide in Georgia

Two South Carolina Air National Guard F-16 pilots safely ejected after their jets collided during a training flight June 7 in Jefferson County, Ga. The pilots, assigned to the 169th Fighter Wing, were flying a routine night training exercise when their jets collided at 9:15 p.m. The jets crashed in wooded areas in the military training area and no injuries were reported on the ground.

The crash was the latest in a series of recent military jet mishaps and the second USAF F-16 accident within a week. An Air Force Thunderbirds F-16 crashed on June 2 after a flyover at the US Air Force Academy in Colorado Springs, Colo. A Navy Blue Angels pilot was killed after his F/A-18 crashed on June 2 during a practice air show in Smyrna, Tenn., and two F/A-18s collided off the coast of North Carolina in late May. The two pilots and two weapon systems officers involved in that crash safely ejected.



USAF photo by A1C Dennis Hoffman



USAF photo by A1C Kevin Tanenbaum



**I Was Made for This:** A C-17 raises a cloud of dust as it lands on an airstrip at the Nevada Test and Training Range, observed by a combat controller. The transport can land on—and take off from—austere airfields as short as 3,500 feet. This Globemaster III is assigned to the 17th Weapons Squadron at Nellis AFB, Nev., and was taking part in a joint, forcible entry exercise in June. The exercise demonstrated USAF's ability to deliver and recover combat forces in a contested environment.

#### ■ Doolittle Raider Thatcher Dies, One Remains

Former SSgt. David J. Thatcher, one of the last two surviving members of the Doolittle Tokyo Raiders, died June 22 in Missoula, Mont., the Air Force announced. Thatcher, then a corporal, served as a B-25 gunner and engineer in crew No. 7 on the fabled April 18, 1942, mission to bomb Japan in response to the Pearl Harbor attack.

Thatcher's death leaves one remaining Doolittle Raider, retired Lt. Col. Richard E. Cole, Doolittle's co-pilot on crew No. 1.

Thatcher received a Silver Star for his role in the raid. He helped rescue his injured crewmates after his aircraft crash-landed onto a beach and worked with friendly Chinese to take them to safety. Cole and Thatcher, last year, were awarded the Congressional Gold Medal on behalf of the 80 raiders.

#### ■ Air Force Declares Nunn-McCurdy Breach on OCX

The Air Force declared a Nunn-McCurdy breach on its Global Positioning System Next Generation Operational

Control System because the program exceeded the 25 percent cost overrun threshold. Air Force Secretary Deborah Lee James declared the breach on June 30 after quarterly reviews showed inadequate systems engineering at program inception, Block 0 software with high defect rates, and Block 1 designs requiring rework, according to a USAF news release.

Program contractor Raytheon received a total of \$43.9 million in award and incentive fee payments up through August 2013, but has lost a total of \$48.3 million in fees since the contract's inception. About \$64.8 million in fees remains available on the contract, according to the release.

The Air Force is required to notify Congress of the breach, followed by a selected acquisition report by the Defense Secretary and an assessment of the program by Frank Kendall, the defense undersecretary for acquisition, technology, and logistics. The future of the program, either recertification or termination, is dependent on the findings of the assessment, expected to be released in October.

#### ■ Recruiting the Future

The Pentagon is overhauling how it recruits and retains service members, using all-digital approaches and even targeted ads to expand the pool from which future service



members will enlist. On June 9, Defense Secretary Ashton B. Carter unveiled more proposals in his Force of the Future initiative, a broad approach to make the Pentagon more enticing to future uniformed and civilian hires.

The changes will start at the outset of recruiting, moving away within five years from a system weighed down by stacks of paperwork, into an all-digital system for recruitment and enlistment. The Pentagon will expand work done by its Joint Advertising, Market Research, and Studies program to use data science and micro-targeting to build a recruiting database. The military needs to change how it retains officers and start encouraging experiences outside the traditional military mission while working to promote those best suited for a job instead of those who are the most senior.

Carter proposed that the military services be able to adjust, based on performance, the “lineal numbers of their officer corps” to promote based on performance, not on seniority. The services should be able to defer when officers are considered for promotion, so an officer can put off promotion boards if they wish to pursue “less traditional career paths” and not be harmed for it. The Pentagon should be able to recruit properly skilled civilians and place them into service at a rank commensurate with their experience, much like what happens with a medical doctor. Lastly, Carter said future Defense Secretaries need to have the flexibility to adjust officer promotions and retention.

#### ■ Pentagon Reverses Ban on Transgender Troops

The Pentagon on June 30 reversed its policy barring transgender individuals from openly serving in the military, prohibiting service members from being involuntarily separated, discharged, or denied re-enlistment because of their gender identity.

The Defense Department will by Oct. 1 create a commander’s training handbook, medical protocol, and guidance for changing a service member’s gender in the Defense Eligibility Enrollment System. It will finalize training plans and implementation guidance, along with revising regulations to train commanders, human resources specialists, recruiters, and other service members.

## By the Numbers

# 334

The number of remotely piloted aircraft pilots the Air Force expects to produce by the end of this year, up from 188 the previous year. The service is looking to dramatically increase the number of RPA pilots, up to 384 next year, Gen. Mark A. Welsh III, then Air Force Chief of Staff, said June 15. The service had been losing about 240 pilots per year and was unable to replace them before an overhaul of its training program.

By July 1, 2017, the military will begin allowing transgender individuals to join if they meet accession standards. These individuals will be allowed entrance to service academies and the Reserve Officer Training Corps.

#### ■ USAF Unveils First Replacement Pave Hawk

The Air Force on June 28 introduced its first of 21 new HH-60G Pave Hawks built to replace helicopters lost in combat since 2001. The aircraft was unveiled during a ceremony in Huntsville, Ala., as part of an operational loss replacement program to build the HH-60G fleet to the original authorized size of 112, according to an Air Force news release.

The service purchased UH-60L Black Hawks and added equipment and other modifications to outfit them for the combat search and rescue role. After initial testing, Air National Guard units in California, Alaska, and New York will begin receiving aircraft in Fiscal 2018, “while former Guard aircraft will reflow to Active units with the highest number of flight hours,” significantly reducing the overall age of the Guard’s HH-60 fleet, states the press release.

#### ■ The Enlisted RPA Pilot Beta Test

Enlisted airmen will begin training to fly the RQ-4 Global Hawk this September, Air Combat Command chief Gen. Herbert J. “Hawk” Carlisle said. Speaking during a June 28 enlisted all-call that was broadcast online, Carlisle said career enlisted aviators will make up the first two enlisted pilot initial classes during a beta phase before the training is opened to more enlisted airmen. Carlisle said the service expects to eventually have 100 enlisted RQ-4 pilots.

The Air Force announced in December that enlisted airmen would soon be able to fly unarmed RQ-4 Global Hawks in an effort to help alleviate strain on the RPA community. There is no plan to have enlisted airmen fly the armed MQ-1 Predator or MQ-9 Reaper, but Carlisle hinted the enlisted mission could broaden in the future.

#### ■ GE, Pratt Get \$1 Billion for Engine Development

The Air Force on June 30 kicked off a high stakes battle between General Electric and Pratt & Whitney for the next generation adaptive engine, awarding the companies \$919.5 million and \$873.2 million respectively to begin their designs.

The total value of each contract, including a priced option, is \$1.01 billion, according to a Pentagon announcement. The contract calls on the companies to design, fabricate, integrate, and test multiple full, flight-weight centerline, 45,000-pound thrust turbofan adaptive engines, with work slated to finish in September 2021. The engine is expected to increase fuel efficiency and power—for example, the F-35’s Pratt & Whitney F135 engine produces 43,000 pounds of thrust.

General Electric, in a news release announcing the contract, touted its engine design’s projected statistics, including 25 percent better fuel consumption and 30 percent improvement in range. Its engine uses ceramic composites for lighter weight and a “three-stream” adaptive engine for better heat absorption.

Pratt & Whitney, builder of engines in the Air Force’s most recent F-22 and F-35 fighters, touts its “low-risk, follow-on” engine as a development from the only company that has built power plants for fifth generation fighters.



# The War on Terrorism

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

### Casualties

As of July 13, 22 Americans had died in Operation Freedom's Sentinel in Afghanistan, and 21 Americans had died in Operation Inherent Resolve in Iraq and Syria.

The total includes 39 troops and four Department of Defense civilians. Of these deaths, 15 were killed in action with the enemy, while 28 died in noncombat incidents.

There have been 107 troops wounded in action during OFS and 16 troops in OIR.

### B-52s Double Rate of Strikes Against ISIS

B-52s deployed to fight ISIS almost doubled their rate of strikes in late June compared to the first several weeks of the deployment, as airmen have built up the infrastructure and tactics at Al Udeid AB, Qatar, necessary for the massive bomber.

Stratofortresses began flying strikes as part of Operation Inherent Resolve on April 18 and have since flown more than 130 sorties, employing 630 precision weapons during more than 125 strikes, according to numbers Air Forces Central Command provided to *Air Force Magazine*.

AFCENT Commander Lt. Gen. Charles Q. Brown Jr. had said during a May 26 briefing that B-52 operations started slowly because there was not enough infrastructure at its deployed base, since the heavy bombers hadn't been based in US Central Command for more than 26 years. AFCENT said that between May 26 and June 22, the B-52s flew 77 of the 130 sorties, using 351 precision weapons during 73 strikes.

While the B-52 is known for its nuclear-capable, large payload, the bombers deployed against ISIS are specifically using laser guided GBU-12 Paveway IIs, GBU-38 Joint Direct Attack Munitions, and GPS guided GBU-31 bombs, according to AFCENT.

### More Troops To Stay in Afghanistan

President Obama on July 6 said the United States will keep about 8,400 troops in Afghanistan through the end of his second term in office, a change from the planned drawdown to 5,500 troops by the end of this year.

Speaking alongside Defense Secretary Ashton B. Carter and Chairman of the Joint Chiefs of Staff Marine Gen. Joseph F. Dunford Jr. at the White House, Obama said the current mission, focused on training and advising Afghan forces and supporting counterterrorist operations, will not change. "But even these narrow missions continue to be dangerous," the President acknowledged.

Thirty-eight Americans—military and civilian—have died in Afghanistan since the end of combat operations a year-and-a-half ago. "And we resolve to carry on the

mission for which they gave their last full measure of devotion," Obama said.

The latest change to the US strategy and force structure in Afghanistan was based on the recommendation of Army Gen. John W. Nicholson Jr., who assumed command of US and NATO forces in Afghanistan earlier this year, as well as members of Obama's national security team.

In June, Obama had granted broader authority to Nicholson to decide when US troops can accompany conventional Afghan forces in the field. Previously, US forces could only accompany Afghan Special Forces.

Obama said his decision to keep more troops in the country reaffirms the US commitment to Afghanistan, but he also called on allies and partners to "align their own commitments." July's NATO Summit in Warsaw was to be "an opportunity for more allies and partners to affirm their contributions." Obama said he is "confident they will."

### The Afghan Air Force's Manning Shortfall

The fledgling Afghan Air Force does not have enough aircrews operational or in training for either its current or projected fleet, though the limited pipeline is growing, according to a Pentagon report.

The Defense Department's "Enhancing Security and Stability in Afghanistan" report, released June 17, outlines issues facing the Afghan military and the security situation in the country. The 116-page report describes the state of the Afghan Air Force from Dec. 1, 2015, to May 31. "The development of human capital remains a critical component of overall AAF progress," it states.

For example, the AAF has just four fully trained pilots for its eight-aircraft fleet of A-29 Super Tucanos. The AAF expects to field 20 A-29s for close air support, though it is struggling to identify capable pilots and train them. The AAF similarly has nine fully trained pilots for its four C-130s, and 27 MD-530 attack helicopter pilots for its authorized fleet of 30 aircraft. As of May 31, 172 students are enrolled in 18 US-funded training programs for AAF development, a 13 percent increase from last year. This covers basic pilot training, aviation safety, and language training.

### NATO To Increase Support for Afghanistan

NATO member countries have pledged to increase support to Afghanistan in 2017 and beyond, including placing troops in a "constellation" of sites around the country, US Defense Secretary Ashton B. Carter said.

Speaking at the end of a ministerial meeting in Brussels on June 15, Carter said NATO would finalize plans at its July summit to keep a stronger presence in the country to help the Afghan government. The alliance also has agreed to fully fund the Afghan National Defense and Security Forces through 2020.





USAF photo by A1C Sashie Colbert

**Eagle Eye:** CMSgt. Sonia Lee helps attach an aero surface strake on an inert GBU-38 v1 munition. The command chief for the 28th Bomb Wing, Lee was learning about the 28th Munitions Squadron mission. The unit has more than 200 airmen and is responsible for 86 facilities and a 647-acre munitions storage area. Lee said in a news release, "The behind-the-scenes details and work to construct a bomb made me realize they are their own supply chain, vehicle maintenance, and much more."

### ■ USAF Unveils Total Force Award

The Air Force unveiled a new award to honor the top joint force team. Named for the recently retired Air Force Chief of Staff, the Gen. Mark A. Welsh III One Air Force Award will be bestowed on a team that "demonstrates improved effectiveness, operational readiness, and mission accomplishment through integrated solutions," according to an Air Force news release.

Air Force Secretary Deborah Lee James announced the award during Welsh's retirement dinner on June 23. To be considered, a team must include at least two Total Force components. The team must submit an award package covering actions between May 1, 2015, to April 30, 2016, that must "justify the team's best practices and explain how the procedures would be limited if performed by a single component."

A board will evaluate the packages based on the contributions of an integrated team, the scope of the impact to the Total Force, and leveraging a Total Force team. The winner will be recognized at AFA's Air, Space & Cyber Conference in September.

### ■ Boeing's Boom Solution

Boeing announced in July it has implemented a hardware fix to a "higher-than-expected boom axial load" on the KC-46A's boom system that caused issues in early tests, leading to a program delay. The updated boom successfully offloaded fuel to a C-17, an F-16, and an A-10, completing the required set of refueling tests.

Prior to the fix being announced, the Air Force and Boeing began "in kind" compensation to USAF due to Boeing's inability

to deliver 18 KC-46 tankers by the contract deadline of August 2017, sources reported.

That compensation could come in the form of no-cost service life extensions to KC-135 tankers, which will have to serve longer than expected because of the schedule slip, or discounted contractor logistics support, parts, or other accommodations. A Boeing spokesman on June 14 could not immediately say whether the compensation would be limited to tanker-related transactions or could widen to include other Boeing products, such as JDAM bombs or F-15s.

The Air Force announced in May it expects Boeing to miss the August 2017 deadline to deliver 18 KC-46A tankers. Now, Altus AFB, Okla., the first formal training unit, and McConnell AFB, Kan., the first Active Duty-led KC-46A operating base, will begin receiving the first Pegasus aircraft "by late summer or early fall 2017," rather than spring 2017, and Boeing will now deliver the 18th aircraft in January 2018.

### ■ B-52s Complete European Deployment

Two B-52H Stratofortresses flew home to Minot AFB, N.D., on June 23 after completing a roughly one-month deployment to RAF Fairford, UK. While in Europe, the bombers participated in exercises Baltops 16 and Saber Strike 16, flying a total of 25 sorties in countries such as Poland, Denmark, Sweden, Estonia, Lithuania, Latvia, France, Germany, and Italy.

"The B-52 is a great sign of America's presence for assuring allies and deterring potential enemies," said Col. Kieran T. Denehan, 5th Expeditionary Operations Group commander, in a June 23 news release. ★



By Robert S. Dudley

**Squeezed Out**

"I'd love to build a new CAS airplane right now, while we still have the A-10, [and then] transition the A-10 community into the new CAS airplane. We just don't have the money to do it, and we don't have the people to keep flying the A-10 and build a new airplane and bed it down. [However] we don't think this would take that long to do, and we don't think it [the design problem] is that complicated."—*Gen. Mark A. Welsh III, then USAF Chief of Staff, Defense Writers Group, June 15.*

**Sour Note**

"For every dollar that is spent on our bands to entertain at social functions, that's a dollar we're not spending on national security and our troops and families. ... While our communities certainly do enjoy being entertained by our military bands, they would prefer to be protected by our military."—*Rep. Martha McSally (R-Ariz.), a retired USAF colonel and A-10 pilot, quoted in Air Force Times, June 26.*

**Paper, Money, Gunship**

"You've got to have a wheelbarrow full of paper [for documentation] before you get a wheelbarrow full of money. Well, we're busy filling the wheelbarrow [with] paper. ... I'm a firm believer that it's time we take directed energy in the form of high energy lasers and move it into the battlefield on an AC-130 gunship. The next weapon is a directed energy weapon."—*Lt. Gen. Bradley A. Heithold, head of Air Force Special Operations Command, remarks at the annual Directed Energy Summit, June 23.*

**Through the Side Door**

"I really question who is going to do it. I don't see a lot of people I know of saying, 'Hey, I want to go abandon my current position and go be in the military.' Can you imagine someone coming in as an O-5 or O-6 and not knowing who salutes who? Or how to wear a uniform? The traditional military's worst nightmare is to bring in some long haired hippie and make him a colonel."—*Former USAF officer Richard Bejtlich, now a cybersecurity expert at Brookings Institution, on DOD*

*plan to allow "lateral entry" of civilians in the armed services, Military Times, June 19.*

**80 Percent Solution**

"I think it's possible that the USAF has reached the point with bombers where it's being driven to the '80 percent solution.' The B-21 might well be a B-2 'mini me.' Modern computerized design and production techniques will certainly make production of a B-2-like aircraft less costly than it was 20 years ago. If that's the case, it's smart—silver bullets have simply gotten too expensive. The USAF might have realized that it has to choose between quantity and 'quality' (AKA sophistication)—and has chosen the 80 percent solution this time. The B-21 might be to the B-2 what the Virginia-class submarine is to the exquisite but prohibitively expensive Seawolf class—good enough to get the job done and affordable enough to buy."—*Andrew Davies, research analyst, Australian Strategic Policy Institute, online posting, July 1.*

**History Rhymes?**

"It is hard not to feel a certain satisfaction with the comeuppance that Brexit has delivered to the unaccountable European Union bureaucrats in Brussels. Nonetheless, we would do well to refrain from smug condescension. Unity is not easy. ... Seven decades into the postwar era, ... the EU is facing an existential crisis. Yet where were we Americans seven decades into our great experiment in continental confederation, our 'more perfect union' contracted under the Constitution of 1787? At Fort Sumter."—*Syndicated columnist Charles Krauthammer, Washington Post, June 30.*

**Well, Do Give Up the Ship**

"If I had decided to start a firefight, I know a lot of my guys would be dead. We might all be dead at that point. ... I didn't want to start a war with Iran either. I didn't want to start a war that would get people killed. ... That was also on my mind. ... Allowing us to be captured—that was my decision and my decision alone. ... I made the gamble that they were not going to kill us. I made the gamble that they were not going to take us to Tehran and parade us around

like prisoners of war."—*Unnamed Navy lieutenant who, as skipper of a riverine ship in the Persian Gulf, surrendered at gunpoint to Iranian Guards. Navy report quoted by Navy Times, June 30.*

**They Did Not Try**

"We expect our government to make every effort to save the lives of Americans who serve in harm's way. That did not happen in Benghazi. Politics were put ahead of the lives of Americans, and while the Administration had made excuses and blamed the challenges posed by time and distance, the truth is that they did not try."—*Rep. Mike Pompeo (R-Kan.), member of the House Benghazi panel, statement on June 28, upon release of the highly critical report.*

**On the Run, Part 2**

"There has been no strategic victory for ISIS in over a year now. We have seen them, in fact, lose significant territory over and over again. Fallujah, Ramadi, Rutbah, Hiit, Sinjar, Baiji on the Iraq side. In Syria, we've seen them lose Al Hal, Shaddadi, Tishrin Dam, and now the stranglehold on Manbij, and they will soon lose that as well."—*Navy Capt. Jeff Davis, spokesman for the Defense Department, June 27.*

**Carter Speaks**

"I'm announcing today that we're ending the ban on transgender Americans in the United States military. Effective immediately, transgender Americans may serve openly, and they can no longer be discharged or otherwise separated from the military just for being transgender."—*Secretary of Defense Ashton B. Carter, formal statement, June 30.*

**McCain Speaks**

"I will be calling up the chiefs of the services, those men [and women] in uniform who are the heads of the military, and asking their views. ... Unlike any other Administration that I have been associated with, we received no heads up. ... It's customary ... to give members, particularly the chairman, a briefing. ... Something like this will require some legislation."—*Sen. John McCain (R-Ariz.), on removal of the military's ban on transgender persons, interview on Fox News, June 30.*



# Technology Readiness Levels, Explained

By Gideon Grudo, Digital Platforms Editor

Fielding new technology is quite an undertaking—one that normally starts at universities.

Within the Air Force, agencies will identify needs that seep into the walls of classrooms and labs, where experts will study them. From there, the technological journey progresses along a path of landmarks called Technology Readiness Levels, or TRLs, ranging from one to nine, the last one denoting the collateral is ready for operational use. As each level of readiness is achieved, the technology advances, flexing its muscles and trying to overcome its next set of challenges.

Jack L. Blackhurst, Air Force Research Laboratory director of plans and programs, explained the TRL process and its real world applications.

Blackhurst said, "You're building expectations" along the various TRLs, seeing if potential new tech looks promising. Even if the science doesn't pan out, as with all research, negative feedback can be valuable.

"We need some way to evaluate the maturity of technology" in the acquisition process, he said. Those discussions are almost always based on TRLs.

Here, we break down for you what the official definitions of the TRLs actually mean, using a fictional aircraft rocket (let's call it RocketX).

You'll also find the real-life maturation from TRL 1 to TRL 6 of a solid state semiconductor, as explained by AFRL. And we have the real life maturation from TRL 7 to TRL 9 of a collision avoidance system employed on F-16s. It has already saved at least two lives.

Staff illustrations by Mike Tsukamoto

## TRL 1

### Definition

Basic principles observed and reported.

### What That Means

Chemistry and physics theory in an academic setting. Think chalked equations and bubbling beakers examining the very concept of RocketX.

### USAF Example

Researched material properties for a wide-bandgap semiconductor. The idea was to make devices that can handle high voltages, high current densities, high temperatures, and fast transients.



## TRL 2

### Definition

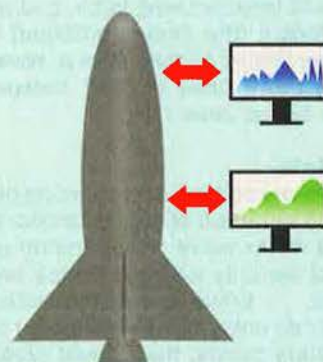
Technology concept and/or application formulated.

### What That Means

It's time to see if the theory behind RocketX works. A lab takes the research and puts it into capabilities testing.

### USAF Example: SSCB

Conceptual circuits for a solid state circuit breaker (SSCB) are designed and analyzed.



## TRL 5

### Definition

Component and/or breadboard validation in a relevant environment.

### What That Means

The tests get real. RocketX is exposed to real life conditions.

### USAF Example: SSCB

Tested a brassboard SSCB panel in a laboratory ground demonstration with simulated aircraft circuits.



## TRL 6

### Definition

System/subsystem model or prototype demonstration in a relevant environment.

### What That Means

AFRL is confident in RocketX and pushes for the fuel to be developmentally and operationally tested.

### USAF Example: SSCB

Flight tested the SSCB panel in an aircraft electrical power system used to protect actual aircraft circuits/equipment.





### TRL 3

#### Definition

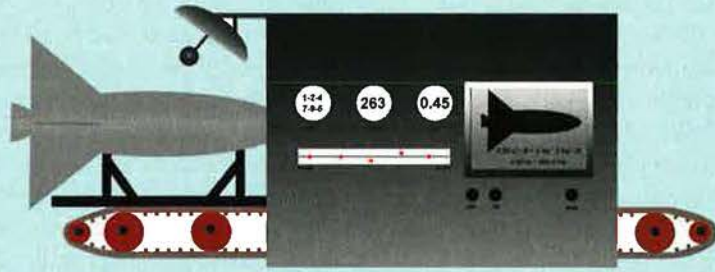
Analytical and experimental critical function and/or characteristic proof of concept.

#### What That Means

AFRL might investigate if RocketX has an Air Force application. It may even fabricate a prototype of the rocket and run it through tests.

#### USAF Example: SSCB

Fabricated and successfully tested an SSCB capable of fast fault detection and interruption.



### TRL 4

#### Definition

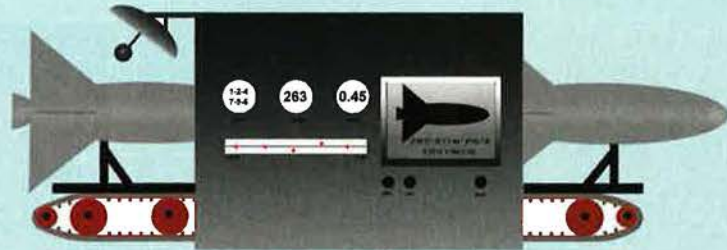
Component and/or breadboard validation in a laboratory environment.

#### What That Means

We've reached low fidelity testing on RocketX. The technology will be produced en masse sufficient for meaningful results.

#### USAF Example: SSCB

Built and tested an SSCB panel.



### TRL 7

#### Definition

System prototype demonstration in an operational environment.

#### What That Means

RocketX is installed and tested on various aircraft. The idea is to build yet more confidence by placing the rocket in a place where humans rely on it.

#### USAF Example: Auto-GCAS

Installed Automatic Ground Collision Avoidance System (Auto-GCAS) software on an F-16 and completed 103 flights to prove it would protect against a majority of controlled flight into terrain mishaps and allow nuisance-free operation.

### TRL 8

#### Definition

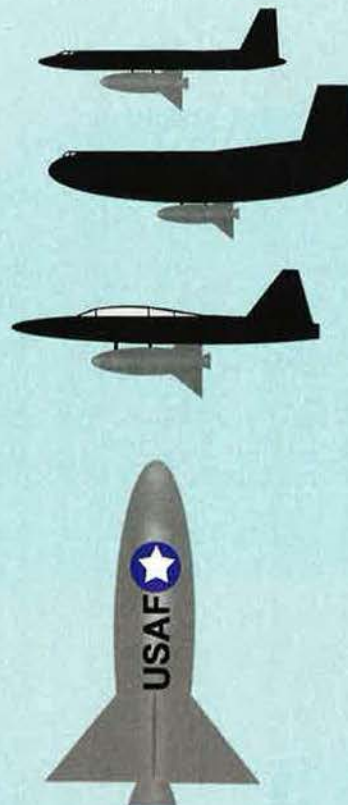
Actual system completed and qualified through test and demonstration.

#### What That Means

After testing RocketX on various aircraft, USAF decides this new technology is "the right way to go" and installs it on aircraft.

#### USAF Example: Auto-GCAS

F-16 program completed integration and test of the Auto-GCAS system for installation on operational aircraft.



### TRL 9

#### Definition

Actual system proved through successful mission operations.

#### What That Means

Under actual mission conditions, RocketX proves itself worthy of passing all nine TRLs.

#### USAF Example: Auto-GCAS

Auto-GCAS was fielded on Block 40/50 F-16s in fall 2014. System was integrated on more than 600 Block 40/50 F-16s and has saved at least two pilots' lives since.





**F**OR several years, Pentagon leaders have raised alarm over the erosion of America's military lead on many fronts. As the US fought fairly low-tech counterinsurgencies in Afghanistan and Iraq, competitors like China, Russia, and Iran studied the capabilities that made the US dominant in the 1991 Gulf War and later in the Balkans, looking for ways to blunt American military advantages and build matching capabilities.

Those advanced adversary systems are now being fielded.

Frank Kendall, Pentagon acquisition, technology, and logistics chief, told a think-tank audience in April that the rapid technological advance of competitors is "what I lose sleep over."

The Pentagon's response has been the "Third Offset." Coined by Deputy Defense Secretary Robert O. Work in 2014, this term refers to a broad effort to leap ahead of competitors who are now mastering the very skills and technologies that have given the US its military edge for more than 40 years. Those include stealth, advanced sensors, electronic warfare, space, and cyber.

Work's term referenced two previous offsets. The first was in the 1950s, when America relied on a large arsenal of nuclear weapons to asymmetrically deter the Soviet Union's superior conventional power. The second, since the 1970s, was characterized by the US using high-tech conventional systems to counter being outnumbered.

Two years after Work's coinage, however, Third Offset is misunderstood. It's not a crash program to rapidly usher in a specific new slate of Buck Rogers weaponry. Rather, it's an intense focus on certain technologies—as well as organizational models and new tactics—offering the greatest opportunities to extend US dominance in many areas. The keys will be speed of fielding and restoring "asymmetry" with competitors.

"There's not going to be a Third Offset Czar," said Stephen P. Welby, assistant secretary of defense for research and engineering. In an interview with *Air Force Magazine*, Welby, the Pentagon's chief technology officer, said Third Offset is a simple recogni-

By John A. Tirpak, Editorial Director

# THE THIRD OFFSET

It's a mindset.

ANG photo by MSgt. Robert Trubia



tion that “overmatch is temporal,” and all military advances eventually are countered.

“Over time, others catch up,” he observed.

Third Offset is “the collective thinking of the [Defense] Department,” he continued. “It’s really [about] how do we organize ourselves to think differently about the future?”

What is in hindsight now called the Second Offset was really a directed campaign of “robust experimentation ... in terms of technology development, the organization within the services, and across the joint realm,” Welby explained. “And we expect the same thing to occur here.”

Defense Secretary Ashton B. Carter told Congress in February that the Pentagon is requesting \$3.6 billion for Third Offset-related efforts in Fiscal 2017. These efforts are slated to get \$18 billion over the Future Years Defense Program. The numbers are large, but are a relatively small fraction

of the \$951 billion over the FYDP “to help research, develop, test, evaluate, and procure the right technology and capabilities our military will need to deter and, if necessary, fight and win full-spectrum conflicts in the future,” Carter said in budget testimony before the House Appropriations Committee.

### DELIBERATELY INVISIBLE

Some of the Third Offset investment areas are identified in the budget and “some are not visible in the budget, deliberately,” Welby observed. The Pentagon doesn’t want to tip its hand and show its most high-value cards.

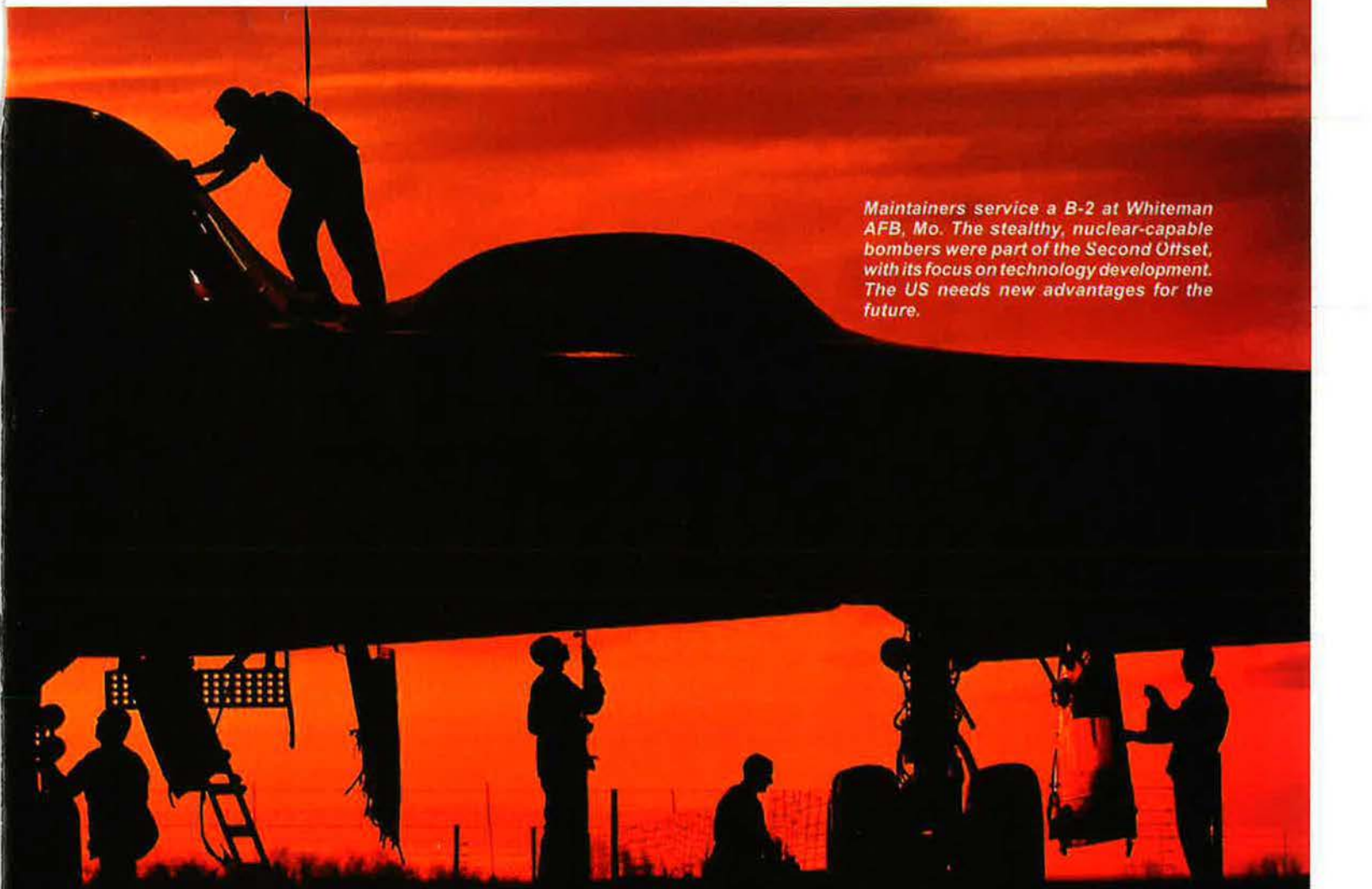
The Pentagon has some clear models for how to field effective programs faster. Some capabilities, such as those resident in the E-8 JSTARS ground surveillance aircraft, RQ-4 Global Hawk high-altitude reconnaissance jet, and the MQ-1 Predator medium-altitude scout, began life as some of the most visible Advanced Concept Technology Demonstrations, or ACTDs.

Though they provided extraordinary new capabilities in record time, the speed of their fielding created headaches in that a logistical train to support them had to be developed after the fact. So high were Global Hawk costs at one point that the Air Force threatened to shut down the program.

“‘Build it and they will come’ is not a strategy,” Welby said. “But I think we often beat ourselves up too much for some of the ACTD programs, which did get fielded and did have enormous impacts on the war—impacts so significant that we couldn’t do without them.”

Congress has not been kind to the Pentagon about these ACTDs, but fielding a capability which is scarcely a step removed from the laboratory has inherent cost and risk, Welby said. The best thing to do is, “as soon as we recognize” that an ACTD is going to be folded into the force as a permanent feature, “we need to be investing in normalizing those programs.”

Moreover, “today we have new models of how we do that.” One is the



*Maintainers service a B-2 at Whiteman AFB, Mo. The stealthy, nuclear-capable bombers were part of the Second Offset, with its focus on technology development. The US needs new advantages for the future.*



*A Russian Sukhoi T-50 prototype flies near Moscow. It is due to begin delivery in late 2016 or 2017. China, Russia, and Iran seek to match US capabilities and field ever-more advanced systems.*

move toward “leveraging commercial technology to a greater extent and counting on commercial supply chains as a way to avoid having to create your own military-unique capacity behind it.”

He cited the Apple iPhone as an example of a system that seamlessly works with older and newer versions of itself, is adaptable to use in many ways—and many new ways, as time goes on—and yet is low-cost enough to be replaced without breaking the bank. That commercial model is almost the opposite of a military-unique system, “where we field an entire service-worth of gear homogeneously across the service,” every user getting the same thing and the same training.

“There’s no life cycle support plan for the iPhone in my pocket,” Welby said. By using commercial gear, reducing military-unique capabilities may “in some cases” allow use of a “planned obsolescence” model, “where, if we get to the right price points and performance, maybe I don’t need to build that entire maintenance chain behind it.”

Welby wants to apply that thinking to weapons, looking to the day when

“wooden rounds” are the norm—those that “don’t need a lot of care and feeding until the day they’re used in anger.”

In the science and technology arena, 17 specific areas—called Communities of Interest—are being targeted for rapid experimentation, prototyping, and fielding of new systems. They range from advanced electronics, cyber, electronic warfare, and air platforms to propulsion, sensors, space, weapons, and biomedical and materials sciences. They are viewed as “crosscutting” in that they have applications for all the services.

“We’re after finding ways to disrupt ourselves before somebody else does,” Welby said.

### NEEDED CONVERSATIONS

Through a multiservice, multiagency forum called Reliance 21, Welby brings defense technologists together so that he and they can understand their investment portfolios and “in some cases” challenge them to make sure the S&T investments are coordinated and deconflicted.

The name is to convey that the services do, in fact, rely on each other. The meetings allow the participants to voice opinions about areas they think aren’t getting enough attention, or where organizational stovepipes are thwarting progress, Welby said. His role, and that of the other top leadership, is to “help them focus.”

The forum keeps the investment portfolio responsive. Some of the 17 communities of interest will change

this year—Welby declined to say what might be added or subtracted—because conditions change.

“We’ve had very large investments in counter-IED [improvised explosive devices],” he said, but they were driven by the threat in Afghanistan and Iraq. “Should that grow? Should that go flat? Taper? ... Those are the kinds of conversations we need to have.”

Welby said the S&T enterprise is “lucky” that in a time of acute austerity, its budget is not losing ground.

“‘Flat’ is the new ‘up’ in the current budget environment, I guess,” he asserted. Under such conditions, it’s critical that portfolios be managed carefully and priority assigned where it will produce the most payback.

Autonomy is one area “we’re paying a lot more attention to,” he acknowledged. It’s a key area of interest for the Air Force. Service chief scientist Greg L. Zacharias told AFA’s Mitchell Institute for Aerospace Studies in May that autonomy applies across a huge range of applications, from “big data” to aircraft that fly themselves to the displays airmen use to gauge a situation and choose a course of action. He said industry has been asked for concepts to conduct a demonstration of what USAF is calling the “loyal wingman” concept, in which an unmanned, autonomous aircraft flies cooperatively with a manned combat aircraft. A demonstration is eyed for the 2020-21 time frame.





An illustration of DARPA's Falcon Project HTV-2 unmanned, rocket-launched aircraft. HTV-2 was to travel through the Earth's atmosphere at Mach 20, carrying sensors to collect data.

The Army and Marine Corps have “a core competency in ground vehicles. But the lines blur between” the services, he said. Autonomy will have a big impact on logistics, planning systems, and cyber, which “touches every service.”

Similarly, hypersonics and directed energy get a lot of notice and are frequently cited by Pentagon leaders as examples of leap-ahead capabilities.

“There’s a significant increase in Air Force and DARPA [Defense Advanced Research Projects Agency] investments in hypersonics,” Welby noted, “given the importance of that area.”

Electronic warfare is a discipline all the services must master in their domains—and across them, Welby said. Still, all the services have to keep current on each others’ activities because a breakthrough in one domain “might apply in others” and could be leveraged across the services.

Former Air Force acquisition chief William A. LaPlante frequently railed against what he called “the valley of death,” the hard-to-leap chasm between a promising experiment or prototype and a funded program to get something in the field.

Welby said the Pentagon leadership is sensitive to this problem and is doing all it can to ensure laboratory successes have a chance to compete for deployment.

The Second Offset, Welby observed, relied heavily on trying new ideas.

So important is autonomy to USAF that Zacharias’ predecessor, Mica R. Endsley, focused an entire Air Force yearly technology study on it. Zacharias expects to release “Autonomous Horizons II” before the fall, and a third volume could be coming next year.

While some services naturally take the lead in certain areas—the Navy heads undersea technology research, for example, and USAF is leading in hypersonics—all the services are involved in focus S&T areas to some degree.

Autonomy “is really an adjective, more than a technology,” Welby said. Where it applies to sea-based applica-

tions, the Navy will lead, while the Air Force “has unique expertise in the area of air platforms, obviously, and is working a lot of very novel programs in that space.”



DARPA awarded contracts for the Grem-lins program, which would enable an aircraft to launch several low-cost, reusable unmanned aerial systems with a variety of payloads.

DARPA illustration





*TSgt. Matthew Hoover monitors a signal generator to simulate radar emissions and test the threat detection systems of an F-15E.*

“gives the adversary 20 years to come up with countermeasures before we deploy our capability. We’re going to have to think about how we put technology to programs much faster.”

He said the Pentagon has not gotten the credit it deserves for having straightened out acquisition and achieving better timelines and better cost performance.

“People have not been paying enough attention to what’s been going on” in acquisition, he asserted. “Quite frankly, we’re doing amazing things in terms of large program acquisition at this point. It’s a story that doesn’t get told.” Programs are hitting their marks in cost and schedule to a degree “that we haven’t seen in decades, in terms of their success.” The achievements have been due largely to the Better Buying Power initiatives pushed by Carter when he had Kendall’s job, and Kendall’s promotion and refinement of those principles ever since.

Better Buying Power 3.0 “is almost entirely focused” on making the acquisi-

The 1980s was “a time when there was an enormous amount of materiel experimentation, a lot of ferment,” such as the origins of remotely piloted aircraft and operational stealth, he said. “They weren’t technology programs that were designed to mature the technologies themselves,” but rather “opportunities to understand how we might fight” with new gear. That, in turn, led to requirements being drawn up and programs being launched. He said this is how to “jump that gap, so that it’s no longer just a gleam in the technologist’s eye but ... a demand in an operator’s sight.”

The experimentation effort—getting heavy emphasis under the Third Offset concept—will also build experience by mixing new technologies with existing systems because “we’re not going to turn everything over overnight,” Welby pointed out. The Air Force’s strategic-agility push makes a priority of rapidly integrating new tech rather than waiting for the next revolutionary development.

Carter, in his budget testimony, said the “arsenal plane” concept will marry new long-range standoff munitions

having a variety of effects with existing aircraft, creating a new challenge for adversaries by mixing old and new.

Many of those dollars that Carter identified as going to Third Offset activities in FY ’17 “all drive to operational experimentation,” Welby said. Then, “those system concepts will have to compete with the current” systems, “but we’ll be informed at that point what those capabilities really offer.” It’s crucial that the Defense Department become “a more informed buyer” through experimentation, prototyping, and demonstration.

### NEED FOR SPEED

Speed will be crucial in this process. In its recent Air Dominance 2030 study, the Air Force said the near-term demands of the battlefield indicate that a 20-year program to develop a successor for the F-22 will be “late to need,” and incremental improvements will be necessary to maintain the technology edge in air combat.

“I’ve said on the Hill that I don’t expect to see another 20-year development program,” Welby noted, because that



*An F-22 fires an AIM-120 air-to-air missile at a small target drone over the Gulf of Mexico.*



tion system more innovative while cutting “red tape and bureaucracy,” Welby said, with a focus on speed from lab to fleet. There’s been a focus on tech insertion, modularity, and modified commercial items access, “focused on getting capability faster to the user.”

A lot of experimentation is happening with technology and contracting approaches that will “shorten the process associated with getting to contracts.” Contracts are being written to align incentives with speed, Welby said.

The Air Force’s B-21 bomber development contract, awarded last fall, puts heavy emphasis on speed, providing big rewards to Northrop Grumman if it can make its timetable. The reward dwindles and possibly “goes to zero” if the marks are hit late, Air Force assistant acquisition chief Lt. Gen. Arnold W. Bunch Jr. said.

In the Air Dominance 2030 study, the Air Force discussed using large numbers of inexpensive, reusable RPAs to perform missions such as electronic warfare, strike, and decoy. They would be built in enough numbers that it wouldn’t matter too much if some were lost, and likewise would be numerous enough that an adversary might not want to expend the effort or cost to destroy them.

The concept is “something we should explore,” Welby said, “and there’s interesting experiments going on in that space.” It’s a “cost trade” with an adversary.



Airmen during a Red Flag exercise in the Combined Air Operations Center at Nellis AFB, Nev.

“Today, with emerging autonomy technologies and low-cost networking, we are seeing advances where a collection of [inexpensive] systems may be greater than the sum of its parts.” A number of cheap, small systems “that work together may be more capable than an expensive platform.” Distributed over a wide area, the pieces become harder to target.

“I can be more resilient and recover, reorganize, and fight my way through loss of even some portion of that capability,” Welby explained.

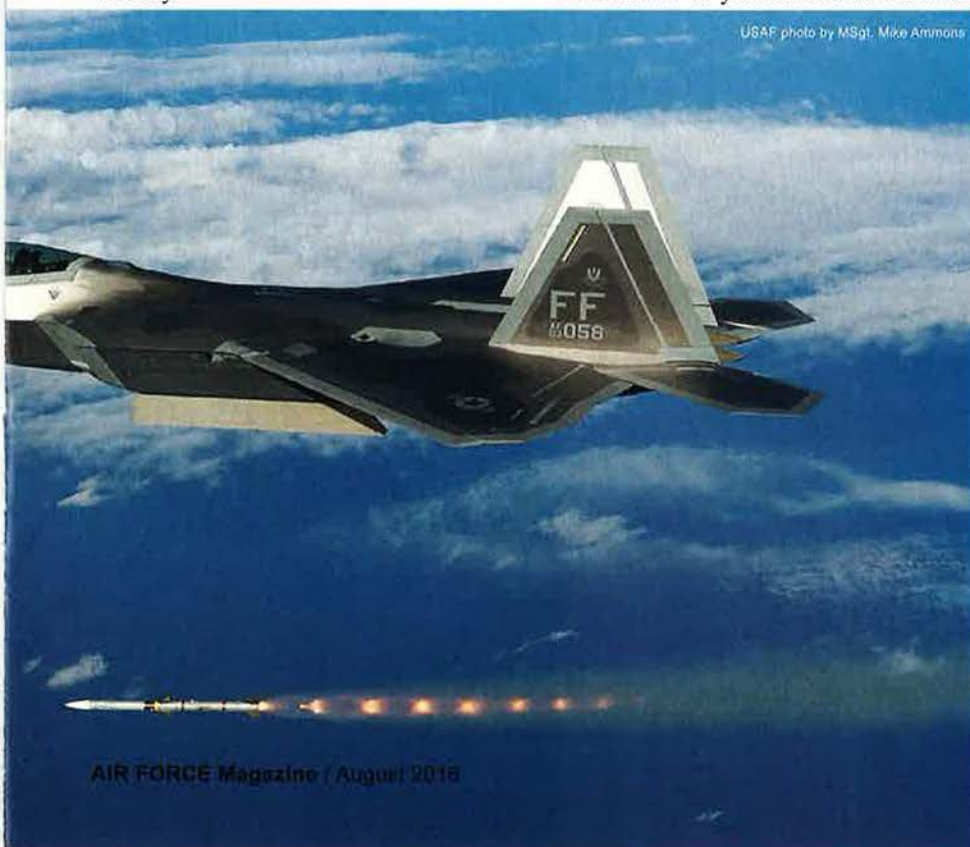
Work, Kendall, and others have suggested that it may be impossible to maintain a 40-year lead in some areas

of military technology—that the rate at which innovation is happening around the world means keeping a decisive edge will be a hard, if not an impossible, goal. A Defense Science Board study last year suggested that adversaries may already have a lead, for example, in electronic warfare. Welby, however, is optimistic.

“I don’t know if we’re going to have 40-year advantages,” he said, but “I’m sure there’ll be decadal advantages available.” The “natural advantages” of the US are that “we are the best-trained, best-exercised force in the world, and that is ultimately an advantage that no amount of technology allows you to overcome.” The trick will be to “out-innovate our adversaries” and get inside their “OODA loops,” the time it takes to observe, orient, decide, and act. Welby also said it won’t be sufficient to have “silver bullet” capabilities; they must be distributed throughout the force in the hands of “well-trained, creative operators.”

He recognized that the catch-up timeline is collapsing. Time after the first US use of precision guided weapons was relatively long, but the time it took adversaries to see the advantages of the US establishing “real-time persistent situational awareness” with RPAs “has been much shorter.”

Still, “we’ve been at this point before. We’ve been at places where our ... asymmetric advantage became less asymmetrical, ... and we have found ways to break that symmetry in the past.” Welby said he is “excited” that the Defense Department is “organizing to think about that well ahead of the day of crisis.”



USAF photo by MSgt. Mike Ammons



Air Force Space Command needs resilient systems and a warrior mentality.

# MAKING SPACE MORE MILITARY

By Jennifer Hlad, Senior Editor

**I**t is hard to overstate the importance of space assets to the United States' ability to project power and fight wars. Virtually every weapon the US drops today is guided by GPS; weather and surveillance satellites have become critical to ground operations; and communications satellites provide the ability for troops all over the globe to communicate and navigate.

However, since the end of the Cold War, space has been largely regarded as a safe domain—a sanctuary in which capability could be emphasized at the expense of protection.

That is clearly no longer the case. Today, 11 countries can launch objects into space, and more than 170 countries have access to space. Anti-satellite tests by China and Russia show that space may never again be an uncontested domain.





*A United Launch Alliance Delta IV boosts a classified payload into orbit from Cape Canaveral AFS, Fla., June 11.*

ULA photo



Defense officials are well aware of the issue, and many have been talking about potential threats in space for years. Now, the talk has turned to action: Air Force Space Command earlier this year began reorganizing the space force in an effort to be better trained and postured to operate in a contested space environment.

Speaking at the Space Foundation's Space Symposium in Colorado Springs, Colo., in April, Gen. John E. Hyten, AFSPC commander, offered an example to explain the criticality of space. As good as US GPS capability is, he said, the 2nd Space Operations Squadron at Schriever AFB, Colo., gets a call three or four times a week from the combined air operations center in the Middle East requesting more accuracy. For these tactical operations, the airmen will "tweak the constellation" to "give very specific accuracy" to whichever weapon is dropping, Hyten said.

At the 16th Space Control Squadron, Hyten said, airmen monitor communications links around the clock, so commercial and military comms and remotely piloted aircraft links to their pilots in the US all happen

seamlessly. Soldiers on a hill in Afghanistan looking down on a target ask for information to be there, and they need it to be there.

Those troops "can never be left alone. ... The switch is always on," Hyten said. "We can never allow that to change."

Just as pararescue jumpers have a threat focus every day, space operators "have to start preparing for the same kind of threat," Hyten said. "Not the same physical threat that they fear in their lives, but the same kind of attitude that they bring to their challenges every day, we have to bring the same challenges."

In his speech at the Space Symposium, Deputy Secretary of Defense Robert O. Work said space has "become deeply enmeshed in our plans, training, and operations and is central to our ways of deterring conflict, assuring allies, and ultimately to our warfighting."

If an adversary took space assets away from the US, "our ability to project decisive military power across trans-oceanic distances—the very essence of our conventional deterrence—would be critically weakened," he added.

## VITAL RESOURCES

Yet as the domain and the threat have evolved, Work said, US space assets have become increasingly vulnerable.

Adm. Cecil D. Haney, commander of US Strategic Command, said he believes part of the problem is that space has been viewed as an enabler, rather than a critical mission capability.

"Our sensors, command and control systems, and our space situational awareness capabilities underpin our ability to maintain awareness. These resources are vital to the decision-making process and supporting forces around the globe," he said.

Winston A. Beauchamp, deputy Air Force undersecretary for space, noted in February that the "secret is out" about the US and allied reliance on space. Those things that give us "a qualitative and quantitative edge over adversaries also makes space an irresistible target," he said.

Still, up until last year, space operators were told that if they got into trouble with a satellite, they should put it in safe mode and call an engineer, Hyten said.

That method does not work in a threat environment, Haney said.

## EXPERIMENTATION THROUGH THE JICSpOC

The Joint Interagency Combined Space Operations Center, established at Schriever AFB, Colo., in September 2015 and slated to run experiments just through 2016, has already revealed critical lessons and likely will continue its work in 2017.

Difficult to spell and pronounce, JICSpOC—it rhymes with ticktock—is an experimental center that is by design separate from the similarly named Joint Space Operations Center, or JSPOC, at Vandenberg AFB, Calif.

At the 32nd Space Symposium in Colorado Springs, Colo., Air Force Space Command boss Gen. John E. Hyten said USAF has been trying to experiment in the JSPOC at Vandenberg for "the last five years," but has not been successful because "they're gainfully employed" and "busy every day" with the conflicts going on in the world. The JSPOC is US Strategic Command's command and control node for space operations.

"There's no way they can just stand down for three weeks and focus, and that's what we do in the JICSpOC," Hyten told reporters. "We had to put it someplace that had all the right connectivity, and Schriever is like the only place in the world that has all the connectivity we need, both in the Intelligence Community side as well as the Air Force and DOD side."

The JICSpOC itself is simply a 3,000-square-foot room at Schriever, playing host to roughly three dozen people from the Department of Defense and the Intelligence Community.

It is a space for experimentation, Hyten said, preparing the US to defend the space domain and perform command and control if there is ever a war in space.

"We need to be able to defend the entire space domain," he said. "We are going to experiment and explore what we need to do, what we have to have, how

we need to operate. We decided we can do that with a unity of effort construct, not a unity of command construct."

Adm. Cecil D. Haney, STRATCOM commander, said the center "represents a fundamental step forward in ensuring the US outpaces emerging and advancing space threats" and will "enhance the nation's deterrent posture by demonstrating the US is prepared should an adversary threaten our space capabilities."

Haney quoted Deputy Secretary of Defense Robert O. Work, saying the JICSpOC is the first operational construct of the Third Offset Strategy and a "key contributor to maintaining the military's competitive edge."

Work, in a separate speech, noted that the center is part of an effort to improve battle management command and control and will help "more fully integrate DOD space operations with those of the Intelligence Community."



"When one of our space systems goes offline, or a receiver is no longer receiving information from space systems, we can no longer assume that it's the result of an equipment problem or operator error," he stressed. "We must quickly assess and verify that we're not under attack."

If space assets are not made more resilient, there will be more temptation for an adversary to take them out, and that will undermine conventional deterrence, Work said.

"One of the fundamentals of deterrence is that people are more likely to attack you if they see you as weak and vulnerable—in other words, don't be the injured gazelle on the Serengeti; you're just inviting attack," he said. "A perception that our space systems are an easy target leads to a destabilizing reality: An adversary might think that by attacking, or even threatening, our space systems, they may deter US entry into conflict."

Haney, Hyten, and others have repeatedly stated their fervent wish to avoid war in space. But if deterrence

fails, Haney said, "we must be ready with a resilient capability and associated operational concepts and tactics to defeat efforts to an attack on our space systems."

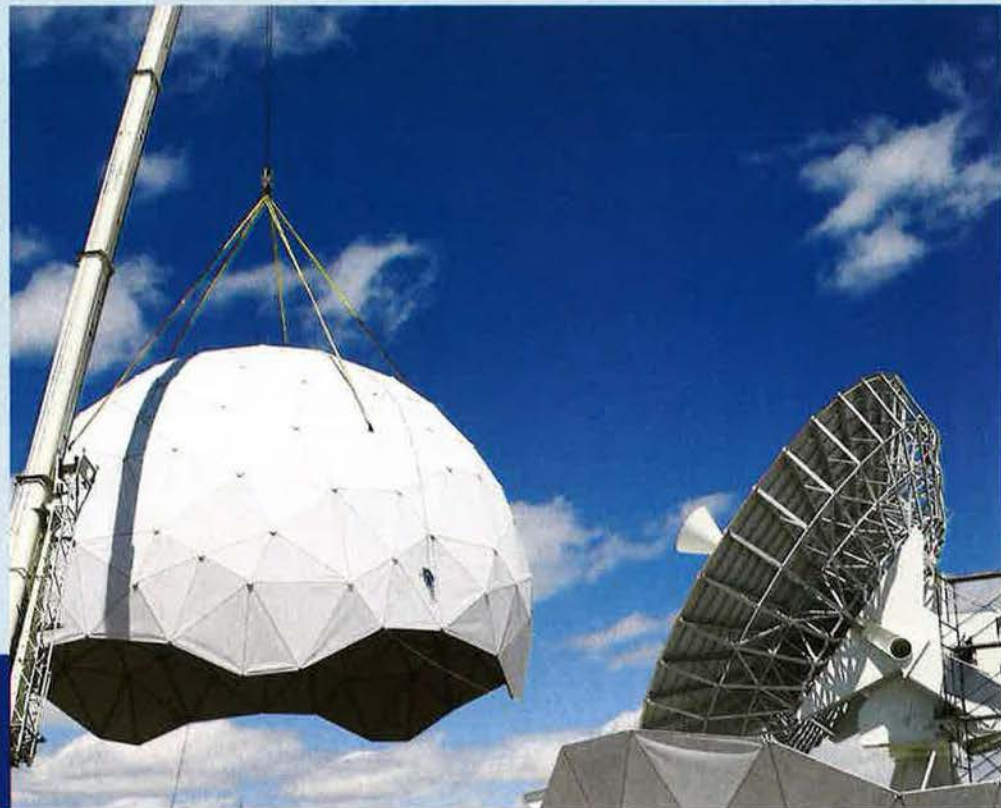
Haney made it known that he is "not happy" with AFSPC's ability to "see, characterize, and understand" the space domain; Hyten said he saw

a "fundamental hole" in the way the space enterprise was organized.

In response, Hyten last year proposed what he calls the Space Mission Force: a construct under which space operators work and train like operators in other domains.

When he announced the change in April 2015, Hyten said the force was

USAF photo by A1C Jike W. Nowakowski



A crane removes the protective geodesic dome from a radar antenna at Buckley AFB, Colo. USAF civil engineers are replacing the existing antenna with one that can communicate with newer satellites.

That integration did not immediately go smoothly.

In the JICSpOC's first experiment, Hyten said, the participants realized that the existing capabilities and systems were developed for individual needs and could not work well with each other.

"The first integration tool that we had at the JICSpOC was white boards, bought from Office Depot," Hyten told reporters in April. "Then we realized, you know, that's probably not the best way to do business, and so we actually went to a couple of labs and hired coders, developers" to go to Schriever and observe what was happening and develop code on the spot, in a working prototype model.

The first experiment was "one red thing against one blue thing," or "the most simple experiment you can have," Hyten explained. Once people learned the scenario, he immediately began getting calls asking why he would bring experts from

all over the country to run the simplest experiment possible.

"I said, 'I don't think you understand. This first one is going to be so hard that I wanted to make it as easy as possible,'" Hyten said, noting that as soon as the experiment started, everyone realized how difficult the task was.

"In just a matter of days, we went from, 'Gosh, this is going to be so easy,' to 'Holy cow, this is going to be hard,'" Hyten said.

Now, "we've added complexity in each kind of those scenarios, and we're learning unbelievably fast," but the initial realization was that it wasn't quite as simple as it seemed.

Since then, the JICSpOC has run two more scenarios. A fourth was scheduled for May. Much has already been learned, including where deficiencies exist, but Hyten said he could not "say enough good things about the Intelligence Community. ... That is the key piece to the puzzle."

The most critical element "of being ready for war that might extend into space is a tight partnership with the Intelligence Community," Hyten said.

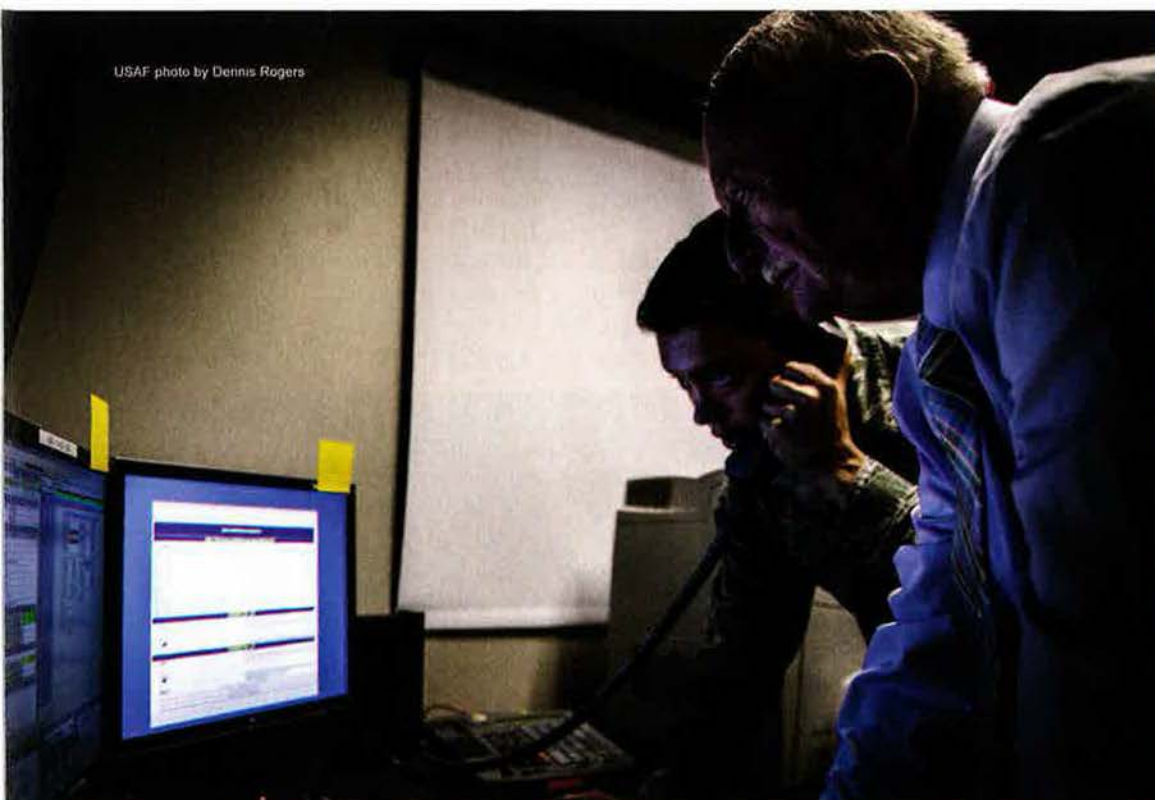
Like any other domain, he said, "the most important element will be in the indications and warnings—that comes from the Intelligence Community."

Hyten had said in September that the JICSpOC would deliver the requirements for the future of the space command and control mission and an integrated concept of operations with Intelligence Community partners.

But in February, after the rollout of the President's budget request, which includes additional funding for the JICSpOC in Fiscal 2017, Hyten said leaders were "happy with the way" the experimental center was going.

No final decisions had been made, he said, but the Air Force hopes it will continue "into the out-years," he said.





“unbelievably young and unbelievably inexperienced” and that they would begin doing business “in a fundamentally different way,” to prepare for a contested environment in space, the Colorado Springs *Gazette* reported.

On Feb. 1, 2016, the 50th Operations Group was the first to roll out the Space Mission Force concept, dividing its 600 space operators into two groups. One group operates on 12-hour shifts around the clock, as though it is forward deployed, while the other group engages in advanced training, leading toward a combat readiness certification.

Col. Dennis Bythewood, commander of the 50th Operations Group, told *Air Force Magazine* that part of the transformation was to “align ourselves with the same way that the rest of Air Force” does business, by creating and building 62 different unit type codes, or packages of capability.

On the air side, that might be a certain number of airplanes with associated maintainers and pilots. On the space side, he said, it would be something like a GPS constellation with the operators needed to operate it, plus the planners needed to plan and deliver the capability.

On Feb. 1, the unit went into initial operation for both pieces: the way it presents forces to combatant commanders and the way it trains and staffs the mission. A set of crews rotated onto 12-hour shifts, where they will stay for

four months, while another set of crews began working on tactics, techniques, and procedures to close gaps and improve the ability to work in a contested environment.

Before the Space Mission Force rollout, “we would offer a capability that was really geared for a benign environment,” Bythewood explained.

“I didn’t have one set of troops forward, providing the combat effect, and another set of troops back, practicing, learning, and building out capabilities to close gaps,” he said. “What I had is one set forward providing a combat effect and working on advanced techniques and procedures as they could.”

The new program allows half the force to focus on building capability, whereas before it was a “catch as catch can activity,” Bythewood said.

1st Lt. Brinetta Hence, a GPS mission commander with 2nd Space Operations Squadron, said that previously, airmen’s schedules would change all the time. Now, she said, they do set rotations in 12-hour shifts during their “deploy in place” period and can take leave, sign up for classes, and do advanced job training during the “dwell” period.

The construct has made life a lot easier, Hence said, and has been a big morale booster.

“Schedule equals morale,” she said, adding that the time for advanced training will help everyone know their job better.

1st Lt. Dustin Crews, a mission commander with 3rd Space Operations Squadron, whose crew was doing its advanced training rotation in April, said they are conducting a series of mission scenarios where they plan, execute, then debrief lessons learned.

From those lessons, the crew will develop new tactics, techniques, and procedures to allow the airmen to operate in a threat environment.

“It’s exciting because it’s a change of mindset,” Crews said.

## NEW WAY OF DOING BUSINESS

Historically, training consisted of going into an auditorium and watching a PowerPoint presentation, said Maj. Eric Bogue, director of operations for 3rd SOPS. The new training is scenario based, bringing a lot of benefits.

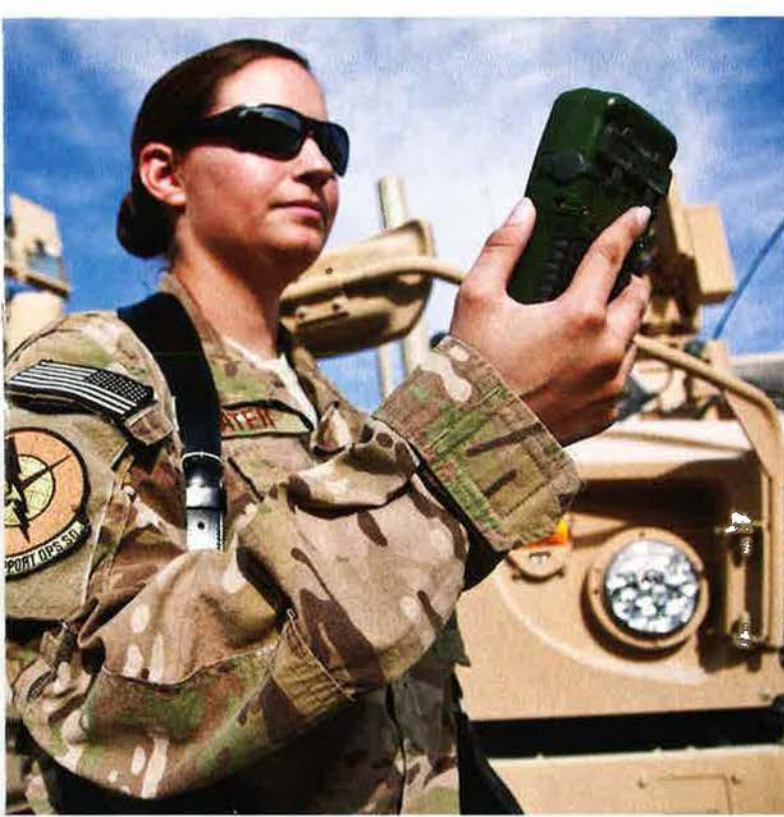
“We’ve changed the way we’ve done business,” said Lt. Col. Chris Todd, commander of 3rd SOPS.

It’s all a part of developing combatants and “trying to build that warfighter culture,” said Lt. Col. Tim Purcell, commander of the 50th Operations Support Squadron.

The 21st Space Wing, Peterson AFB, Colo., is the next unit to transition to the Space Mission Force concept and will be followed by the 460th Space Wing at nearby Buckley Air Force Base.

In addition to the changes in advanced training, there has been a transforma-





tion in initial space training, according to Bythewood.

Previously, Air Education and Training Command did all the training and delivered airmen capable of doing basic operations. With the revamp, AETC kept the undergraduate space training, which teaches how to be a space operator in a generic sense, but the Air Force moved individual weapons-specific training from Vandenberg AFB, Calif., to Schriever, Buckley, and other sites.

“One of the big impetuses for moving that training out was to be much more responsive,” Bythewood said.

1st Lt. Kaitlynn Plummer, a GPS trainer with the 50th OSS, said that since all the weapons systems are at Schriever, it “just makes sense” that new airmen would do their training on the systems there.

But 50th OSS didn’t simply bring the old courses to a new location, Plummer said. They completely overhauled the training “so the mindset is changed from the beginning.”

That is “absolutely necessary” to get the space enterprise where it needs to be, said SrA. Chris Hisey, an intelligence trainer for 50th OSS.

Altogether, the training has created a “dynamic learning environment,” where space operators are finding issues and devising fixes for them all the time, Bythewood said. “As we do that, I want to be able to take that change,

turn around, and train it in the next class that comes out—and not have to wait a year.”

Lt. Gen. David J. Buck, commander of 14th Air Force, said at the Space Symposium that he is happy with how the transformation of the space enterprise is going.

“I’m proud to say that there’s a war-fighter culture that’s taking root in the command,” Buck said. “This construct allows operators to train right now for the high-end fight of the future. It will inform how we respond to current and future threats in the space domain.”

Still, the Space Mission Force and training transformation are just parts of a larger Space Enterprise Vision, announced by Hyten during a closed session of the Space Symposium. The vision of integration across all mission areas was prompted by a study commissioned by Space Command to determine how to make the space enterprise more resilient to attack.

The vision is a “ground-up approach” to getting ahead of threats, with the idea that someone in the Joint Space Operations Center could see a threat coming and send data to the person operating the satellite, so they can see the threat and react to it, Maj. Patrick Gaynor, Hyten’s speechwriter, told *Air Force Magazine*.

Then, in May, Hyten released his commander’s strategic intent, offering

*Left to right: SrA. Guillermo Delacruz-Martinez (l) and contractor Jim Brewer send the disposal command to a GPS satellite, marking the end of its use. / Capt. Bryony Veater, a space liaison officer, reads a GPS receiver in November 2011 in Afghanistan. She was training US and coalition forces to use space assets in ground warfare. / A1C Amber Wagner inspects an inert JDAM on an F-22 Raptor.*

still more details on how he sees the enterprise—and threats—in the future.

“State and nonstate actors are actively fielding and modernizing forces, testing new capabilities, and expanding their areas of operations—in the physical and virtual domains,” he wrote in the document. “More than ever, Air Force Space Command is called upon to deliver agile, integrated, and resilient effects in, from, and through space and cyberspace.”

In the last year, Hyten pointed out, space command has “updated and clarified” what it means to be resilient, and the command must increase “resilience capacity” in all it does.

“Any capability that cannot survive when facing the threats of today and the future is worthless in conflict—no matter how impressive its peacetime capability,” he wrote.

“Our job is to prepare for conflict. We hope this preparation will deter potential adversaries and that conflicts will not extend into space or cyberspace, but our job is to be ready when and if that day comes.”







# PILOT SHORTAGE, BACK WITH A VENGEANCE



By Will Skowronski, Senior Editor

**T**he Air Force's long-predicted pilot shortage is here. And it's getting worse.

Last fall, at the end of Fiscal 2015, the Air Force was 511 fighter pilots short of its needs. In March, that number had risen to 614, and if trends continue, by this fall the deficit will exceed 700. That would be 20 percent of the 3,500 fighter pilot positions currently authorized, according to Air Staff numbers.

By design, the Air Force has more fighter pilots than fighter aircraft—to fill staff jobs, air operations centers, instructor slots, planning, and as reserve—but officials say they may not

have enough fighter pilots to fill the available cockpits by 2018.

By 2022, the overall shortage is expected to reach 1,000 if a fix isn't found.

The situation is nothing less than a "crisis." Col. Farley Abdeen, chief of the Total Force Aircrew Management Integration Division, said.

The shortage is being felt first and hardest in those nonflying positions because keeping aircraft flying is the top priority.

"If we say we are cutting into the fighter squadrons," Abdeen said, "things have gotten really bad because that means we can do barely anything







Clockwise from left: An F-15 pilot on the flightline at Tyndall AFB, Fla., during exercise Checkered Flag 16-1. / (L-r) F-15C pilots Capt. Aaron Schuett, Capt. Cody Clark, Maj. Jason Bianchi, and Capt. Robert Hendrick walk to their aircraft during a training mission in 2013. / An F-15 takes off from Nellis AFB, Nev., during a 2015 Red Flag exercise. By fall of this year, 20 percent of the fighter pilot positions authorized could be unfilled.

USAF photo by S/A Lausanne Morgan

else on the periphery, and those things are very important.”

Paradoxically, Air Force officials say it's the shrunken force that's at the root of the pilot shortage—a fact that prevents a quick fix. The service doesn't have enough aircraft or experienced pilots to season new pilots to fill the ranks. To address the situation, planners are working to ramp up pilot production at the maximum rate they can be absorbed, reduce the number of required rated positions where possible, and keep experienced pilots from voluntarily leaving the service. Those remedies, however, will take years to erase the shortage.

### BOTTOMING OUT

Exacerbating the situation is an airline hiring surge, already underway and predicted to continue through 2025. The airlines are luring away pilots in all specialties, because these aviators already have the millions of dollars' worth of training necessary to certify a commercial captain.

“It's a big problem,” Lt. Col. Jason Cockrum, who manages career fields for the Combat Air Forces, told *Air Force Magazine* in May. “Obviously it's taken us a decade-plus to get here, and it's going to take a decade to get out of it.”

Managing the pilot inventory is tricky. A disparity in the number of pilots USAF produces and the number it needs can create an imbalance—either a shortage or excess, both of which endanger readiness—that takes years to flatten out. It's been a struggle for the Air Force to fine-tune that balance during the force structure reductions since the end of the Cold War. (See “How Many Aircrew,” January 2014, p. 42.)

In the past, Cockrum said, the Air Force was able to cut its way out of shortages. Fewer squadrons meant fewer cockpits to fill. But that won't work this time.

“The problem now is, we've reached the floor,” he said. “There's no more cut that you can take and execute the mission that we're tasked to execute.”

In fact, Air Force officials say reductions in the number of operational and training squadrons are largely to blame for the current fighter pilot shortage. The service has cut the number of its combat-coded fighter squadrons by nearly 60

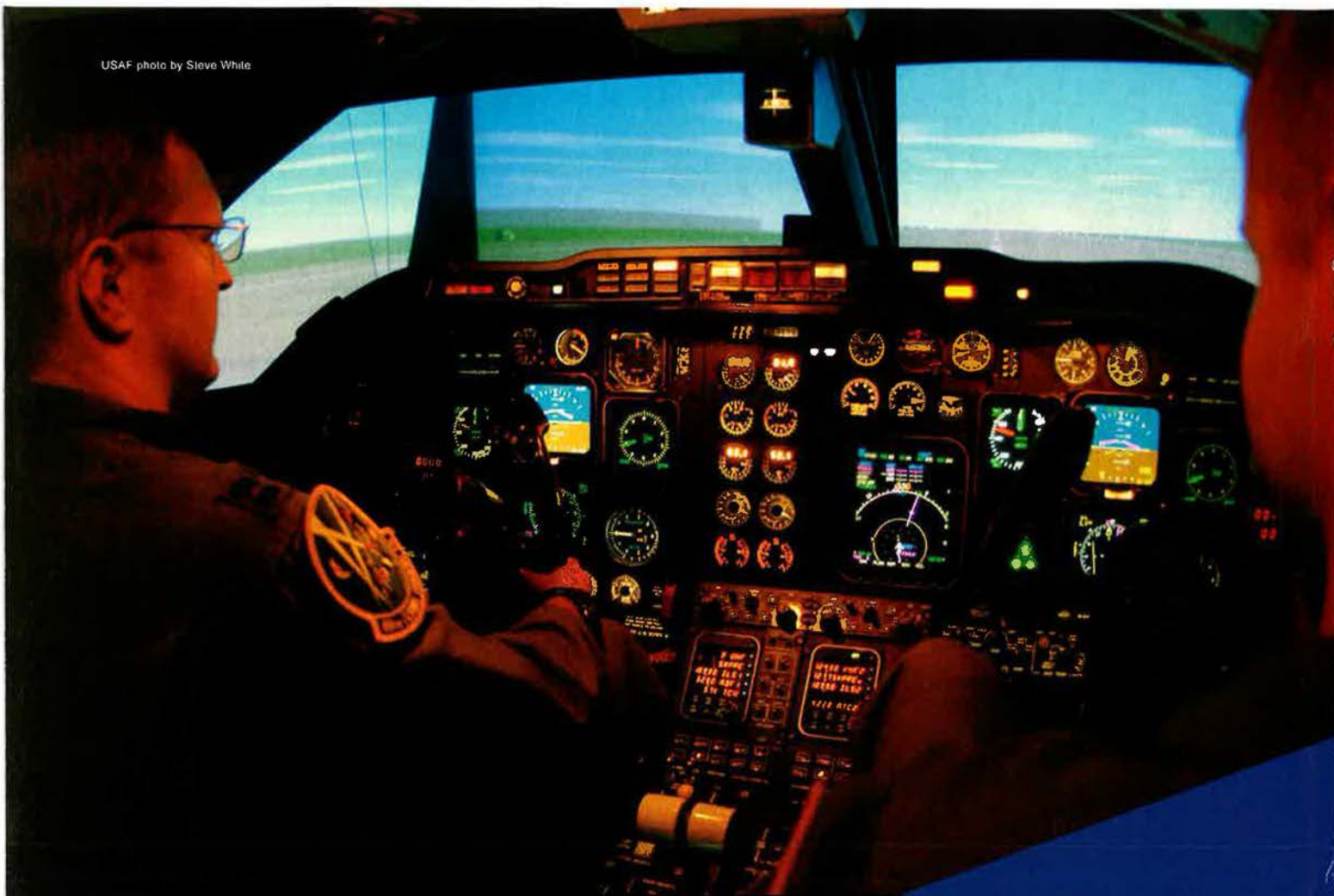
USAF photo by TSgt. Eric Burks

IT MAY TAKE A DECADE FOR THE AIR FORCE TO DIG OUT OF ITS LATEST PILOT SHORTAGE.

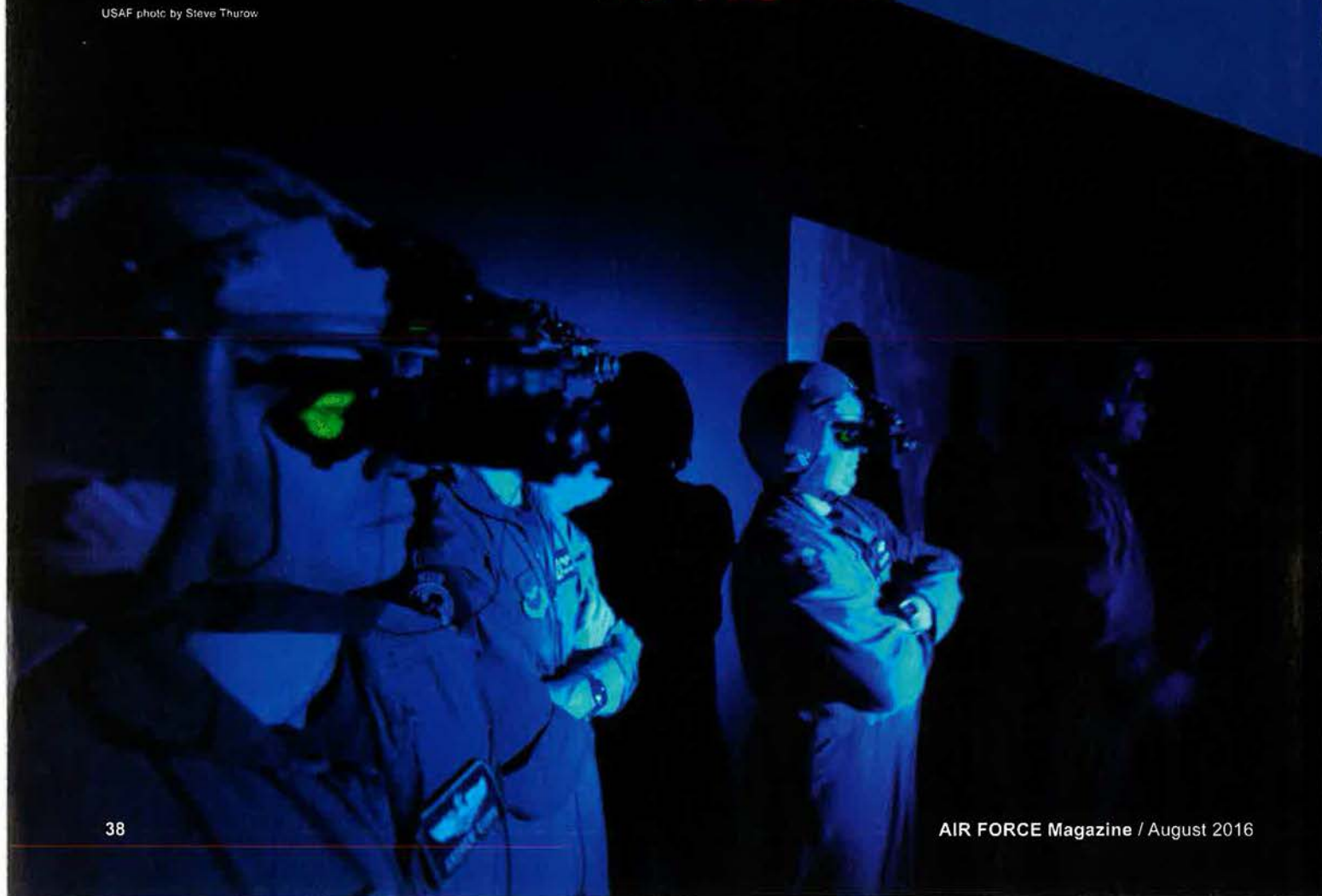




USAF photo by Steve White



USAF photo by Steve Thurov





percent—from 134 to 55—since the 1991 Gulf War.

“The remaining active component fighter squadrons do not produce enough experienced fighter pilots to meet all of the staff, test, and training requirements,” officials informed members of the Senate Armed Services Airland Forces Subcommittee in March. “Projected impacts include reductions in air-operations expertise during the development of war plans and a gradual erosion of fighter pilot experience in test and training.”

The shortage, in turn, creates extra work for the experienced pilots who remain. In September, Chief of Staff Gen. Mark A. Welsh III stood up a fighter enterprise redesign to address the shortage. As part of the effort, planners have surveyed pilots about the factors they consider when deciding to stay in or leave the service. They’ve found the high operational tempo between deployments—the result of exercises

for service beyond their initial 10-year commitment in exchange for a bonus closely followed the pace of airline hiring, according to an Air Force-sponsored RAND study released in 2015. When hiring was slow, the bonus “take rate” was between 60 and 70 percent, but during times of increased hiring, it only ranged between 30 and 40 percent.

### LURING MILITARY AVIATORS

For much of the last 15 years, the airline industry faced curtailed growth in the aftermath of the 9/11 attacks, and then due to further travel reductions related to the SARS disease outbreak and the US financial crisis, according to a February 2014 Government Account-

jet airliner pilots on their own, thanks to Federal Aviation Administration rules implemented after the 2009 Colgan Air crash in New York.

Airlines used to be able to hire pilots with 250 hours of flight time as first officers, or copilots, but can now only hire pilots with 1,500 hours, with few exceptions, according to the GAO. Former military pilots qualify with 750 hours. The new requirements disrupted the civilian-track career pilots who used to start out as first officers at regional airlines and rack up hours and experience in that position.

“When [the airlines] look for experienced aviators, it definitely puts military aviator at the top of those folks

Left: Capt. Jamie Gray, a T-1A student instructor pilot, runs through basics of flying a Jayhawk simulator. / Maj. Andrew Quinn, a T-38 course instructor with the 435th Fighter Training Squadron, learns how light affects night vision goggles. Right: An American Airlines 787-8 lifts off from Los Angeles Airport. Commercial airlines are hiring at a furious rate and recruit military pilots specifically.

Photo by Glenn Beliz



and other support missions—is a primary concern.

“Even when they’re home, they’re not home,” Gen. Herbert J. “Hawk” Carlisle, commander of Air Combat Command, said while discussing pilot retention at AFA’s Langley Chapter Airpower Symposium at JB Langley-Eustis, Va., in April.

As a result, the service is finding it can’t hold onto its experienced pilots at a time when it’s not creating enough. Planners fear the airlines—which offer a chance to live in one place, a steady schedule, and higher pay—will pull more and more pilots away.

The Air Force has long offered incentives such as increased flight pay and signing bonuses to compete with the airlines for its own experienced pilots. But the competition is getting more intense.

For the last several decades, the percentage of USAF pilots who signed up

ability Office report. During that period, about 65 percent of the Air Force’s pilots consistently took the incentive bonus, Cockrum said.

Now, however, the airlines anticipate years of growth at a time when many of their pilots are nearing the mandatory commercial pilot retirement age of 65. In 2015, the major airlines hired about 3,500 pilots, Welsh told House appropriators in March. The major airlines forecast a need for 3,500 to 4,000 pilots a year through 2025—and possibly beyond. By comparison, the Air Force only produces about 1,200 pilots a year.

“If you look at the airline demand and what they need,” Abdeen said, “it’s huge.”

To make matters worse, it has become much tougher for civilians to become

they want to look for,” Lt. Col. Robert Butkovich, chief of rated force policy, told *Air Force Magazine*.

The numbers are already bad. In Fiscal 2015, only 55 percent of all eligible pilots and 47 percent of fighter pilots took the retention bonus.

Carlisle told the Senate committee in March that the “draw from the airline hiring has reignited at a phenomenal level.” Butkovich said the total take rate is expected to drop to about 49 percent by the end of the year.

If not handled correctly, the overall shortage could get worse.

“We have to manage the talent across the whole force. And when you look at what we do—air, space, and cyberspace—air is a huge component of what we do,” Col. Robert Romer, chief of the





First Lt. Kyle Brown preflights a T-38 trainer at JBSA-Randolph, Texas.

USAF photo by Johnny Saldívar

Air Staff's military force policy division, said. "If we don't have the pilots and the experience, if that continues to erode, it's definitely going to impact readiness, and that's a huge concern."

To stave off an even more massive exodus and reduce the pilot shortage, Air Force planners are considering a myriad of approaches. Increasing the retention bonus, they believe, could have the most immediate impact. Notably, about 800 pilots will be eligible to sign new commitments in exchange for a bonus in Fiscal 2017.

In March, Welsh told lawmakers the service would be seeking legislation to increase the retention bonus, in place since 1999, from \$25,000 per year of renewed commitment to \$35,000 a year. But even that might not be enough.

Air Force studies indicate a \$48,500 bonus is required to maintain the pilot inventory when the airlines hire just 3,200 pilots a year. Between \$54,750 and \$61,500 would be required if the airlines hire between 3,500 and 3,800 pilots a year.

As it costs the service an average of \$10 million to train a fighter pilot, planners see the bonuses—even when they amount to hundreds of thousands of dollars for extended commitments—as worth it.

"We retain experience using the bonus," Butkovich said. "If we lose that experience, it's going to continually erode the Air Force's position." Offering the right amount, Butkovich said, could return the retention rate to the ideal 65 percent within two to three years.

The Air Force hopes quality of life improvements will convince its pilots to stay. Cockrum said planners believe increasing administrative support within the squadrons would reduce the pilots' workload and allow them to focus on flying, instead of relying on pilots to perform unrelated nonflying duties.

The Air Force is also working to increase the number of pilots it produces—a balancing act all its own. Production needs to be ramped up in line with absorption capacity, to avoid creating a surplus of inexperienced pilots.

### LARGER, EXPEDITED CLASSES

This fiscal year, 1,230 pilots—including Active Duty, Air National Guard, Reserve, and foreign military members—will complete undergraduate pilot training. The service is increasing class sizes to reach 1,400 pilots a year. Planners are looking for ways, including the use of civilian contractors, to increase its capacity to train even more. Contractors could be used as instructors, for example.

The service will also increase the number of fighter pilots passing through advanced training from the current 250 (Total Force) to 350 in Fiscal 2017. The ultimate goal is to produce 400 fighter pilots a year—an amount planners think the Total Force needs to overcome the shortage. Expedited graduate or platform-specific pilot training is being considered, as well.

In the meantime, planners are looking to get the most out of the available

iron. If every aircraft in a squadron flies one more sortie a month, Cockrum said, that squadron would be able to support three more pilots. But increased flying requires increased funding, which can't be counted on.

The lack of stability in the budget and the threat of a return to sequestration is "damaging to the Air Force," Abdeen said.

More aircraft require more maintainers. The service was short more than 4,000 maintainers in 2015, but planners hope efforts to reduce that shortage will increase the number of hours the service's aircraft can be flown. Officials are also considering seasoning new pilots in Reserve or Guard units that have available aircraft.

In April, Carlisle said "something different" needs to be done. The Air Force, he suggested, could increase the initial service commitment from 10 to 15 years, but allow its pilots to spend periods of that with the Reserve and Guard or even the airlines.

Planners admit, however, these fixes won't solve the underlying problem—a small force being called on to do more and more.

"All those cuts that we had to take made us too small, and we have to grow back up if they want us to do all the things we need to do," Abdeen said. "We don't have all the fighter squadrons that we used to have. If we had those right now, we could push up a lot more production and absorption to make that happen, but we're very limited because of the number of aircraft that we have." ❖



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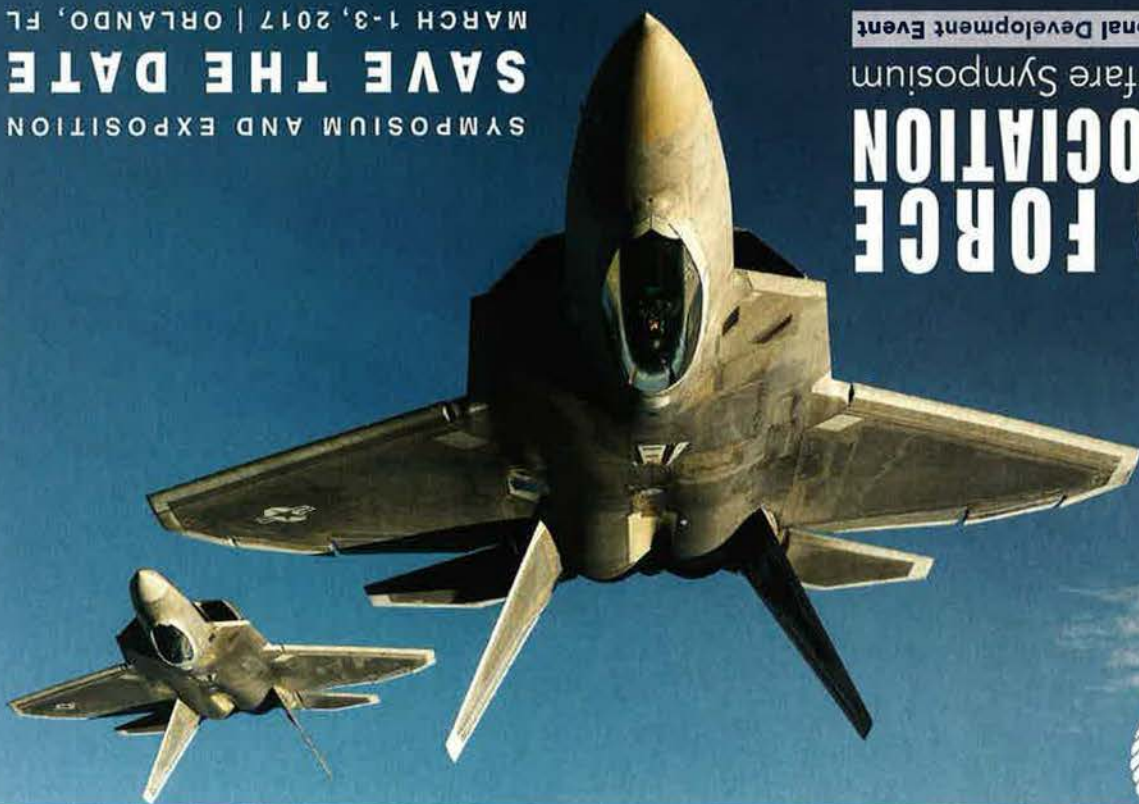
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## SAVE THE DATE

SYMPOSIUM AND EXPOSITION





# RECONNAISSANCE



**W**hile the Air Force seems to be laser-focused on combat operations in the Middle East, it still must keep watch on global military activities. Operating intelligence, surveillance, and reconnaissance aircraft is a mission that never ends, and these systems—and the tactics they employ—must be constantly modernized to react to a perpetually evolving world environment.

“There’re always things going on,” said Col. Mohan S. Krishna, commander of the 55th Operations Group, which includes the majority of Air Combat Command’s special reconnaissance

and special mission aircraft. “Most of the times when you see things in the paper, we probably already knew about it, because we were probably tasked against it.”

The 55th Operations Group, at Offutt AFB, Neb., includes the C-135 derivatives carrying out signals intelligence, radar intelligence gathering, treaty verification, and sniffing out evidence of ballistic missile tests and nuclear tests. In the past three years, attention to the Middle East has been joined by a rising emphasis on the Pacific, along with an increasing need to keep close watch on Europe, as Russia’s incur-

sions into Ukraine have changed the dynamics on the continent.

The Defense Department has begun to appreciate that “the rest of the world needs our services,” Krishna said in an interview with *Air Force Magazine*.

The workhorse of the Offutt inventory has been the RC-135V/W Rivet Joint, a 17-strong fleet tasked with collecting signals intelligence around the globe. Last September, the type surpassed 24 years of service in the Middle East. Between June 2014 and May 2015 alone, it flew 2,281 combined flying hours over 218 missions in that region.

**USAF’s airborne recon capabilities evolve in the face of constantly changing threats.**

USAF photo by SrA. Bobby Cummings





# NEVER SLEEPS

By Brian W. Everstine, Pentagon Editor

While they have been busy, the tasking has actually dropped. During earlier years of the wars in Iraq and Afghanistan, the 55th had six of its eight Rivet Joint crews in the desert. Now, Krishna said, that's down to three. The freed-up aircraft have been grabbed by other regional commands.

"It seems to be spreading us thinner, but it gives us more opportunities to not be blindsided and to understand the whole world," Krishna said.

Combatant commands, especially in the Pacific and Europe, have increased their use of the Rivet Joint and their understanding of how it fits in their

plans. Over the past three years, the aircraft deployed 19 times, flying 400 mission sorties, and more than 3,400 flight hours. RC-135Us, WC-135Ws, and RC-135Ss have, combined, flown more than 300 operations and more than 2,600 flight hours between 2013 and 2015, 55th Wing officials said in November.

The intense focus on the Middle East caused the enterprise to lose "our balance on PACOM and on EUCOM," Krishna said. That became evident "in the last couple years because of different threats popping up in those different areas."

North Korea's testing of nuclear weapons and long-range missiles has heavily tasked the WC-135W Constant Phoenix—which collects effluent and dust in the atmosphere to examine for evidence of nuclear tests—and the RC-135S Cobra Ball, which collects ballistic missile test data. Both have been on continuous deployment to the Pacific. Both types are very small fleets—there are just two WC-135Ws and three RC-135Ss—challenging aircrew and maintainers to keep the jets healthy and not over-deploy the crews.

It's also getting more than a little risky. With an increasing operating

*A U-2 comes in for a landing for an air show at JB Andrews, Md. USAF plans to retire the aging Dragon Lady fleet in 2019, replacing its capabilities with an upgraded Global Hawk.*



tempo in contested areas such as the Baltics and the South China Sea, RC-135 and other reconnaissance airplanes have seen more close intercepts—the types characterized by the Pentagon as “unsafe.” Chinese fighters have repeatedly intercepted Rivet Joints and Navy P-8s; one of the the most recent was June 7.

“Every now and then you’ll see an incident in the air that we may judge to be unsafe,” US Pacific Command Commander Adm. Harry B. Harris Jr. said June 4 at the Asian security summit, Shangri-la Dialogue, in Singapore. He said that “over the course of time” such dangerous intercepts are “rare.”

The US and China have a bilateral Military Maritime Consultative Session to discuss these cases, and “that’s an opportunity for us and China to work through these incidents that we

experienced on the high seas and in the air,” Harris said.

Russian fighters flew within 50 feet of an RC-135 in April, performing a barrel roll over the top of the jet, the Pentagon said.

While Air Force reconnaissance crews have seen an uptick in these types of provocative moves, they haven’t affected operations, Krishna said. US pilots are careful to remain in international airspace and “make sure we are always in the right,” he said.

### OPEN SKIES TREATY

“As we fly more—and our peers are noticing we fly more—our adversaries are going to fly more in reaction,” he said. “It’s all going to ratchet up. There will be more intercepts,” and a greater number will turn “unsafe and unprofessional.”

Russia and the US have remained professional regarding Open Skies Treaty flights, where reconnaissance aircraft from each country regularly fly over the other to monitor each nation’s nuclear weapons programs.

The US flies about 10 Open Skies missions per year over Russia, while two different Russian aircraft fly over the US at about the same pace. Adm. Cecil D. Haney, head of US Strategic Command, said the US has had “ample access” to review Russia’s nuclear arsenal, with another 18 inspections each year in addition to the flights. “That transparency is important,” he said.

Russia’s approach to the flights is changing, though. It has moved away from wet film cameras to digital imaging systems on its aircraft. In February, it requested permission to fly with digital cameras and said it would share all of



USAF photo by SSgt. Andy M. Kin



USAF photo by MSgt. Steven Clark



USAF photo by TSgt. Christopher Bollz

**Top:** USAF maintenance technicians perform a preflight inspection of a Global Hawk in Southwest Asia. Northrop Grumman recently flew the first demonstration flight of an RQ-4 Global Hawk loaded with the Universal Payload Adapter, a 17-point system that will permit the remotely operated aircraft to carry multiple sensors. **Above:** Part of the WC-135 aircraft’s equipment that allows it to collect effluent and dust from the atmosphere to be tested for evidence of nuclear tests. **Right:** A flight line expediter inspects a Global Hawk in Southwest Asia.



its photographs with the US after the flight, the Pentagon said.

The US is lagging behind Russia on the shift to digital, releasing a request for proposals in May 2015 on replacing the wet film sensor with a digital suite on the OC-135 fleet. The Air Force “still has plenty of film” to use in the meantime and expects to have the digital suite in place in 18 months’ to two years’ time, Krishna said.

Like the C-135 airframes they’re based on, most of the 55th Wing’s reconnaissance and special mission fleet is old. Unlike the KC-135 tankers, however, they get lots of special attention.

The fleet is managed under USAF’s Big Safari program office, tasked with sustaining and modifying special mission aircraft so they remain relevant and capable, even as the service looks to replace KC-135s with KC-46 tankers.

The C-135 derivatives in the fleet all received new engines more recently than the tanker fleet, extending their service lives, Krishna said. Big Safari takes each aircraft into depot every four to five years and completely strips it for inspection. Lately, these teardowns have revealed new corrosion problems that can be fixed in depot.

The wing expects its fleet to remain relevant until 2040. The oldest tail on the Offutt flight line was produced in 1962, meaning it could reach nearly 80 years of service.

“The air hasn’t changed. We don’t do drastic maneuvering or anything,” Krishna said. “The airplane remains relevant” and was “well-designed.”

While Offutt is the hub for much of the service’s reconnaissance and special mission surveillance fleet, Beale AFB, Calif., has the bulk of the service’s high-altitude surveillance aircraft. These, too, have been heavily tasked and face a modernization crunch in the near future. The base’s U-2s and RQ-4 Global Hawks are constantly answering an insatiable demand for ISR from combatant commanders, to the tune of a 1,000 percent increase in sorties in the Pacific, Beale officials told *Air Force Magazine* earlier this year. U-2s and Global Hawks are also deployed to the Middle East and are increasing their flights against ISIS, Defense Secretary Ashton B. Carter



**Lt. Col. Doug Sachs (l) and 1st Lt. Beth Brockshus monitor equipment aboard an RC-135 Rivet Joint. Middle East taskings have recently declined, but other combatant commands have increased their C-135 taskings.**

said during a visit to the United Arab Emirates in April.

Meanwhile, USAF plans to retire its entire U-2 fleet by 2019 and upgrade its Global Hawks to match the capability of the venerable Dragon Lady’s sensors. Northrop Grumman in February flew the first demonstration of a Universal Payload Adapter, a 17-point system on the belly of a Global Hawk that will permit the remotely operated aircraft to carry multiple sensors, such as the Senior Year Electro-Optical Reconnaissance System. Later this

year, the U-2’s Optical Bar Camera and an MS-177 multispectral sensor will fly on the Global Hawk.

Once the U-2 is retired, its builder and depot maintainer, Lockheed Martin, believes USAF will have a shortage of strategic air-breathing reconnaissance capacity and capability. The company is studying development of a follow on to the U-2, calling it the TR-X. Lockheed’s strategic reconnaissance business manager, J. Scott Winstead, said in February the company is preparing a formal pitch

## ELITE AWARD

The RC-135 crew Elite 72 came from four squadrons, one of them an RAF unit. On Christmas Day 2014, the crew was flying a Rivet Joint over Iraq and Syria, providing support for combat search and rescue aircraft trying to find a downed Jordanian pilot taken captive by ISIS.

On station, the crew developed a track to provide the best coverage of the area, considering the threat from Syrian aircraft and anti-aircraft systems.

After three hours on station, the crew found information that could have led to the pilot and relayed it to command and control, which, according to the Gen. Jerome F. O’Malley Award citation, “ordered a complete focus of ISR activities on the [rescue] event” and requested the aircraft to refuel and stay on station.

While refueling, the aircraft “reacted to threats from enemy ground entities” and alerted other coalition forces. The crew also worked with a joint terminal attack controller to begin the combat search and rescue phase. Throughout the flight, the joint US and UK crew issued more than 130 reports, identifying gaps in coalition tactics and gathering intelligence on how ISIS forces responded to coalition actions.

Although the pilot was not rescued, “the intelligence gathered during this mission proved to be invaluable as it underlined enemy reactions to coalition operations and enabled CSAR forces to hone their procedures in a dynamic and effective manner,” the award citation stated.





to the Air Force of the concept. It calls for a new, unmanned airframe featuring advanced low-observable/stealth technology, reuse of the U-2's GE F118 engine—deemed by Lockheed to have substantial remaining service life—and reuse of the U-2's existing sensors. The aircraft would operate at about 70,000 feet; Winstead characterized this as “the sweet spot” for strategic recce work. With aerial refueling, the TR-X would be able to fly missions of about 40 hours. The U-2, by contrast, is limited by the endurance of the pilot, typically about 11 to 12 hours at most.

When sequestration hit Air Combat Command in 2013, it struck fighter squadrons hard. More than a dozen were forced to stand down and large-scale exercises were canceled. The 55th Wing was largely spared, because its capability was “so ubiquitous, so required across the world,” Krishna said. However, the wing was unable to plan exercises due to the budget cuts. Since these exercises have resumed, the Air Force has shifted its reconnaissance focus. For years, the main event was Green Flag, using recce assets in the counterterrorism role.

“Over the last couple years, we’ve gone back into focusing on larger scenarios,” Krishna said.

RC-135s are training in anti-access, area-denial scenarios and practicing against more lethal integrated air defenses. The air war in Iraq and Afghanistan “was easy” because there was no airpower to fly against, Krishna observed. Now, crews are learning to fight major wars in large exercises such as Red Flag. There they practice to face an enemy with a similar capability, he said.

**GROWING CAPABILITY**

The changes mean more simulator work and new tactics. An example of this is the recently developed reachback capability on RC-135s. Advancements in technology and bandwidth have allowed an RC-135 to be more capable and less dependent on crew size.

“If something happens ... [and] we need a skill we didn’t anticipate, we are able to add that,” Krishna said.

With reachback, an airman on the ground can plug into a console and take over the aircraft’s sensors or intelligence-gathering systems in real time. The capability began in 2007, but the technology in the past couple years has matured to where there’s no latency and the additional capability can sharply increase the aircraft’s capability. As the aircraft become more

*The RC-135 Rivet Joint has served 25 years in the Middle East, collecting signals intelligence.*

powerful, there will be a need for more analysts than can fit on the airplane.

Beyond growing the capability of the RC-135 fleet, the aircraft’s global presence is increasing. The UK’s Royal Air Force now has three of its own RC-135s. The UK received its second aircraft, dubbed Airseeker, in July 2015 and deployed one to the fight against ISIS. The UK has exchange aircrew members at Offutt training on US aircraft and flying with American aircrews, including in real-world operations.

“It’s more than just the UK purchasing aircraft; it’s about a cooperative mission,” Krishna said.

One of these joint deployments (see box, p. 45) was recognized last year with the Air Force Association’s Gen. Jerome F. O’Malley Award for best Air Force airborne reconnaissance crew.

The growth of the fleet to 20, including the three RAF aircraft, and crews flying more missions like these together will “be a great story for the future, of how well our two countries have been able to keep the reconnaissance platforms and be able to use our capabilities throughout the world,” Krishna said. ✪



# Come the Revolution

Gen. Richard E. Hawley had been head of Air Combat Command for only a few months when he spoke to an AFA audience some 20 years ago in Los Angeles. His principal subject was a good one—the revolution being wrought by precision weapons. Barely one week earlier, three B-2 bombers using GPS guided bombs had staged a stunning demonstration of accuracy on the ranges at Nellis AFB, Nev. Though Hawley's speech was short—only about 1,800 words—it had considerable punch, tracing the evolution of precision weaponry over the decades and concluding with the words, "The revolution in air- and space power is upon us."

**[F**uture USAF aircraft] will deliver bombs from eight miles high, with accuracy that would make our early airpower pioneers drool with envy. ...

Now, we could trace a lot of history—from our early efforts at daylight precision bombing in World War II to those incredible videos of bombs going down elevator shafts that we all witnessed during the Gulf War.

We could recall that day in the spring of 1944 when more than 700 bombers and 800 fighter escorts—8,000 airmen—set out to attack Berlin with over 1,600 tons of bombs. Seven hundred airmen were killed or captured on that mission. Seventy-five bombers were lost and another 350 damaged. [Gen. Carl A.] "Tooe" Spaatz's report on the mission to Gen. [Henry H. "Hap"] Arnold said: "Generally poor results obtained. Hit none of the primary targets."

It was during the Vietnam conflict that technology began to catch up with the promise of airpower. The march to today's very impressive capabilities began with frustrations over our inability to take out targets like the Thanh Hoa Bridge—targets that had consumed hundreds of sorties with "generally poor results obtained."

Then came the first laser guided bombs, and the Thanh Hoa Bridge that had defied hundreds of attacks, yielded to a single flight of four.

But LGBs, and the equipment needed to employ them, are expensive. And by the Gulf War, nearly two decades after Vietnam, only a small fraction of the force could use them.

On 19 January of 1991, we attacked a key industrial complex near Baghdad with 72 F-16s, supported by 18 F-15s, F-4Gs, and EF-111s. We lost two F-16s that day. Capt. Mike Roberts and Maj. Jeff Tice were captured. Tooe Spaatz might have written the mission report—"minimal target effects."

## "Sticking to the Basics: Preparing for the Right Future"

Gen. Richard E. Hawley, USAF  
Commander, Air Combat Command  
Address to AFA Symposium  
Los Angeles  
Oct. 18, 1996

Find the full text on the  
Air Force Magazine's website  
[www.airforcemag.com](http://www.airforcemag.com)  
"Keeper File"

Four years later, during Operation Deliberate Force in Bosnia, ... more than 60 percent of the weapons we used were PGMs [precision guided munitions].

Now, there are still pundits who belie the significance of this revolution in air- and space power. They compile data in ways that make it seem we have gained little from our investments in these capabilities. They argue that the old ways are much less expensive and just as effective. ...

Too bad they can't roll in off base into a hail of triple-A fire. It can be very enlightening. Maybe they should talk to Mike Roberts and Jeff Tice. ...

A new generation of very accurate munitions is taking to the field—bombs that exploit the power of satellite navigation to find their way to within feet of any target.

The first of these are now in the hands of our B-2 [bomber] opera-

tors at Whiteman Air Force Base in Missouri, and on 8 October [1996] they attacked an array of 16 targets on the Nellis ranges. The B-2 crew, call sign Spirit 09, delivered eight 2,000-pound GPS-aided munitions, or GAMs, from 40,000 feet high and six miles from the targets—targets that were spread over an area of more than two square kilometers.

Tooe Spaatz would have been proud to submit this mission report: "Eight targets destroyed."

Spirit 14 followed with seven more bombs from 43,000 feet. Four targets destroyed, two severely damaged, and one moderately damaged.

One target had eluded attack because it could not be identified on radar with sufficient certainty to meet the stringent rules of engagement that were applied to this simulated combat mission. ...

That's where Spirit 33 came in, the cleanup hitter. That third B-2 achieved the needed radar clarity, delivered a single bomb from 40,000 feet, and shacked the target.

Overall results—13 targets destroyed, two severely damaged, and one moderately damaged.

The widest miss was 30 feet. No collateral damage.

This revolution in air- and space power is upon us now. Our investments in air superiority and precision attack will yield enormous benefits in the 21st century—if we can just see them through to the finish. ✪





# The Promise and Peril of 3-D PRINTING

By Gideon Grudo, Digital Platforms Editor

**T**he military has been salivating over the potential for additive, or 3-D, printing for a number of years. No need for warehouses full of parts or an elaborate logistics system that flies crucial components to forward locations. Theoretically, just take a 3-D printer along on a deployment and any spare parts needed can be whipped up in a matter of hours.

Industrial futurists have speculated that entire systems—such as munitions or unmanned aircraft—could be produced using additive techniques, potentially abolishing the need even for factories.

Well, not quite yet. While 3-D is already being used successfully in a wide variety of low-tech applications, there are still a lot of fundamentals to be worked out in order to use it in flight-critical or mission-critical applications.

Repeatability, consistency, and quality are the keys to reliable components that lives depend on, and those are the focus areas in additive printing now. Once those issues are solved, there's genuine potential to realize the 3-D vision.

Additive printing uses a machine to convert a digital, computer model of an item into the real thing. Using a variety of techniques involving heat, chemicals, and lasers, and on materials ranging from plastics to aluminum to stainless steel, the machine lays down cross-sections of the item layer by layer. Depending

on the quality required, the process can take as little as a few minutes or several days. Each layer bonds with the previous one; in metals, the process can be performed so the resulting piece is a continuous medium without line breaks or cleavage points.

When finished, the result is a physical representation of what had been an intangible digital model.

The technology goes one better than computer-aided casting or machining, which starts with a block of material and whittles away everything not wanted. Three-D printing inherently uses only as much material as needed and no more, reducing the cost and cleanup of machining.

## PRINT IN PLASTIC

There are "realizable, near-term impacts for using additive manufacturing for sustainment applications," said Jon Miller, a materials research engineer with Air Force Research Laboratory's Materials and Manufacturing Directorate.

Sustainment applications are items like fixtures, jigs, masks, tooling, and design aids. The latter is a printed prototype that engineers can work with to rapidly and inexpensively refine a design.

"I can print that geometry with a CAD [computer-aided design] file that didn't exist 50 years ago. I want to make sure it fits. I can print it in plastic. I can issue that procurement. This prevents rework," Miller told *Air Force Magazine*. For most

parts, USAF spends "a lot of money," he said, to have fabricators work up prototypes, and they arrive months later. If a part is defective, that means more delay and more money.

Right now, Miller said, if he needs to cover the lights on an aircraft, he can just 3-D print some covers. Drill holes can be mapped out on a 3-D-printed sheet of plastic, their location precisely aligned, and a permanent template rapidly produced. For all of these small applications, 3-D printing presents what Miller calls a "very simple, easy fix."

These examples are for noncritical and nonstructural items, though. An airplane won't crash if one of these items fails. It's the critical safety items, or CSIs, that challenge 3-D's utility.

"We have to know what the worst one" in a run of 10,000 pieces will do, Miller said. The Air Force isn't "confident enough yet" about 3-D printing's ability to handle CSIs.

For some items, there's no doubt the technology will mature to the point of mission-critical reliability. For others, it may long remain an "if."

Only research can answer those questions, and Miller and his team are focusing on three areas: variability, quality assurance, and material integrity.

A recent example with a B-52 part illustrates the state of the art. Boeing has not made B-52s since 1962, and it stopped making "life of the airplane" parts not



# Can high-tech additive manufacturing solve USAF's parts obsolescence problems?



*Three-D prints of blower motors and impellers for B-52 avionics.*

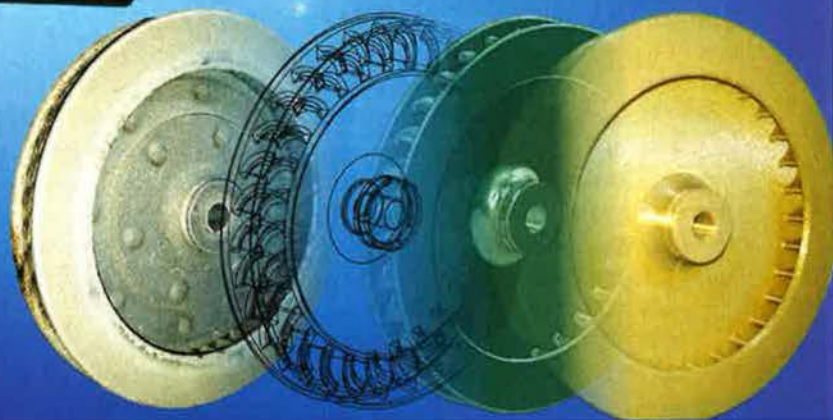


Image courtesy of Elevate Systems





USAF photo by Kelly White

**Left: Additive manufacturing with a laser created the titanium part at left, while a 3-D printer made the colorful "Brain Gear" in one piece. Right: A typical 3-D printing setup, including a 3-D printer, a computer, and some examples of 3-D printed objects.**

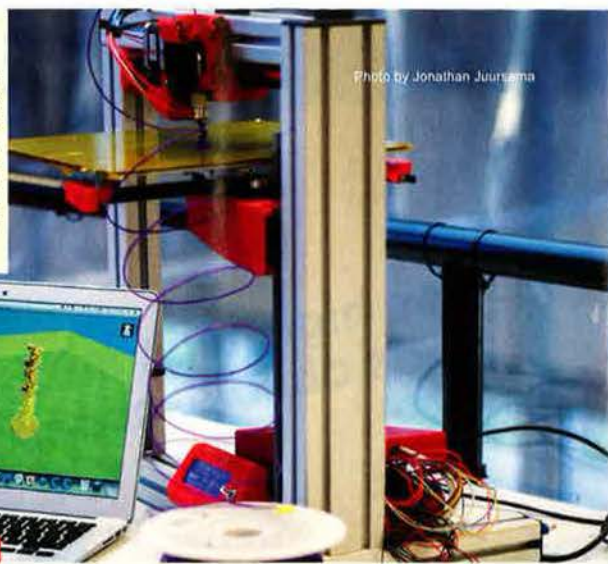


Photo by Jonathan Juonema

long after, because the B-52s were never expected to serve upward of 50 years.

Under contract with Tinker AFB, Okla.—the overhaul depot for B-52s—Elevate Systems reverse-engineered a part for the B-52.

Company President Scott Gray wanted to print it, he said in an interview, but didn't have a 3-D printer. His business then was creating blueprints used by other fabricators to make replacement parts.

Gray knew the College of Engineering at the University of Texas-San Antonio had recently purchased a 3-D printer. Once Elevate engineers made Gray a stereolithographic, or digital, model of the needed part—a blower motor assembly that cools the B-52's radar avionics during engine startup and taxi—he "just emailed it" to the university. Students at the school printed a thermoplastic (acrylonitrile butadiene styrene or ABS) model for him. It took four hours and cost about \$150. They didn't charge him.

After Gray's model got tested and reprinted by different, and more sophisticated, printers, Elevate was able to get its blower motor onto 15 B-52s between January and October 2015. He expects there'll be more.

Elevate Systems now has three 3-D printers.

There's still some variability in the technology, and eliminating it is the key to printing CSI parts. The reality is that different printers—and sometimes the same printer—can create different products from the same CAD model and materials. That's unacceptable, Miller said.

AFRL needs a method to "prove that we can inspect the part sufficiently to prove that none of those defects exist," he said. Material integrity in this respect means figuring out how much variation in a part is allowable.

Once AFRL eliminates these and tangential unknowns, "the value of these opportunities depends strongly on the specific

part geometry, part requirements, availability of engineering data, and economic factors for the conventional manufacturing approach," Miller said.

In the example of the B-52 component, after Gray had his \$150 ABS plastic model in hand, he wanted a prototype print of the impeller (a component of the blower) in metal and sent the STL file to a company that printed a second prototype out of stainless steel. (This process uses stainless steel powder mixed with an aluminum alloy, called direct metal laser sintering or DMLS). The cost was about \$600.

## LOWER COST

He then wanted to "bump it up a notch" and had a third prototype print made out of aluminum (in a process called selective laser sintering or SLS). That one cost \$3,500.

This was getting expensive.

Tinker officials originally wanted the impeller made from aluminum, but Alex Villareal, Elevate Systems chief engineer, knew it could be made cheaper and lighter.

He thought of looking at thermoplastic, which could meet USAF's requirements and lower the cost. A material called Ultem 9085 fit the bill. Each impeller would now cost \$350 and take between six and seven hours to print.

"We got that into our office and thought, ... 'This is crazy,'" Miller said. Ultem 9085 isn't like aluminum exactly, but it's chemical- and heat-resistant.

Everything had to meet milspec—in this case including torque, vibration, volumetric airflow, and revolutions per minute. "Everything fell in line," Miller said.

It took a fraction of the usual time and cost. Traditional methods to reverse-engineer the part, do the production engineer-

ing, build jigs and fixtures, and establish a manufacturing capability would have cost about \$10,000 and taken months to produce, by his estimate.

The real beauty of Gray's motor, however, became apparent when it failed in the early phases of development. Gray's people were scratching their heads when the finished motor wasn't doing its job. They had reverse-engineered the part exactly as it had been made 60 years before. What could be wrong?

"We didn't know why it was failing," he said, but his company had been given only the part—and no data about it.

It finally became apparent that the part they'd been given to model was, itself, defective. "The spacing of the vanes on the impeller was so close together, it was suffering restrictions of airflow in the housing," Miller said. That caused a torque problem, in turn "causing an over-amping issue, causing the motor to burn out," he explained.

Working this out through the traditional procurement methods would have cost "a lot of money," Miller said. With 3-D printing, Gray's team fixed the trouble in 20 minutes.

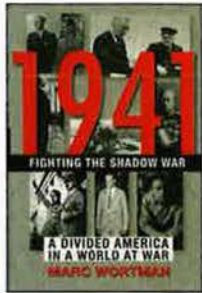
"I had it in my hand the next day," he said. It passed all the tests.

This successful failure, so to speak, exemplified the intrinsic value of having what Miller calls an "alternative manufacturing process."

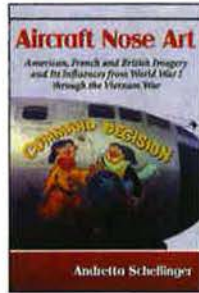
Additive manufacturing, he said, is another tool in the industrial toolbox and "may offer an alternative manufacturing process for improvement in lead time, cost, or component performance, depending on the specific application."

Asked about its role in how USAF designs parts for future systems, he said there's "strong potential." ★

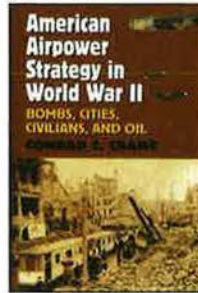




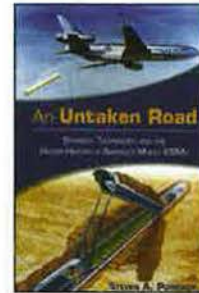
**1941: Fighting the Shadow War, A Divided America in a World at War.** Marc Wortman. Perseus Book Group, Jackson, TN (800-343-4499). 409 pages. \$27.00.



**Aircraft Nose Art: American, French and British Imagery and Its Influences From World War I Through the Vietnam War.** Andretta Schellinger. McFarland & Co., Jefferson, NC (800-253-2187). 177 pages. \$39.95.



**American Airpower Strategy in World War II: Bombs, Cities, Civilians, and Oil.** Conrad C. Crane. University Press of Kansas, Lawrence, KS (785-864-4155). 272 pages. \$34.95.



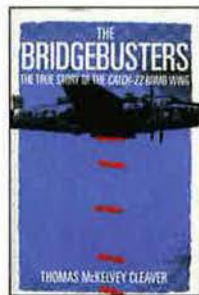
**An Untaken Road: Strategy, Technology, and the Hidden History of America's Mobile ICBMs.** Steven A. Pomeroy. Naval Institute Press, Annapolis, MD (800-233-8764). 287 pages. \$44.95.



**The Big Book of X-Bombers and X-Fighters: USAF Jet-Powered Experimental Aircraft and Their Propulsive Systems.** Steve Pace. Zenith Press, Minneapolis, MD (614-344-8100). 360 pages. \$40.00.



**Blue Skies, Orange Wings: The Global Reach of Dutch Aviation in War and Peace, 1914-1945.** Ryan K. Noppen. Wm. B. Eerdmans Publishing Co., Grand Rapids, MI (800-253-7521). 338 pages. \$45.00.



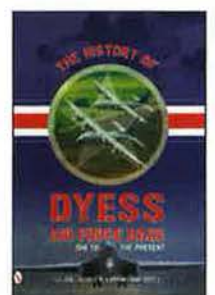
**The Bridgebusters: The True Story of the Catch-22 Bomb Wing.** Thomas McKelvey Cleaver. Perseus Book Group, Jackson, TN (800-343-4499). 264 pages. \$29.99.



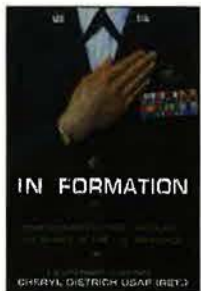
**Eyeing the Red Storm: Eisenhower and the First Attempt to Build a Spy Satellite.** Robert M. Dienesch. University of Nebraska Press, Lincoln, NE (800-848-6224). 279 pages. \$34.95.



**Harriet Quimby: Flying Fair Lady.** Leslie Kerr. Schiffer Publishing, Atglen, PA (610-593-1777). 112 pages. \$16.99.



**The History of Dyess Air Force Base: 1941 to the Present.** Lt. Col. George A. Larson, USAF (Ret.). Schiffer Publishing, Atglen, PA (610-593-1777). 272 pages. \$59.99.



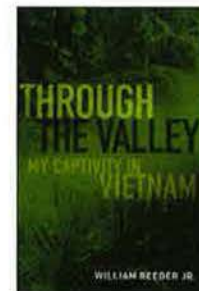
**In Formation: One Woman's Rise Through the Ranks of the US Air Force.** Lt. Col. Cheryl Dietrich, USAF (Ret.). Skyhorse Publishing, New York (212-643-6816). 293 pages. \$24.99.



**Painting Aviation's Legends: The Art of Mike Machat.** Mike Machat. Specialty Press, Forest Lake, MN (800-895-4585). 192 pages. \$39.95.



**Strategy: Context and Adaptation From Archidamus to Airpower.** Richard J. Bailey Jr., James W. Forsyth Jr., and Mark O. Yeisley. Naval Institute Press, Annapolis, MD (800-233-8764). 279 pages. \$29.95.



**Through the Valley: My Captivity in Vietnam.** William Reeder Jr. Naval Institute Press, Annapolis, MD (800-233-8764). 238 pages. \$29.95.



**Veterans Voices: Remarkable Stories of Heroism, Sacrifice, and Honor.** Robert H. Miller and Andrew Wakeford. National Geographic Books, Washington, DC (888-647-6733). 254 pages. \$35.00.





**The MQ-9 can perform strike, coordination and reconnaissance against high-value targets.**



# REAPER

## and the RPA Resurgence

By Will Skowronski

**U**nmanned aircraft have been taking to the skies for more than 100 years. For almost as long, militaries have tried to use them to gain advantage over their enemies. But until the recent advent of the ability to control aircraft from a remote location, they've played a minor role on the battlefield.

Today, the Air Force's remotely piloted aircraft can loiter for hours, provide constant surveillance, and strike targets with precision across the globe. They're highly sought after tools, and for years the service has been unable to meet the demand despite exhausting the airmen who handle them.

But the Air Force's plan to stabilize the RPA community is underway, and the service is set to stem the widening shortage of RPA pilots this year.

"The RPA get-well plan has been going as well as we hoped it would," Gen. Mark A. Welsh III, then the Air Force Chief of Staff, told reporters in June.

For the first time, Welsh said, the service produced more than 300 RPA pilots in a year, with 334 being trained this year. In prior years, the service produced 188 a year and lost about 240. In Fiscal 2017, 384 airmen are expected to become RPA pilots. The increases, he said, mean the existing shortage of 250 pilots will be halved by the end of this year and gone by the end of next.

"We've been chasing that requirements rabbit since 2008," he later told *Air Force Magazine*. "And we have now stabilized it."

A skyrocketing demand forced the RPA enterprise to expand at an "unprecedented rate" over the past 10 years, Air

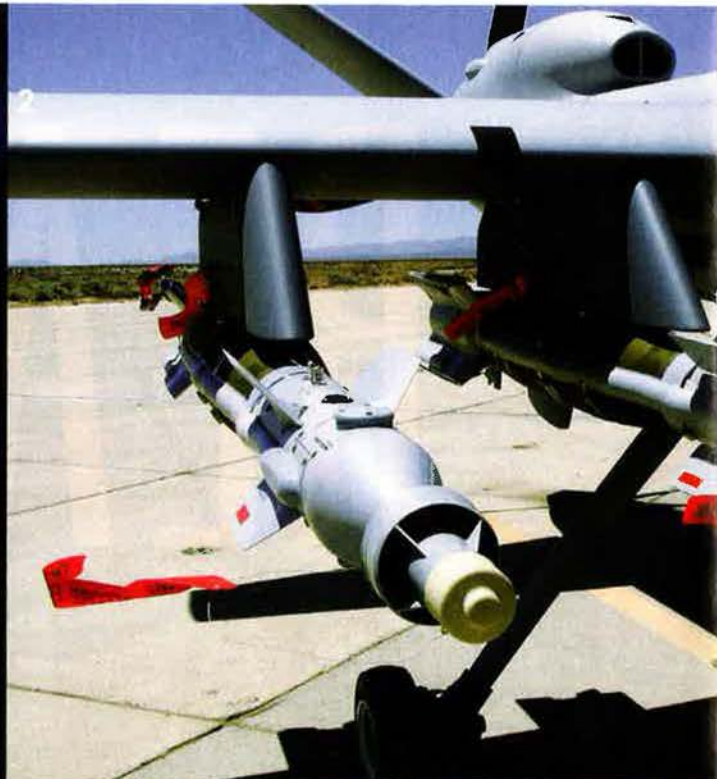
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*An MQ-9 Reaper performs aerial maneuvers over Creech AFB, Nev., in June 2015. The Reaper is heavier and more powerful than its predecessor, the MQ-1 Predator.*





USAF photo by A1C Christian Clauson



Combat Command chief Gen. Herbert J. "Hawk" Carlisle told lawmakers in March. The airmen who fly, operate, and maintain the RPAs were strained.

In 2007, the service's RPAs had seven combat air patrols, but were flying 65 by 2015. Defense Secretary Ashton B. Carter approved a reduction to 60 to help with the service's manning challenges. Between Aug. 8, 2014, and June 24, 2016, alone, coalition MQ-1 Predators and MQ-9 Reapers flew more than 9,100 sorties for Operation Inherent Resolve, employing nearly 3,400 precision weapons in over 1,800 strikes, an OIR spokesman told *Air Force Magazine*.

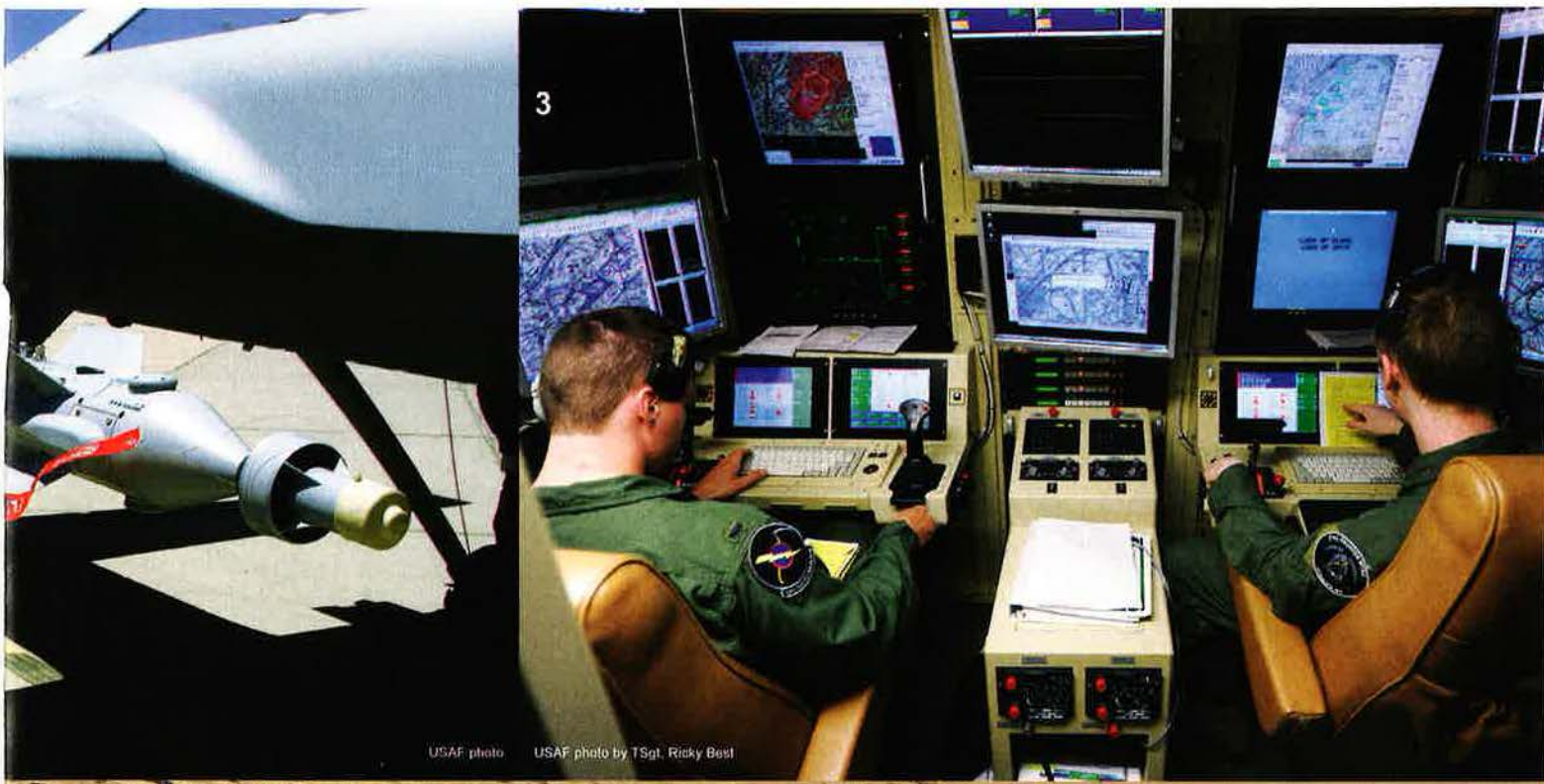
The RPA community's 1,300 pilots now make up the largest group of pilots in the Air Force, Gen. David L. Goldfein, now Air Force Chief of Staff, told lawmakers during his Senate nomination hearing in June. The next largest group is the service's 800 C-17 pilots.

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*/1/ A1C Ashley Kellar, a 432nd Aircraft Communications Maintenance Squadron radio frequencies transmission technician, checks communications equipment. /2/ The Reaper's armament includes a combination of AGM-114 Hellfire missiles, GBU-12 Paveway IIs, and GBU-38 Joint Direct Attack Munitions. The enhanced GBU-49, pictured here, is a 500-pound bomb with both laser- and GPS-aided guidance. /3/ A pilot and sensor operator make up the Reaper's crew. Here, a student pilot undergoes training at Hancock Field, N.Y. /4/ As its name suggests, the Reaper is a capable strike aircraft. Here, the MQ-9's multispectral targeting system and armament stand out against the desert backdrop.*







USAF photo    USAF photo by TSgt. Ricky Best



USAF photo by S/A. Cary D. Payne

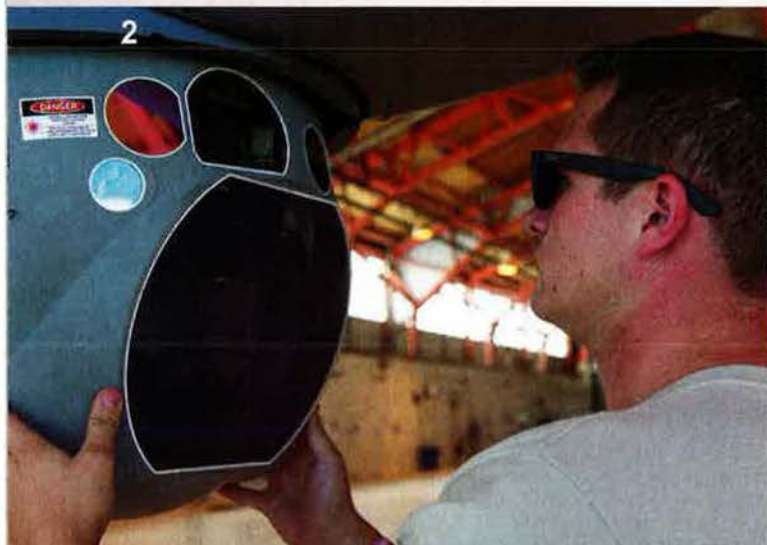


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USAF photo by MSgt. Dennis J. Henry Jr.

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USAF photo by A1C Emily A. Kenney

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USAF photo by A1C Leah Ferrante

“So the RPA is part of the fabric of the Air Force,” Goldfein said.

To make the increasing growth sustainable, the service is overhauling the RPA force. ACC is calling for an additional \$3 billion in funding over the next five years to double the number of pilots and sensor operators and to acquire 75 more MQ-9 Reapers. If approved, 3,000 airmen and 17 squadrons would be added to the service’s RPA community. Ultimately, the service plans to take 140 actions to improve RPA operations. (See “Don’t Fear the Reaper,” February 2016, p. 18.)

In other words, the number of pilots isn’t the only concern moving forward. While more pilots will alleviate some of the strain on the operators, only structural changes to the RPA enterprise will sustain the force.

The service needs to create a battle rhythm that is acceptable to the operators and their families, create an environment that makes the airmen want to stay with the RPA force, and give them the resources to get the job done, Welsh said in June.

“The first step is to make sure that everybody in the community realizes how terribly important they are to the joint fight and to the United States Air Force,” he said.

“There’re no easy fixes, there’re no magic answers, it’s just hard work,” he added. “Now the institution kind of needs to go around [the RPA community] and give it the stability and the direction it needs over time and the support it needs over time, and that’s what we’re trying to do now.”

*/1/ An MQ-9 Reaper performs a low pass during a first-ever air show demonstration at Cannon AFB, N.M., in May 2016. /2/ SrA. Daniel Hawley, a crew chief with the 49th Aircraft Maintenance Squadron, checks the multispectral targeting system. /3/ Two crew chiefs assigned to the 49th AMXS inspect the aircraft. /4/ The MQ-9 touts a wingspan of 66 feet. The aircraft is 36 feet long and 12.5 feet high. /5/ A Reaper sits waiting for its wings in a hangar at Holloman AFB, N.M.*



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USAF photo by SrA Cory D. Payne

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USAF photo by A1C Emily A. Kerney

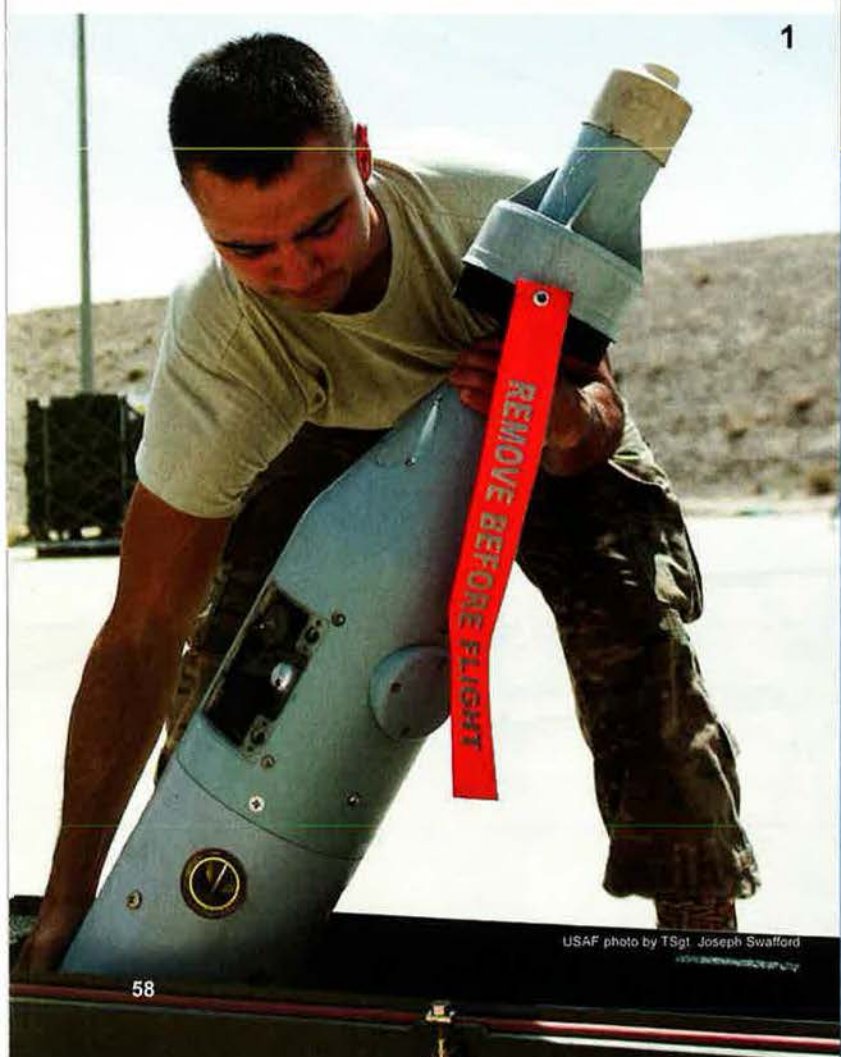
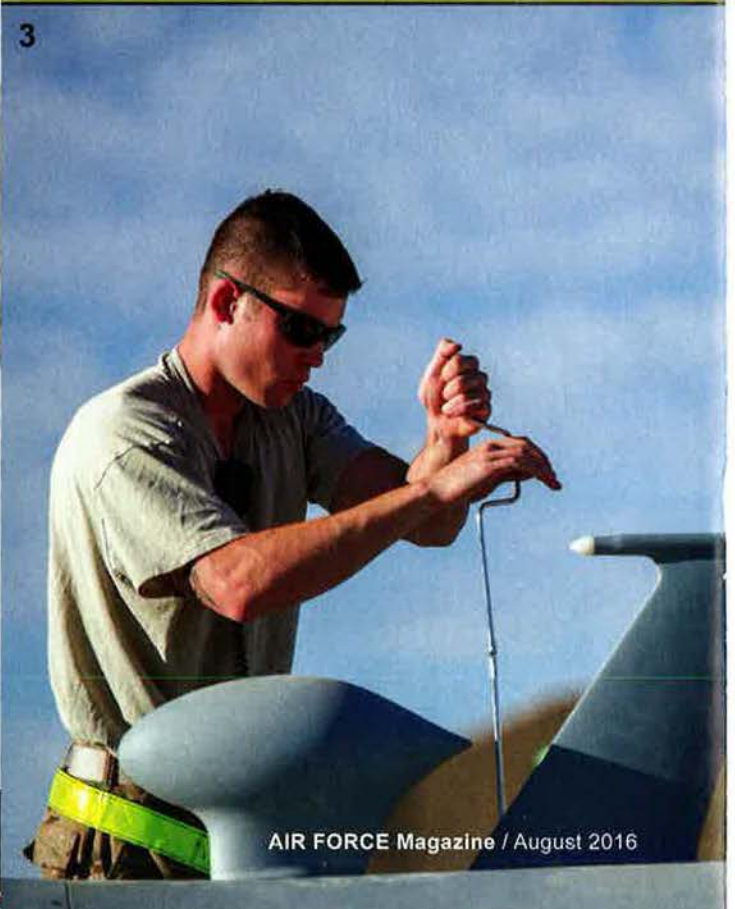


Some of the changes are underway. In April, the service announced MQ-1 Predator units would be redesignated as attack squadrons and RPA aircrews would be able to log combat time while flying aircraft in a hostile airspace regardless of where they were controlling them from. The redesignation anticipates the service's phase out of the Predator in favor of the larger and more powerful MQ-9 Reaper.

"Aerial warfare continues to evolve. Our great RPA airmen are leading that change. They are in the fight every day," Welsh said in a news release announcing the changes. "These policy changes recognize the burdens they bear in providing combat effects for joint warfighters around the world."

The service is calling on enlisted personnel to change their role within the RPA force. Enlisted airmen will begin training to fly the unarmed RQ-4 Global Hawk this September, Carlisle said in June. Career enlisted aviators will make up the first two enlisted pilot initial classes during a beta phase

*/1/ A1C Matthew Lopez, a 62nd Expeditionary Reconnaissance Squadron munitions systems technician, unpacks a GPS guided GBU-49 at Kandahar Airfield, Afghanistan, in August 2015. /2/ Airmen prepare an MQ-9 Reaper for a mission over Afghanistan in August 2013. /3/ An airman secures a radio antenna prior to a sortie from Kandahar in December 2015. /4/ An airman assigned to the 451st Expeditionary Aircraft Maintenance Squadron directs a Reaper prior to launch.*



USAF photo by TSgt Joseph Swafford





USAF photo by TSgt. Robert Cloys.

USAF photo by SrA. Jack Sanders  
USAF photo by SSgt. Whitney Amstutz.

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before the training is opened to more enlisted airmen. The service expects to eventually have 100 enlisted RQ-4 pilots.

"There's absolutely no doubt in my mind, and I know this for a fact because I've been around the Air Force for 38 years now, ... our enlisted force can do absolutely anything in our Air Force," Carlisle said. "This is one extension of that. This is taking advantage of our talent. This is giving us more flexibility in the future as we move forward."

There is no plan to have enlisted airmen fly the armed MQ-1 Predator or MQ-9 Reaper, but Carlisle hinted the enlisted mis-

sion could broaden in the future. "And we'll see where that goes," he said, "it will probably lead to more."

Welsh said now that the service seems to have the pilot equation figured out, it will need to evaluate whether there are viable career fields for maintainers within the RPA community. He said he didn't know the answer, but the community itself will help figure it out, noting "they didn't get a lot of help" from the beginning "because nobody else knew how to do it."

Down the line, the service also hopes to open operations groups at bases other than Creech AFB, Nev., including

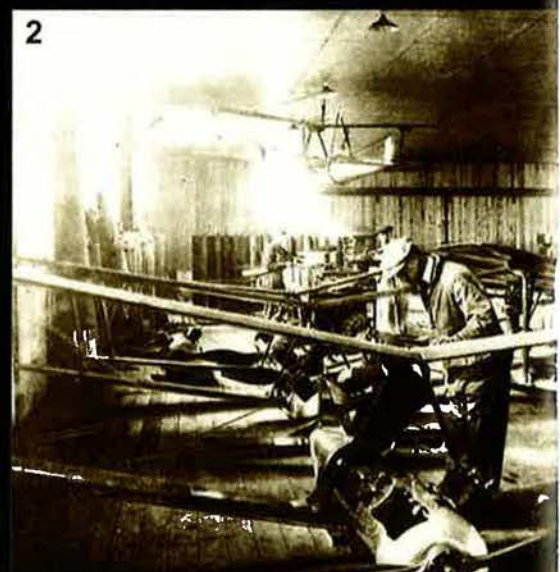
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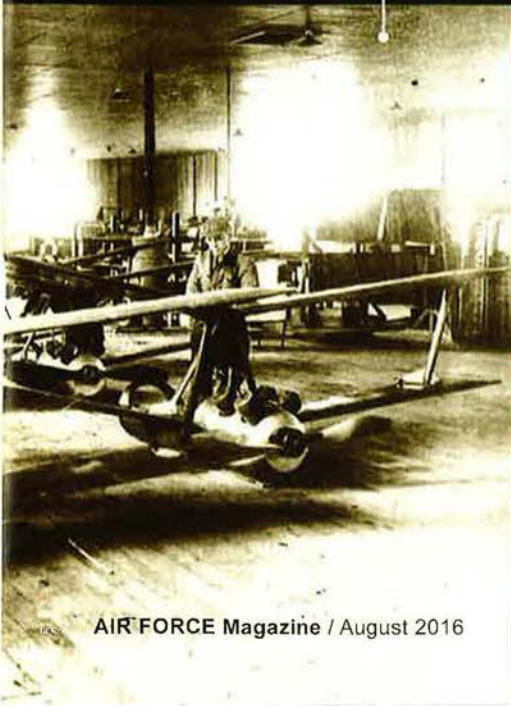
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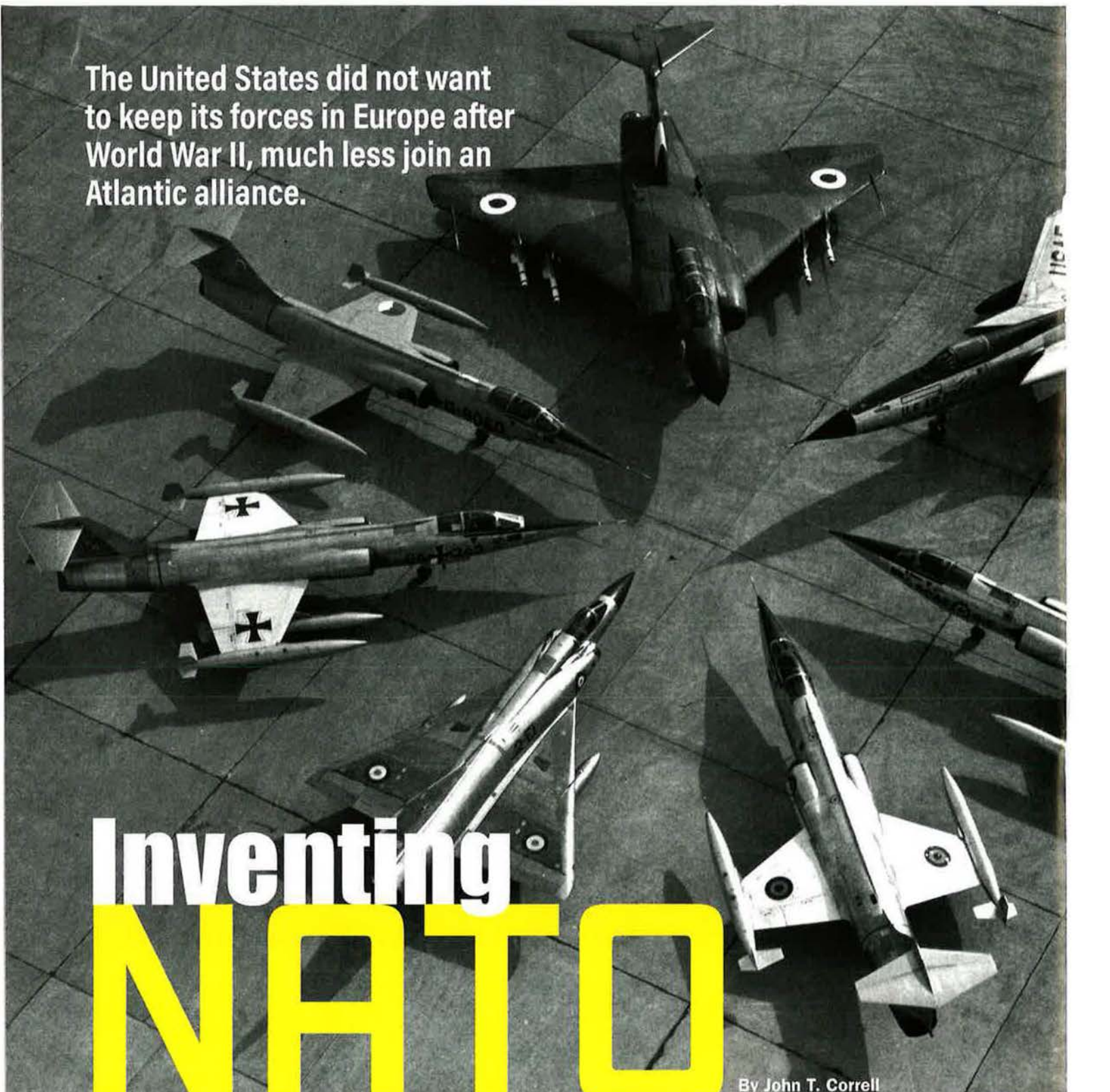


Beale AFB, Calif., Davis-Monthan AFB, Ariz., JB Langley-Eustis, Va., and locations abroad. While speaking with reporters in June, Welsh noted the new locations could mean shorter commutes, allowing the airmen more time with their families. The end result of this multipronged relief effort "is RPAs delivering exactly what our combatant commanders are asking for now and in the future," Carlisle told lawmakers in March. "No breaks, no reductions, just theater level airpower from this enterprise." ☛

*/1/ In May 1896, Samuel Pierpoint Langley's Aerodrome No. 5 unpowered aircraft proved mechanical flight was possible. It is on display at the Smithsonian National Air and Space Museum. /2/ Workers assemble the Liberty Eagle Aircraft—better known as the Kettering "Bug"—in 1918. The US Army intended to use the unmanned aircraft as an aerial torpedo and ordered 25. /3/ A Predator surrogate air vehicle, General Atomics' GNAT 750, at NAS Fallon, Nev.*







The United States did not want to keep its forces in Europe after World War II, much less join an Atlantic alliance.

# Inventing NATO

By John T. Correll

**A**t the Allied Big Three conference at Yalta in February 1945, President Franklin D. Roosevelt announced that US troops were unlikely to stay in Europe for more than two years after the end of World War II.

The war had forced the United States to depart from its traditional foreign policy of isolationism, but the nation had no intention of forming any peacetime alliances or getting entangled in European politics.

By January 1946, US troops were returning home from overseas at the rate of 300,000 a month. The Russians, on the other hand, maintained their military strength. The Red Army in central Europe outnumbered the British, French, and Americans by 30 divisions to seven, with more in reserve in the Soviet Union.

The line of Soviet occupation lay west of the Elbe in Germany—the new frontier of the Soviet Union, 700 miles closer to the

Atlantic Ocean than it had been in 1939. The Baltic states seized by the Soviets in 1940 were now “republics” in the USSR and the nations of eastern Europe were repressive Soviet satellite regimes. Never before in their history had the Russians held a position of such opportunity.

The Soviet Union, a wartime ally, was not yet seen as an adversary. President Harry S. Truman, like Roosevelt before him, hoped to gain the support of USSR



Premier Joseph Stalin for the new United Nations, upon which the postwar peace was presumed to depend.

Stalin, encountering only token objection from the Americans and British when he reneged on his promise of free elections in liberated Europe, pressed for further concessions. In western and southern Europe, communist parties with ties to Moscow promoted discontent and disruption.

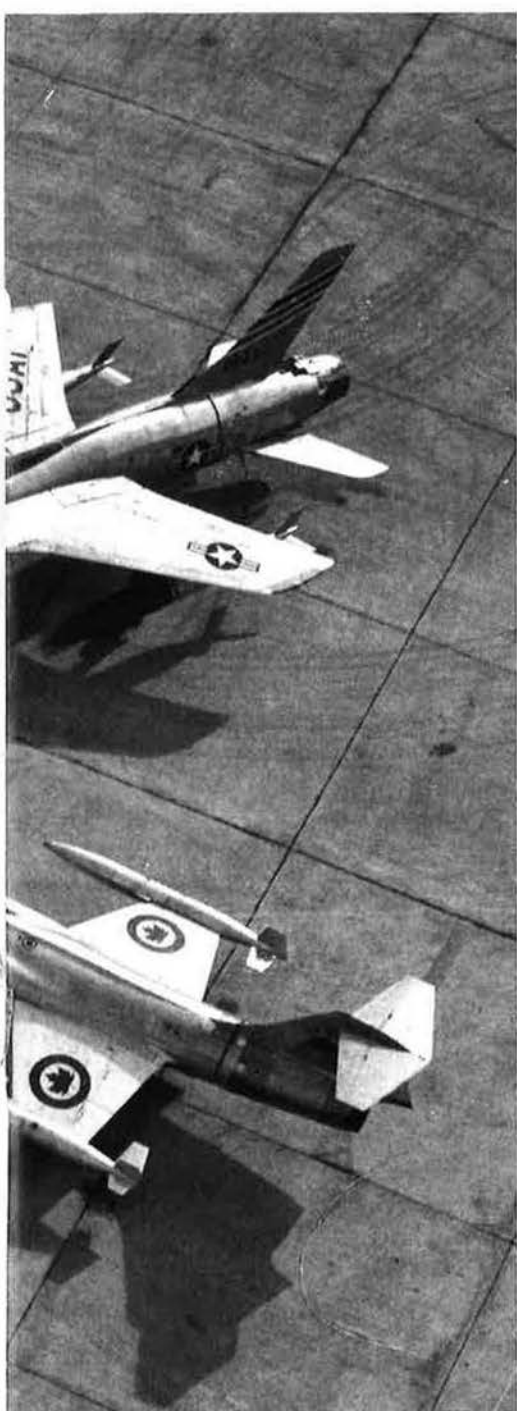
### BREAKUP

A series of events in 1946 drove a wedge between the Soviet Union and its former partners in the United States and Britain. A radio speech by Stalin Feb. 9 marked the end of Soviet cordiality.

In a long-winded rant, he condemned "monopoly capitalism" as the basic cause of the two world wars. He gave the Red Army and the Soviet industrial base nearly all of the credit for the defeat of Germany, virtually ignoring Allied forces and the substantial aid given to the USSR.

Stalin announced a new five-year plan to build on Soviet strength so that "our country will be insured against any eventuality." Another member of the Politburo added, "We must remember that our country continues to be in capitalist encirclement."

*Left: NATO aircraft in 1970. Clockwise from top, an RAF Javelin Mk 9, USAF F-105 Thunderchief, Canadian CF-104 Starfighter, Belgian F-104G, French Mirage IIIC, West German F-104G, and Netherlands F-104G. Below: President Harry Truman signs the North Atlantic Treaty in the Oval Office, Aug. 24, 1949, flanked by representatives of Britain, Canada, Denmark, France, Italy, Netherlands, Norway, and Portugal and US Secretary of State Dean Acheson and US Secretary of Defense Louis Johnson.*



A few days later, Canadian officials disclosed the arrest of 13 persons in a spy ring operating out of Canada that had obtained US atomic secrets through espionage in New Mexico and passed them to Moscow.

The situation was further inflamed by clumsy Soviet efforts to intimidate Iran and Turkey. The US, Britain, and Russia had agreed at Yalta to withdraw their forces from Iran when the war ended, but the Soviets defiantly delayed their departure. Stalin also demanded a military base in Turkey from which the Soviet Union could dominate the Dardanelles strait and project power into the Mediterranean.

The pressure on Iran and Turkey did not end completely until the United States sent ships to the area as a show of force and created the US Sixth Fleet as a permanent presence in the Mediterranean.

In March, a conservative coalition won elections in Greece by a landslide, but a communist faction instigated an insurgency. It rapidly grew into a civil war, supported by the communist governments in Bulgaria, Yugoslavia, and Albania. Stalin kept his distance from the fighting in Greece, but the Western powers did not make a sharp distinction between the Soviet Union and international communism.

Unbeknownst to the players on either side, events were aligning for the creation of the North Atlantic Treaty Organization.

### IRON CURTAIN

On Feb. 22, two weeks after Stalin's speech, Washington received early warning of Soviet intentions in the famous 19-page "Long Telegram" to the Secretary of State from George F. Kennan, chargé d'affaires at the US embassy in Moscow. Kennan reported that the USSR did not want peaceful coexistence and was committed to a "patient but deadly struggle for total destruction of rival power." Kennan urged a policy of "containment," which eventually became the cornerstone of US doctrine in the Cold War.

Kennan's telegram was not public knowledge but the "Iron Curtain" speech by former British Prime Minister Winston Churchill on March 6 in Fulton, Mo., made headlines around the world.

"From Stettin in the Baltic to Trieste in the Adriatic, an iron curtain has descended across the continent," Churchill said. "Behind that line lie all the capitals of the ancient states of Eastern Europe.





**Above: Ernest Bevin, Britain's foreign secretary and the man who originally proposed NATO. Above right: US transport aircraft unload at Tempelhof Airport during the Berlin airlift.**

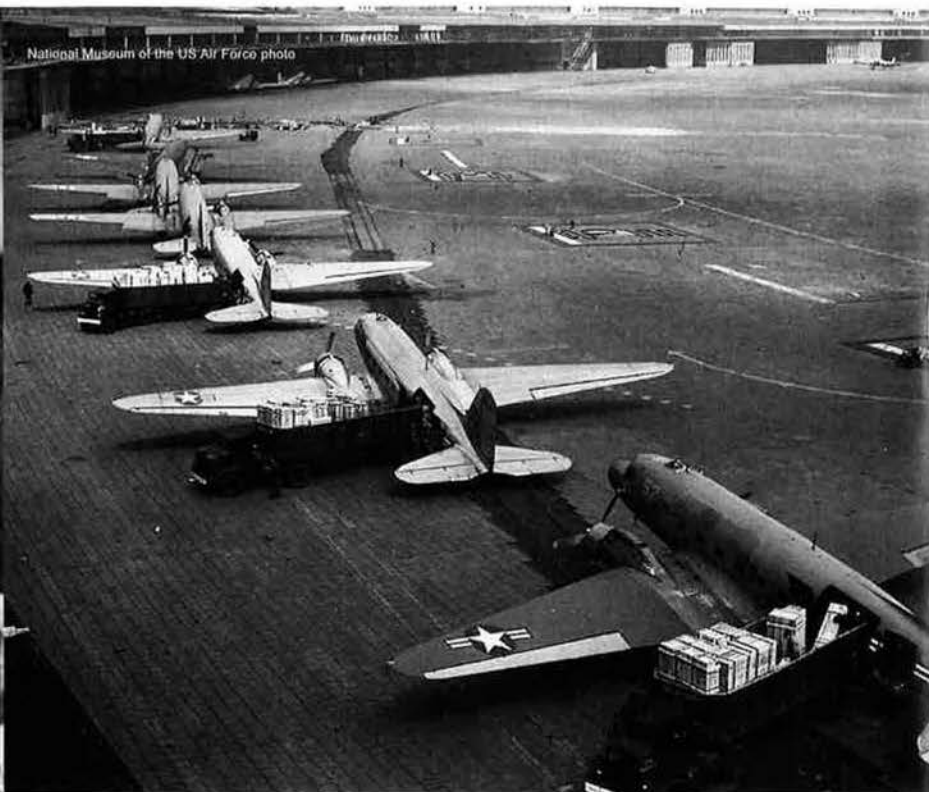
Warsaw, Berlin, Prague, Vienna, Budapest, Belgrade, Bucharest, and Sofia, all these famous cities and the populations around them lie in what I must call the Soviet sphere, and all are subject in one form or another, not only to Soviet influence but to a very high, and in some cases, increasing measure of control from Moscow."

Churchill did not mention a European military alliance, only a continuance of the "special relationship" between the United States and Britain, but what he meant was well understood.

There was an immediate backlash from various members of Congress and liberal groups still enchanted with Stalin and the Soviet Union. Secretary of Commerce Henry A. Wallace, who had been vice president from 1941 to 1945, denounced the speech as "an attack on a former ally."

Truman had accompanied Churchill to Missouri and was present for the speech but took political cover by refusing to comment on what Churchill had said. Before the year was out, however, the United States came reluctantly to the understanding that a return to the isolationist past was no longer possible.

In September 1946, the United States canceled the plan for US troops to leave Europe. "Security forces will probably have to remain in Germany for a long period,"



Secretary of State James F. Byrnes said. "I want no misunderstanding. We will not shirk our duty. We are not withdrawing. We are staying here, and will furnish our proportionate share of the security forces."

### THE US TAKES A HAND

The new US policy began to take shape in 1947 with the "Truman Doctrine" and the Marshall Plan.

Speaking to a joint session of Congress in March, Truman called for economic and military support for Greece and Turkey but went beyond that to state a broad principle. "It must be the policy of the United States to support free peoples who are resisting attempted subjugation by armed minorities or by outside pressures," he said.

Truman's message was lamented both by isolationists and pro-Russia liberals. The Progressive Citizens of America said Truman's speech "announces the end of an American policy based on one world" and "threatens the peace of the world."

However, Truman was strongly reinforced by Sen. Arthur H. Vandenberg (R-Mich.), a former isolationist and chairman of the Senate Foreign Relations Committee. The Truman Doctrine was approved by lopsided votes in both houses of Congress.

The European Recovery Plan, known to history as the Marshall Plan, originated with George C. Marshall, the Army Chief of Staff during the war who became Secretary of State in January 1947. It offered major economic aid to nations that agreed

to participate in the cooperative rebuilding of Europe. After extensive debate in 1947, it was signed into law in April 1948.

The Russians, who wanted to keep tight control of their puppet states, complained that the Marshall Plan would lead to the Americanization of Europe. In Italy and Turkey, local communists obediently staged strikes and street demonstrations to support Soviet objections.

Eventually, 16 European nations and the three western zones in Germany received Marshall Plan aid amounting to more than \$12 billion, but the Soviets would not allow their client states to receive any such assistance.

The Europeans were alarmed enough about their security to make two regional defense agreements, the Dunkirk Treaty between Britain and France in 1947 and the five-nation Brussels Treaty in early 1948. These arrangements were insufficient in scope to deal with the growing problem of the Soviet Union.

### BEVIN'S PROPOSAL

The proposal that led directly to the North Atlantic Treaty Organization was made in January 1948 by Ernest Bevin, the foreign secretary in Britain's postwar Labour government.

Bevin, a former truck driver and trade union leader, had gone to work at age 11 and had little formal education, but is widely regarded as one of the most able foreign ministers of the century.



"I believe the time is ripe for a consolidation of Western Europe," Bevin said in a thundering speech to Parliament Jan. 22. The Soviet Union had "cut off eastern Europe from the rest of the world and turned it into an exclusive, self-contained block under the control of Moscow and the Communist Party," he said.

Winston Churchill arose immediately from the opposition bench to praise Bevin, recalling how he had said much the same thing in his Iron Curtain speech in 1946. Bevin no doubt welcomed the support, but Churchill's endorsement did him no political good with the left wing of his own party.

The big question was what role the United States might take. Marshall noted with approval that the Europeans were moving beyond their agreements for economic coordination to the consideration of a western European union. On the other hand, the isolationists and the liberal left were opposed to an American-European alliance, as were the Joint Chiefs of Staff, who were reluctant to divert US military resources and funding.

Once again, the heavy hand of the Soviet Union tipped the scales. In February, a Soviet-directed coup ousted the government in Czechoslovakia and replaced it with a client regime. Except for Berlin, the conquest of Eastern Europe was complete.

In June, the Soviet Union decided to blockade Berlin, the first big event of the Cold War. Berlin lay 110 miles inside the part of Germany held by the Russians, but the city itself was under four-power control. It was divided into American, British, French, and Soviet occupation zones.

Stalin, fearing the growth of US influence in Europe and disliking the attractive example West Berlin set for its East German neighbors, cut off all road, rail, and river routes into West Berlin on June 24.

However, three air corridors, each 20 miles wide, remained open. These became the routes for the Berlin airlift, flown principally by US transports, to sustain West Berlin with food, fuel, and supplies until the Russians lifted the blockade in 1949.

By the end of 1948, meetings between US and European diplomats had produced

a draft treaty for a North Atlantic alliance. The main point of contention was Article 5, the "commitment clause," which obliged all signatories to go to war on behalf of any of the others who were attacked. The Europeans wanted a stronger commitment than the Americans were prepared to give.

### THE CREATION OF NATO

In January 1949, Truman announced that he hoped to soon send a proposed North Atlantic security treaty to the Senate. In actuality, the Senate was a full participant from the beginning in review and modification of the draft. The *New York Times* and other newspapers carried daily blow-by-blow reports of the exchange between the White House and Congress.

The argument was mostly about Article 5. As drafted, it said that in the event of an attack on one nation, all of the others would respond with "such military or other action ... as may be required." There was significant objection to such an "automatic commitment." In the Senate, Vandenberg and Sen. Tom Connally (D-Texas), who had succeeded Vandenberg as chairman of the Foreign Relations Committee, led the negotiations for change.

The final draft said that an armed attack against one nation would be regarded as an attack against all, but that each of them would take "such action as it deems necessary, including the use of armed force." The Europeans did not like the watered-down language but understood that an ambiguous commitment was the best they were going to get.

The Russians accused the US and Britain of fomenting an aggressive policy to establish "Anglo-American world domination," which was "very menacing for peace-loving peoples."

The North Atlantic Treaty was signed April 4 by Belgium, Britain, Canada, Denmark, France, Iceland, Italy, Luxembourg, Netherlands, Norway, Portugal, and the United States.

As the treaty moved toward ratification hearings in the Senate, the strongest opponent was a powerful Republican stalwart, Sen. Robert A. Taft of Ohio, who complained that the commitment clause could drag the US into war, bypassing the Constitutional provision that wars be declared by Congress.

Taft suggested instead "a Monroe Doctrine for western Europe" patterned on the declaration by President James Monroe in 1823 warning that the United States would regard European intervention in the western hemisphere as "dangerous to our peace and safety" and would respond by military force if required.

The US should decide for itself when and where to fight in Europe, Taft said. He was unable to persuade his colleagues and on July 21, the Senate confirmed the treaty, 83-13.

### IMPLEMENTING THE ALLIANCE

In 1949, Hastings Ismay, the first Secretary General of NATO, said the purpose of the alliance was "to keep the Russians out, the Americans in, and the Germans down," but the new organization



**Right: US Army 2nd Lt. William Robertson (l) and Soviet Red Army Lt. Alexander Sylvashko pose in front of a sign that says, "East meets West" near Torgau, Germany, on April 25, 1945.**





**East German soldiers set up roadblocks at the Brandenburg Gate in Berlin in 1961, separating East Germany and West Germany.**



**TSgt. Paul Svetlovics (l) an AWACS weapons controller, is thanked by Gen. Joseph Ralston, Supreme Allied Commander, Europe (r), for NATO AWACS missions flown in Operation Eagle Assist following the 9/11 terror attacks in the US.**

was not nearly prepared to fulfill such a description.

For the first two years, NATO was essentially a political association with no military structure. Allied military forces in Europe were organized and positioned for occupation duty rather than combat, and they were badly outnumbered by the Soviet troops on the other side of the line.

The Pentagon had no intention of assigning more forces to Europe. In the US view—which was not exactly what the Europeans were hoping for—the Americans would provide a strategic bombing capability, backed by the credibility of the atomic bomb, while most of the ground forces and tactical air defense would come from the Europeans themselves.

Plans changed quickly in 1949 when the Soviet Union exploded its first atomic weapon and China fell to a communist revolution. In June 1950, North Korea invaded South Korea. Western intelligence saw these events as interrelated parts of world communism on the march. In 1951, the United States sent four additional army divisions to Europe, increasing the total to six, and built up the US Air Forces in Europe.

In 1947, the number of USAFE aircraft had dwindled to 458 from a wartime high of 17,000. Of those, fewer than half were combat aircraft, with only three dozen of them—three B-17 bombers, two A-26 attack bombers, and 31 P-47 fighters—fully operational. With the buildup, USAFE added 25 new bases and by 1954, had 2,100 aircraft in operation. F-84 and F-86 fighters replaced the obsolescent P-47s.

Allied Command Europe, the military arm of NATO, was established in 1951 and Supreme Headquarters Allied Powers Europe (SHAPE) was set up in Paris.

Gen. Dwight D. Eisenhower arrived in April 1951 as the first Supreme Allied Commander, Europe.

The communist parallel to NATO, the Warsaw Pact, was created in 1955, overseen by the Soviet Union with Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, and Romania as members. The organizational change was nominal since the Soviets had been in control all along. Suppression by the Red Army of the brief Hungarian revolution in 1956 served notice that the client states were not independent.

### EXPANSION AND ENDURANCE

Greece and Turkey joined NATO in 1952, and West Germany was admitted in 1955. That brought membership in the alliance to 15 nations, the configuration that prevailed through most of the Cold War.

Today, NATO has 28 members, having added most of the Baltic and east European nations. Sixty-seven years after its founding, the alliance is still plugging along.

As always, NATO has its critics, foremost among them Russian President Vladimir Putin. In December 2015, Putin proclaimed a new security strategy that depicted NATO as a threat to his country.

Gary P. Leupp, an associate professor of history at Tufts University, expressed a similar assessment in “NATO: Seeking Russia’s Destruction Since 1949,” published in the Dec. 25, 2015, issue of *Counterpunch* magazine.

“It’s clear that the US has, to the consternation of the Russian leadership, sustained a posture of confrontation with the Cold War foe principally taking the form of NATO expansion,” Leupp said.

After World War II, Russia “wanted preeminently to secure its western border,” Leupp explained. “To insure

the establishment of friendly regimes, it organized elections in Poland, Czechoslovakia, Hungary, and elsewhere. These had approximately as much legitimacy as elections held under US occupation in Iraq or Afghanistan in later years, or at any point in Latin America.”

NATO was “formed to aggressively confront the USSR,” he said. “Isn’t it obvious that Russia is the one being surrounded, pressured, and threatened?”

The nations and peoples of the Warsaw Pact reached a far different conclusion. The Pact disbanded in July 1991, six months ahead of the collapse of the Soviet Union. As soon as they were free to do so, every one of the former Pact nations joined NATO. In addition, eight more countries in eastern Europe have established partnerships with NATO.

In 1949, the abiding concern about the Article 5 commitment clause was whether the United States might be drawn into a war to defend the European members of NATO from the Soviet Union.

Ironically, Article 5 was invoked for the first time by unanimous vote of the North Atlantic Council on Sept. 12, 2001, the day after the terrorist attacks against the World Trade Center and Pentagon in the United States.

Within days, NATO Airborne Warning and Control System aircraft were dispatched to the United States where they flew alongside US aircraft on the patrol of American airspace for the next five months. ✪

*John T. Correll was editor in chief of Air Force Magazine for 18 years and is now a contributor. His most recent article, “The Yom Kippur Airlift,” appeared in the July issue.*





Published by the Air Force Association

# WINGMAN





# THE AIR FORCE ASSOCIATION CYCLING CLASSIC

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# Wheels Turning

The athletes came for a challenge—the AFA Cycling Classic’s Challenge Ride.

Text by Kyle W. Gaumnitz and Karl Lynn Hahn



**1.** In Arlington, Va., in June, bicyclists line up for the Sunday morning Challenge Ride. This amateur event is held during the weekend-long AFA Cycling Classic, part of the Pro Road Tour for elite bike racers. AFA’s Wounded Airman Program, in partnership with the Air Force Wounded Warrior program, fielded a team of six

Wounded Warrior athletes. They’re on the recumbents, hand cycles, and two-wheelers in the front rows for this Sunday ride. **2.** The Wounded Airmen and their caregivers took in many activities while in Washington, D.C. Here (l-r), US Rep. Marlin Stutzman (R-Ind.) joins Heather Carter, Mindy Rust, TSgt. Chris Rust, Tino Uli, and Shari Trujillo

at an Air Force Band concert at the Air Force Memorial on Friday night. **3.** Carter crosses the finish line of the Challenge Ride’s 9.3-mile course. She averaged a 7.4 mph pace—and that includes the hill at the Air Force Memorial. **4.** Multisport athlete Uli finishes lap one. He did three laps of the course. Bikes@Vienna provided





Boeing photo © 2016

4



Photo by Paige M. Bernklau

6



Boeing photo © 2016

7



Photo by Paige M. Bernklau

5

## You Said Yes. We Say Thank You!

AFA volunteers and corporate sponsors made possible a record-breaking \$30,500 donation that Arlington Sports and Rosenthal Automotive presented to AFA's Wounded Airman Program after the AFA Cycling Classic.

The Nation's Capital Chapter, Virginia State AFA, and Maryland State AFA raised funds for the athletes' travel. American Airlines donated airfare, and the Wounded Airman loved the roomy seats. Avis provided a van we nicknamed the "WAPmobile." I drove it around Washington, D.C., for five days with a load of backseat drivers!

Ruth's Chris Steak House treated us like royalty and covered meals for our warriors and caregivers on Friday night, thanks to ties built over the years by the Donald W. Steele Sr. Memorial Chapter. Another longtime relationship—between Virginia's Northern Shenandoah Valley Chapter and the Sacred Heart Academy—led to the students making greeting cards to cheer our cyclists.

These and other supporters said "Yes!" to our Wounded Airmen, giving them the amazing experience they deserved.

—Kari Lynn Hahn



Photo by Paige M. Bernklau

8

his wheels. Uli served three tours in Iraq and is working on a sports medicine degree. **5.** Rust is an aircraft maintainer at Grissom ARB, Ind. After the bike ride, the AFA team went to a baseball game—tickets donated by VetTix and the Washington Nationals. **6.** Rust speaks at an AFA-Air Force panel discussion on Friday, featuring athletes and caregivers.

Uli (left) told the audience that adaptive sports helped him understand, "I'm still part of the fight, still part of the team. I'm still part of the Air Force." **7.** AFA has lent its name to the Cycling Classic since 2013. This year, some 1,500 cyclists finished the Challenge Ride. **8.** Can we toot our own horn? AFA's Wounded Airman Program

benefits from fund-raising associated with the Cycling Classic. This year it raised the largest amount yet. All funds donated to the WAP directly support the airmen.

*Kyle W. Gaumnitz and photographer Paige M. Bernklau are interns at AFA. Kari Lynn Hahn is AFA's vice president for member and field relations.*





2016-17

# AFA NOMINEES



**Peters**

**T**he Air Force Association Nominating Committee met on May 7 and June 28 and selected candidates to send forward for National Officer positions and National Director positions on the Board of Directors. The Committee consists of three past Chairmen of the Board, one person selected by each of the two Vice Chairmen of the Board, two persons representing each geographic area, and one person each representing the Total Air Force, Air Force veterans, and aerospace industry constituencies. The slate of candidates will be presented to the delegates at the AFA National Convention in National Harbor, Md., in September.

#### **Chairman of the Board**

**F. Whitten Peters**, Washington D.C., nominated for Chairman of the Board for a first one-year term. A Life Member, Peters joined AFA after becoming Undersecretary of the Air Force, a position he held from 1997 until 1999. He was subsequently confirmed as the 19th Secretary of the Air Force in 1999 and served in that position until 2001. Before then, he was the DOD Principal Deputy General Counsel. Peters has been appointed an AFA National Director five times since October 2008 and is one today. He has been serving on AFA's national-level Executive Committee and Development Committee. Peters received the W. Stuart Symington Award in 1999 and the DOD Distinguished Public Service medal three times. He is the first Secretary of the Air Force to hold the Order of the Sword. Peters earned a bachelor's degree from Harvard University in government, a master's degree in economics from the London School of Economics, and a juris doctor degree from Harvard Law School.



**MacAloon**

He served in the Navy Reserve as a Computer Systems Division Officer and Company Commander. Peters has been a member of several advisory organizations, including the National Commission on the Structure of the Air Force, the Defense Science Board, and the presidential advisory Commission on the Future of the United States Aerospace Industry. He has been on the Board of Trustees for the Air Force Aid Society, the Air Force Academy's Falcon Foundation, and the Air Force Enlisted Village. Peters is a lawyer.

#### **Vice Chairman, Field Operations**

**F. Gavin MacAloon**, Fairfax, Va., nominated for Vice Chairman of the Board for Field Operations for a first one-year term. A Life Member, MacAloon joined AFA in 1984. He has been the Central East Region President since 2013 and serves on the Field Council as Chairman of the e-Business and the Emerging Leader Program Subcommittees. He is a Founding Member of AFA's Wounded Airman Program and continues to serve on that committee. He served on the national-level Nominating Committee, Supervisor of Elections, and in several offices, including President, for the Donald W. Steele Sr. Memorial Chapter. He has received an AFA Chairman's Citation, an Exceptional Service Award, and a Medal of Merit and numerous awards from the region and chapter, including the 2012 Virginia Member of the Year. MacAloon earned a bachelor's degree in psychology from Southeast Missouri State University and a master's degree in administration from Central Michigan University. He served in the Air Force for 22 years primarily as a Master Air Battle Manager on AWACS and Airborne Battlefield Command and Control Center aircraft. MacAloon





**Bundy**

also served on the Air Staff, gaining leadership, management, and acquisition experience. Along with extensive AFA involvement, he is a member of the Association of Old Crows, the National Defense Industrial Association, Military Officers Association of America, and the American Legion. MacAloon retired after a second career with an aerospace and manufacturing corporation and is now a consultant.

**Vice Chairman, Aerospace Education**

**Richard B. Bundy**, Spotsylvania, Va., nominated for Vice Chairman of the Board for Aerospace Education for a second one-year term. An AFA member since 1971, he is on the Executive Committee of the Richmond Chapter and previously served as Delaware State President for nine years. At the national level, he has been on the Nominating Committee and the Aerospace Education Council. AFA awards include the Presidential Citation, Exceptional Service Award, and Medal of Merit. Bundy served in the Air Force for 33 years as an Airlift Pilot and as a Staff Officer at major command, Air Staff, Joint Staff, and DOD levels. He commanded a squadron, group, and wing. He later served as the Executive Director of the Arnold Air Society and Silver Wings for 10 years as the direct liaison with senior officers and the staff of AFA and AFROTC. During this period, he convinced the Silver Wings members to join their Arnold Air counterparts as full members of AFA. Due to his efforts, all members of Arnold Air and Silver Wings are AFA members. He earned a bachelor's degree in transportation and logistics management from San Francisco State University and a master's degree in personnel management from Webster University.



**Brock**

**Secretary**

**John T. "Tim" Brock**, Oviedo, Fla., nominated for a second one-year term as National Secretary. Brock is Director of Competition for AFA's StellarXplorers science, technology, engineering, and math initiative. He has been an AFA Life Member since 1996 and has held Chapter, State, and Region Presidencies and was State Membership Chairman. He is presently serving as Chapter Treasurer. At the national level, Brock has been a National Director, served on the Audit, Nominating, Strategic Planning, Membership, and Field Council Committees and has received the 2013 AFA Member of the Year and the 2012 Storz Membership Individual Award. He earned a bachelor's degree in mathematics at the University of Georgia and a master's degree in space operations from the Air Force Institute of Technology. Brock served in the Air Force for 24 years in space operations. He is involved with the Lion's Club, National Space Society, and National Air and Space Society. Brock is a retired space systems officer/aerospace engineer.

**Treasurer**

**Steven R. Lundgren**, Fairbanks, Alaska, nominated for a first one-year term as National Treasurer. An AFA member for more than 30 years, Lundgren was AFA National Treasurer from 2005 to 2010 and is on the national-level Audit Committee. He is also Alaska State AFA Treasurer. Lundgren has been a chapter and state leader and Northwest Region President and served on the national-level Finance and Executive Committees. He received AFA's Member of the Year Award in 2011 and was awarded a Presidential Citation in 2003. His volunteer and civic organization work includes the Alaskan Command Civilian Advisory Board, the



**Lundgren**

American Bankers Association (ABA) Community Bankers Council, and the Greater Fairbanks Chamber of Commerce board. He is Vice Chairman of the state committee for the Employer Support of the Guard and Reserve program. Lundgren, who completes his term as President of the Alaska Bankers Association this fall, earned a bachelor's degree in business administration from Oregon State University and attended three ABA professional-school courses. Lundgren began his career in banking in 1978 and is president and CEO of a bank.

**National Director at Large**

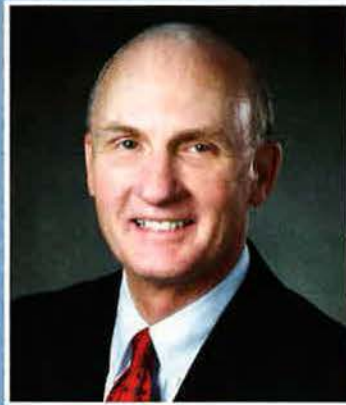
The Nominating Committee submits three names for National Director at Large. Two will be elected for a three-year term.

**Charles L. Johnson II**, Arlington, Va., nominated for National Director at Large for a three-year term. He has been an AFA member since 1972. Johnson earned a bachelor's degree in civil engineering from the Air Force Academy and a master's degree in engineering administration and law from George Washington University. He retired from the Air Force in 2008, after more than 36 years, primarily as a Helicopter and Fixed-wing Pilot; an Operations Group Commander; Director and Program Director for the C-141 and C-17 Program Offices; and Commander of two Systems Centers. Johnson is a Board Member for Our Military Kids and for the Air Force Historical Foundation. His community involvement also includes the Air Force Academy's Falcon Foundation and So Others Might Eat. Johnson is a Vice President for a major aerospace and manufacturing corporation.

**Kathleen M. McCool**, San Antonio, nominated for National Director at



# AFA NOMINEES



**Johnson**



**McCool**



**Vernamonti**



**Cox**

Large for a three-year term. McCool is presently an appointed National Director and seeks election to the position. She joined AFA as a Life Member in 2011 when she was selected as an Air Force Outstanding Airman of the Year. She has been on AFA's Board of Directors since 2014 and is on the Air Force Memorial Advisory Committee. She also served on the national-level Membership Committee and was a Chapter Membership Vice President. McCool was an Alamo Chapter SNCO of the Year and AFA Texas Member of the Year and in 2015 received a national-level Exceptional Service Award. McCool earned a bachelor's and master's degree from Wayland Baptist University and three associate degrees from the Community College of the Air Force. She volunteers with the Randolph Chiefs Group, the Air Force Sergeants Association, and the Senior Enlisted Advisory Council, San Antonio. McCool is on Active Duty as a Superintendent for a security forces and logistics support group at JBSA-Randolph, Texas, and has completed more than 20 years of military service.

**Leonard R. Vernamonti**, Clinton, Miss., nominated for National Director at Large for a three-year term. Life Member Vernamonti joined AFA in 1967. He was AFA's National Treasurer from 2010 to 2014 and has previously been a National Director at Large and Chairman of the AFA Audit Committee. He has served as a Region, State, and Chapter President. On the national level, Vernamonti has been on the Executive Committee and the Field Council and was Chairman of the Finance Committee and the Presidential Evaluation and Compensation Committee. He was also on AFA's Audit, Constitution, Research and Development, and Nominating Committees. He also served on the Field Structure Team for afa21. Vernamonti is on the Finance and Strategic Planning Committees and on the Ad Hoc Financial Governance and Lobbying Review Committees. He has received an Exceptional Service Award and two Medals of Merit. An Air Force Academy graduate with a bachelor's degree in economics, Vernamonti also earned a master's degree in systems engineering from the University of Florida. He served in the Air Force for over 26 years, mostly in strategic planning, programming, research and development, and finance and served 2.5 years on the President's staff. Vernamonti is a national security and financial consultant.

## **National Director, Central Area**

The Nominating Committee submits one name for National Director, Central Area.

**Terry J. Cox**, Enid, Okla., nominated for National Director, Central Area, for a three-year term. A Life Member of AFA who joined in 1993, Cox was a member of AFA's national-level Field Council and the Strategic Planning Committee and was Chairman of the Airmen and Family Support Subcommittee under the Field Council. He has served as Texoma Region President, Oklahoma State President, and the Enid Chapter Vice President. He is now the Enid Chapter's Vice President for Airman and Family Support and is on the Chapter Executive Committee. Cox has received an AFA Chairman's Citation, Medals of Merit, Exceptional Service Awards, and was also named Chapter Officer of the Year. An Air Force Academy graduate, Cox received a bachelor's degree in economics and operations research. He then served in the Air Force for just over 20 years, primarily as a Fighter Pilot, Instructor Pilot, Staff Action Officer, and Air Liaison Officer. In his community, Cox is Vice President of the local Experimental Aircraft Association and is active with the Civil Air Patrol and the Daedalians. He is a Simulator Flight Instructor for the T-38 and T-6 at Vance AFB, Okla. ★



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\*Executive Director (President-CEO) Emeritus



CMSAF No. 6—shown here at Schriever AFB, Colo., in 2013—has traveled widely to share thoughts with airmen. Below: A photo from the 1970s, when Jim McCoy was SAC's first senior enlisted advisor.

# IN GOOD COMPANY

By Edward L. Burchfield



**Jim McCoy has been inducted into the SAC Hall of Fame, joining a list of legends.**

The SAC faithful gathered in April at the Strategic Air Command & Aerospace Museum in Ashland, Neb., for the biannual “Wings of Freedom” gala.

This year’s event highlighted the induction of the first class into the SAC Hall of Fame, including retired CMSAF James M. McCoy.

A former AFA president and chairman of the board (1992-96), McCoy was in august company among the inaugural Hall of Famers: Gen. Curtis E. LeMay, USAF Chief of Staff and SAC commander in chief; Gen. Thomas S. Power and Gen. Richard H. Ellis, both SAC commanders in chief; Gen. Bernard A. Schriever, often called the father of the Air Force’s ballistic and space program; Omaha, Neb., civic leader Arthur C. Storz Sr.; and J. Robert Beyster, a physicist who founded technology company SAIC.

“For the inaugural class of the SAC Hall of Fame, we sought individuals who stood out and stood tall,” museum Executive Director Michael L. McGinnis explained in an email. “Chief McCoy embodies both military professionalism and strong ethic.”

On the evening of the gala, a strong headwind coming out of the south howled past the B-1 bomber standing point at the entrance to the museum,

and the guests—military and civilian leaders, museum board members, and media—leaned sideways as they walked from the parking lot to the museum’s front doors.

A lively reception under the wings of former SAC aircraft greeted the guests as they entered the massive south wing of the museum. Everyone knew just about everyone else—and everyone knew “the Chief.”

## A HEARTLAND CELEBRITY

McCoy is a bit of a celebrity here in America’s heartland. After all, he is the sixth Chief Master Sergeant of the Air Force, and that night, he became the only enlisted airman to be inducted into the SAC Hall of Fame.

Interviewed afterward, McCoy said he was “honored to be a part of such a distinguished group.” He praised the museum for its work preserving SAC history. He said “it is important for the enlisted force to become involved with military-related organizations such as the Strategic Air Command & Aerospace Museum as well as other key organizations like the Air Force Association and the Air Force Sergeants Association.”

Asked if he thought he would ever be honored in such a way, McCoy looked back on his career and recalled





Photo courtesy of SAC2 & Aerospace Museum

They're all McCoy's: Surrounding Jim McCoy at the Hall of Fame induction were family members (l-r): Dani, Traci, Jim's wife, Kathy, Tom, and Mike.

a program founded by AFA in 1956. He said, "If I hadn't been named one of the 12 Outstanding Airmen of the Air Force in 1974, none of this would have been possible."

The next year, Gen. Russell E. Dougherty, CINCSAC No. 8, appointed McCoy as the command's first senior enlisted advisor, a post now called command chief master sergeant.

#### ONE-WORD JOB INTERVIEW

Ellis took over as SAC commander in 1977. McCoy recalls that his job interview "was quick and to the point.

He asked if I wanted to stay. I said, 'Yes.' The interview was over, and I stayed with him until he nominated me to become the sixth Chief Master Sergeant of the Air Force in 1979."

But before he left to become the Air Force's top enlisted leader, McCoy said he and Ellis "had a great adventure ... working together to improve the lives of the dedicated and hard-working enlisted men and women of the command."

#### TWINKLE

As the museum's gala evening drew to a close, guests and friends of McCoy

stopped to congratulate him. His wife, Kathy, was at his side, as were some of their children and grandchildren. The chief seemed to have a bit of a twinkle in his eye, and I imagined him saying, "Thank you for allowing me to serve in the greatest military organization the world has ever known: Strategic Air Command." ✪

*Edward L. Burchfield is an AFA Life Member and belongs to Nebraska's Ak-Sar-Ben Chapter. He was special assistant to Gen. Richard Ellis.*

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# CHAPTER NEWS

By Frances McKenney, Deputy Managing Editor

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

## LT. COL. B. D. "BUZZ" WAGNER CHAPTER

On Memorial Day weekend, Lt. Col. B. D. "Buzz" Wagner Chapter members dedicated a replica P-40 aircraft like the one flown by the chapter's namesake during World War II.

It was the latest project the chapter has completed to commemorate Boyd D. Wagner, a native of the area who became the AAF's first ace of World War II in the Philippines on Dec. 16, 1941. Wagner flew P-40 Warhawks and died in one during a training flight in Florida the following year. Because he wasn't on the expected flight path, it took weeks to recover most of his remains.

Among the guests at the May 28 dedication of the replica airplane was chapter member James E. Moschgat, a researcher who discovered more of Wagner's remains at the Florida crash site in 2003. The chapter in 2010 helped arrange a second interment ceremony at Wagner's original memorial near Johnstown. In 2013, the chapter successfully lobbied for a road at John Murtha Johnstown-Cambria County Airport to be dedicated to Wagner. That same year, the chapter began searching and fund-raising for the P-40.



Photo by Keeia Bai, Tribune-Democrat

Retired Col. Jim Moschgat, Wagner Chapter President Bill Burns, Jan Bolha—a Wagner cousin—and Chapter Secretary Bob Rutledge (l-r) exchange greetings near the P-40 replica. "It's the ultimate tribute to a flyer to have an airplane in their honor," Burns told a local newspaper.

## CAPE FEAR CHAPTER

In North Carolina, the Cape Fear Chapter's meeting in June highlighted the Chapter and State Teacher of the Year, Lisa Giacomelli.

The primary science teacher at the Wilmington Academy of Arts and Sciences, Giacomelli is not your typical teacher, said Chapter President John Lasley.

For example, she teaches physics principles by having an airborne helicopter drop eggs, challenging students standing below to catch one without breaking it.

More than 50 members and guests attended the chapter meeting, the largest turnout in years, Lasley reported.

Another high point was a presentation by Col. Michael G. Miller, vice commander of the 916th Air Refueling Wing at Seymour Johnson AFB, N.C. He spoke about the selection of the Reserve wing as one of the first bed down units for the KC-46 tanker and its role in testing the integrated wing concept.



Photo by Scott Spike

It's physics. Cape Fear Chapter and North Carolina State Teacher of the Year Lisa Giacomelli (left) uses Knocker ball—a variation on soccer—to demonstrate Newton's laws of motion.





Photo by Jared Story, Winnipeg Free Press

## THE PM REWARDS EXCELLENCE

Canadian Prime Minister Justin Trudeau (left) presented CyberPatriot coach Charles Bazilewich with a 2015 Prime Minister's Award for Teaching Excellence, in May.

Bazilewich teaches at Sisler High School in Winnipeg, Manitoba, Canada. He developed the school's Cyber Security Academy, described on its website as the first of its kind in the country.

Bazilewich's CyberPatriot teams have participated five consecutive times in AFA's National Youth Cyber Defense Competition. His most recent team made it to the National Finals in Baltimore in April and won the Cisco Networking Challenge, Open Division.

The Sisler team already registered for CyberPatriot IX.

### ALBANY-HUDSON VALLEY CHAPTER

The Albany-Hudson Valley Chapter in New York presented two AFA awards to AFROTC cadets at a joint-service awards ceremony in May at Rensselaer Polytechnic Institute in Troy, N.Y.

Kevin Merrill received an AFA Outstanding Aerospace Studies 300 Cadet award, while Devin Sullivan—a member of New York's Long Island Chapter—received the chapter's Brother Leo Merriman Award.

### MEL HARMON CHAPTER

"Local Vets Group Named State's Best," read *The Pueblo Chieftain* newspaper headline.

The Mel Harmon Chapter earned the high praise after the United Veterans Committee of Colorado selected it as the state's Outstanding Veterans Organization. Veterans Affairs Secretary Robert A. McDonald presented the award to Chapter President Margaret E. Eichman in Denver in April.

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As a thank you gift, Cook Chapter President Randy Witt presents retired Lt. Col. Jack Trimble with a football autographed by Air Force Academy head foot ball coach Troy Calhoun. Academy grad Trimble spoke at the Tennessee State Convention.

## SARASOTA-MANATEE CHAPTER

The Sarasota-Manatee Chapter's latest bimonthly Laid-back Luncheon in Florida featured chapter member George Hardy.

Now 91, Hardy was a Tuskegee Airman pilot in World War II. He flew 21 combat missions.

Afterward, he completed a 28-year military career and retired as a lieutenant colonel.

He and fellow Tuskegee Airman alumnus 96-year-old Charles McGee recently traveled to the National World War II Museum in New Orleans to help dedicate a P-51 Mustang replica painted in the red tail colors made famous by the Tuskegee Airmen's 332nd Fighter Group. (See McGee's photo in "Red Tails," March, p. 37.) While at the museum, the two pilots shared their stories during an hour-long webinar.

Twenty-five people attended the chapter's luncheon. The series provides a low-key social event between major activities. They are casual and usually do not have a program or a speaker—just the opportunity to meet with friends and swap war stories.

—Michael E. Richardson, Sarasota-Manatee Chapter president

## EVERETT R. COOK CHAPTER

The Everett R. Cook Chapter hosted the Tennessee State Convention in East Memphis in April. Nearly 70 people attended.

Tennessee State President Derick E. Seaton served as master of ceremonies. The convention highlighted awards for AFROTC and AFJROTC cadets, Civil Air Patrol, Air National Guard units, and CyberPatriot division winners. The year's best Air Force Recruiter, Air National Guardsman, Teacher, and AFA Volunteer received honors, as well.

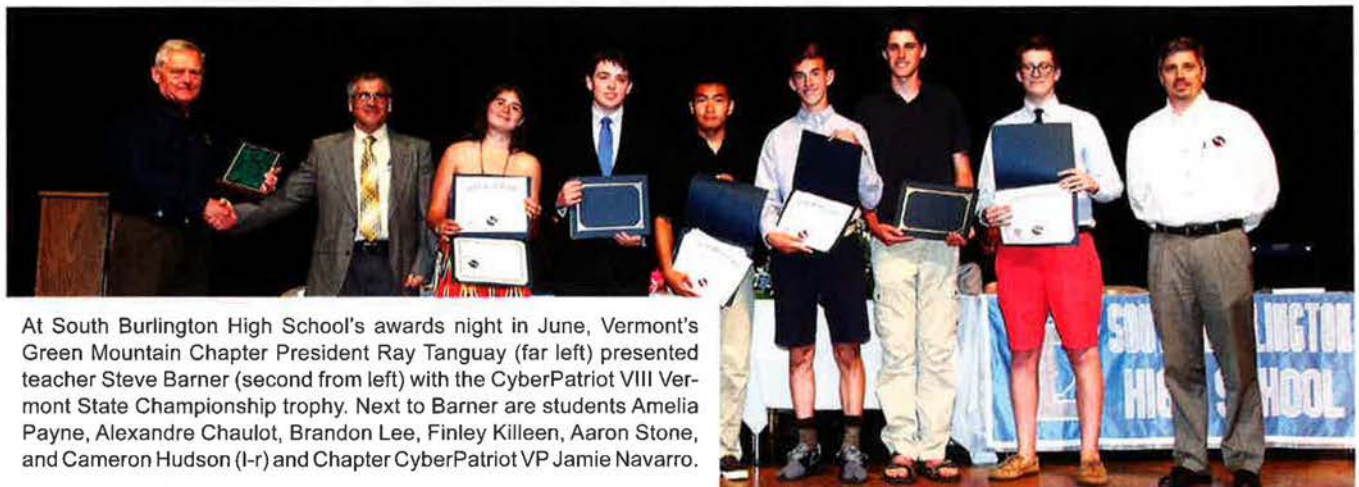
Past Cook Chapter President James A. Van Eynde received the AFA Distinguished Service Medal, and Chapter Vice President/Aerospace Education Philip Z. Horton III was awarded an AFA Medal of Merit.

Retired Lt. Col. Jack R. Trimble, a Cook Chapter member and Vietnam War POW, was convention keynote speaker. He was an F-4 Phantom pilot when shot down over North Vietnam in 1972. Trimble prepared a multimedia presentation for the convention, with photographs and video taken during his captivity at the infamous "Hanoi Hilton" POW prison. He also showed photos taken during his return to Vietnam in 2012—exactly 40 years after his capture. He spoke of the natural beauty of the country and the resilience and dignity of its people. The audience was captivated by his story, particularly the cadets and students.

—Joseph C. Bryant, Everett Cook Chapter secretary



Lewis E. Lyle Chapter's Teacher Of The Year, Melody Gilleran (right), was named Arkansas State Teacher of the Year. Arkansas State President Jerry Reichenbach (left) presented the award. Gilleran is a facilitator for environmental and spatial technology at Fountain Lake High School in Hot Springs, Ark.



At South Burlington High School's awards night in June, Vermont's Green Mountain Chapter President Ray Tanguay (far left) presented teacher Steve Barner (second from left) with the CyberPatriot VIII Vermont State Championship trophy. Next to Barner are students Amelia Payne, Alexandre Chauot, Brandon Lee, Finley Killeen, Aaron Stone, and Cameron Hudson (l-r) and Chapter CyberPatriot VP Jamie Navarro.



## SARASOTA-MANATEE CHAPTER

Veterans got in free when the Sarasota-Manatee Chapter hosted a showing of the movie "Lone Survivor" in April in Sarasota, Fla.

The 2013 movie is based on Marcus Luttrell's memoir—a *New York Times* best seller—and stars Mark Wahlberg. It tells the story of a Navy SEAL team on a covert mission in Afghanistan in 2005.

Some 50 chapter members and guests attended the Saturday screening of the movie at the Regal Cinema, wrote Chapter President Michael E. Richardson.

Afterward, Brig. Gen. Robert G. Armfield and SMSgt. Bradley T. Reilly delivered a presentation on Air Force special operations. Armfield is vice director of strategy, plans, and policy at US Central Command, MacDill AFB, Fla. Reilly is director of the Joint Special Operations Forces Senior Enlisted Academy. He had met the real-life SEALs depicted in the movie when he was deployed to Afghanistan.



Photo via Michael Richardson

SMSgt. Brad Reilly (left) and Brig. Gen. Robert Armfield joined former AFA Chairman of the Board Sandy Schlitt (center) for the Sarasota-Manatee Chapter's screening of the movie "Lone Survivor."



Photo by Tim Matczak/AFAP

In Pennsylvania, York-Lancaster Chapter President Edwin Hurston attaches an AFA pin to the shirt of Chapter Teacher of the Year Andrew Friedlund.

## YORK-LANCASTER CHAPTER

The York-Lancaster Chapter in Pennsylvania named Andrew Friedlund as its 2016 Chapter Teacher of the Year.

A science teacher at J. P. McCaskey High School in Lancaster, Friedlund started a robotics program there and soon began looking for funds. He found a resource in the teacher in the classroom next door: senior aerospace science instructor retired Col. Edwin A. Hurston, who also happened to be the York-Lancaster Chapter president. Hurston steered him to an AFA-Civil Air Patrol program that allowed the chapter to sponsor Friedlund—at no cost—to become a CAP Aerospace Education Member. Through the program, Friedlund received a STEM kit that led to his students building a robot. ★

## Reunions

reunions@afa.org

**1st Flight Det.,** Nha Trang AB, Vietnam (1964-72). Sept. 26-29 in Fort Worth, TX. **Contact:** Norman Baker (972-357-7923) (ndbaker64@yahoo.com).

**39th Fighter Squadron.** Sept. 14-18 in San Antonio. **Contact:** L. Haddock (719-687-6425) (comm63@mac.com).

**384th Bomb Group (WW II).** Oct. 19-23 in St. Louis. **Contact:** Debra Kujawa (912-748-8884) (managingdirector@8thafhs.org).

**4080th SRW.** Sept. 22-24 at Ramada Inn Del Rio, Del Rio, TX. **Contact:** George Pride, 309 S. Main St., Del Rio, TX 78841 (830-719-9380) (laughlinhf@att.net).

**Air Weather Recon Assn.** Sept. 28-Oct. 2 in Dayton, OH. **Contact:** Bob Tuttle, 17118 Hideaway Ridge Rd., Eagle River, AK 99577 (907-242-5479).

**Assn of Former OSI Special Agents.** Sept. 7-11 in San Diego. **Contact:** John Perryman (muffin@olg.com).

**Phan Rang AB.** Oct. 6-9 in Oklahoma City. **Contact:** Lou Ruggiero (914-589-4974) (louruggs@comcast.net).

**Pilot Training Class 64G,** Webb AFB, TX. Oct. 6-9 at the Desert Diamond Casino Hotel, Tucson, AZ. **Contact:** Dick Johnson (rklmj59@cox.net).

**Pilot Training Class 66-H,** Vance AFB, OK. Sept. 28-Oct. 2, in Washington, DC. **Contact:** Skip Foster (flyerskip@cs.com).

**U Tapao Royal Thai Navy Airfield, Thailand.** Sept. 27-Oct. 1, Doubletree by Hilton, Reid Park, Tucson, AZ. **Contact:** Jim Gilmore (utapao1@gmail.com).

### Having a Reunion?

Email reunion notices to [reunions@afa.org](mailto:reunions@afa.org) or mail notices four months ahead of time to "Reunions," *Air Force Magazine*, 1501 Lee Hwy., Arlington, VA 22209.



## F-22 Raptor



With the F-22 Raptor, the Air Force acquired unequaled power to project air dominance. Lockheed Martin's single-seat, twin-engine, all-weather fighter blended stealth, supercruise, great agility, and all-sensing avionics. Those features, plus high reliability and low maintenance, marked a huge leap in capability over USAF's own F-15 Eagle, long the class of air combat. Indeed, the F-22 could not be matched by any known or projected fighter.

The F-22, with clipped-delta wings, made heavy use of lightweight composite materials. Its turbofans generated thrust greater than any fighter engine and sported thrust-vectoring nozzles. Sleek aerodynamic design and great power enabled it to "supercruise"—or fly at supersonic speeds without resorting to afterburners. At the center of F-22 design was its stealthiness, evidenced in very low radar, infrared, acoustic, and even

visual signatures. Stealth greatly improved the fighter's survivability and lethality against air-to-air and surface-to-air threats. The result was a "first-look, first-shot, first-kill" combat capability.

The Raptor brought supreme air-to-air power; configured for air battle, it carried six AIM-120 and two AIM-9 missiles. It possessed significant air-to-ground capability—two 1,000-pound or eight 250-pound bombs. With advanced sensors and communications, it could function as a "mini AWACS" to watch the battlespace and direct other fighters. Its primary weakness is low numbers. Secretary of Defense Robert Gates capped production at 187 despite a validated need for 381.

—Robert S. Dudley with Walter J. Boyne

**This aircraft:** USAF F-22A Raptor—#10194—as it looked in 2013 when assigned to 94th Fighter Squadron, 1st Fighter Wing, JB Langley-Eustis, Va.



USAF photo by S/A Kayle Newman

*An F-22 during an exercise at JB Langley-Eustis, Va.*

### In Brief

Designed, built by Lockheed Martin and Boeing ★ function, air dominance ★ first flight Sept. 29, 1990 (YF-22); Sept. 7, 1997 (F-22) ★ number built 197 (187 production + eight test + two prototypes) ★ crew of one pilot ★ two Pratt & Whitney F119-PW-100 turbofan engines with thrust-vectoring nozzles ★ defensive armament, one 20 mm M61A2 Vulcan cannon; up to eight missiles (six AIM-120 AMRAAM + two AIM-9 Sidewinder, carried internally) ★ load, up to 2,000 lb (two 1,000-lb JDAM or eight 250-lb GBU-39 Small Diameter Bombs) ★ max speed 1,500+ mph ★ cruise speed 1,220 mph ★ max range 1,840 mi (with two external tanks) ★ combat radius 470 mi ★ weight (max T/O) 83,500 lb ★ span 44 ft 6 in ★ length 62 ft 1 in ★ height 16 ft 8 in ★ service ceiling 65,000+ ft.

### Famous Fliers

**F-22 Firsts:** Kevin Sutterfield (first combat engagement); Steven Rainey (first USAF pilot); Dawn Dunlop (first female USAF pilot); Michael Schaner (first ANG pilot); Paul Moga (first demo team pilot). **Accident Fatalities:** Jeffrey Haney, David Cooley. **USAF Notables:** Mike Hostage, Burton Field, Stephen Hoog,

C. D. Moore, Darryl Roberson, Tod Wolters; Mark Barrett, Thomas Bergeson, Jeffrey Harrigan, James Hecker, Matthew Molloy, John McMullen; James Browne, Andrew Croft, Hubert Hegtveldt, John Hillyer, Kevin Huyck, David Krumm, Donald Lindberg, Robert Nolan, Thomas Tinsley. **Other Notable:** Michael Wosje (Navy F-22 pilot). **Test Pilots:** YF-22—Dave Ferguson (YF-22 first flight); William Jabour; Mark Shackelford (first USAF YF-22 pilot); Paul Metz (F-22 first flight); David Cooley; Carl Schaefer.

### Interesting Facts

Won 2006 Collier Trophy ★ barred from export due to classified features ★ appeared in films "Transformers," "Iron Man," "Olympus Has Fallen" ★ named "F/A-22" for brief period ★ selected over Northrop YF-23 ★ considered—but rejected—as Navy carrier fighter ★ built with parts produced in 46 states ★ demonstrated Herbst Maneuver and Pugachev's Cobra ★ used titanium alloys and composites for 39 and 24 percent, respectively, of structure ★ posed radar cross section equal to steel marble.

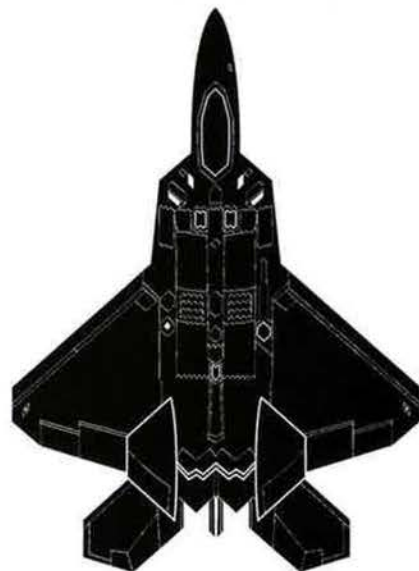


Illustration by Zour Eylanbekov





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