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Funding Crisis 60



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AIR & SPACE FORCES

September 2022 Vol. 105, No. 9

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SpaceX

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Senior Airman Stephen Pultar

A 199th Fighter Squadron F-22A Raptor approaches a 909th Air Refueling Squadron KC-135 Stratotanker over the East China Sea. What's Next for the F-22, see p. 40

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Air Force Magazine (ISSN 0730-6784) September 2022 (Vol. 105, No. 9) is published monthly, except for two double issues in January/February and June/July, by the Air & Space Forces Association, 1501 Langston Blvd, Arlington, VA 22209-1198. Phone (703) 247-5800. Periodical postage paid at Arlington, Va., and additional mailing offices. **Membership Rate:** \$50 per year; \$35 e-Membership; \$125 for three-year membership. **Subscription Rate:** \$50 per year; \$29 per year additional for postage to foreign addresses (except Canada and Mexico, which are \$10 per year additional). Regular issues \$8 each. USAF Almanac issue \$18 each. **Change of address** requires four weeks' notice. Please include mailing label. **POSTMASTER:** Send changes of address to Air Force Association, 1501 Langston Blvd, Arlington, VA 22209-1198. Publisher assumes no responsibility for unsolicited material. Trademark registered by Air & Space Forces Association. Copyright 2022 by Air & Space Forces Association.

By Tobias Naegele

National Treasure

Washington, D.C. is a city of monuments and memorials. The Washington, Lincoln, and Jefferson Memorials, each iconic in its own way, loom large not just in the cityscape but in the national consciousness. They are destinations for families and school groups, political activists, and foreign tourists. They pay tribute to three Presidents and their foundational contributions to the American experiment.

Looming even larger than these, however, are the working monuments of American power and symbols of our democratic republic. The Capitol, with its great wedding-cake dome and repetitive pillars, and the White House, with its stately porticos, are recognizable not just to Americans, but to people the world over.

The Capitol was brand-new when it was burned by British raiders in the War of 1812. Americans rebuilt it, bigger, grander, greater than before. When President Harry S. Truman moved into the White House following Franklin Delano Roosevelt's death in April 1945, it was approaching its sesquicentennial and in deep disrepair. In letters home to his wife and daughter in Missouri, he mused that the creaks and groans he heard overnight were the ghosts of Presidents past. "I sit here in this old house and work on foreign affairs, read reports, and work on speeches—all the while listening to the ghosts walk up and down the hallway and even right here in the study," Truman wrote his wife in 1945. "The floors pop and the drapes move back and forth."

Ghosts or not, the old mansion was falling apart. In 1948, he moved out, the White House was gutted, and then completely rebuilt.

That is what we do with national treasures: We preserve them.

Our Air Force is also a national treasure, and it too is in need of renovation, preservation, and reinvention.

As the Department of the Air Force turns 75 this month, Washington will enjoy a grand Air Tatoo, host a gathering of international air chiefs, and converge on National Harbor, Md., for the Air & Space Force Association's largest-ever Air, Space & Cyber Conference. There is much to celebrate. Yet, there is much to be done. The U.S. Air Force and Space Forces of tomorrow must not be allowed to decline into memorials to a greatness of the past; they must, rather, be reinvigorated and reinforced to be the working monuments of American power our nation needs.

Four years ago, Air Force Secretary Heather Wilson shared the broad overview of a classified analysis she called "The Air Force We Need." This analysis identified requirements for 386 operational squadrons, 74 more than the Air Force had at the time. This was arguably the most definitive study to date comparing the national defense strategy's requirements and the operational capability and capacity of its Air & Space Forces.

Wilson and then-Chief of Staff Gen. David L. Goldfein were sounding an alarm, declaring an emergency that should have galvanized the American public to a crisis in their midst. But the warning was lost amid the crazy politics of the time. Within months, Defense Secretary

James Mattis would quit the Pentagon; Wilson would depart the Air Force for a new role in academia; and the Air Force We Need would be set aside, viewed as an academic exercise incompatible with the Air Force We Can Afford.

This month we share the second of a three-part series of interviews with every former Air Force Chief of Staff since 1990 (the series concludes next month with Gens. Michael Ryan and Goldfein). Collectively, their story is that of an Air Force on a downward trajectory, managing resources and preserving capability, but gradually being strangled by endless budgetary debate and the unyielding economics of supply and demand. With too few airplanes, not enough people, and insufficient resources (supply), the Air and Space Forces have struggled to meet combatant commanders' requirements (demand).

Well-informed air power aficionados know this story well. We talk about it among ourselves all the time. The problem is that the rest of the country is largely unaware. The occasion of the Air Force's 75th birthday is a good time to tell that story, because it's not the story Americans expect to hear. It is, however, the story they need to hear.

Elsewhere in this issue Lt. Gen. David Deptula and Col. Mark Gunzinger offer a deep and compelling analysis demonstrating the scale of the financial shortfall the Air Force suffered over the past three decades and the decline in our nation's prioritization of air and space power. The charts unmask the effects of budgetary gimmicks and lays bare the fact that the Air and Space Forces receive a smaller net investment than the Departments of the Army, the Navy, and the collective "fourth estate" of other

A New Title for a New Era

Welcome to Air & Space Forces, the magazine of the Air & Space Forces Association. The birth of the Space Force in 2019, like that of the Air Force in 1947, reset the stage in national security affairs and the reverberations will continue for years to come.

In April, after more than 76 years as the Air Force Association, AFA became the Air & Space Forces Association, elevating space in our title in recognition of our equal support for and commitment to the advancement of space power along with air power, and our belief that the two, while distinct, have clear and indelible links.

First published as "Air Force Magazine" in December 1942 as an official military publication at the behest of the Chief of Army Air Forces Gen. Henry H. "Hap" Arnold, the magazine predates AFA by three years. Arnold wanted a magazine that could tell the story of the Army Air Forces not to itself, but ultimately to the American people. That remains our mission today.

Changing the title of a storied publication—and association—is not something to be taken lightly. A title must define who we are and what we're about. Air & Space Forces magazine does the job.



defense agencies.

"The question for the United States of America," says former Air Force Gen. Mark Welsh, "is who do we want to be in the future? Do we want to be the global superpower? Do we want to be a major regional power? Do we want to roll up the sidewalks, draw a line to the ocean, and say, 'Stay away and leave us alone'? That's a national decision."

That question has been before the country for a generation. "Primacy remains our grand strategy," Welsh said. "But as a nation, we haven't been able to do that since the mid-'90s. We can't respond everywhere on Earth, we can't do all those things anymore. We don't have the force structure, period. People can act like we do, but we do not."

Take that message far and wide.

It does little use to talk amongst ourselves about the good old days or about what's wrong today if the sources and solutions for fixing these problems lay elsewhere. That's a message that needs to be heard far and wide, not just among Air Force insiders. The White House wasn't gutted until after a piano leg dropped through the floor, finally convincing engineers that the structure was no longer sound. We can't afford to wait for things to get so dire for the Air & Space Forces.



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AFA's Mission

Our mission is to promote dominant U.S. Air and Space Forces as the foundation of a strong National Defense; to honor and support our Airmen, Guardians, and their Families; and to remember and respect our enduring Heritage.

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- **Educate** the public on the critical need for unrivaled aerospace power and a technically superior workforce to ensure national security.
- **Advocate** for aerospace power, and promote aerospace and STEM education and professional development.
- **Support** readiness for the Total Air and Space Forces, including Active Duty, National Guard, Reserve, civilians, families and members of the Civil Air Patrol.

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KC-46 Facts

I applaud you for what I consider a well written article on the KC-46 and its successes and challenges. I've been Air Mobility Command's KC-46 lead for two years and have read every article produced on the aircraft. You were able to accurately capture what the deficiencies we are working though really mean to our boom operators and receiver pilots and yet, simultaneously articulate some of the technologies that make the KC-46 an incredible asset in our nation's military inventory.

Regardless of how an article about the KC-46 is aligned (positive, neutral or negative), having it factually correct and in the right context is of utmost importance to me. Yours delivered on that! I rarely reach out to authors, but felt the need to as a result of your recent work. Well done.

Brig. Gen. Ryan R. Samuelson,
Air Mobility Command
Scott AFB, Ill.

Chiefs

The electric copy of this article is eye-opening! ["Four Chiefs" August 2022, p. 52].

No doubt who the author likes; but the amount of money wasted on a series of useless "new" uniforms and other fashions would have funded a lot of warrior equipment.

In addition his reorganizations made no sense, except to shake up and waste funds on new stationary, flags, signs, patches while adding nothing to function. One wonders if Dugan might not of served the country's needs better.

If all Chiefs could fly as well as Jumper or focus on the troops like Fogleman; the Air Force would be in a superior condition.

The admission that the AEF/EAF was

not a stable idea is the first truth about that fantasy I have seen published. The concepts were based upon purely imaginary numbers and never looked at personnel as anything but a series of AFSCs.

The treatment of the USAF in the 90's was a disgrace particularly when the Army couldn't even get assets to Clinton's military diversion, from his scandal, to fight.

Since then the requirements for Chief seem to have morphed into lemmings as we have had a series of political appointees.

Interesting question, why skip Chief [Micheal E.] Ryan?

Lastly, the quality of Air Force Secretary starting sinking around this time and continues to raises serious questions about the support for the warriors vs the ever-changing social engineering experience.

Charlie McCormack,
Danville, Calif.

Rules of Engagement

It appears that the former mission of the Air Force, which was 'to deter any aggression on the U.S. and its allies and if deterrence fails, to defeat the enemy' has been reduced to four priorities as stated in "A Strategy on the Installment Plan," Air Force Magazine, June/July 2022. The article cites four priorities of the new National Defense Strategy, briefly to defend the homeland, deter attacks on the U.S. and allies, deter aggression by being able to win wars and build a resilient joint force.

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WRITE TO US

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

What happened to “destroying the enemy? Have we lost the ability or the will to do so?

The article also reflects on a lessons learned from the Ukraine War, mainly the Ukrainians’ will and capability to fight. To me the lessons that should have been learned are that U.S. sanctions, defensive weapons, and standing down U.S. forces and allies only led to the physical destruction of Ukraine. Therefore, the weapons that should be pursued by the U.S. in defense of Taiwan should be capable of destroying targets which are equivalent to what the PRC attacks on Taiwan. Additionally, U.S. and allied forces need to be deployed to Taiwan’s territory as soon as enemy forces are determined to be preparing for war against Taiwan.

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

Eye On NATO

Finland and Sweden are poised to apply to join NATO [“Strategy & Policy: The Chinese-Russian Axis After Ukraine,” August, p. 18]. What does this do for NATO’s strategic situation (and Murmansk)?

What steps are being taken to reinforce the NATO nations closest to Russia?
[Re:] Russian blockade of Odessa

Editor’s Note: In the August issue’s “75 Years of Innovation in Flight,” several photos were mis-captioned due to production errors. The pages were corrected online and are reprinted here with the correct captions:



F-22 Raptor



F-106 Delta Dart



HH-3E Jolly Green



HH-53 Super Jolly Green

and Ukrainian wheat: There may not be starvation or malnutrition in some Middle East countries today, but it is likely to come because of the blockade of the wheat shipments (or any shipments) out of Odessa to the Middle East. Could NATO protect ships in the coastal waters of Turkey, Bulgaria, and Romania? This would leave only a 40-mile stretch of Ukrainian coastal waters for these ships to traverse. What would it take to protect

ships in this area?

There are many, many aspects of the Ukrainian War that I think AFA should be writing about, but, except for a paragraph here and there, you aren’t writing about the Ukrainian War. Why not? Is there some prohibition about writing about the war? It’s in all the papers, TV channels, youtube.com.

William Thayer
San Diego

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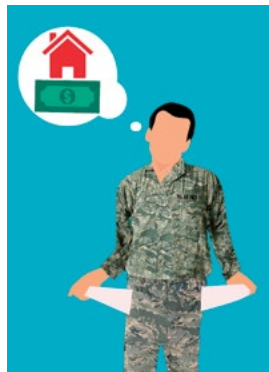
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What's the Point



Mike Tsukamoto/staff; Pixabay

"If you can't afford your job, why the hell would you stay in the job?"

—**Kate Needham**, co-founder of the nonprofit Armed Forces Housing Advocates, on the widening discrepancy between BAH payments and housing market costs, quoted by Associated Press [Aug. 20].

Safe Space

"The protection of civilians is a strategic priority as well as a moral imperative. Our efforts to mitigate and respond to civilian harm directly reflect our values and also directly contribute to achieving mission success. The excellence and professionalism in operations essential to preventing, mitigating, and responding to civilian harm is also what makes us the world's most effective military force. It is therefore critical that we continue to improve our efforts to mitigate the harm that armed conflict visits upon civilians."

—Secretary of Defense **Lloyd Austin** in a memo to Pentagon leaders, commanders of combatant commands, and defense agency and field directors, introducing a new Civilian Harm Mitigation and Response Action Plan, Aug. 25.



Presidential Office of Ukraine

Homeward Bound

"We will bring freedom to Ukrainian citizens in Crimea, and we will restore justice to all those who suffered from the repression and abuses of the Russian occupiers. ... I know that Crimea is with Ukraine, is waiting for us to return. I want all of you to know that we will return. We need to win the fight against Russian aggression. Therefore, we need to free Crimea from occupation."

—Ukraine President **Volodymyr Zelensky**, speaking Aug. 23 at an online forum called the Ukrainian Platform.



Senior Airman Nick Emerick

WE'RE NOT READY

"The war in Ukraine should galvanize Washington policy makers. It has demonstrated that America's defense-industrial base isn't up to the job of supplying the U.S. military with weapons for a prolonged conventional conflict with a major power such as China."

—**Elbridge Colby**, co-founder and principal, The Marathon Initiative, former U.S. Deputy Assistant Secretary of Defense for Strategy and Force Development, and **Alexander Gray**, senior adviser, The Marathon Initiative, former White House Deputy Assistant to the President and Chief of Staff of the National Security Council, in editorial "America's Industrial Base Isn't Ready for War With China" [Wall Street Journal, Aug. 19].

LOVE WHAT YOU DO

"There's increased responsibility, there's increased risk, but there's increased reward too—more experience across the force, and we do our best to give those days back. But there's something to be said that we're here to accept that responsibility of giving our weekends to the Air Force and what we're supporting."

—**Capt. Lori Ingersoll**, KC-135 pilot at RAF Mildenhall, U.K., on the effect of the Russia-Ukraine war on their ops temp [July 29].

Protect Democracy



Mike Tsukamoto/staff; Adam Jones; LexieBee Photography

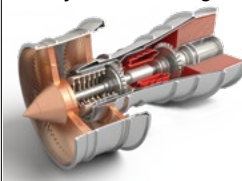
"Our delegation came to Taiwan to make unequivocally clear that we will not abandon Taiwan. Now, more than ever, America's solidarity with Taiwan is crucial, and that's the message we are bringing here today."

—Speaker of the House **Nancy Pelosi** to Taiwan's President Tsai Ing-wen, who Beijing suspects of pushing for formal independence—a red line for China, during her roughly 19-hour visit to Taiwan [Reuters, Aug. 3].

RUNNING IN PLACE

"The perception I think that's out there is that we're maintaining, if not advancing, our military advantage in propulsion. And that's always been because we've always had the world's greatest advantage in propulsion. But the reality is that ... we're essentially stagnating, and we're starting to lose our lead."

—**John Sneden**, director of the Air Force Life Cycle Management Center propulsion directorate, at LCMC Industry Days, Dayton, Ohio [Aug. 11].



Mike Tsukamoto/staff; Speed-Modeling/Pixabay

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By John A. Tirpak

After Ukraine, A Stronger NATO



Tech Sgt. Corban Lundborg

Viewed from the cabin of a B-52H Stratofortress high over Sweden, three Swedish JAS-39 Gripen fighter jets emerge from the clouds as escorts during a recent bomber task force mission. Sweden, long a nonaligned ally, will soon join NATO as a full member of the alliance, an expansion driven by Russia's war against Ukraine.

Whether Vladimir Putin calculated that the West would shrug off his invasion of Ukraine or respond with little more than sanctions, he now faces a far stronger NATO—enlarged with new members, invigorated with more troops on alert, equipped with more advanced equipment, and committed to increased defense spending.

The U.S. Senate voted 95-1 in early August to approve the inclusion of Finland and Sweden into NATO. The two countries were officially invited to join the alliance on June 29; every NATO ally must agree to adding new members. All but a few alliance members have ratified their admission thus far, and none are anticipated to oppose their inclusion.

Russia's closest ally among NATO members, Turkey, offered mild objection, but quickly relented when it received assurances that Finland and Sweden would moderate their support for Turkish opposition groups that Ankara brands as terrorists.

The addition of Finland and Sweden will bring to 32 the number of full NATO members, and put all of Scandinavia—Denmark and Norway in the NATO column. It adds 800 miles of NATO border to Russia's frontier, including nearly all of the Baltic Sea (except for Russian access on the Gulf of Finland near St. Petersburg and Kaliningrad, Russia's isolated enclave on the Polish coast).

The two new members also bring under the NATO banner hundreds of combat aircraft with modern gear and weapons, thousands of armored combat vehicles, dozens of modern naval vessels, and nearly 100,000 military personnel. In addition, while Sweden alone has some 60,000 personnel under arms among its Active, Guard,

Reserve, and conscription forces, Stockholm intends to increase that figure to 90,000 by 2025.

Finland ordered 64 F-35s prior to its NATO application, which will give it one of the largest stealth aircraft fleets in Europe when the jets are delivered over the next eight years, eventually replacing Finland's 55 U.S.-made F/A-18s. Finland also has more than 60 U.S.-made AGM-158 JASSM stealthy ground-attack missiles and an array of American air-to-air and air-to-ground ordnance.

Although there Russian and Swedish or Finnish forces held goodwill visits over the decades, the two Scandinavian countries more often exercised with NATO. They also share Western equipment—Sweden uses U.S. GE F404 engines in its frontline generation 4+ Gripen fighters, for example, and they also use U.S. weapons. Integration with NATO should be quick and practically seamless.

The only “no” vote in the Senate came from Josh Hawley (R-Mo.), who said “expanding NATO ... will commit us to sending more troops and spending more money and devoting more resources to Europe,” distracting from China's threat. Sen. Marco Rubio (R-Fla.) countered that a stronger NATO “allows us to focus on China.”

NO DOWNSIDES

James J. Townsend Jr., adjunct senior fellow in the Center for a New American Security's Transatlantic Security program, said neither Finland nor Sweden come with any baggage such as Hungary's autocratic-leaning Viktor Orban, or Turkey's Recep Erdogan.

“Basically, there are no downsides,” he said. Neither Finland nor Sweden come with any “pre-existing conflict” that could be “flash-

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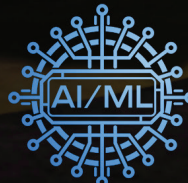
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points" with Russia, and each has thousands of trained troops and top-of-the-line military equipment and training.

"They are not going to cost us anything," said Townsend, who was deputy assistant secretary of defense for NATO and European Defense for eight years during the Obama administration. Neither country needs NATO to build any bases in their country, and when exercises are run on a member's soil, "typically ... it's the host nation that pays," he said.

As for facilities, those would be funded by NATO when needed. If NATO needed a warning radar in Finland, for example, NATO would pay, just as NATO funded a tank disembarkation port in Bayonne, N.J., because the facility benefited the alliance, not just the U.S.

Adding Sweden and Finland expands NATO's ability to monitor Russian activities in the Arctic, particularly submarine activity, Townsend continued.

Finland and Sweden are "as solid as they come" as independent democracies, and both "learned a bitter lesson" from Denmark and Norway being seized by Nazi Germany in WWII. Finland "fought the ... Soviets twice," Townsend said, and both have "kept up with their defense."

Today, they have two of the most modern defense enterprises in Europe, Townsend said, with an intertwined defense and commercial industry. In fact, they are in far better shape than some NATO members, in particular former Warsaw Pact countries that are still using old Soviet hardware.

Finland and Sweden might have stayed out of a conflict in the Baltics in the past, Townsend said, but now, "they've solidified our northern flank."

For Russia, their joining NATO is "more a complication" than "catastrophic," because neither poses a direct threat to Russia.

"What's happened is that it's ... removed the ambiguity" for Russia over whether it would face the two countries in a fight with NATO, he said. Until now, "they didn't know" if Finland and Sweden would join a war on the side of NATO; "now they do." Under Article Five of the NATO charter, an attack on any member is considered an attack on all.

The two countries also have a long history of standing alongside NATO "in real world operations ... like Afghanistan, Iraq, Libya. They played various roles" in those countries, "so they're not an unknown quantity" to the alliance.

NATO's 12 charter members included Belgium, Canada, Denmark, France, Iceland, Italy, Luxembourg, the Netherlands, Norway, Portugal, the U.K., and the U.S. (1949). Greece and Turkey came aboard in 1952; Germany in 1955, and "NATO's 16 Nations" was set when Spain joined up in 1982. It would be 17 years before the next big expansion in 1999, when former Warsaw Pact nations Czech Republic, Hungary and Poland signed on, followed by the "big bang" expansion of 2004, when Bulgaria, Estonia, Latvia, Lithuania, Romania, Slovakia, and Slovenia were added. Albania and Croatia were admitted in 2009; Montenegro in 2017, and North Macedonia in 2020.

Ukraine was put on the NATO Membership Action Plan (MAP) in 2008, but its membership was put off in 2010 when then President Viktor Yanukovich wanted to remain unaligned. Following Russia's 2014 invasion of Crimea, the government resumed talks to join NATO and at the 2021 NATO Brussels summit, Ukraine was back on the MAP, which sets conditions for membership, including military readiness and interoperability requirements.

NATO Secretary General Jens Stoltenberg said Russia would not have a "veto" over Ukraine's membership, but Putin disagreed, invading Ukraine earlier this year. With war underway, admitting Ukraine now would be tantamount to declaring war on Russia.

NATO'S BIGGEST OVERHAUL

In the wake of Russia's invasion NATO has stepped up defense spending, accelerating a trend that began a few years earlier. Since

2014, when NATO nations committed to spending at least 2 percent of their Gross Domestic Product on defense, alliance members have collectively increased defense spending "well over 350 billion U.S. dollars," Secretary-General Jens Stoltenberg said in June. The U.S. alone added \$58.1 billion increase to its 2022 funded programs the Pentagon didn't ask for, however.

In a press conference on the eve of the NATO Madrid summit in June, Stoltenberg said Putin's invasion of Ukraine had made Russia "the most significant and direct threat to our security." NATO increased the number of "our highest-readiness forces" from just 40,000 in the NATO Response Force to over 300,000, and agreed to alliance-wide "pre-positioning ... and stockpiles of military supplies," he said. It has added "more forward-deployed capabilities, like air defense," strengthened command and control, and upgraded its defense plans, he stated, "with forces pre-assigned to defend specific allies."

These forces "will exercise together with the home defense forces" of individual countries, to become better acquainted with the terrain, facilities, and pre-positioned gear, he noted, "so they can respond smoothly and swiftly to any emergency."

Overall, Stoltenberg said, "this constitutes the biggest overhaul of our collective deterrence and defense since the Cold War."

Nine allies have reached or exceeded the goal; 19 have plans in place to reach it by 2024, and "five have made commitments to meet it thereafter," according to Stoltenberg. That's a huge change since 2014 when only three countries met the 2 percent threshold. What's more, he said, 2 percent is "a floor, not a ceiling."

The alliance has committed billions in defensive gear to help Ukraine defend itself and has "a new 1 billion Euro NATO Innovation Fund" to invest in dual-use emerging technologies.

Stoltenberg noted that NATO is deepening ties to allies including Australia, Japan, New Zealand and South Korea, all of which attended the NATO summit "for the first time." Georgia—which Russia invaded in 2008—also participated, as did representatives of the European Union. Concerns about China were a consistent theme during the Madrid summit.

ARTICLE 5 IS REAL

Expressing confidence that Putin "understands our collective security guarantees ... and the consequences" of attacking any NATO member Stoltenberg voiced concern about "the military buildup in Kaliningrad," where Russia has deployed its most advanced S-400 air defense systems. That gives Moscow the potential ability to shoot down aircraft long before they approach Russia, while they're still deep inside Germany and Poland, or high over the Baltic Sea.

Stoltenberg touted increased Baltic Air Policing and an influx of 40,000 troops under NATO command, "most of them in the eastern part of the alliance and many in the Baltic region." The intent: "to send a message that we are ready to defend every inch of allied territory."

He said that military actions go hand-in-hand with economic sanctions, which the alliance rapidly imposed on Russia and which members are sticking with.

Russia agreed as recently as 2010 to be open to arms control talks with NATO, and to have "strategic dialogs" aimed at peaceful conflict resolution. But that's done now, Stoltenberg said, ... Russia is "no longer ... a strategic partner."

Stoltenberg noted the billions of dollars' worth of both lethal and humanitarian aid NATO countries are providing, individually, to Ukraine and promised the flow will continue.

"The allies are prepared for the long haul," he said. Ukrainians are "fighting for their independence ...but also fighting for the values which are important for NATO, fundamental for NATO: the sovereignty [and] territorial integrity of every nation. Therefore, this matters for our security."



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Hybrid Capabilities Propel Industry Partners to “Accelerate Change and Win”

Emerging threats in space and the rise of commercial satellite technologies are driving the national security space sector in a new, hybrid direction to answer the evolving needs of the Air Force and Space Force.

“Traditional aerospace and defense companies develop their national security space systems based on customer requirements and an acquisition strategy,” said Jason Kim, CEO of Millennium Space Systems, a Boeing Company. “But commercial companies don’t have to abide by those requirements or acquisition cycles.”

Commercial companies continually invest to upgrade their technology, as long as they see a return on that investment.

This private financing model provides a unique opportunity for industry partners to push Air Force and Space Force capabilities ahead of modern-day demands to meet the needs of the future.

“Commercial companies are not designing systems based on a requirements pool, an RFP, or an agency’s acquisition strategy,” Kim said. “They are seeing things in the market based on modern technologies that are commercially available and providing that as a capability. It’s becoming more of a commercial technology push that creates new market demand, while also addressing a government requirement not yet thought of before.”

Founded in 2001, Millennium Space Systems, a small satellite prototype and constellation company, embodies this hybrid nature of leveraging both commercial technologies and traditional aerospace and defense industry capabilities, including secure and tailored systems.

“We started off taking a lot of the commercial dual-use technologies that were available at the time and space-qualified them with the aim of providing systems on rapid timelines and at affordable costs,” Kim said. With its acquisition by the Boeing Company in 2018, Millennium gained the capability to scale its systems and deliver

entire constellations of satellites.

“We’re now seeing our systems delivered in missile warning, missile tracking, ISR, and advanced space science missions,” Kim said. To build at that kind of scale, Millennium is continually tech-refreshing. “We invest constantly in research and development and are regularly tech refreshing our components and mission capabilities,” Kim said.

The lessons taken from the first launch of small satellites can be applied to the next launch. “We’re an engineering company, and we operate our spacecraft, so we’re able to get data on all of our spacecraft components on-orbit and feed that back to the design process. We’re able to apply what we’ve learned into how we manufacture our constellations to improve and tech refresh our components every time we deliver them.”

This capability enables the Air Force and Space Force to align with the go-fast message of Chief of Space Operations Gen. John Raymond and his partner in arms, Air Force Chief of Staff Gen. Charles Q. Brown, Jr.

“The Air Force has stated that we have to ‘Accelerate Change or Lose’ to respond to the advanced threats challenging our capabilities,” Kim said. Millennium addresses that imperative by taking “the most advanced systems in the commercial world” and “space-qualifying those capabilities and making them secure and interoperable,” he said.

Millennium builds 80 percent of its spacecraft components in-house. “A majority of those components are using dual-use commercial technologies,” Kim said. “For example, we take battery technology from the commercial automotive industry and apply that to national security space missions to gain cost savings and faster timelines for our customers.”

This is what Kim means by “space-qualifying” commercial tech.

“Space qualification entails having the right experts that know how to test these components for radiation, susceptibility to upsets, and latch up,” he said. Requirements

vary depending on the deployment model.

“The distinct radiation environments of LEO [low-Earth orbit], MEO [mid-Earth orbit] and GEO [geosynchronous orbit] demand different constraints, requirements and limitations on these technologies,” Kim said.

Space-qualifying these technologies requires a rigorous process of radiation testing, vibration testing, and thermal testing in vacuum chambers similar to conditions experienced during a launch and orbit. “Once we test all these components in piece parts, we’re able to take that data and really select the parts that are able to withstand the harsh environments that our systems are going to operate in.”

As part of Boeing, Millennium can access a host of capabilities with expertise in supply chain management, manufacturing, and so much more. “We’re able to take advantage of a lot of resources that [Boeing] provides in mission domain expertise,” Kim said. “[Boeing] has a lot of senior technical fellows that we’re able to deploy to our different flight programs to help us enhance capabilities and overcome challenges. We also have been able to bring in a lot of expertise in model-based systems engineering and digital engineering, which includes the tools that they’ve invested in and the processes that they’ve developed over the years, as well as a lot of the proof points and lessons learned from other programs in other domains.”

Millennium Space Systems remains an agile, flexible player, providing its customers with the best of all worlds: The nimbleness of a startup and the strength and experience of an aerospace giant.

“Millennium can keep ahead of advanced threats, to really sense the threats, track them, and provide information directly to the warfighters,” Kim said. “Our hybrid nature enables us to do two things: Invest to bring forward future capabilities and to rapidly adapt to changing requirements. That’s what our customers need.” ★

MISSILE WARNING AND TRACK ACROSS ORBITS





A Republic of Korea Air Force KA-1 Woongbi flies alongside two 25th Fighter Squadron A-10 Thunderbolt IIs during July's Buddy Squadron 22-5 exercise in the Republic of Korea. The Woongbi light-attack plane is based on Korea's first completely indigenous aircraft design. The July exercise was the first of its kind since the COVID-19 pandemic.

Senior Master Sgt. Hyung Kwon/
ROKAF



An old friend returned to the former Loring Air Force Base in Limestone, Maine, this past July, the first visit of a B-52H Stratofortress in 29 years. The base was once one of the largest Strategic Air Command facilities, but was closed in 1994 and developed as the Loring Commerce Centre, home to industrial, entertainment, and other uses. The Defense Finance and Accounting Service is among the tenants, operating from the former base hospital.



Google

Defense agencies, including the Air Force, are adopting the scalability, flexibility, and speed of cloud data centers. Google Cloud is very deliberate about where it places digital infrastructure.

Google Public Sector: An Innovative Technology Partner for the Future

Born in the early dawn of the Information Age, the U.S. Air Force (USAF) has established a reputation and culture of embracing technological advancements to propel the service forward. Its newly formed sister service, the U.S. Space Force (USSF) is a product of that culture and reflects a vision for national defense that seeks to address the challenges in the cyber and space domains. As the Department of Defense (DoD) pursues its digital modernization strategy, the services are not waiting - pursuing the implementation of their CloudOne strategy, which seeks to enable the USAF and USSF to maintain

at the cutting-edge of the best technology available today. Google Public Sector was created specifically to support the U.S. government's needs, is emerging as an important strategic partner and enabler for the USAF and USSF to realize their Force Design 2030 visions. Specifically, Google Public Sector is helping the services establish capabilities leveraging Google Cloud's commercial solutions that eclipse antiquated "government cloud," or "gov cloud" offerings, which have shown to be less secure, less resilient, and less future-proof.

Indeed, government clouds were originally designed because the U.S.

government was choking on the operational inefficiencies and costs of maintaining thousands of siloed and disparate data centers. In 2010, the Federal Data Center Consolidation Initiative (FDCCI), intended to save the taxpayers between \$5 billion and \$8 billion annually by consolidating U.S. government data on a gov cloud. This was expressly created for U.S. federal, state, and local governments to meet the U.S. government's thorough security and compliance regulations. However, like constructing castles with a single moat around them, gov clouds were by design intended to provide a perimeter defense around U.S. govern-

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ment information—ultimately creating a single pane of attack for cyberattackers to lay siege to (not to mention in the event an attacker was able to breach their defenses).

Since gov clouds were initially conceived and pursued, the internet, and the data riding on it, has grown exponentially. Today, the internet is a virtual superhighway of data transport. Gov clouds have not kept pace, requiring traffic to be routed through a boundary cloud access point (BCAP) that ostensibly forces all of the traffic from that virtual superhighway to use a single lane exit. This requirement has created latency issues, degraded the user experience, and is largely antithetical to the expectations of today's Airmen and Guardians. As the USAF and USSF look to the future, they are seeing the limits of gov cloud solutions that struggle to provide them the support they need at the speed of relevance.

Google Cloud experienced firsthand what happens to a cloud that uses a perimeter defense. In early 2010, in the wake of a nation-state-sponsored cyber attack, called "Operation Aurora," which targeted more than 20 technology companies, Google Cloud found itself a victim and recognized that it needed to go beyond the perimeter-defense approach of gov clouds. Making a strategic decision to design and implement a 21st century enterprise network, Google Cloud's pioneering approach to security could be summarized in two words: zero trust. Instead of creating moats that attackers could infiltrate over time, Google Cloud assumed that bad actors were already on the network and started building controls to manage that risk from within.

Google Cloud created an equivalent software that meets the BCAP security outcomes, without being constrained by the same hardware or physical infrastructure limitations of gov clouds. Intentionally keeping the needs and pain points of their commercial and public sector customers in focus, Google Cloud sought to keep their customers in the fast lane of the digital highway and not be constrained by a suboptimal or bespoke solutions that

could not scale or survive in a dynamic and ever-changing landscape. Google Cloud developed methods of encryption, including encryption keys, to provide a defense-in-depth approach to protecting data - even when the data is at rest.

In addition to encryption, Google Cloud is very deliberate in where it builds global infrastructure and data centers, and allows its customers to direct the geographic distribution of data. Google Cloud has fourteen data centers in the United States - all across the country, from Oregon to Georgia. Google Cloud's data centers are also globally located throughout Europe, South America, and Asia and ready to support the Guardian or Airman where they are located to provide the best and fastest response to their needs. These are just a few examples of how Google Cloud actively seeks to proactively reduce the surfaces of attack, across the entire network, that could otherwise be exploited by bad actors.

With the creation of Google Public Sector in June 2022, Google has signaled it is now prepared to bring its comparative advantage and paradigm-shifting approach to meet the U.S. government's digital transformation requirements.

Rather than create and certify a bespoke gov cloud that is inherently limited, Google has invested in certifying its entire network to meet the U.S. government's thorough security and compliance regulations. At the same time, Google Cloud has worked to ensure its products can be used on any cloud service provider platform. Building in these characteristics from the beginning, Google Cloud is demonstrating a commitment to driving an open approach that encourages competition through multi-vendor, multicloud, and hybrid cloud solutions. Rather than endorsing a winner-take-all approach, Google Cloud is putting the customers' needs first and has intentionally structured its cloud to be adaptable, flexible, and anti-vendor lock-in. Over the past several years, Google Cloud has invested considerable time, money, and human capital to demonstrate how the same services it provides to the public sector either meet or exceed the security and compliance regulations of the private sector.

USAF and USSF visionaries, who have also been looking over the horizon to identify the requirements of the future and seeking the best-in-class commercial solutions can be brought



With the help of Google Cloud, the Air Force Life Cycle Management Center's Rapid Sustainment Office is optimizing aircraft operations and sustainment using data to ensure global strategic advantage.

Rick Goodfriend/USAF

online, are seeing the value Google Public Sector provides. Some of the most innovative units within the Department of the Air Force, like the Air Force Research Lab, are using Google Workspace to drive collaboration within their ranks and among academia and our allied partner nations. Google Cloud is the platform of choice for a range of solutions, like simulation training for pilots, predictive maintenance, and combating cyber threats. For example, with the help of Google Cloud, the Rapid Sustainment Office (RSO) within Air Force Lifecycle Management Center (AFLCMC) is optimizing aircraft sustainment and operations to ensure global strategic advantage, especially in an increasingly complicated security environment.

The way the USAF and USSF have viewed their digital transformations has evolved over time as well, due to their partnership with Google Cloud, and now Google Public Sector. The USAF pivoted from its plan to take a “lift-and-shift” approach to its transi-

tion to the cloud; recognizing the move to the cloud had significant implications beyond simply realizing cost-savings. Instead, the USAF appears poised to embrace the opportunity to fundamentally transform the way it approaches its mission through the use of cutting-edge technology. Similarly, the USSF continues to establish a force that can win in both cyber and space domains and is deliberately pursuing solutions that can operate at the speed and scale it requires. Though much work remains, both services see their respective digital transitions to the cloud as a defining moment. Partnering with cloud service providers that keep pace with the strategic imperatives of today, while simultaneously enabling integration that avoids vendor lock out, and investing in the development of future capabilities that anticipate future service requirements, is critical.

SO WHAT DOES THIS MEAN FOR OUR AIRMEN AND GUARDIANS?

The paradigm shift away from gov

clouds is happening and the digital transformation of the USAF and USSF has begun. Google Public Sector is providing solutions that help Airmen and Guardians perform tasks faster, more efficiently, and more effectively. As important, Airmen and Guardians are starting to explore new and innovative ways to use information—exploring the “art of the possible” in ways they have never enjoyed. At the same time, Google Public Sector is emerging as a strategic partner and thought leader that is committed to providing the best of their battle-tested and validated commercial solutions to the USAF and USSF—ensuring they can operate at the speed of relevance.

As with any change, implementation and adoption take time. However, the Airmen and Guardians in the ranks of the USAF and USSF, both today and in the future, should be more optimistic than ever that their voices are being heard and that their leaders are demanding they have the tools needed to focus on their mission. ✪



Sean Worrell/USAF

Google Cloud is the platform of choice for a range of solutions, like simulated training for pilots, predictive maintenance, and combating cyber threats. U.S. Air Force Second Lt. Charles Keller, left, and Airman First Class Tyler Haselden, use virtual reality flight simulators at the Armed Forces Reserve Center in Austin, Texas.

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Airman 1st Class James Miller

Military forces' reliance on GPS navigation raises the stakes for identifying solutions should an adversary jam signals or harm the constellation. Timeliness and accuracy makes GPS a crucial tool for joint terminal attack controllers and others—on the ground, in the air, and at sea.

GAO Criticizes DOD on GPS Alternatives

By Amanda Miller

The Defense Department's growing reliance on the GPS constellation's navigation and timing signals is increasingly at risk of interference, both by jamming and potential kinetic attack, the Government Accountability Office reports, saying DOD has not done enough to invest in alternatives.

GAO said the Air Force's business case for its Resilient-Embedded Global Positioning System/Inertial Navigation System (R-EGI) are complete, but that the Navy must still finish business cases for its proposed GPS alternatives so Congress can properly oversee and fund the programs.

The GAO report criticized the Pentagon's Precision Navigation and Timing Oversight Council for focusing on modernizing existing GPS constellation at the expense of alternatives. DOD's intent in using this approach is that these alternative sources would work together, even when GPS is available, to check the accuracy of each source, including GPS, and combine information if the quality of a single source degrades."

The most common mode of interfering with GPS is jamming—blocking communication between transmitters and receivers by sending out signals in the same band of radio frequencies, according to the report. Yet while jamming is

limited in geographic range, cyberattacks "can have far greater reach as long as the target is accessible via a computer network, and can present a greater threat" the report said, characterizing "automation and connectivity" as "fundamental enablers of DOD's modern military capabilities" that also "make weapon systems more vulnerable."

USAF's REG-I, a "multi-PNT" receiver for air platforms, includes GPS service plus inertial navigation, with an open architecture to accommodate future alternative PNT mechanisms.

The Navy's receiver, the Upgrade to Global Positioning System based Positioning, Navigation, and Timing Service (GPNTS), adds clocks plus inputs for commercial satellite data. The Navy is also acquiring celestial and inertial navigation systems and an upgrade to its Cooperative Engagement Capability sensor network for situational awareness. The business cases aren't complete for any of the Navy's programs.

The Army's Dismounted Assured Position Navigation and Timing System (DAPS) for troops on foot and its Mounted Assured Position, Navigation, and Timing System (MAPS) for combat vehicles involve inertial systems along with clocks plus receivers for commercial satellite data. DAPS and MAPS have yet to transition from the "urgent" to the "middle tier" or "major capability" acquisition "pathways" like the Air Force's and Navy's.

The report acknowledges that depending on urgency and other factors, the services don't have to turn in completed business cases but said that doing so is a "leading practice" that can help the DOD "improve its acquisition outcomes."

"The information in a complete business case can help decision-makers in DOD and Congress oversee acquisition efforts. With a complete business case, decision-makers can better ensure that the necessary resources are available to match the program's requirements, and that technologies used in a system will work as expected. Without a complete business case,

as is the case with the four Navy efforts, DOD assumes more risk, which may result in reduced capabilities of the eventual system, delayed delivery of PNT capabilities to the warfighter, or unexpected cost increases," according to the report.

The GAO report also pointed out that the DOD's three-tiered PNT Oversight Council "only rarely addressed alternative PNT efforts" and instead "focused its efforts on addressing GPS issues," which DOD officials said was "due to the pressing need to purchase computer chips to support M-code receiver cards," referring to the department's new stronger, encrypted signal. 📶

USAFE, AFSOC Buy SpaceX Internet Service

By Greg Hadley

A pair of Air Force units across two major commands have announced plans to purchase services from SpaceX's Starlink constellation of satellites in low Earth orbit (LEO). The contracts come not long after service leaders praised the effectiveness of the satellite internet service in aiding Ukraine against Russia's invasion.

U.S. Air Forces in Europe-Air Forces Africa contracted SpaceX to use Starlink's services from August 2022 to July 2023, principally for the 86th Airlift Wing, which is the host unit at Ramstein Air Base, Germany, and its tenant units.

The agreement states that SpaceX will "provide either First-Generation or High-Performance satellite terminals and internet service either static/fixed site or portable/mobile to the terminals enabling users to connect devices to the internet," according to contract documents published Aug. 4. That internet service will provide low-latency connectivity and download speeds of up to 500 megabits per second.

The sole-source contract is worth a little more than \$1.9 million and was not contested because "Starlink is the only LEO constellation communications company that currently provides this commercial satellite solution with services to Europe and Africa," the documents state.

That same rationale was cited by the 1st Special Operations Contracting Squadron of Air Force Special Operations Command in its contract with SpaceX published Aug. 5.

That contract will also cover a 12-month period, with SpaceX providing five Starlink terminals as well as access to Starlink's

internet services, for "operational evaluation."

The exact unit that will receive the terminals was redacted from the contract documents, but the 1st SOCONS provides contract support for the 1st Special Operations Wing, one of five wings under AFSOC. The 1st SOW operates everything from CV-22 Ospreys to AC-130J gunships to U-28A Dracos.

The estimated cost of the contract was also redacted.

USAFE-AFACRICA's and AFSOC's moves to purchase commercial satellite internet access come as lawmakers and analysts alike have called for the Department of Defense to rely more on commercial space capabilities for things such as communications and intelligence, surveillance, and reconnaissance.

Russia's invasion of Ukraine has helped to highlight some of the areas where commercial capabilities could be useful. Satellite imagery before and during the conflict have shown Russian troop movements and buildups, and SpaceX has made Starlink available for Ukrainians, allowing the country's government and civilians to more easily communicate despite the chaotic



Tech. Sgt. Brigitte Waltermire/ANG

AFSOC is using Starlink to gain services in Europe and Africa. A 352nd Special Operations Wing CV-22B Osprey transited U.K. skies in August, en route to night-time refueling operations.

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situation on the ground. Founder Elon Musk has even said the constellation has proven resilient against Russian cyberattacks.

"I would ... say that commercial space has been very important in providing capabilities that have been helpful to Ukraine," Chief of Space Operations Gen. John W. "Jay" Raymond said at the Aspen Security Forum in July.

The impact of Ukraine was even mentioned in USAFE's Starlink contract documents.

"With Ukraine's operations emergent communication requirement, the communication requirements within and around eastern European areas in support of Ukraine operations expands daily," the document states. ... "Starlink LEO fulfills the requirement of reducing processing times and increases theater based operations on changing requirements and locations."

At the same time, DOD, led by the Space Force, is still pursuing sizable low-Earth orbit constellations of its own. In particular, the Space Development Agency is planning to launch hundreds of satellites as part of Tranches 0 and 1 of its Transport Layer, though those satellites won't launch until 2023, rolling out over time into 2024. ✪

NRO Director: Agency Will Accept Instructions From Space Command

By Amanda Miller

The leader of the National Reconnaissance Office said the NRO will follow instructions from U.S. Space Command if needed. Meanwhile, the NRO awaits a finding by the Space Force on whether the office's intelligence, surveillance, and reconnaissance activities "need to expand."

In a webinar hosted by AFA's Mitchell Institute for Aerospace Studies on Aug. 4, NRO director Christopher Scolese described how the office is formalizing its roles and relationships among the defense space and intelligence agencies.

Addressing the needs of both the Defense Department and Intelligence Community, the NRO gets its instructions—"what to look at and listen to"—from the National Security Agency and the National Geospatial Intelligence Agency, Scolese explained.

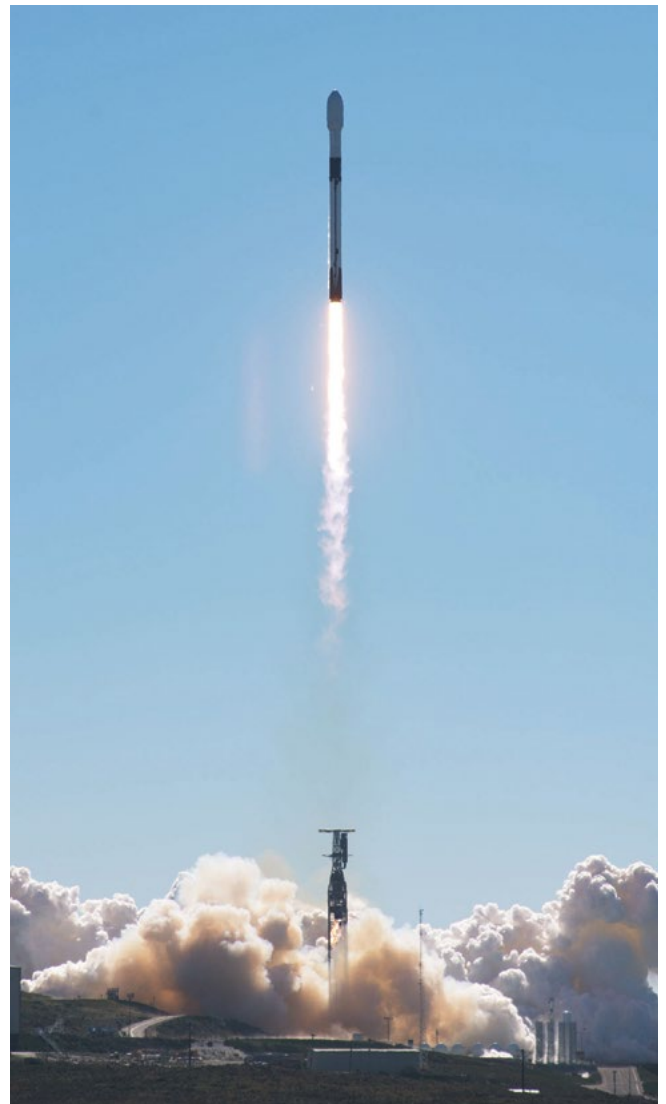
"They collect all the requirements from the combatant commands, from the broader DOD, and from the Intelligence Community," Scolese said. The two agencies "then let us know where the priorities are, and then we go off and manage the constellation."

The NRO has had "a long-standing relationship" with U.S. Space Command and its predecessors, according to Scolese. Now the two entities are hammering out "the framework for how we're going to operate under various conditions."

"Because it will be necessary for us to coordinate and, in some cases, take direction. And we have agreed to do that. We're in the process of developing the strategies on how that happens, and when it happens, and under what situations it happens," he continued. "For the most part, it's a coordination effort, but it sometimes will be, 'Hey, you need to do this.' And we will do that."

Like the Space Force, Scolese said the NRO is adding to its satellite constellations to make them more resilient against attacks—and that doing so is also making the system "more responsive" because with more satellites, the office can revisit sites for observation more frequently.

Smaller satellites built on common buses are also adding to the constellations' resilience because they're fast to replace



Michael Peterson/USSF

A SpaceX Falcon 9 rocket carrying National Reconnaissance Office mission NROL-87, launches from Vandenberg's Space Launch Complex-4, Feb. 2, 2022.

and can be launched from more sites. NRO launches have now taken off from Rocket Lab's New Zealand hub and NASA's Wallops Flight Facility in Virginia in addition to the typical Eastern Range and Western Range launch sites in Florida and California; and an air-launched flight from the U.K. is coming up later this year.

"Having the capability to launch pretty much from almost anywhere in the world gives us great flexibility," Scolese said. "Should we lose a capability either due to a mission failure or ... if we should lose them due to some adversary action that would take them out, we now have more places to go off and launch from and, therefore, reconstitute the constellation."

Scolesse said he didn't foresee big changes to the NRO's role based on a study of its intelligence, surveillance, and reconnaissance activities. He didn't see a need for the Space Force to contract separately for commercial ISR products because it makes the information it acquires readily available.

"So the mechanism is there already for organizations to take advantage of," Scolese expressed. Meanwhile the Space Force is "studying ISR in general. They will find out if we need to expand that, or if it's fine as is, and then we'll adjust, or adjust as a community." ✪

Air Force Keeping F-16s, For Now

By John A. Tirpak

DAYTON, OHIO

With upgrades, F-16s can serve as a numbers-builder in the combat air forces until the 2040s, and it's not necessary to launch its successor yet, program officials said at an industry conference.

"We anticipate hundreds of F-16s in active service for decades to come," meaning into the 2040s, Col. Tim Bailey, Air Force Life Cycle Management Center's F-16 program manager, said in a press conference at the Life Cycle Industry Days.

Brig. Gen. Dale White, program executive officer for fighters and advanced aircraft, said much of the recent service-life extension program (SLEP) work on the F-16 has bought years of additional life for the type, and he's gotten no instructions to start work on its successor, which USAF has dubbed the "MR-F" or "MR-X," for a future multirole fighter.

White also said there's no requirement passed to AFLCMC to evaluate the Boeing T-7 as a possible successor platform to the F-16.

The MR-F first showed up in planning documents in 2021 that indicated the Air Force was looking to an F-16 successor in the mid-2030s. The documents suggested the aircraft sought would not be intended as an all-up, very stealthy jet, but what Chief of Staff Gen. Charles Q. Brown Jr. characterized as a "fifth-gen-minus" fighter, for which affordability, and not necessarily high-level survivability, would be a key requirement.

Former head of Air Combat Command retired Gen. James "Mike" Homes suggested that an armed version of the Boeing T-7 trainer could be adapted to such a role and also serve as an export fighter for partner countries lacking the funds or expertise to operate and maintain a more complex aircraft.

But "I have nothing in the mix with requirements from ACC to pursue that," Bailey said of the MR-F and T-7 derivative.

The Air Force last year laid out its future fighter force structure, necking down from seven fighter types today to "4+1," in which the F-22, later replaced by the Next Generation Air Dominance system, is one; the F-35 is the second; the F-15E/F-15EX are the third; and the F-16 is the fourth—with the A-10 as the "plus one" set to phase out in 2030. The service posited the clean-sheet MR-F design or T-7 derivative as succeeding the F-16.

"The 4+1 is still the strategy," White said, "and there has been talk about the MR-X. We do what the requirements folks tell us. It's good to have options."

White said it's "a healthy thing" that the Air Force has the F-35 and F-15EX in production for itself and that Lockheed Martin is still building F-16s for the international market. Technology created for the latest F-16s can be inserted into the Air Force's existing F-16 aircraft, he said, noting that a major radar upgrade for the jet was "actually paid for by Taiwan."

"While I don't have any firm requirement" for an F-16 replacement, "I know the MR-F piece is going to continue to be looked at, because at some point we'll have to have a replacement" for the F-16.



Airman 1st Class Tylon Chapman/ANG

F-16 fighters will remain the most numerous fighter in the U.S. inventory for more than a decade longer, USAF officials say.

He said the MR-F for now resides with ACC's program planning shop.

The F-16 is structurally healthy and can continue to serve, Bailey said.

The service life extension program now largely complete, "for a few million dollars per jet, gives you 20 years of life," Bailey said.

"The F-16 provides the capacity in our Air Force: lots of fighters to cover all kinds of combatant commander needs," he said. However, "it has to be relevant. Not just the F-16 of today."

White said F-16s are being fitted with active electronically-scanned array radars "as fast as we possibly can," saying this modification is underway "at nine different bases" and the F-16 depot at Hill Air Force Base, Utah. The radars expand the sensing range of the aircraft, the number of targets it can track, and the modes with which it can prosecute ground targets.

The jets will also get "a host of other upgrades: EW (electronic warfare) kind of things," which, along with the radar, are the "big mods" being done on the fighter, White said.

The F-16 entered Air Force service in 1978 but has been modified over the years with more powerful engines, radars, self-protection systems, and nearly every munition the Air Force fields.

Additional upgrades depend on the capabilities available across the fighter enterprise, White said, and any upgrade to the F-16 could be costly because of the numbers of the aircraft.

"There are ... almost 900 F-16s in the Air Force. ... Any mod becomes an expensive mod when you have that many airplanes," he said. "So, we'll see. See what it takes."

Future upgrades may borrow from the foreign military sales "side of the house," he said, wherein USAF can apply upgrades that F-16 customers are adding to their new or existing jets.

Most of the Air Force's F-16s will also eventually wear the "Have Glass" finish, which substitutes a new radar-absorbing coating for the jet's traditional gray-on-gray paint scheme.

Asked if the Air Force has F-16s available for potential transfer to Ukraine, White said "the needs of Ukraine today are being met with the systems you see being exported to Ukraine—HiMARS, etc."

Ukraine has "other needs" as well, and "a few years down the road ... some of those could involve fighter aircraft," he said. 🚀

F-35 Squadrons in Alaska Shift to Full Operations

The 354th Fighter Wing is gearing up toward FOC at Eielson Air Force Base in northern Alaska. Two of the wing's F-35 Lightning IIs operated alongside a KC-135 Stratotanker from the 909th Aerial Refueling Squadron, Kadena Air Base, Japan, during RED FLAG-Alaska 22-3 over the Joint Pacific Alaska Range Complex in August.



Airman 1st Class Andrew Britten

By Amanda Miller

U.S. Indo-Pacific Command has two new F-35 squadrons at its disposal in Alaska just as “quite a bit of action” has taken place in the combatant command’s area of responsibility and the “advanced threats” there are becoming “more lethal,” said the squadrons’ wing commander, Col. David J. Berkland.

Berkland’s 354th Fighter Wing at Eielson Air Force Base received the 54th of its 54 F-35s in April, giving Alaska—when also counting the F-22s at Joint Base Elmendorf-Richardson—the “largest concentration of fifth-gen, combat-coded air power in the world” within its borders, Berkland told AFA’s President, retired Lt. Gen. Bruce Wright, in an Air & Space Warfighters in Action virtual conversation Aug. 10.

Berkland said the wing’s priority now is to “shift ourselves into full operational capability to conduct agile combat employment operations throughout the Pacific AOR at austere locations.”

Unlike a typical wing assigned to an Air Force major command, the 354th Fighter Wing—with its motto “We’re ready to go at 50 below”—belongs to the joint INDOPACOM combatant command, Berkland explained. Situated at Eielson, “we can really, in a single fighter sortie, range to just about any AOR in the Northern Hemisphere pretty easily.”

In terms of “advanced threats” posed by the Chinese military’s technology, he said, “They’re becoming more lethal, and they’re becoming more lethal at further and further ranges in terms of the ability of an air defense system to detect, target, and then engage our joint forces.”

Without going into detail about already “deploying forces throughout” the INDOPACOM AOR, Berkland said the goal of the wing’s “dynamic force employment events is to ensure a free and open Indo-Pacific.”

Since F-35s began to arrive at Eielson in 2020, a “combat-focused mentality” has taken shape among the pilots whose expe-

rience ranges from new pilots who “did a lot of virtual reality-type simulated flying” in their training—“and they have performed brilliantly, to be honest,”—to others who have “a couple thousand hours in a different airframe, Berkland said

“And those airframes run the gamut of fighter aircraft across the Air Force. We get people in from the A-10, the Strike Eagle, the F-15C, obviously the F-16 as well.”

Their variety of backgrounds has proven to be both a challenge for the F-35 community—“because to some degree we have baggage from a different aircraft and a different culture”—and a strength because of the ability “to take the best of all those cultures, take the best of all those tactics and techniques and procedures, and blend them into what we’re doing with the F-35.”

As more F-35 natives have started flowing in, Lt. Col. Ryan Worrell, commander of the 356th Fighter Squadron, said “the community has really developed and grown to point where it is sustaining its own culture now” and the focus “is less about trying to determine what the culture is and more about bringing new people in.”

Transitioning from the F-16 to the F-35 was like going from driving a 1969 Mustang to a Tesla, Worrell said. The degree of automation has freed him up to fly less and think more.

The Mustang “makes a lot of great noise, and it still does the job extremely well.” The F-35, on the other hand, with its sensors and automation, involves less “driving the car” and more “managing the decisions that you’re making.

“I’m no longer running the radar. I’m no longer trying to manage where my radar is looking to get the correct aspect on something,” Worrell said.

In an exercise over the ocean, for example, when a tanker is lost, “you just lost a hundred thousand pounds of gas ... and so you’re constantly involved in continuing to solve that problem. And because it’s less about specifically flying the aircraft and managing the sensors and more about making those decisions, you have the brain space to actually start to

work through that.”

At the same time that standing up the new squadrons has brought together a broad mix of aviators, flying the F-35 has also built bridges “across services and across alliances,” Worrell said. “We actually had the Australian F-35s up here, and we flew as mixed formations with them—so two of them and two of us in a four-ship ... all doing the same tactics from our tactics manuals,

and it was incredible to be a part of that.”

The same effect played out in “similar integrations” with Marine Corps F-35Bs, he said.

“When you start to put more F-35s together from different communities, it doesn’t matter where you come from ... you’re able to speak the same language and execute the same tactics together.”



Brown Tours PACAF Amid Dueling Exercises

By Abraham Mahshie

Air Force Chief of Staff Gen. Charles Q. Brown Jr. had hardly left the Indo-Pacific theater before China flew a joint bomber and fighter mission with U.S. partner Thailand. In nearby Indonesia, the U.S. concluded exercise Garuda Shield alongside Australia, Japan, and Singapore.

Brown’s first trip back to the theater where he commanded Pacific Air Forces from 2018 to 2020 comes at a time of heightened U.S. competition with China. Brown kicked off his trip at Travis Air Force Base, Calif., before visiting Joint Base Pearl Harbor-Hickam, Hawaii; Andersen Air Force Base, Guam; Kadena, Air Base, Japan; Osan and Kunsan Air Bases, South Korea; Eielson Air Force Base, Alaska; and U.S. partners and allies in Singapore and the Philippines from Aug. 4 to 13.

“In order to protect and enhance our collective international security, we need to focus on purposefully fostering our relationships,” Brown told senior enlisted leaders Aug. 1 at a gathering of 65 nations outside Washington, D.C.

Brown reflected on the relationships he built at the Air Command and Staff College at Maxwell Air Force Base, Ala., in 1997. His former classmates included the current air chiefs of Japan, Mexico, and Israel.

“Those relationships are so important, relationships you build at the senior level, and relationships you build at more junior levels, and how they overlap in some form or fashion and offer the chance to work together,” Brown said. “The emerging challenges and threats of today require the weight of effort from all our nation’s best.”

Just days after delivering the message of nurturing long-standing relationships, Brown was on a plane for the Indo-Pacific to rekindle some of his own.

Meanwhile, China soon began live-fire exercises around Taiwan and launched a major exercise with the Thai Air Force. Thailand’s joint training exercise with China comes despite a close and long-standing U.S. basing relationship with Thailand and a June visit by Defense Secretary Lloyd J. Austin III.

BROWN’S PACIFIC SWING

Brown set the stage for his Pacific swing Aug. 4 at Travis, the largest air mobility wing, and what he called the “Gateway to the West” for its role in defense of a free and open Indo-Pacific.

At Hickam, Brown discussed the value of strengthening relationships with allies and partners, and 15th Wing Airmen highlighted how they work with regional partners to integrate joint operations. As he spoke, 14 nations, hosted by Indonesia and the United States, were conducting exercise Garuda Shield 2022.

Garuda Shield welcomed for the first time Australia, Singapore, and Japan alongside Canada, France, India, Malaysia, New Zealand, South Korea, the United Kingdom, and growing U.S. Pacific partners Papua New Guinea and Timor-Leste. While primarily a land and sea exercise, this year’s expanded

“Super Garuda Shield” also included air defense exercises, airborne operations, and an airfield seizure exercise.

By Aug. 7, Brown toured Andersen Air Force Base and Northwest Field, Guam, which have undergone new construction as America’s westernmost power projection point.

At each stop, Brown held an all-call with Airmen to discuss the Air Force’s role in the National Defense Strategy, to talk about resiliency, and to urge Airmen to innovate. In small group settings, he had breakfasts and lunches with Airmen to gather their feedback and to provide mentorship, according to a readout provided to Air Force Magazine.

At Kadena Air Base on Aug. 11, Brown said Airman must exploit the air domain through mission control and empowerment of Airmen.

“Successful operations and combat support in a contested environment demand maximum delegation, trust, and empowerment of Airmen before conflict starts,” he said at the all-call. Brown also honored Master Sgt. Jason Yunker for his innovative work on the Versatile Integrating Partner Equipment Refueling (VIPER) kit to refuel aircraft in austere locations.

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In South Korea, Brown visited both Osan and Kunsan Air Bases on Aug. 12, where in 2007-2008, he served as 8th Fighter Wing commander. Brown then flew north to Eielson Air Force Base. Details were not available about his Eielson trip, and the Air Force chief held no public meetings before his partner-building trips to Singapore and the Philippines.

Brown was in the city state of Singapore Aug. 7-10, one of the strongest U.S. partners in Southeast Asia, to reaffirm the strong bilateral defense partnership and to discuss ways to enhance cooperation. There, he met with the Singapore minister of defense, chief of the defense force, and chief of the Air Force. He participated in a National Day Parade and was given Singapore's military Meritorious Service Medal.

"Strong bilateral relationships like that of the U.S. and Singapore are cultivated over time and are based on communication and transparency and shared values and interests," Brown said, according to an Air Force press release.

The United States and Singapore celebrated the 30th anniversary of exercise Commando Sling in June. Brown and Singapore's leaders discussed the planned consolidation of Singapore's Air Force F-16 and future F-35 fighter jet training detachments in the United States.

Brown's final stop was the Philippines, where a new government has signaled its willingness to cooperate militarily with China. Brown's visit was consistent with a Defense Department hope to deepen the U.S.-Filipino defense partnership after strained relations under ex-president Rodrigo Duterte.

In Manila, Brown met with the Chief of Staff of the Philippines Armed Forces and the Air Force command general to discuss ways to deepen cooperation. The Philippines is among the nations with whom China has acted aggressively on the high seas and maintains a maritime dispute. The Philippines, nonetheless, is deeply dependent on China economically.

"The U.S.-Philippine alliance is strong; we support a resilient and independent Philippines with the capability to protect its sovereignty and defend its security interests on its own terms," Brown said, according to a press release.

The Air Force Chief of Staff told Philippines defense leaders that the United States would support Philippine Air Force modernization requirements. Brown is expected to brief members of the media at the end of August to provide further details about the objectives and accomplishments of his Pacific trip. ★

EUROPE

Biden Signs Ratification for Finland and Sweden to Join NATO

By Abraham Mahshie

The mood was festive in the packed East Room of the White House on Aug. 9 as President Joe Biden signed the instruments of ratification for the entry of Finland and Sweden into NATO.

The two High North nations had up until months ago remained unaligned and fiercely independent, Biden said, until Russia's aggression against Ukraine spurred public support for NATO entry.

"I think it's a pretty big day," Biden said with a wide smile as he welcomed the ambassadors of Finland and Sweden to the United States to his side to witness the signing.

The President's signing came after the Senate voted 95-1 on Aug. 3 to approve a resolution ratifying the two countries' entry into NATO.

Biden invited Swedish Prime Minister Magdalena Andersson and Finnish President Sauli Niinistö to visit the White House on May 19 to set the stage for an invitation by all 30 NATO countries at the Madrid NATO summit in June.

"Putin thought he could break us apart when this all started," Biden said, referring to Russian President Vladimir Putin's efforts to divide the alliance with hybrid warfare tactics including misinformation and cutting off vital gas access to parts of Europe.



President Joe Biden, joined by Vice President Kamala Harris, Swedish Ambassador to the U.S., Karin Olofsdotter, and Finnish Ambassador to the U.S., Mikko Hautala, giving the United States' approval for Finland and Sweden's membership in NATO.

Putin also warned that, should NATO assets be positioned in Finland and Sweden, he would respond in kind.

"He believed he could break us apart, in my view, weaken our resolve," Biden said. "Instead, he's getting exactly what he did not want. He wanted the Finland-ization of NATO. But he's getting the NATO-ization of Finland, along with Sweden."



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The United States becomes the 23rd country to ratify Finland's and Sweden's entries into NATO. Remaining NATO partners required to finalize the process include the Czech Republic, Greece, Portugal, Slovakia, Spain, Russia-ally Hungary, and disruptor Turkey, which made demands to both ascending countries before allowing the process to continue.

Turkey sells arms to Ukraine, including the unmanned aerial system Bayraktar, which has proven vital to Ukraine's efforts to destroy Russian tank columns and armored vehicles. Turkey purchased the S-400 missile system from Russia, resulting in its banishment from the F-35 program.

Before Turkey allowed Finland's and Sweden's invitations to proceed, Turkish President Recep Erdogan demanded that Finland and Sweden extradite alleged Kurdish terrorists to Turkey, and an agreement was signed between the three parties in Madrid on June 28 to explore the accusations.

None of the remaining hurdles or past contention were mentioned at the White House signing ceremony, only how the two new members would strengthen U.S. security.

"We're going to be better able to meet the new challenges of a changed European security environment with two strong,

reliable, highly capable new allies in the High North," Biden said, noting how the U.S. and Allies have enhanced deterrence on NATO's eastern flank.

Both Finland and Sweden participate in multilateral NATO exercises with longtime NATO member Norway, while all three Nordic countries have chosen to fly the F-35.

In a Senior Enlisted Leader International Summit outside Washington, D.C., this month, Sweden briefed 65 participating countries and NATO on how it conducts agile combat employment, or the use of remote bases, in the Arctic. A Finnish defense official similarly told Air Force Magazine that Finland works closely with the U.S. Air Force on developing the ACE concept for the Arctic.

Finland has a 900-mile border with Russia and brings much experience in the realm of defending against hybrid warfare and operating within Russia's anti-access and area denial bubble.

"Seeking to join NATO, Finland and Sweden are making a sacred commitment that an attack against one is an attack against all," Biden said, referring to Article 5 of the NATO treaty. "We see all too clearly how NATO remains an indispensable alliance for the world of today and the world of tomorrow." ★

B-52s Land at RAF Fairford for Bomber Task Force Mission

By Greg Hadley

Multiple B-52 bombers from Minot Air Force Base, N.D., arrived at RAF Fairford, England, on Aug. 18 as part of a bomber task force mission in Europe, U.S. Air Forces in Europe announced.

"These bomber task force missions across Europe provide a great opportunity to improve our combined readiness, promote interoperability and demonstrate our global power projection alongside our Allies," Gen. James B. Hecker, commander of USAFE-AFAFRICA, said in a statement. "Our ultimate strength in the European area of operations is a joint-force lethality—our ability to train and operate with our Allies and partners as one layered, capable and credible combat team."

Flying into Fairford, the B-52s from the 5th Bomb Wing got a quick start on that training with allies, integrating with fighters from Norway and Sweden.

For Sweden, in particular, the integration marks another milestone as the country continues to progress toward NATO membership.

"Witnessing our nation's Gripen fighter aircraft flying alongside several of America's most powerful military aircraft visually depicts the strength and solidarity of NATO," Maj. Gen. Carl-Johan Edström, commander of the Swedish Air Force, said in a statement. "These moments truly capture the military power that exists within NATO—as individual nations, but, more importantly, as a unified Alliance."

Media reports in the United Kingdom noted four of the iconic bombers landing at Fairford, garnering considerable attention from locals.

"Our strategic bomber missions demonstrate our always ready, global strike capability," Lt. Col. Ryan Loucks, 23rd Expeditionary Bomb Squadron BTF commander. "The B-52 remains a universally recognized symbol of America's assurances to our Allies and partners."

This marks the second time this year B-52s from Minot



Senior Airman Jason Cochran

A B-52 on approach into RAF Fairford, England, in August. This is the second time B-52s have flown from Minot AFB to RAF Fairford this year.

have flown to RAF Fairford for a bomber task force mission. In February, four of the bombers arrived in Europe. Prior to that, B-1B bombers from Dyess Air Force Base, Texas, deployed to RAF Fairford in November 2021.

RAF Fairford is the only forward operating location for U.S. bombers in Europe, so bomber task forces are usually based from there, with the aircraft flying missions across the continent and sometimes farther in a projection of U.S. air power and as an opportunity for aircrews to integrate with allies and partners.

This most recent BTF marks the first one the Air Force has announced since Russia invaded Ukraine in late February, raising security concerns across the region and leading NATO to significantly increase its air policing and air shielding missions along its eastern flank. USAFE's release on the mission made no mention of Russia, and it is unclear if the B-52s will fly over Eastern Europe during their time in the region. ★



A World War II Lockheed P-38 Lightning, right, flies in formation with a Lockheed Martin F-35A Lightning II during a Heritage Flight display at the California Capital Airshow, Sept. 21, 2018, in Sacramento, Calif.

Senior Airman Alexander Cook

Lockheed Martin and USAF Stir the Secret Sauce of Innovation

Early morning, April 18, 1943. A formation of 16 P-38 Lightning aircraft cruises 50 feet above the Solomon Sea en route to a fixed point 400 miles northwest of Guadalcanal. Secrecy and detection avoidance demand complete radio silence and a roundabout route that adds 200 miles to the trip.

Operation Vengeance is underway. Its target: Adm. Isoroku Yamamoto, commander in chief of the Imperial Japanese Combined Fleet.

Lockheed-built P-38s and their crews had a finite window of opportunity to intercept Yamamoto, who was traveling southeast at the end of a 315-mile leg from Rabaul to Bougainville in the South Pacific. Arriving precisely one minute ahead of plan, the four attack group pilots found and shot down Yamamoto's transport bomber. It was a crucial morale builder as Allied forces continued their long journey toward Japan.

"It happened on the shoulders of giants, the men and women who built the planes and then operated them in the Army Air Corps," said retired Air Force Gen. Gary North, vice president

of customer requirements at Lockheed Martin. "You think about the P-38, the B-24—very successful in both theaters of operation. They helped lead us out of World War II and into the birth of our Air Force."

Lockheed Aircraft Corporation was an early air power pioneer, part of an American industrial machine that ramped up wartime production on a scale unparalleled before or since. Lockheed's ascendance as an exemplar of American aerospace ingenuity and, in the wake of its 1995 merger with Martin Marietta, to its position as the world's preeminent supplier of advanced defense technology, from precision munitions and hypersonic missiles to radar-evading 5th Generation fighter aircraft.

Lockheed Martin's collaboration with the Air Force evolved steadily over time as a closely integrated partnership, the result of a culture uniquely constructed to nurture the best innovators and rapidly adapt to changing threats and opportunities.

"You change things because the threat necessitates it, and we saw that in the Reagan years, which was the buildup

that made us so successful in Desert Storm and beyond," North said. "And then we saw an innovation of change in 9/11—these events, these shifting tectonic plates that forced you to be able to adapt at the speed of need."

FOUNDATIONAL RELATIONSHIP

Two months after Operation Vengeance, Lockheed experts were called in to the Army Tactical Service Command to help counter the growing threat from German jet fighters. Within a month, Lockheed engineer Clarence "Kelly" Johnson and his team conceived what would become the P-80 Shooting Star, the United States' first operational jet. Without a contract in hand, Lockheed engineers began work with the goal of delivering their first prototype in 150 days. Johnson's team did it in just 143.

Steeped in secrecy, the P-80 grew out of Lockheed Martin's legendary Skunk Works® division. Even now, 85 percent of Skunk Works programs remain shrouded in secrecy, but its legacy is long and dazzling, including developments that led to the U-2, SR-71, F-117, F-22, F-35 and so much more.

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COLD WAR COLLABORATION

Lockheed was on the forefront of a new era in which the U.S. found itself locked in a strategic competition and Cold War with the Soviet Union. Discretion and revolutionary design were essential to gain strategic advantage in the high-stakes competition playing out on the world stage.

“Coming out of World War II, leaders realized that the world was going to change in the strategic domain, particularly with the advent of the atomic age and nuclear weapons,” North said. “This generated some strategic thought.”

It was a natural fit for Lockheed and the Air Force, and they consistently worked together to leapfrog the international competition.

As the Cold War intensified, speed and performance were the focus, and Lockheed broke one barrier after another. Its X-7 ramjet test vehicle, which began development after World War II and continued into the 1950s, set records for air breathing flight, achieving speeds of more than 2,800 mph and reaching 106,000 feet in altitude. After scraping the edge of the atmosphere, Lockheed created its Missiles Division, now known as Lockheed Martin Space.

Lockheed’s three-stage X-17 solid-fuel rocket, developed in the 1950s, could achieve 9,000 mph, providing crucial data for better understanding the rigors of re-entering the atmosphere that helped shape the future of ICBM development.

Throughout the Cold War, the need to understand what adversaries were doing demanded its own technological advancements. Lockheed’s U-2 Dragon Lady flew so high—more than 70,000 feet—that it was believed to be beyond the reach of ground-based interceptors when it was introduced in 1955.

On Oct. 14, 1962, Maj. Richard Heyser completed a photo shoot exposing the establishment of Soviet nuclear missiles in San Cristobal, Cuba. The mission captured 928 photos that led to a showdown between the United States and the Soviet Union that put the two nations on the brink of nuclear war. Two weeks later, Soviet Premier Nikita Khrushchev agreed to remove the missiles, ending the Cuban missile crisis but proving the enduring value of irrefutable surveillance

photography.

In the early 1960s, two schools of design thought emerged for dealing with adversary threats. One was fly fast at low level. That school produced the F-111, a deep strike aircraft that remained in the USAF inventory for three decades, from the Vietnam era to Operation Desert Storm, where it destroyed more targets and logged more missions than any other aircraft in the conflict.

The other design path was to fly high and go fast. Lockheed’s single-seat A-12 very high altitude reconnaissance aircraft reached Mach 3 in 1962, paving the way for the two-seat SR-71 Blackbird reconnaissance jet, which had the advantage of extreme speed that the U-2 lacked.

The Blackbird exemplified the speed of the times, exceeding 2,000 mph. And it could sustain flight well above 80,000 feet. If detected, it could outrun any aircraft or missile that tried to catch it. After logging 53,490 hours—11,675 of those more than Mach 3—the SR-71 retired in 1998, concluding its 30-plus-year history with speed and altitude records that remain unchallenged to this day.

In 1990, an SR-71 left Los Angeles headed for retirement at Washington, D.C.’s Air and Space Museum. Along the way, the aircraft set four speed records, including making the transnational flight of 2,299 miles in just 64 minutes, 20 seconds—an average of 2,144.8 mph.

But again the threat advanced and something completely different was required. “Most people don’t know this, but the SR-71 was generally recognized as the first marginally stealth airplane, because some parts of the platform had nascent technology and coatings on it,” North said.

The next phase of stealth had little similarity to the long, sleek, and powerful SR-71’s iconic design. Lockheed’s F-117 Nighthawk was a Skunk Works special, drawing from numerous other aircraft and featuring a stunningly unique design with angled facets and an otherworldly look.

Science magazines hinted at stealth, but little was known about the aircraft. The Nighthawk’s combat debut came in Operation Just Cause over Panama in 1989, with a curtain call in which it provided the opening fireworks for Operation Desert Storm in 1991.

Lockheed Martin took stealth to a new level with the development of the F-22 Raptor air dominance fighter and, later, the multi-role, multi-national F-35 Lightning II.

TIMELESS INNOVATION

Lockheed wasn’t all about speed and stealth, however. Its C-130 Hercules remains a workhorse of the fleet nearly 70 years after its original introduction. The aircraft has been reinvented multiple times over the decades, and its timely utility makes it the longest produced military aircraft in history, flown by air forces around the world. Its variations range from special operations AC-130s to cargo aircraft and specialized versions fitted for various intelligence and electronic warfare applications.

Its massive sibling, Lockheed’s C-5 Galaxy, remains the largest airlifter in the Air Force inventory 52 years after its introduction. Its payload capacity is twice that of any other USAF cargo aircraft.

During Operation Allied Force over Serbia in 1999, Air Force aircrews flying Sikorsky HH-60G Pave Hawk helicopters helped recover pilots down behind enemy lines. Many more were recovered during Operations Enduring Freedom in 2001 and Iraqi Freedom in 2003. Peacetime utilization of the HH-60s was also high. After Hurricane Katrina in September 2005, more than 20 Pave Hawk crews flew in and around New Orleans to save more than 4,300 Americans.

Following the Pave Hawk is today’s HH-60W Jolly Green Giant II Combat Rescue Helicopter. With greater range, integrated avionics and enhanced digital connectivity, these helicopters provide Air Force rescue crews with new tools for their noble mission—That Others May Live.

These successes and many more are part of a larger evolving process—scaling innovative solutions through the development of critical, breakthrough technologies that ensure those who serve get in front of emerging threats and disasters.

21ST CENTURY SECURITY SOLUTIONS

The dynamic threat landscape is driving innovation in stealth, information sharing, command and control, and hypersonic missile technology. Acceler-

ating the integration of digital technology and delivery of advanced capabilities brings faster decision-making to the defense arena. Ensuring networked security is vital.

Hypersonics, first pioneered with the X-7 and X-17, are seen as the future of warfare. In March 2022, Lockheed Martin, in partnership with The Defense Advanced Research Projects Agency, Air Force Research Lab and Aerojet Rocketdyne, successfully demonstrated its Hypersonic Air-breathing Weapon Concept (HAWC). This historic flight reached

speeds in excess of Mach 5—3,800 mph, altitudes greater than 65,000 feet and helped further understanding of operations in the high-speed flight regime. Just two months later, Lockheed Martin tested the AGM-183 Air-launched Rapid Response Weapon (ARRW), and in July a second ARRW demonstration achieved speeds greater than Mach 5.

Lockheed Martin engineers demonstrated their multi-domain prowess in July 2022, employing the Lockheed Martin-built F-35 Lightning II as an aerial sensor to help a Lockheed Martin MIM-104

PATRIOT Advanced Capability missile intercept a cruise missile in a successful test at White Sands Missile Range, N.M.

The F-35's versatility as a flying sensor and communications suite is unparalleled the world over. Combining radar-evading stealth with the most advanced integrated avionics suite, it is the centerpiece of the U.S. Air Force's fighter modernization strategy and the choice of U.S. allies on four continents. The Air Force is building out F-35 capacity and capability, bringing up operational squadrons in the continental United

States, Alaska, and the U.K., and operating seamlessly with allies.


The Lightning II built on Lockheed Martin's record of innovation, including the earlier 5th Generation experience with the F-22 Raptor and on the demonstrated success of the ubiquitous F-16 Fighting Falcon.

First flown in 1976 and operational with the USAF since 1978—and the first of more than 25 Allied countries shortly after—the F-16 remains a marvel of innovation, North said. Having flown more than 3,700 hours in the airplane, he said

he never doubted its remarkable design and production quality. "Every upgrade added to its capability, a demonstration of the teamwork between the military and Lockheed Martin in continually improving on a superior airplane."

Today, Lockheed Martin is still at it, leveraging the "secret sauce" of its Skunk Works division, North said. "The secret is the incredible relationship between the government, the program managers and the labs that we work with, and our ability to recruit, retain and develop talent," he said.

The mutually supporting partnership between Lockheed Martin engineers and Air Force engineers and Airmen fuels a continuous striving for the next evolution of aviation technology. This partnership is rooted in a deep understanding and a shared commitment to the mission ahead, and the desire to stay "ahead of ready" in the needs of the warfighters.

"The thing that really drives the relationship is a desire to always match to the needs of the mission," North said. "Lockheed Martin does that better than any other company in the world." 

Lockheed & USAF: A Long-Term Partnership

Lockheed Martin's history with the Air Force dates back long before USAF was an independent military branch. Here are just a few highlights from the past 75 years.

September 18, 1947: As Stuart Symington is sworn in as the first Secretary of the Air Force, the Lockheed P-80 Shooting Star, a year before being redesignated F-80, is America's first jet-powered operational aircraft. Sikorsky's H-5 Hoverfly is USAF's rescue helicopter and six Lockheed aircraft types are in development or test and numerous WWII aircraft remain in the inventory, including Lockheed C-69 Constellation transports and approximately 200 P-38J/L Lightning fighters.

April 12, 1953: After Air Force ace Capt. Joseph McConnell claims his eighth MiG kill over Korea, his F-86 Sabre suffers mechanical difficulties and ejects over the Yellow Sea. Two Sikorsky H-19s from the 3rd Air Rescue Squadron recover him minutes after he hits the water.

August 23, 1954: Lockheed's YC-130 Hercules tactical transport prototype flies from the Lockheed plant in Burbank, Calif., to nearby Edwards AFB, setting the stage for the ubiquitous aircraft. Today, there are more than 2,600 C-130 variants in the skies, including five major production models, and more than 70 variants—the longest, continuous, active military aircraft production line in history.

August 1, 1955: Article 341, prototype for Lockheed's U-2 high altitude reconnaissance aircraft makes an inadvertent first flight during a high-speed taxi test at Groom Lake, Nevada. The Dragon Lady still flies today.

February 6, 1959: The first test launch of the Martin SM-68 (later HGM-25) Titan I intercontinental ballistic missile lifts off from Cape Canaveral AFS, Florida. Entering operational service in 1962, Titan I was the United States' first multi-stage ICBM, providing an additional nuclear deterrent to complement the U.S. Air Force's Atlas missile.

July 20, 1960: The last of about 100 flights by a Lockheed X-7 ramjet test vehicle is completed. Lockheed built The 26 X-7s and set multiple speed and altitude records for air breathing vehicles, topping out at Mach 4.31 and, on a different flight, an altitude of 106,000 feet.

June 17, 1963: The first Sikorsky S-61 prototype flies. A variant of the Navy SH-3 Sea King antisubmarine warfare helicopter, it will evolve into the CH-3C utility, and HH-3E Jolly Green Giant, the workhorse rescue helicopter of the Vietnam era.

December 21, 1964: Company test pilots Dick Johnson and Val Prah make the first flight of the variable geometry, or swing-wing, F-111 deep strike aircraft from Carswell AFB, Texas, next to the company's plant in Fort Worth. A total of 562 F-111s were built.

August 28, 1967: Company test pilot Bill Park makes the first flight of the Lockheed U-2R Dragon Lady high altitude reconnaissance aircraft. Although similar in appearance to the early model U-2s, the U-2R is about one-third larger and powered by a much more powerful J57 engine. About 50 U-2Rs were built, later upgraded with an F118 turbofan engine and other improvements and redesignated U-2S.

January 20, 1974: Company test pilot Phil Oestricher takes the General Dynamics YF-16 prototype out on a high-speed taxi test at Edwards AFB, Calif., but the aircraft makes an unplanned and unofficial first flight. Today, about 3,000 of 4,588 F-16s produce are in service today in 25 countries.

June 18, 1981: Company test pilot Hal Farley makes the first flight of the Lockheed F-117 Nighthawk, the world's first production stealth aircraft. First used during capture of the Panamanian strong man Manuel Noriega in 1989, F-117 pilots would carry out the first strikes against Baghdad on the opening night of operation Desert Storm in 1991.

September 30, 1983: Officials at the Air Force's Rome Air Development Center at Rome, New York approve the AN/FPS-117 built by legacy Lockheed Martin GE Aerospace. Developed under a program called Seek Igloo, this low power, long-range, phased array, 3D air search radar that operates in the D-Band modernized the Distant Early Warning (DEW) Line series of radar stations across the Arctic, from Alaska through Canada over Greenland to Iceland. The FPS-117 reached full operational capability later in 1983.

April 5, 1996: The new Lockheed Martin C-130J Super Hercules transport takes its first flight. Now with more than 500 aircraft built, the C-130J (as of 2022) is today flown by 26 operators worldwide, including the Active-duty U.S. Air Force, Air National Guard, and Air Force Reserve Command.

September 7, 1997: The first flight of the Lockheed Martin F-22 Raptor air dominance fighter is made, six years after Lockheed won the competition in 1991. On May 12, 2005, the first combat-capable Raptor was delivered to the Air Force at Langley AFB, Va.

1997-2009: Twenty GPS IIR and GPS IIR-M satellites built by Lockheed Martin for the U.S. Air Force are launched, adding new capabilities, signals, and anti-jamming to the GPS constellation.

December 15, 2006: The first flight of the first F-35 Lightning II multivariant, multirole, multinational fighter includes a military power takeoff and a series of maneuvers to demonstrate the handling qualities of the conventional takeoff and landing (CTOL) variant.

June 24, 2016: The fifth of five Mobile User Objective System (MUOS) secure, narrow band communications satellites is launched from Cape Canaveral AFS, Fla. Originally built for the U.S. Navy, MUOS was transferred to the U.S. Space Force in 2022.

April 14, 2018: Lockheed Martin AGM-158 Joint Air-to-Surface Standoff Missiles (JASSM) are used in combat for the first time. The U.S. Air Force deployed B-1 bombers and launched 19 JASSM missiles at the Syrian regime's chemical weapons production facility.

September 26, 2019: The U.S. Air Force declares Initial Operational Acceptance for the ground control system of the Lockheed Martin Space-developed Space Based Infrared System (SBIRS).

March 28, 2020: The newly created United States Space Force (USSF) declares operational acceptance and initial operational capability of the Space Fence S-band radar on the Kwajalein Atoll in the Republic of the Marshall Islands. Space Fence, now the world's most advanced radar, provides uncued detection, tracking, and accurate measurement of space objects, including satellites and orbital debris, primarily in low-earth orbit (LEO).

July 23, 1953: Martin chief test pilot O.E. "Pat" Tibbs makes the first flight of the first Martin-built B-57A Canberra medium bomber. When B-57 production ended in 1959, USAF had acquired a total of 403 Canberras.

March 4, 1954: The Lockheed XF-104, supersonic superiority fighter makes its first flight. On May 18, 1958, an F-104A sets a world speed record of 1,404.19 mph, and on December 14, 1959, an F104C sets a world altitude record of 103,395 feet. The Starfighter was the first aircraft to hold simultaneous official world records for speed, altitude, and time-to-climb.

June 11, 1957: The first test launch of the Lockheed Martin legacy company Convair B-65 Atlas (later redesignated SM-65; later still, designated HGM-16) intercontinental ballistic missile (ICBM) is carried out from Cape Canaveral AFB, Fla. The Atlas, America's first ICBM was declared operational and served for six years.

August 19, 1960: The reentry vehicle containing film images, captured by a classified Lockheed Missile and Space Company KH-1 reconnaissance satellite, is recovered in mid-air over the Pacific by a Fairchild C-119 Flying Boxcar—the first usable intelligence images from the Corona satellite family.

April 26, 1962: Company test pilot Lou Schalk makes the first true flight of the Lockheed A-12 high altitude, high speed reconnaissance aircraft at Groom Lake, Nev. Developed by the Lockheed Skunk Works—the A-12 is the forerunner to the YF-12 interceptor and SR-71 Blackbird.

June 30, 1968: The Lockheed C-5A Galaxy, then the world's largest aircraft is flown for the first time. Five years later, during the 1973 Yom Kippur War, battle tanks flown directly to Tel Aviv on the C-5s were on the front lines within 90 minutes. Two recently completed upgrade programs will keep what's now designated the C-5M Super Galaxy flying until at least the 2040s.

June 17, 1983: Air Force Systems Command Ballistic Missile Office, the 6595th Missile Test Group, and a contractor launch team carry out the first test launch of the Martin Marietta (a legacy Lockheed Martin company) LGM-118 Peacekeeper intercontinental ballistic missile (ICBM) from Vandenberg AFB, Calif. The missile travels 4,800 miles to strike successfully in the Kwajalein Test Range in the Pacific.

1985: Launched in the heat of Santa Barbara California's "Infrared Valley," Lockheed Martin Missile and Fire Control's Santa Barbara Focalplane facility is established. **September 29, 1990:** Lockheed test pilot Dave Ferguson makes the first flight of the Lockheed-Boeing-General Dynamics YF-22 Advanced Tactical Fighter (ATF) prototype. It is the forebear of the F-22 Raptor.

May 7, 2011: The first Lockheed Martin-built Space Based Infrared System (SBIRS) geosynchronous Earth orbit satellite for the U.S. Air Force is launched from Cape Canaveral AFS, Fla. Follow-on space vehicles will form an orbiting Overhead Persistent Infrared (OPIR) missile warning constellation equipped with powerful scanning and staring surveillance sensors.

June 26, 2014: The Air Force awards Sikorsky the contract for the Combat Rescue Helicopter (CRH), the follow on aircraft to the HH-60G Pave Hawk. The HH-60W takes its first flight five years later, on **May 17, 2019**, and is dubbed the Jolly Green Giant II.

September 21, 2021: The first demonstration of air-launched palletized munitions from a mobility aircraft (a Lockheed Martin C-130) is carried out.

May 14, 2022: U.S. Air Force Armament Directorate and Lockheed Martin conduct the first successful hypersonic-boosted flight test of the AGM-183 AGM-Air-launched Rapid Response Weapon (ARRW). Launched from a B-52H Stratofortress based at Edwards AFB, Calif., the test demonstrates the system's ability to attain hypersonic speed—in excess of Mach 5. ARRW is the first air-launched hypersonic weapon for the Air Force.



Targets in Space

Establishing international norms could help protect commercial assets.

A SpaceX Falcon 9 rocket lifts off into the evening sky from Pad 40 at Cape Canaveral Space Force Station, Fla., with Italy's second satellite in a new generation of COSMO-SkyMed radar remote sensing spacecraft in February 2022.

By Amanda Miller

The rapid proliferation of commercial satellites is also revealing increased potential for counter-satellite military operations and collateral damage.

SpaceX reported that its Starlink satellite internet service was jammed in Ukraine after the start of the war, and Viasat reported hackers attacking its satellite internet service there around the same time. In the wake of Russia's debris-generating test of a ground-launched anti-satellite weapon in November 2021, operators running satellites in low-Earth orbit saw increased risk as more than 1,500 new pieces of debris were scattered in that region.

No law prohibits such ASAT tests today, but the Russian action intensified calls to establish norms of acceptable behavior in space. The U.S. government pledged not to perform any future debris-generating tests in space.

To help inform efforts to establish norms, the not-for-profit Aerospace Corporation's Center for Space Policy and Strategy studied other areas where civil and military activities converge. That study, "Commercial Normentum: Space Security Challenges, Commercial Actors, and Norms of Behavior," published Aug. 23, notes that commercial satellites could make attractive targets in a space war and suggests that commercial operators should be involved in the issues raised as a result. The paper lists factors for companies to weigh when deciding whether to take an active role in establishing norms and ideas for how they might do so.

Aerospace's Robin Dickey, the report's author, writes that

establishing security norms could be more important in space than in other domains because "the physics of debris propagation in space make it much harder to limit the effects of any single accident or conflict."

Indeed, Dickey continues, "the behavior of any single actor in space has the potential to affect other actors in space through phenomena like debris or spectrum interference, and this interconnectedness raises the stakes on norm development."

MORE PLAYERS

The number of satellites the U.S. tracks in Earth orbit has more than tripled since the Space Force became an independent military service.

"Three years ago, I would have told you we were tracking 1,500 satellites," said Chief of Space Operations Gen. John W. "Jay" Raymond at the AFA Warfare Symposium in March. "Today, we're tracking almost 5,000 satellites." The number increases by leaps and bounds in part because satellites have gotten smaller and satellite constellations have proliferated. In that same speech, Raymond noted a single launch that had just released "another 47 out of Cape Canaveral."

Adding to the complexity and risk is the emerging intermingling of civil and military uses of satellite assets. The Space Force is increasingly interested in incorporating commercial constellations and data into its activities, both as a means to extend situational awareness and to ensure resilience in space in the future. Raymond has called America's and allied space industries a "great advantage" and said the Space Force must

harness and leverage the “explosion of business that’s going on.”

Army Gen. James H. Dickinson, head of U.S. Space Command, said at April’s Space Symposium, Colorado’s largely commercial space event, that he is most interested in how commercial space firms can improve space domain awareness. “How do I get better at space domain awareness ... is very critical to what we do.”

ATTRACTIVE TARGETS

The risk, both to commercial entities and the U.S. military, is how military uses for those systems could turn them into legitimate military targets. “The increasing role that commercial satellites play in providing services such as communication and remote sensing to militaries could also contribute to heightened perceptions of commercial satellites as potential threats,” Dickey writes.

Some companies worry, she writes, that “commercial satellites could be the first targets in a conflict.” China, in particular, would be unlikely to differentiate between military and commercial constellations: “Were conflict to significantly escalate in space, the potential lack of distinction between military and commercial satellites could result in targeting of even commercial satellites that do not provide military services.”

As uncrewed assets, commercial satellites could also be seen as lower-threshold targets, making their destruction “less escalatory” than manned assets in other domains, Dickey writes. And because they travel in predictable orbits, they are particularly vulnerable to attack. Meanwhile, “potential defenses are prohibitively expensive or infeasible given the constraints of physics in space.”

Treaties already address a potential nuclear detonation, and a pre-existing prohibition on sovereignty means no one can violate it. The cost, complexity, and risks associated with a kinetic attack on a satellite also make less-destructive, nonkinetic attacks more likely.

“Just as a kinetic attack on another country’s commercial satellites could create debris that in turn threatens the aggressor’s [own] satellites,” Dickey states this could reduce the likelihood of commercial satellites being attacked. “An aggressor may instead target a ground station or opt for more limited means of attack,” she added.

RISKS FOR COMPANIES TO CONSIDER

Dickey drew comparisons with past instances in which militaries targeted civilian property, organizing them into three categories:

■ **Collateral damage from attacks on military objectives.** Landmines roughly equate to how ASATs scatter destructive debris, she writes. The International Space Station provides an example of how the debris field created during Russia’s test affects satellites. In the July meeting of NASA’s Aerospace Safety Advisory Panel, member Mark Sirangelo, former chair of the DOD’s Defense Innovation Board, reported that out of 681 conjunction notifications the ISS crew had received in 2022, to warn of closely approaching objects, 505 traced back to the Russian ASAT test. For satellites, radio frequency interference or nuclear detonations could potentially cause collateral damage to commercial satellites as well.

■ **Attacks due to misidentification or misinterpretation of a commercial activity.** At least six commercial airliners were shot down before clear norms were established for mitigating against such commercial targets in the midst of combat. In space, similar norms could provide a way for satellite operators to establish safe passage in space, avoiding risk of loss due to military activity.

■ **Deliberate targeting—either kinetic or nonkinetic—in war.** Historically, commercial maritime shipping has been targeted during military conflict, justified because such ships either carried legitimately targeted supplies or helped support military activity economically. In space, deliberate jamming, cyberattacks, or the “disruption of sensors” with directed energy could similarly be used to apply pressure to commercial activities. Some legal experts have warned that co-locating military and commercial payloads on the same satellite could turn that platform into a legitimate military target. The same could be argued for commercial satellites whose primary use serves military purposes.

Dickey makes the case, in part, that because companies have a stake in space security, they should also get a say in establishing the security-related norms that otherwise might seem like the purview of governments.

BROAD NORMS

Because norms will only work to deter bad behavior to the extent that they’re accepted around the world, Dickey concedes that they may prove most useful in justifying a response—“providing a legal or political point around which other space actors can rally if a state goes rogue.”

Practices such as establishing minimum cybersecurity standards for satellites; transparently sharing mission data between the commercial sector and governments—even competing ones; and implementing formal lines of communication in case of problems all could help protect satellites and avert disaster.

So could coming to a “common understanding of which behaviors will be interpreted by states as a threat” and which can inform commercial operators on actions to avoid. For example: “How close can a satellite get or what actions can it take before a state is allowed to use force against it? What measures are states expected to take to identify and communicate with satellites before they can be categorized as a threat? Is the burden to prove that a satellite is not a threat on the state, the commercial operator, or some combination of the two?”

Dickey’s paper recommends three potential approaches:

■ **Protect all civilian/commercial satellites.** In this circumstance, any attack on commercial assets would be ruled out, regardless of the satellite’s purpose. Determining what constitutes an attack would also be necessary. “Does temporary interference that does not cause physical damage count as an attack?” Dickey writes. “Are commercial satellites that sell services to militaries viable military objectives?” However, she acknowledges that this option could be “ignored by states that perceive a strong strategic need to disrupt any services flowing to the military of an adversary.”

■ **Protect all essential space services.** In this approach, only certain kinds of services would be protected. The risk of this plan “would exclude numerous commercial satellites from the highest degree of normative protection” ... but it could get closer to legal and political common ground.

■ **Protect only those commercial satellites that do not provide military services.** This could be done by conveying to other countries “intentions and activities to de-escalate misunderstandings.”

Establishing normative behavior does not assure that satellites will never fall prey to military attack or collateral damage, Dickey notes. But by establishing international standards of behavior, such rules could help mitigate against risks.

Norms “should not be the only approach to mitigating potential threats,” Dickey writes. “However, they can be an important piece of the larger puzzle.”



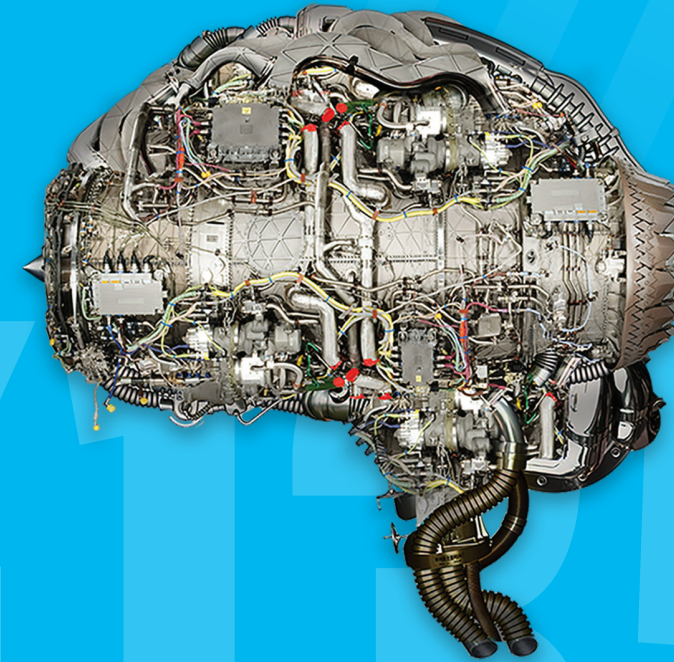
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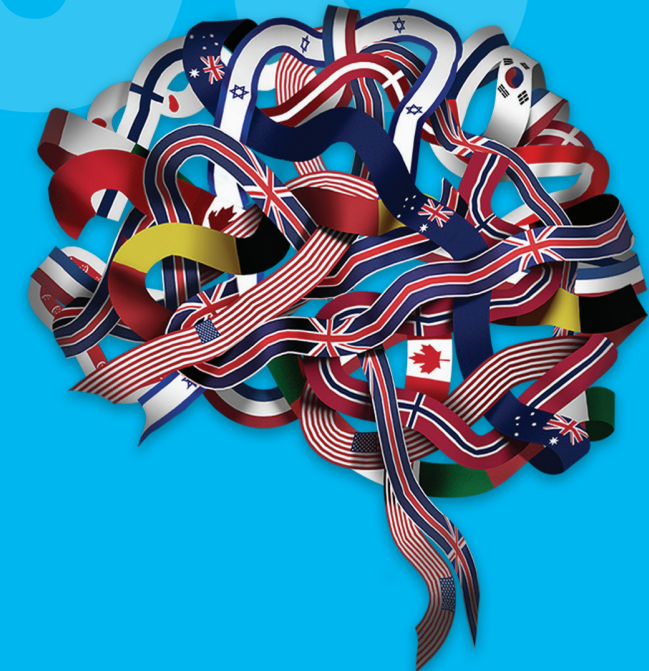
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A RAYTHEON TECHNOLOGIES BUSINESS

Raptor Rebellion

The Air Force wants to retire its F-22, the world's greatest fighter jet, within the decade. Congress doesn't agree.



Airman 1st Class Joshua Hastings

The first plans for the F-22 called for building 750 planes, but the number halved and then halved again, with final production ceasing at 187. Now, despite remaining the world's unmatched air superiority fighter, having such a small fleet make upgrades and sustainment even more costly on a per-aircraft basis.

By John A. Tirpak

The Air Force plans to invest billions to keep its F-22 Raptor fleet relevant and lethal for the remainder of its operational life, then retire the jets circa 2030. Upgrades years in the making will soon reach operational squadrons, keeping the Raptor at the cutting edge as the Air Force prepares for the arrival of its successor, the Next-Generation Air Dominance (NGAD) family of systems.

But as the Air Force moves to retire its oldest 33 Raptors next fiscal year, Congress appears unready to buy into its vision. Giving up the Raptors, which average age about 16 years old today, making them the second-youngest fighters in the force after the F-35—is anathema to lawmakers skeptical of the Air Force's ability to deliver replacements any time soon.

F-22 advocates are loathe to see USAF give up its unique combination of stealth, power, and payload capacity before the highly secretive and

“The F-22 was built for a different era. The threat has changed, and the fight has changed.”
—AFLCMC PEO for Fighters and Advanced Aircraft, Dale White

still-nascent NGAD technology is ready for prime time. The House version of the fiscal 2023 National Defense Authorization Act would block the Air Force from retiring those 33 F-22s and instead order the Air Force to upgrade them to match the most advanced operational configuration. The Senate, meanwhile, appears set to freeze any action that would diminish F-22 capacity until the service can demonstrate it won't lose any combat capability. The final joint NDAA will almost surely direct the Air Force to change course on the Raptor.

Chief of Staff Gen. Charles Q. Brown Jr. stunned Air Force watchers a year ago when he outlined a “4+1” future fighter plan that included the F-35, F-15EX, F-16, and NGAD—but not the F-22. Despite being the unmatched air superiority machine of the past three decades, Air Force leaders explained, the F-22s advancing years, the limitations of its relatively small fleet size, changing threats, and the advent of new technology all pointed to setting a firm sunset for the fighter's service life. There is only so much money, manpower, and real estate

to support the air-dominance mission, and NGAD will need every bit of each to be successful.

Brig. Gen. Dale R. White, Air Force Life Cycle Management Center program executive officer for fighters and advanced aircraft at AFMC, said that view still holds today. In an August 2022 interview, he said, “From a sustainment cost perspective, it's unlikely we would have both” F-22 and NGAD once it is available.

“These things are costly to sustain and maintain,” he said. “The Chief has been pretty clear” that the 4+1 roadmap cannot sustain both.

The F-22 was built for a different era, White said. “The threat has changed, and the fight has changed,” he said. “The problems we have to solve with the pacing challenge of China are very different.”

Gen. Mark D. Kelly, head of Air Combat Command, said at AFA's September 2021 Air, Space & Cyber Conference that U.S. fifth-generation fighters—F-22s and F-35s—need new, fifth-generation weapons to keep them out of reach of Chinese defenses.

“We take a lot of bang out of our low-observable force because we push them into ranges where everyone is observable,” he said. New, longer-range weapons will buy back some advantage to be able to see and shoot first, he said.

The Air Force remains committed to modernizing and upgrading the F-22 and will roll out improvements as long as it

is operational, officials have said repeatedly. Yet planning for the jets' retirement is essential because by 2030, the fleet will average more than 23 years old, a point at which sustainment will only grow more challenging.

NEW CAPABILITIES

Scarcely a month goes by without a new photo circulating in aviation circles of the F-22 testing some unexplained weapon, pod, coating, or camouflage. After a flurry of revelations surfaced on the internet earlier this year, the Air Force released in May an illustration showing the F-22 firing what appears to be the new AIM-260 Joint Advanced Tactical Missile (JATM), while carrying conformal, apparently stealthy external fuel tanks and slender, chiseled pods that could contain a new electronic warfare and/or infrared search-and-track system (IRST). Former Lockheed F-22 program manager Ken Merchant said in 2017 that the F-22 lacked available “real estate” to accommodate an internal IRST, providing the basis for that conjecture.

The artwork “is simply an artist's rendering of an F-22 with any number of future capabilities,” an ACC spokesperson said. “We need every combat platform to go farther, sense farther, and shoot farther.”

White said there are more changes to the F-22 than will meet the eye. Lt. Gen. David S. Nahom, then-deputy chief of staff for plans and programs, echoed the sentiment in an

An F-22 Raptor from the 411th Test and Evaluation Squadron was seen sporting a pair of unidentified pods on underwing mounts in this May 2022 photo captured at Edwards Air Force Base, Calif. The pods suggest Lockheed Martin and the Air Force have mastered the challenge of mounting external stores on the Raptor without sacrificing its stealth attributes.



James Reeder

April interview with Air Force Magazine. “We’re modernizing the F-22 in many ways,” he said.

“It’s going to be our air superiority hedge for our nation for the next decade. ... There is a lot of investment in that portfolio,” he stated.

The 33 F-22s the Air Force asked to retire in its 2023 budget request are older Block 20 models that have grown increasingly different from the new Block 30/35 configuration. Retiring those planes would free funds to help pay for new Raptor capabilities. Nahom said the difference between the Block 20s and the Block 30/35 “is getting greater and greater over time.”

Pilots must “relearn a lot of things” when they transition from type qualification to squadron duty, he said. “It’s not a quick top-off.”

A former F-22 pilot put it more bluntly: “Pilots are getting negative training” in the Block 20 jets, he said. “They’re having to unlearn bad habits.”

As Air Force Secretary Frank Kendall explained to the Senate Armed Services Committee in May, the issue isn’t that the Block 20s “have no capability or that they have a defective design—[they’re] just not upgraded to the state that we need to meet the current threat.”

The cost to bring them up to that capability, Kendall said, is “about \$2 billion to upgrade these aircraft; \$50 million apiece, roughly.”

But given all the Air Force’s other competing needs, “it’s not a high-enough priority for us to do, relative to other investments,” he added.

White said the Air Force and Lockheed Martin are developing fresh cost estimates, but described the outcome as unlikely to change. The upgrades would come, he said, at “a tremendous cost.”

“When you say, ‘Bring it up to a certain level,’ you’re talking about bringing it up to the level the Raptor’s at today,” White explained. “And that costs X amount of dollars.” But then, “you also have to carry those 33 jets with the combat fleet forward as well.” In other words, the Air Force is calculating its savings not just on not funding the upgrade, but on not manning,

maintaining, and upgrading those 33 aircraft over the next five to eight years. The biggest savings is in that ongoing cost.

If the Air Force keeps those aircraft, White will be hit with a continuous stream of cost increases: “I have 33 additional jets I have to do sensor enhancement on,” he said, “as well as low drag tanks and pylons” and other improvements.

Col. Brian Griffin, F-22 program manager, said that the operations and maintenance funding for the 33 F-22s was “taken out” of the budget for fiscal 2023 and future years. If the jets are restored, “that money ... to operate them” must be put back, too.

Air Combat Command did consider that upgrade, but each time it has in the past it has ultimately chosen to pass.

The idea always lost out to a higher priority, said retired Gen. James “Mike” Holmes, a former ACC commander in June 2020. Decisions must be made about “the best place to spend your counter-air dollar,” and upgrading the older Raptors never quite made the cut, he said.

Holmes said ACC and Air Education and Training Command’s recent overhaul of fighter pilot training—dubbed “Reforge”—makes it possible to reduce the number of F-22 training aircraft needed by freeing up some of the operational aircraft used to train new Raptor pilots.

That could “create more capacity without spending more money,” he said.

The House version of the NDAA would ask the Air Force to upgrade the “mission systems, sensors and weapons employment capabilities” of the older airplanes rather than retire them.

A House staffer told reporters in a background briefing that the Air Force assured Congress “back in 2010” that the F-22 training jets could be added to the combat fleet in a contingency, “along with the 234 F-15Cs.”

But “now the Air Force is retiring all their F-15Cs, they’ve cut the buy in half for the F-15EX, NGAD has slid farther to the right ... and now they want to reduce their F-22 capacity,” the staffer said. “We think there’s a significant risk in meeting future air-superiority requirements. And so we’re holding



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the Air Force accountable to their commitment to have the training-coded jets available.”

Retired Lt. Gen. David Deptula, now dean of AFA's Mitchell Institute for Aerospace Studies, noted that the full count of F-22s is never available for combat at any given time. While the total F-22 force numbers 186, one must account for both training jets and a wartime mission capable rate of 80 percent. That takes the number available for missions on any given day to only about 100 combat-capable F-22s.

Mission planes would calculate that during operations, one-third of those planes will be “in the fight,” one-third preparing to launch or enroute to the battle, and one-third “recovering, refueling, or re-arming,” Deptula said. “That results in 33 F-22s in a fight at any one time, using the entire current USAF F-22 inventory.”

Upgrading the 33 F-22s to full-combat capability would give the service “an additional squadron of its most capable fighter in the most expeditious time possible for a fraction of the cost of any alternative,” Deptula said.

He worries that the Air Force is already too small, and that reducing its inventory by 1,000 aircraft over the next five years as planned will make it 25 percent smaller by 2027—precisely the point at which experts anticipate China will be “capable of successfully assaulting Taiwan.”

To counter that scenario, the Air Force should move now to fill “a deficit of aircraft” with fifth-generation jets, both new F-35s and upgraded F-22s. But the Air Force can only do that “if additional funding is provided,” Deptula said. An unfunded congressional mandate to enhance those less-capable F-22s would compel the Air Force to carve those funds out of other “critical and necessary priorities,” he said, including NGAD.

The Air Force's fiscal 2023-2027 budget justifications include an average \$547.9 million per year to fund research and development for F-22 upgrades—a total of \$2.8 billion. These development efforts include new external fuel tanks; an infrared search-and-track system; improved navigation

and new GPS antennas; enhanced identification friend or foe (IFF); the SATURN radio; improved pilot interfaces; sensor improvements; and an open-systems architecture to allow rapid software updates. Most of these are “rapid prototyping/mid-tier acquisition” efforts, USAF said.

In contrast to the 4+1 plan, however, the budget documents state the F-22 will perform “homeland and cruise missile defense into the 2040s.”

The F-22 was built with an 8,000-hour service life said Kevin “Red” Smith, Lockheed Martin's vice president for F-22. He said the fleet has “decades of life left.” In fact the Raptor, “with the highest number of [flying] hours, is not yet even halfway to 8,000,” he said. “Most other aircraft are much lower than that.”

The Raptors can serve well beyond 2030—that's not a question, he said. “What's most important is that we ensure that the airframe has the relevant capabilities for the fight ahead of us.”

Smith said the Air Force has explored the idea of a helmet-mounted weapon cuing system for the F-22, no such upgrade was ever funded. He declined to say where the IRST will be put on the F-22. Air Force and industry sources have said the system will not be akin to the F-35's electro-optical targeting system, or EOTS, which is a faceted window beneath the chin of that aircraft.

Expanding the F-22's weapons capacity has always been a challenge. Right angles, which are typical of external stores hanging off wings, sharply increase an aircraft's radar cross-section. Lockheed proposed a larger, dedicated attack version of the F-22 called the FB-22 in the early 2000s, which would have had “external weapons bays,” in which non-stealthy weapons could be carried. The new stealthy-looking external fuel tanks and pods being carried by test F-22s in recent images seem to indicate Lockheed has solved the problem of staying stealthy with external stores.

In its justifications for the fiscal 2023 budget request, the



Samuel King Jr./USAF

The Air Force has proposed retiring 33 Block 20 F-22s, which lack upgrades included in combat-rated Block 30 models. The differences between the models have reduced the relative value of these jets for training, the Air Force says.



Among the new capabilities being prepared for the F-22 Raptor are the still-classified AIM-260 Joint Advanced Tactical Missile, evoked here in an image released earlier this year by Gen. Mark Kelly, head of Air Combat Command. Developed by Lockheed Martin, JATM is an air-to-air weapon designed to attack targets beyond visual range. It is needed to counter China's next-generation PL-15 weapon.

Air Force identified the new fuel pods as the Low Drag Tank and Pylon system, calling them a "critical capability" to retaining air superiority by preserving the F-22's "lethality and survivability." The Air Force said the F-22 can fly at supersonic speed with the tanks, but that they can be jettisoned with "smart rack pneumatic technology." The 600-gallon external tanks the F-22 has flown with to date are not stealthy, and when jettisoned, leave a connection point that compromises the jet's stealth.

"The updated F-22 pylons, external tanks, and new pods are advanced technological designs providing increased performance, persistence, and range while maintaining lethality and survivability," Smith said. The low-drag tanks also "facilitate supersonic flight with external tanks and extend the range of the F-22."

The Air Force's budget request notes it's using a "rapid acquisition construct, leveraging commercial best practices such as agile and lean" to enhance the F-22. "This allows the F-22 Raptor enterprise to develop, test, and field software/hardware from multiple programs (product lines) using an annual delivery cadence for capabilities as they mature."

The document added that "funds may be used to resolve emerging safety of flight and diminishing manufacturing sources."

NEW WEAPON

The JATM will restore the F-22's ability to shoot well beyond the range of adversary aircraft. China's stealthy J-20 Mighty Dragon carries an upgraded PL-15 missile, similar to the AMRAAM, F-22's primary weapon today. The new PL-15 is believed to have greater range than AMRAAM. JATM, however, offers still more range; while details are classified, sources suggest its range will be at least double that of the AIM-120 AMRAAM-D. The Air Force says the AMRAAM's range is "in excess of 160 kilometers," or 86 nautical miles.

Lockheed officials seem unconvinced that the F-22 is nearing its end. "We're not doing any 'end-of-life' planning on the F-22," said O.J. Sanchez, vice president and general manager, Lockheed Martin Integrated Fighter Group, which includes the F-22. He thinks the Air Force would support that contention. "If we were going out in the next five to nine years, we would need to be doing end-of-life planning [now]."

Instead, Sanchez said, "there are elements ...where we're re-starting" new production for certain components, such as wing leading edges that wear out over time. "The Air Force is funding that ... to keep the platform viable," he said. "We need to be able to deliver critical parts."

White said that "end-of-life planning ... is really supposed to start at the beginning of a program," and the Air Force already has a plan as to how it would phase out the Raptor. Griffin added that USAF has already planned how it will store retired Raptors in a climate-controlled and secure facility to preserve its stealth coatings.

As specified by White, the F-22's capabilities keep it relevant against adversary fifth-generation aircraft, and that it will also test out new capabilities under development for NGAD, which the Air Force touts as a single sixth-generation family of fighter systems that will collectively deliver air superiority.

Lockheed's Sanchez said, "We view the Raptor as a bridge" to NGAD—and White agreed.

"The length of that bridge is yet to be determined ... we need it to be as far as we need it to be," White added. "So we're not taking any actions that would shorten that. ... We want to give the Air Force the most runway to be able to transition into the next generation of technologies as they are ready."

The future of the F-22 "is not yet written," he said. "So we're preparing for a longer life in order to provide the most options for the customer as they work through their own challenging environment."



Pacific Refueling

AMC and PACAF say they have overcome fuel storage and aerial refueling concerns.

A U.S. Air Force KC-135 Stratotanker prepares to refuel a B-52H Stratofortress over the Indo-Pacific region during a Bomber Task Force mission. The B-52 has a range of approximately 8,800 miles, enabling rapid support of Bomber Task Force missions or deployments and reinforcing global security and stability.

By Abraham Mahshie

JOINT BASE PEARL HARBOR-HICKAM, HAWAII and
ANDERSEN AIR FORCE BASE, GUAM

Rust-tinged, white fuel storage tanks dot the coral plateau at Andersen Air Force Base, Guam. Jet fuel pumped up through a 26-mile pipeline from the Port of Guam fills the tank farm, the largest in the Air Force at 66 million gallons of capacity. It's why Airmen call Guam "the gas station of the Pacific."

Across sites in the vicinity of Joint Base Pearl Harbor-Hickam on Oahu, Hawaii, another 250 million gallons of fuel capacity sits underground and in large aboveground tanks that glow white before the deep green Hawaiian mountains.

That's a lot of fuel. But experts say it's not enough to support aerial refueling in the Pacific.

Defense analysts worry about Air Force plans to reduce its tanker fleet, coupled with limited fuel storage capacity in the Pacific, posing risks to U.S. military readiness. They worry Air Mobility Command (AMC) will be unable to meet demand should the U.S. face

"It takes fuel to be able to move around the Pacific, and you've got to have that fuel in the air!"

—PACAF
Commander
Gen. Kenneth
Wilsbach

a war with China.

The anticipated retirement of the Air Force's 48 KC-10 Extenders by fiscal 2025 will create a 13 percent shortfall in tanker capacity versus potential demand, according to a report of fully operational aircraft by the Hudson Institute. In addition, the Air Force plans to retire 13 KC-135 Stratotankers in fiscal 2023. Meanwhile, the new KC-46 Pegasus fleet is still working through problems with its remote vision system (RVS). The Air Force had 29 KC-46As in the inventory at the start of fiscal 2022 and 61 as of June 17, 2022. It anticipates having 14 more by Oct. 1, 2023. By Oct. 1, 2025, the Air Force expects delivery of a total of 119 KC-46s.

Air Force Secretary Frank Kendall is pursuing a "divest to invest" strategy, giving up aircraft that are less useful and more expensive to operate now in order to devote more resources to fund future capabilities.

As of September 2021, the Air Force tanker fleet stood at 490 planes, consisting of 392 KC-135s, 50 KC-10s, and 48 KC-46s. The 2019 National Defense Authorization Act calls for a minimum of 479 tank-



Staff Sgt. Devin M. Rumbaugh



Daniel Mayberry/USN

Storage, like at the Navy's Red Hill Underground Fuel Storage Facility near JB Pearl Harbor-Hickam, Hawaii, is crucial to ensuring access to fuel across the Indo-Pacific theater.

EASY FIXES: MORE FUEL STORAGE

Timothy A. Walton co-authored the November 2021 study on aerial refueling for the Hudson Institute, concluding the risks are growing in the Pacific.

"If we're faced against a major power like China, we'll probably need 479 or more," Walton told Air Force Magazine in June. "You need numerous tankers in order to be able to geographically and temporally distribute your forces. That's going to be a very difficult decision for the Air Force as to whether it's prudent to go down to 455."

Walton admitted that an updated analysis with KC-46 clearance rates above 90 percent does reduce the refueler gap.

"The bigger issue is not the mission capable tanker fuel offload capacity, but rather the Air Force proposal to cut the fleet to a required 455," he said. "There are likely already major capacity gaps at 479 in relevant scenarios and further drops will be problematic, even if there are then more crews to maintain higher surge rates for the 455 aircraft."

Walton said the fiscal 2023 budget does not get after the problem.

"In the latest budget request, I haven't seen any significant changes either in posture, or in the aerial refueling force, that would enhance our ability to support operations at distance throughout the Indo-Pacific," he said. "We need to evolve our posture in the Indo-Pacific to make it more resilient."

Walton sees bulk fuel storage as the best way to ease the capacity shortfall. "DOD needs to shift to adopt a more resilient approach to bulk fuel storage distribution posture," he explained.

The problem was accentuated in March when age and poor maintenance of the underground Red Hill facility in Hawaii led to leaks and the DOD decision to defuel the site.

"We need to shift to something else," Walton said. "We probably need some more distributed, hardened underground fuel storage, smaller capacity than Red Hill, but in more places; we need some complementary maritime tankers to be able to serve as pre-positioned floating gas stations and transport the fuel throughout the theater."

The Defense Department said Pacific fuel storage will be compensated by land and afloat locations, but DOD did not provide a timeline for replacing the lost ground storage capacity.

In Fiscal 2023, the Air Force has asked for military construction funds to add aboveground fuel storage at the U.S. territory of Tinian, Guam's neighbor to the north in the Northern Marianas Islands. The Defense Logistics Agency is adding a

ers. But Kendall wants to reduce that floor number to as few as 455 and the House version of the fiscal 2023 authorization bill would allow the Air Force to end the year with as few as 466.

Air Mobility Command admits that studies to date have shown that limits to refueling capacity are based on the number of tankers available, not their fuel-carrying capacity or offload rate.

The KC-46 is capable of carrying approximately 212,000 lbs of fuel; the KC-135 can carry 199,000 lbs of fuel; and the KC-10 can carry 356,000 lbs of fuel. AMC calls the debate the "booms in the air" vs. "gas in the air" discussion.

"The total number of tankers available to fight is the main driver of capability, regardless of what type of tanker they are," AMC said in a statement. "That being said, the KC-46 will be a fundamentally more capable tanker than anything we've fielded once the platform reaches [full operational capability]."

AMC said fixes tied to the RVS and the Boom Telescope Actuator Redesign, known as "Stiff Boom," are required for the Air Force to declare full operational capability and fully commit the KC-46A to support combatant command requirements. Current Boeing schedules show both upgrades delivering in FY24.

Either way, AMC believes the ICRs have closed any perceived tanker gap, and that 455 tankers provides enough capacity to meet historic TRANSCOM daily tasking levels and wartime demands, should they occur.



Defense Fuel Support Point in Darwin, Australia. Both sites will be aboveground, unhardened facilities.

"There are a number of options that could be taken more quickly to enhance our posture in the Marianas, and throughout the second island chain with other Compact of Free Association states," Walton said, referring to the South Pacific states of Micronesia, the Marshall Islands, and Palau. "This is essential for us to address aerial refueling gaps."

ACE IN THE PACIFIC

The boom operator on the new Boeing-built KC-46 sits upright at a control station with dials and switches and a joy stick to direct the boom, rather than lying facedown at the rear of the aircraft and looking out the back. A remote vision system and special 3D glasses helps him guide the boom to the receiving aircraft.

While flying along an aerial refueling track in upstate New York in July, boom operators who are part of the 2nd Air Refueling Squadron, 305th Air Mobility Wing at Joint Base McGuire-Dix-Lakehurst, N.J., described how shadows and washout caused by the sun at certain times of day can make those final feet before a plug impossible to see clearly.

The booms said the problem arises both for low-backed fighter aircraft, like the Maryland Air Guard F-16s refueling that day, and large mobility aircraft.

Depth-perception distortions with the 3D image on the main 1080 pixel black-and-white screen also make performing an accurate plug more difficult. What's more, when the boom operator turns a dial to change source cameras, there is a momentary blackout on the screen where the image of the boom and receiving aircraft briefly disappear. The Air Force has restricted the boom operator from flipping between camera views, called "scenes," while the receiver is within 50 feet of the boom. That means the receiver aircraft must return astern, or reset, to 50 feet and approach again before the boom operator

can switch scenes to a visual display that might offer better visibility for the lighting condition.

Refueling delays can range anywhere from five to 30 or more minutes, experienced boom operators from the 2nd ARS said.

Problems with the RVS are being fixed at Boeing's expense and the resulting delays have contributed to the tanker shortfall, with no delivery date yet set for RVS 2.0.

Rex Jordan, a 20-year Air Force veteran who now is a senior vice president at Booz Allen Hamilton, said smoothly refueling combat aircraft is essential to America's Pacific deterrence strategy.

"Refueling our fifth-generation fighters is of course going to be the key to success in the Pacific," said Jordan, who leads the defense contractor's Indo-Pacific business. A former navigator who became chief of presidential flight support before retiring from the Air Force, Jordan said the Air Force's agile combat employment (ACE) strategy for operating in a more distributed fashion across the Pacific depends on ample and effective aerial refueling.

"F-35 and F-22 are really the key to employment, and employment requires that ability to aerial fuel," he said by video conference from Honolulu. "So, that gap that starts to emerge between the divest to invest is going to be something that I know [PACAF Commander] General Wilsbach and others will be interested in making sure they fill."

As of May, the KC-46 was cleared for 97 percent of taskings, but not yet for combat operations.

Retired Lt. Gen. David A. Deptula, dean of AFA's Mitchell Institute for Aerospace Studies and director of air and space operations at PACAF from 2003 to 2005, said refueling is a huge issue.

"If a conflict erupts in the South China Sea area, that is going to take the entire U.S. Air Force tanker fleet to support. What do you do about the rest of the world?"



Technical Sgt. Mark Hurd, 344th Air Refueling Squadron KC-46A Pegasus boom operator, performs preflight checks during AMC's Employment Concept Exercise 22-06. The exercise focuses on integration of Total Force and joint training in a multi-domain environment to build real-world proficiency and readiness.

'WE'RE IN PRETTY GOOD SHAPE'

Pacific Air Forces and Air Mobility Command leaders sat down for staff level talks June 22 to 23 at PACAF headquarters at Hickam to ensure they will be ready for whatever demand arises.

"We're in pretty good shape on tankers," Pacific Air Forces Commander Gen. Kenneth S. Wilsbach told Air Force Magazine during a June 9 interview in his Hawaii headquarters.

"We have a method to keep an immense amount of fuel in the air and fuel in the air allows us to project our power forward, and you don't run out of gas and have to go land somewhere," he said. "We're in very good shape with tankers."

Wilsbach went into further detail in March during the AFA Warfare Symposium.

"It takes fuel to be able to move around the Pacific and you've got to have that fuel in the air," he said. "We've got to be able to have the tankers available, then be able to protect those tankers, because the adversary is trying to do long-range kill chains against our tankers and command and control aircraft."

The Air Force has never dipped below 478 tankers, which it hit in 2009, according to historical data compiled by Air Force Magazine.

Over the past decade, the number of tankers flying daily has ranged between 200 at steady-state to 250 during surge operations. "The tanker enterprise can produce this US-TRANSCOM-required daily production with 455 tankers," an Air Force spokesperson added.

Now that KC-46 is approved for most joint force receiver-types, the "extra legacy tankers" are not needed, the spokesperson said.

"Inevitably, a Pacific fight would present an uncharted challenge, but we are accepting a measured amount of risk now in order to modernize and prepare the force to compete in a peer fight," the spokesperson added.

AMC spokesperson Major Hope R. Cronin said that while the KC-46 is still not clear for combat operations, it is used on fifth-generation aircraft with no restrictions. "We can and do refuel all variants of the F-35 and the F-22 with the KC-46 regularly," she said. "It is taskable by TRANSCOM for missions and it gets tasked for missions."

OPERATIONAL KC-46 CLOSES AMC REFUELING GAP

In a quiet backroom at Scott Air Force Base, Ill., on Oct. 5, 2021, then-Lt. Gen. Mike Minihan spoke with Air Force Chief Gen. Charles Q. Brown Jr. Both had served extensively in the Pacific theater, Brown reaching the position of PACAF commander before his appointment as Air Force Chief of Staff, and Minihan with two tours in Korea, two tours at U.S. Indo-Pacific Command, and one in a PACAF staff job.

Brown knew the Air Force needed to quickly overcome challenges in the Pacific. He had urged implementation of the ACE concept as PACAF commander, and he was attuned to the challenges of Pacific refueling. His decision to pin a fourth star on Minihan that day and hand him authority of Air Mobility Command had everything to do with getting after the challenges of the Pacific.



Master Sgt. Amy Picard

U.S. Air Force Tech. Sgt. Jorge Gonzalez watches as a KC-46 Pegasus descends in an austere environment to receive a "dual defuel" during exercise Cope North 22 in Guam. The tanker is not yet cleared for combat operations.

"Five minutes before General Brown promoted me, in the quiet room before we walked down to the ceremony, he told me, 'Go faster,'" Minihan recalled in a July phone interview with Air Force Magazine.

"The only reason I got this job is because of my time in the Pacific. My experience with the China problem set, my experience with the North Korea problem set, is what afforded me this opportunity. I have a full appreciation of the distances, too, but I also have quite a bit of experience in different headquarters from different perspectives."

In his first 10 months at the helm of AMC, Minihan has gone after capability gaps in the Pacific theater: command and control, navigation, maneuvering in route under fire, and tempo. All are meant to better equip tankers to support the Air Force in a China fight.

Minihan cannot speed up the tanker recapitalization program, but he does have control of three areas:

- Modifying tactics, techniques, and procedures (TTPs);
- Taking on more risk; and
- Seeking value that already exists.

Some of the potential solutions he has suggested have already drawn heavy criticism. A new concept called "pilot plus one" would operationally test a KC-46 with a single pilot and a single boom operator while another pilot and boom operator remain in the tanker's bunk on crew rest. A firestorm erupted over social media when the idea leaked out as Airmen worried it was dangerous to have just one pilot in the cockpit. Minihan said ideas like pilot plus one are part of the "intellectual investment" necessary to weigh the viable options for a crisis scenario. Consider, he suggested, this wartime scenario for a tanker landing under fire at Andersen: "Imagine if they get to Guam, and the airfield comes under attack, and it's just the first pilot to the airplane needs to get it airborne," he posed. Testing the pilot plus one concept now could help AMC work out details for how to train for such scenarios.

"My staff, my team, my wings are going to do the proper staffing, understand the risk, understand the benefits, understand the authorities required, and I am going to at least have a risk-informed decision on whether I can achieve that in combat," he said.

Another concept under evaluation is whether hundreds of C-130E and H models could be resurrected from the boneyard and outfitted as refuelers if conflict required, and to examine what it would take to scale up aerial refueling capacity that way. A well-known idea that Minihan has employed that involved taking on more risk were the seven interim capability releases that approved the KC-46 for 97 percent of taskings, falling short of refueling authority for just the A-10, B-2, CV/MV-22, and the E-4B.

Minihan also began testing the KC-46 in the two theaters where America faces peer adversary threats: Europe and the Pacific.

"Part of my 'Go faster' order was to get that girl on step, and the Ukraine-Russia situation offered me an opportunity to get it into Spain," he said of the KC-46.

While the Russia-Ukraine war is not considered a combat operation for the United States, NATO has dramatically increased its air policing missions on the eastern flank of the alliance. In support of enhanced Air Policing operations along the NATO border, the U.S. Air Force has maintained rotations of combat aircraft, including with fifth-generation fighters operating in the Baltic States, Poland, the Black Sea region, and from a hub at Spangdahlem Air Base, Germany.

Minihan wanted to not only provide refuelers to meet the capacity need, he wanted to prove that the KC-46 was ready. Shortly after the Russia-Ukraine conflict began Feb. 24, Minihan directed 220 Airmen and four KC-46s to Moron Air Base, Spain, to support the Air Policing mission and practice refueling on Spanish EF-18 Hornets.

Throughout March and April, Airmen from the 22nd, 931st, 157th, and 916th Air Refueling Wings flew more than 500 tanker hours. The KC-46 had a 98 percent effectiveness rate, Minihan said, only missing two missions related to weather and lightning.

TURNING EAST

After Minihan proved the KC-46 can operate with high effectiveness in the European theater, he turned East.

"We took that, and we instantly turned it out to the Pacific," Minihan said of the employment concept exercise he authorized for the KC-46 in the Pacific in June after the successful run in Europe.

"Being in the geography you're going to fight in matters," Minihan said. "You cannot appreciate the distances in the Pacific until you've flown the distances in the Pacific. You cannot appreciate how much water is out there until you've flown over it for five, 10, 12 hours in a row with no land in sight."

Four KC-46s and Airmen from the 22nd, 931st, and 157th Air Refueling Wings at McConnell Air Force Base, Kan., and Pease Air National Guard Base, N.H., were deployed to Yokota Air Base, Japan, from June 6 to 12 to practice refueling Navy F/A-18 Hornets and Air Force F-35 Lightning aircraft.

AMC points to two distinct advantages the KC-46 has over older tankers in the Pacific: persistence and presence. Since the KC-46 can refuel other tankers, it can extend tanker airtime over vast Pacific distances. The tanker provides added presence due to its integration into tactical data links that give it added situational awareness, allowing it to operate in threat-aware and threat-informed locations to refuel combat aircraft closer to the fight.

For the AMC/PACAF staff-to-staff talks, Minihan brought all of his primary directorates for a classified full working day with Wilsbach, followed by a classified session with INDOPACOM Commander Adm. John C. Aquilino and Wilsbach in his role as INDOPACOM air component commander.

Minihan wanted his headquarters staff to get to know their counterparts at PACAF personally. He wanted them to see the slides and the planning documents used for decision-making, and learn the language that the PACAF team in command would use in a Pacific contingency.

"Our alignment with PACAF is seamless," he said a month after the staff-to-staff. "When I come away from an engagement, especially a direct engagement with General Wilsbach as he puts on his PACAF hat, and he's incorporating the ACE concepts, and I get that exquisite detail of what the operational commander is going to do in that geography, I come away knowing exactly what I need to do to support that and enable it."

Wilsbach, too, came away from the staff-to-staff with a better understanding of how AMC can support PACAF.

"We are confident AMC's capabilities bolsters PACAF's lethality, ensuring our strategic advantage while allowing our joint forces to seamlessly operate in the region," he told Air Force Magazine in a July statement.

Upon return from the PACAF and INDOPACOM talks, Minihan directed his planners to take the feedback and make adjustments to AMC's battle plan for the Pacific.

"They are grinding out concepts right now that are going to win with the kit we have, and then we will take that, and we will go back out to those headquarters and resynchronize," said Minihan.

The AMC commander also directed his staff to take Asia-Pacific Center for Security Studies courses in Hawaii to better understand Pacific geography, countries, political-military, and diplomatic affairs to build a deeper level of understanding about the region. Minihan has urged wing commanders to take every advantage to exercise in the Pacific, and senior planners to incorporate the insights into future exercises. Exercise Mobility Guardian 2023 will consist of several exercises knitted together in the Pacific over several months.

AMC declined to discuss ground fuel storage in the Pacific, directing questions to U.S. Indo-Pacific Command. When it came to the tanker recapitalization plan and Kendall's objective to draw tanker numbers to an unprecedented 455, Minihan declined to talk specifics.

"Whatever the number I have is the number I'm going to win with," he said. Minihan said if a crisis were to arise, he would make the KC-46 fully operational for combat operations.

"I would not hesitate one second to employ it for the other 3 percent," he said of the aircraft not yet authorized for refueling. "We've done the work in advance that if we needed to assume the risk for combat operations, I wouldn't hesitate in a second to put it in."

Minihan admitted that in a Pacific contingency, the Air Force would not have the aerial refueling assets to maintain all current global refueling operations.

"Priority matters. If everything's a priority, then nothing's the priority. So, there has to be a priority established," he said, naming homeland defense as one mission set that he expects civilian leaders would prioritize if tankers were called off other global missions to support a fight in the Pacific.

"If we're in a high-end China fight, that is the thing. There's nothing else going on," he said. "I got what I need to win. Now, that doesn't mean it's going to be a walk-off home run." ★



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Gen. Norton A. Schwartz

Chiefly S

Chiefs of their times; You get four y e

BY TOBIAS NAEGELE

Over the course of its 75-year history, 22 generals have served as Air Force Chief of Staff. Each Chief inherits the unfinished business of his forebears, and each shapes the future for those who follow. No officers do more to shape the force than these select few.

In recognition of the Air Force's 75th anniversary this month, we set out to interview as many of the living former Chiefs of Staff as possible, ultimately interviewing seven. This month we share the two most recent former Chiefs: No. 19 Gen. Norton A. Schwartz (2008-2012) and No. 20 Gen. Mark

PART 2 OF A 3-PART SERIES

A. Welsh (2012-2016). Part 1 of this series appeared in the August 2022 issue, featuring Chiefs No. 14 Gen. Merrill A. McPeak (1990-1994); No. 15 Gen. Ronald R. Fogleman (1994-1997); No. 17 Gen. John P. Jumper (2001-2005); and No. 18 Gen. T. Michael Moseley (2005-2008).

Gen. Norton Schwartz, CSAF No. 19 (2008-2012)

The Accidental Chief

One thing was sure about Gen. Norton A. "Norty" Schwartz: He was never going to be Chief of Staff. Softspoken and a self-confessed introvert, he had spent barely three of the prior 11 years in Air Force jobs in the summer of 2008. Air Force Chiefs are typically fighter pilots, but Schwartz had flown C-130 transports and spent much of his career in the special operations world. When, in the spring of 2008, Schwartz's relief as commander at U.S. Transportation Command was named, Schwartz already filed the paperwork to retire.

Then lightning struck.

Thursday, June 5, 2008. All the Air Force four-star generals were gathered in Dayton, Ohio, for Corona—one of the few, elite gatherings of the service's top generals each year. But on this particular morning, something was wrong in this room full of high-priced talent. The two principals, Chief of Staff Gen. T. Michael Moseley and Secretary of the Air Force Michael Wynne, were late.

"We were all there in the room in Dayton, and we are awaiting the Chief's and the Secretary's arrival," Schwartz recalled. "They were late, which was unusual. And everybody's BlackBerry started buzzing."

The first iPhone had hit the market in 2007, but the military was still deeply wedded to the BlackBerry, a dedicated mobile email machine with a built-in physical keyboard, a small screen, and superior security. Incoming messages awakened the BlackBerrys in every general's pocket to Air Force Times and Defense News reports that Defense Secretary Robert Gates



Staff Sgt. Sheila deVera

Gen. Norton Schwartz spent much of his career in the joint, special operations world, making him at times an outsider in his own Air Force. He met with Airmen from the 212th Rescue Squadron in Alaska during a tour of the JBER installation.

had fired both the military and civilian leaders of the Air Force, an unprecedented beheading of the service's power structure.

"Everyone around the table understood that the institution was in jeopardy," Schwartz said. Everyone also knew that one among them was almost certainly going to be the next Chief. While it was possible to bring someone back out of retirement—Army Gen. Peter J. Schoomaker, who retired in 2000, was recalled to Active duty to become Army Chief of Staff in 2004—the sudden and double-barreled firing would increase the pressure to fill the job rapidly. All of the four-stars were

peaking

ars to make change. It's not enough.



Gen. Mark A. Welsh III

Melanie Rodgers Cox/USAF

All 22 Chiefs have certain common traits: All were pilots, who excelled both in the cockpit and in command, all were warriors, men, and every one of them was lucky. Talent is only one factor of many that puts you in the running for the Chief's job. Timing, health, politics, friendships, and luck are also critical factors.

One other factor is common for all. Whether a new Chief arrives with a long-formed to-do list or finds himself, with little warning, heading a \$160-billion-plus operation with more than 800,000 military, civilian, and contractor staff, outside forces will have as much say in shaping his tenure as his own wants and desires. World events, miscues, accidents, acts of Congress, and acts of God all have a hand in shaping the history of their times. As every Chief is both the beneficiary and victim of these external factors and of the choices made by those before him, it is ultimately his choices—exactly how he plays the cards that he is dealt—that shapes his legacy as Chief and, more importantly, the future of the Air Force.

potential candidates, and to Schwartz, the likeliest candidate seemed to Gen. Kevin P. Chilton, the former astronaut who now headed U.S. Strategic Command.

Gates had other ideas. Chilton was another former fighter pilot, and Gates was looking to do more than change drivers. He wanted to send a lasting signal to a service he viewed as out of touch with the bloody mess that Iraq had become. U.S. military deaths in Iraq peaked in 2007 at more than 900, and while the death rate had slowed by mid-2008, at least one American was dying in Iraq each day. Gates believed Moseley and Wynne were too focused on some future conflict with China and not vested enough on the immediate problem at hand.

He wanted the next Air Force Chief to represent a radical departure from its recent past. And Schwartz was everything the brash and plain-spoken Moseley was not: Quiet, self-effacing, steeped in joint-service thinking after six joint tours—and a transport pilot. If Gates wanted to get the Air Force to change its tune, here was a bandleader who sung a different sort of song.

Moseley retired in July, and Vice Chief of Staff Gen. Duncan J. McNabb assumed the duties as Acting Chief for a month before Schwartz took his oath of office in July. Now Schwartz had to prove himself to the doubters, especially among his fellow Airmen.

"In many ways, I was more respected in the United States Army than I was in the Air Force," Schwartz said. "I had earned my spurs largely in the special ops community. ... There were people in the Air Force who were not persuaded, you know, that Schwartz was worthy. Fair enough, but that didn't matter. There was work to do to preserve the institution of our Air Force," he said. "And the guidance, you know, from Secretary Gates was really pretty straightforward."

Gates' brittle relationship with Moseley and Wynne was characterized most plainly by his characterization of leaders suffering "Next-War-itis" and obsessed with "exquisite" plat-forms that applied to enemies he didn't see on the horizon. But firing a Chief and a Secretary over a disagreement in military

advice and priority would have been unseemly. A series of Air Force failures relating to the safe and secure handline of nuclear weapons provided a ready excuse. In August 2007, an Air Force bomber crew flew from Minot Air Force Base, N.D., to Barksdale Air Force Base, La., unaware they were carrying six nuclear warheads. Seven months later, the Pentagon admitted the Air Force had erroneously shipped a nuclear weapon fuse to Taiwan in 2006, learning about the mistake from Taiwanese authorities.

Gates said that incident was the final straw. "It was the second incident that prompted me to believe that there were serious, systemic problems here," he told reporters.

Schwartz said his marching orders from Gates were clear: "Number one was fix nuke, obviously," he said. In his first 30 days, Schwartz took action to impose accountability. "We let 13 people go during a three-day period," he said. "In every case, I met with the individuals personally," Schwartz said. To him, the major failure was not the fuse shipment, but the Bent Spear incident with the B-52.

"Losing track of six nukes for 36 hours wasn't just a mistake," he said. "It was an egregious level of incompetence."

Next on Gates' list was to move past what he saw as Moseley's and Wynne's intransigence regarding funding for the F-22 fighter and support for the Army's struggles in Iraq. Number two was "Get in the fight."

"There was a perception that we were reluctantly participating in the conflicts in the Middle East," Schwartz said. Gates wanted the Air Force to provide more intelligence, surveillance, and reconnaissance (ISR) support to ground forces in Iraq and Afghanistan, which was crucial to disrupting insurgents' ability to plant the deadly improvised explosive devices (IEDs) that were killing and maiming so many American soldiers.

Prior to the Iraqi invasion, Army Chief of Staff Eric K. Shinseki testified that it would take a force "on the order of several hundred thousand" troops to occupy and pacify Iraq after an invasion. The same week Shinseki testified, Deputy Secretary

of Defense Paul D. Wolfowitz told Congress Shinseki's estimate was "wildly off the mark." The fact was, the Army lacked the capacity to field such a large invasion force. Even with the contributions of a large allied force it would have been impossible to put that many troops on the ground there for any length of time—especially since the U.S. was simultaneously sustaining a second occupation in Afghanistan.

Schwartz had been caught up in this debate in 2003 as the J-3 or operations chief on the Joint Staff, because he testified the same week before the Senate Armed Services Committee. Asked how many troops it would take, he fell back on guidance and declined to speculate, despite knowing a range of estimates that had been discussed among the military leadership.

But what looked like a heady decision at the time would later emerge during Schwartz' nomination hearing to become Chief as a potential obstacle. Sen. Bill Nelson (D-Fla.) questioned Schwartz: Had he been "sufficiently forthcoming?" Schwartz ultimately apologized, saying, "I did not answer your questions directly. And, by definition, that is not sufficiently forthcoming."

Of course, it was obvious by then that it was Wolfowitz and Rumsfeld whose judgment had been wildly off the mark. "You go to war with the Army you have, not the Army you want or wish to have at a later time," Rumsfeld said in answer to a soldier during an all-hands call in Iraq in 2004. By 2008, the Army was facing a recruiting and retention crisis and the Air Force and Navy had become the billpayers, forced to cut their forces, lend their manpower to drive logistics convoys in Iraq, and enable "blue-to-green" service transfer programs.

Being the Army's billpayer galled Moseley, whose blunt objections only increased Gates' frustrations with Air Force leadership. To Gates, the Air Force was failing to see itself as part of the joint team and hewing instead to an individualist view that the Army was responsible for solving the Army's problems.

Schwartz, as his successor, had to answer for it.

"This was the perception of the Secretary of Defense—think about that," Schwartz said. "Fair or not, having been in the positions I had been in, watching the Air Force, outside in, I had some reason to understand why there were such perceptions. There was a view that the Air Force was going to play these conflicts according to its own rules, ... that we were reluctant participants."

Was that fair? "Kids were dying," Schwartz said. "In the Joint Staff, in combatant commands, certainly on the third floor [where the Defense Secretary's Pentagon office is, it seemed] that it required far, far too much effort to get the Air Force to deliver capability."

If perception is reality, this was the perception of the people "that mattered." To an incoming Chief, then, it was fact.

One example was medevac helicopters. In 2009, wounded troops were bleeding out after being wounded by IEDs, gunshots, or rocket-propelled grenades. To stanch the deaths, Gates mandated a "Golden Hour Protocol," cutting in half the objective time required to provide assistance to troops with life-threatening injuries.

"My question was, 'Where are our rescue assets?'" Schwartz recalls asking Airmen on his staff. The Airmen answered that this was an Army casualty evacuation mission, not for Air Force search-and-rescue operators.

"That's nonsense," Schwartz recalls saying. "Kids are dying. Americans need evacuation. Our helicopters, our rescue people



Adm. Mike Mullen (right), then Chairman of the Joint Chiefs, conducted an impromptu job interview on the phone two days before Schwartz learned he would be nominated to be the 19th Air Force Chief of Staff. The two spoke with Medal of Honor Airmen Col. Leo K. Thorsness in March 2011.

Mass Communication Specialist 1st Class Chad McNeeley/USN

are qualified—better qualified than [Army] cas-evac, and we're going to do that."

Then Schwartz went further because his best search-and-rescue operators were trainers, and he wanted them in the fight. "Against some headwinds, we decided to temporarily close the H-60 schoolhouse at Nellis [Air Force Base, Nev.,] and the very best of our H-60 weapons cadre were going to go to Afghanistan to support the Golden Hour. There was a little bit of a disturbance in the force field when we made that decision."

In retrospect, that disturbance was worth it, Schwartz said. "As it turned out, after their return, they were far better instructors in the Weapons School than they were before they departed."

That shouldn't be surprising, he said, nor should it have been a challenge to deploy those talented Airmen. "That it required a Chief of Staff intervention to make that happen," Schwartz said, "is so unfortunate."

'ALL IN'

Every Chief has his watchwords, or themes, and Schwartz was no different. For Gen. Charles Q. Brown Jr., Chief No. 22, it's "Accelerate Change ... or Lose." For Schwartz it was "All In."

Determined to be a team player in the joint world, even if doing so made him unpopular in some Air Force circles, those two words embodied his and Gates' objective.

As Chief, Moseley had objected to using Airmen to drive convoy duty. Where previously, "the Air Force wouldn't support resupply of ground forces because that was Army business," Schwartz said, under his leadership, "well, we played our part."

Gradually, the Air Force began to "change that negative perception."

Within Air Force circles, however, Schwartz was criticized for being Gates' henchman, carrying out his bidding. The military services have a way of attacking their own leadership when it changes direction, a reaction some liken to the antibodies in the human bloodstream that fight infections. In Schwartz' time as Chief, the antibodies attacked him. Today, they are on public display attacking Marine Corps Commandant Gen. David H. Berger, whose efforts to radically redesign the Marine Corps—to retire its tanks, reduce its helicopters, and reshape its infantry to be more relevant in today's Pacific theater—have met with stiff resistance from earlier generations of Marine leaders.

In April, two years after Berger released his Force Design 2030 plan to makeover the Corps, two dozen retired generals pushed back, an unprecedented rebellion of former Marine leaders that reportedly included every living former commandant.

Schwartz was spared such extreme treatment, but was still viewed as too willing to compromise the Air Force to make peace with the Secretary, especially when it came to the F-22 Raptor, the air superiority fighter the Air Force needed to replace its F-15C/Ds. Schwartz, however, said it was the Air Force, not DOD leadership, that failed to prove its case.

"In my mind, the Air Force did not justify the F-22 sufficiently," he recalled. "It's important to understand that Gates was writing letters to the families of the fallen every day. So the 'Next-War-itis' [comment] was not so much ideological, as it was this visceral reality, that we had a lot at stake right then. And you know, had the Air Force played it a little differently, in my view, and been a little more loyal ... it might have turned out differently."

Loyalty gets complex at the highest levels of military service. A leader's loyalty is to the Constitution and the United States, not to an individual office holder.

But military leaders must also navigate the reality that their job is to execute the strategy and directions of civilian leaders. When Schwartz was the J-3 and had dodged the question about how many troops would be needed to keep the peace in a post-invasion Iraq, his choice to not be fully forthcoming had placed loyalty to the administration—over his own obligation to answer questions openly and honestly. As Chief, he would have to wrestle with similar issues more than once.

When the Pentagon sought to shut down the F-22, Air Force leaders sought to take their case directly to Congress, a violation of protocol since the military works for the executive branch. Schwartz said Gates took that personally. In Gates' autobiography, "Duty: Memoirs of A Secretary at War," however, he glosses over his responsibility for killing the F-22. "Over 25 years, the F-22 suffered almost as many cuts from as many hands as Julius Caesar," Gates wrote.

Yet it was Gates who dealt the fatal blow, ending the program at 187 aircraft.

Schwartz and Michael B. Donley, who succeeded Wynne as Secretary, tried to find a middle ground. They advanced a plan that would have kept the production line running until the Air Force had 243 F-22s.

"We did a very good piece of analysis that suggested that the right number was 243," Schwartz said. "And we went to Secretary Gates and his folks and made the argument that if he was going to terminate the program, he should terminate it at 243. ... It may be wishful thinking or it may be Pollyanna, but my view is that had the Air Force enjoyed a slightly better

"Airman is a colloquialism for the Air Force family. It reflects the diversity of this family—military members, family members, civilian employees of the institution. ... I married up in life. There are very few ways in which I am [Suzy Schwartz] equal. ... Once she decided to devote herself to Air Force families she was all in, whether it was exceptional family members or air conditioners at Hurlburt—and who would have known that they were underpowered except for Suzy, wandering by and introducing herself, and asking questions? That's the kind of detective she was."

reputation on the third floor at the time, 243 would have survived."

Gates ended production at 187, however, and by the Spring of 2009, Schwartz and Donley were ready to move on. In an Op-Ed in the Washington Post in April 2009, as the fiscal 2010 budget was being rolled out, they unfurled the white flag, concluding that the \$13 billion bill to keep building more F-22s could not be justified "as defense budgets are becoming constrained."



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Schwartz felt there was no alternative at that point. “F-22 had consumed enough oxygen,” Schwartz said. “The question that every leadership team has to wrestle with is, ‘What are the existential issues for the United States Air Force?’ And our judgment was that, in the long view, the bomber successor was more important.”

Giving up on the F-22 was crucial to ensure Gates did not “double down on the F-22 decision” and also cut off funding for the future bomber. Today, as the B-21 nears first flight sometime in 2023, Schwartz believes his and Donley’s decision was the right one. Better to develop the bomber than to have won the battle for more F-22s at the cost, potentially, of a bomber replacement program.

THE RPA REVOLUTION

Another one of Gates’ frustrations with the Air Force had been over remotely piloted aircraft. Gates wanted more MQ-1 Predators in the fight.

“When I got back to Washington, we had eight 24/7 orbits of MQ-1,” Schwartz said, referring to the Air Force’s ability to maintain continuous overhead presence with Predator unmanned systems. “That was clearly insufficient, and there was frustration that the Air Force wasn’t more aggressive in fielding additional capability. ... When we left, there were 58 orbits of MQ-1 and MQ-9 capability, and some other stuff, and in addition to that, the utility of remote aviation became embedded in the culture.”

Schwartz said institutionalizing RPAs meant ensuring that remote-control pilots earned wings so they could not be seen as “lesser beings” when lined up against other rated officers.

“That was another disturbance in the force field,” recalled

Schwartz. “The reality was, I could not persuade the skeptics because of my pedigree.” Instead, it was his three-star head of operations, plans, and requirements who helped make that happen. “It took Phil Breedlove, who had the correct pedigree, to basically tell the skeptics to pack sand.”

Today, Schwartz said, it is hard to imagine that the next airlifter won’t be optionally manned. “The cargo business is going to go remote,” he added. Passengers will take longer, but cargo is going that way, as is at least some portion of attack aviation, he said. “It is clearly the right path to be on to have a mix that is less costly and where you can afford some attrition.”

Schwartz and Donley also sought to change Air Force leadership in terms of the diversity of backgrounds of Air Force leaders. The choices a Chief makes about general officer assignments and three- and four-star appointments may be their most enduring legacy. Who is chosen—and who is not—leaves a lasting mark.

“Mike Donley’s and my effort to diversify the leadership, both in terms of expertise, of ethnic background, in terms of gender—that was an important undertaking,” Schwartz said. “And it wasn’t done for political reasons. This was the right goddamned thing to do.” Quoting CSAF No. 12, he added, “Larry Welch told me when I first got in the chair that if you don’t spend 25 percent of your time on flag officer management, you’re not doing your job,” Schwartz recalled. “Well I don’t know that I spent 25 percent, but I did spend considerable time on that. The country needs good people to do this stuff, people who are competent, who can withstand the pressure, who model the right behaviors. You try to put people on a trajectory where, if lightning strikes, they’ll be there and they will be prepared.”



Gen. Mark A. Welsh, CSAF No. 20 (2012-2016)

Surviving the Budget Control Act Debacle

Gen. Mark A. Welsh never dreamed of becoming Chief of Staff, never saw himself as a visionary. “I’m not really good at looking deep into the future with a clearer understanding of what we should be and how to get from A to B,” he says, underselling his intellect. “I can figure out what is important for us to be. And I’m pretty good at moving people toward that.” But a visionary? That’s someone else. “I would characterize myself more as a realist, more of a rubber meets the road guy than a deep thinker.”

The rubber hit the road in August 2012. The Budget Control Act of 2011 was now in full force, and its unintended consequences were becoming clear. The measure was the result of a compromise: Republicans agreed to raise the debt ceiling so long as Democrats agreed to cut spending. But the measure was intended to drive further compromise. The BCA imposed annual statutory limits on both defense and nondefense discretionary spending; it established a committee to work on a future deficit reduction agreement; and it imposed annual, automatic spending cuts if no deficit reduction agreement was reached.

The threat of automatic cuts had been seen in 2011 as so onerous that no one would ever let things get that far. But by 2012, it was becoming clear that a deal was not in the offing. Automatic cuts were about to wreak havoc on Air Force spending.

Welsh became Chief with seven weeks to go in fiscal 2012, a year in which the Air Force budget had declined by \$4 billion to \$162.8 billion. For the next fiscal year, spending would plunge more than 11 percent to \$144.3 billion, its lowest total since 2007.

Actually, it was even worse. More than 20 percent of that total passed directly through the Air Force to fund other agencies.

“We were cutting \$20 billion a year out of our budget—or trying to figure out how to do that and get it through Congress—and the Air National Guard had just very publicly started a public argument with the United States Air Force about lack of support for the Guard,” Welsh said.

The Air Force kept running into walls in Congress. Finding cuts was hard enough internally. Finding cuts that could be sold to Congress was harder still. Welsh didn’t want to sacrifice modernization. That had to be a priority. He needed big chunks of money.

In 2013, Air Combat Command proposed paying a chunk of the bill by retiring National Guard A-10 Warthogs. Getting rid of all those A-10s could save \$4 billion in a hurry. But the Warthog was beloved by Soldiers and Marines, who found joy and triumph in the BRRRRRTBRRRRRT of its nose-mounted cannon, and it was a favorite of the lawmakers whose districts were home to the Guard’s A-10s, including Arizona’s influential Sen. John McCain.

Welsh understood the reasoning. Only about 20 percent of the Air Force’s close air support (CAS) missions in Iraq and Afghanistan were being flown by A-10s, and as useful as its 30 mm gun can be, “its only got about 15 seconds of trigger pull with the gun,” Welsh said. “After that, they’re dropping the same precision guided bombs in the same place everybody else is dropping them.”



The A-10s could carry more weapons than the F-16, but there were fewer of them, and they couldn't get places quite as fast. "So really, if you're in a firefight at night somewhere, do you want a B-1 with 36 precision guided munitions or do you want an A-10 with a GAU? They're all great at what they do, but the A-10 does only one thing." The other planes were more versatile.

"All the modeling and simulation that we'd done showed that this would be the least impact of any airplane fleet that you could divest, and it was the only way to divest an entire fleet—back shops, the engines, the whole supply chain—which is where you get the big savings," Welsh said. "There was logic to it. It's just that it wasn't going to happen."

Welsh found himself getting beaten up for a plan that he'd never supported, but it didn't matter. Once a decision was made it was his job to make the case. And the alternative that resulted was hardly his idea either.

"Senator McCain really got irate about this," Welsh added. What ended up happening instead is we got told to keep the A-10 and keep bedding down the F-35, but we were still cutting people." That created a crush. "We needed the people in the A-10 squadrons to transition to F-35 squadrons, but when that didn't happen, we had to cut manning in every squadron in the Air Force to 80 percent, just to have enough manpower to stand up the new F-35 units."

It didn't matter. Congress wasn't buying it. The Air Force appeared tone-deaf to a nation focused on the plight of Soldiers and Marines slugging it out in a ground fight.

In the Spring of 2013, as Welsh was visiting Sen. Carl Levin,



Scott Ash/USAF

Air Force Chief of Staff Gen. Mark A. Welsh III found inspiration in his Airmen. "You don't get more innovative just because you get older and get smarter," he said. "You get more innovative, because you listen to more people." Sharing a bite, as with Airmen at Joint Base Pearl Harbor-Hickam in 2013, was one way to listen.

chairman of the Senate Armed Services Committee, ahead of a budget hearing the next day, one of the senator's aides interrupted to share a news alert on his phone. Levin tried to wave him off, but the aide persisted, handing him the phone. Levin looked down at the device through his reading glasses, then peered over the rims at the general before him.

"You should read this," he said. Welsh learned that a lieutenant colonel, the chief of the Air Force's sexual assault prevention and response branch, had been arrested the night before

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PASSION FOR TECHNOLOGY.



in Arlington, Va. The charge was sexual assault.

"So Senator Levin looks up over those glasses, and says, 'Enjoy your hearing tomorrow.' Ha—not a good day for us," Welsh noted.

He can laugh about it now. At the time, it was just another painful smack, one in a series of embarrassments that kept the Air Force institutionally on the defensive. The officer was later acquitted, but the incident and others made it seem the Air Force had a bigger problem with sexual assault than the rest of the military or society in general. That wasn't a true representation of the facts, Welsh explained. But what that kind of publicity did was deflating.

"The impact those things were having on Airmen in general was significant," Welsh said. "All they heard was bad news about the Air Force. They were frustrated by budget cuts and sequestration from the Budget Control Act, training dollars were going down, they were deploying constantly. They were frustrated. And my biggest concern as Chief was that we can lose everything else, but if we lose Airmen, there's no Air Force."

Welsh saw his job then as rallying the force, reminding Airmen "of who they are, and what they do, and how well they do it, and why they do it—why it matters," Welsh went on. "I spent a lot of time on the road talking to Airmen, all over the world, just trying to let them know that we did care, that people were paying attention, that we wanted to make them better at their mission, and that we weren't going to let everything disintegrate and leave them hanging."

Every Chief's career path is different. In Welsh's case, he'd had very little time on the Air Staff where he would have had more exposure to the politics and knife fighting of the budget process. "I'd never been close to that interaction and activity, and that was a shortfall of mine," he said. "You know, if I'd been the Vice Chief of Staff before, it would have been a much easier transition."

(It is not surprising then to recall that Welsh's successor, Gen. David L. Goldfein, suffered no such challenge; he fledged up from the Vice Chief's job in 2016, with the benefit of a month of prep-time in which he was cut loose to focus on his new role, rather than the duties of the Vice.)

It dawned on Welsh too late that the real fight needed to be about his Airmen. It wasn't just that they needed to be reassured. It was that he needed more of them. And while he and Secretary Deborah Lee James were ultimately able to draw that red line, it was late in his tenure. If there's one thing he would do differently, he said, it would be to fight for people sooner.

"There is this assumption that there's all kinds of efficiencies" to be had in any budget, that there is always fat to be cut, Welsh said. "Well, not really. There isn't nearly as much as you think. When you go to look at where you can take big chunks of money out of the Air Force budget, its infrastructure, it's modernization, or its people. The biggest chunk of money is people. So it's the easiest way to save. But every time you give up an Airman you give up mission capability in some way, shape, or form."

To try to identify what could be sacrificed from the budget and what could not, Welsh knew he needed the buy-in from his four-star major command generals, the Air Staff, and the



Scott Ash/USAF

Welsh felt beaten and battered in congressional testimony, particularly over Air Force plans to retire the A-10. He testified in 2014 with then Secretary of the Air Force Deborah Lee James, one of three secretaries during his four-year term as Chief.

combatant commanders. "You've got to have those conversations across the senior leadership of the Air Force," he said. "It can't just be the Air Staff having this debate."

One of the things Welsh is most proud of is how he attacked this problem by building a visual model of the budget, "a wall of money," he said. Then he "brought all the four-stars in to do our first programming meetings off of that visual."

On the wall were color-coded magnetic strips. "Just one-inch-wide magnetic strips, every inch was a million dollars," Welsh said. They spent two days staring at that wall, "one of the things I learned the most from as the Chief of Staff."

The color-coded magnets created a visual understanding of the challenges—the colors of money, the programs, the available resources. "It goes floor to ceiling and across the whole wall," Welsh said. Everything included in the budget was above a line in the middle. Everything desired but not yet in the budget was below. In

order to move something from below the line to the top, something else had to be subtracted.

This made clear the choices the Air Force faced, choices that were not about what programs were needed or desirable, but about which ones the Air Force needed most. The trade-offs could thus be made across major commands, not just in the usual stovepipes.

"We all sat there for two days and talked about it," Welsh recalled. "And John Hyten who was Air Force Space Command at the time, said, 'Just go to my column and take those two off.' And it was like a hush in the room. I mean, he actually gave something up. And that broke the dam."

Once Hyten got things started, others followed. Hyten, Welsh noted, was nobody's fool, because that bought him good will from others as the horse trading continued. But his initiative, his willingness to take a chance by offering something up in the open was crucial to progressing through the job at hand.

"The big point was, this is our budget, all of us," Welsh said. "And to optimize it, if we want to put something on the board, something's got to come off. And if it's not going to be one of your own things, you've got to justify why they are all more important than everybody else's stuff. That was the discussion

"Airmen, whether they're uniformed, or their civilians are members of the profession of arms, committed to the delivery of air power on behalf of the nation. ... They're phenomenal. They really are, each in their own way. They're all different. There's different styles, different personalities, different approaches, different skill sets, different shortfalls, man, all this have those. But when you measure it all up, and you kind of rack and stack people, they're awesome."

we had and it was a really honest discussion. We did it for every year I was there.”

Like other Chiefs, Welsh found it took too long to learn the job well, that progress came too slowly, and that time went too fast. Four years sounds like a long time, but it isn’t long enough to institutionalize change in an organization so large.

“I do think four years as Chief of Staff is not enough,” Welsh said. Should it be five? Eight? Welsh thought for a moment, then answered decisively: “Six.” The extra time could be subject to re-confirmation by Congress, perhaps, or a renomination by the administration. But more time makes more sense, he said, even if the job itself is exhausting. “Physically, four years is enough,” Welsh said. “I was, I was pretty much dying after four years. But the reason I think it is enough is you don’t really get a chance to implement things that stay implemented. ... You work so hard to put some things in place that you think are really meaningful for the Air Force” and they wither when the next Chief focuses someplace else. “They don’t intentionally get rid of the other stuff, maybe they just quit focusing on it—and then there is a certain stasis on the Air Staff, which everybody will go back to.”

Some call it the frozen middle. Welsh cites “the iron majors and lieutenant colonels and civilians—GS 13s and 14s—who are so incredibly capable and dedicated” to the rules and regulations, the systems and processes. “They understand it, they know how to make it work. And so they’re almost too loyal to it.”

When the change agents depart, the system reverts to its prior function. “It’s very easy just to go back to the process you know and love,” Welsh said. Two more years as Chief might help prevent that.

In the Tank, where the Joint Chiefs of Staff hash out matters of policy and strategy, Welsh said his interservice partners were honest and direct with each other and generally cooperative and reasonable. He always felt he was heard, even if he didn’t

get his way, including during visits to the White House, where he recalls President Barack Obama giving each of the Chiefs or participants around the table a chance to express their views.

Yet in the wider national discussion, the value of Air and Space Power seems little understood, either taken for granted or not recognized for its true and full value.

“The reality is that air power is the most valuable integrating and attacking force on the battlefield. It just is, there’s no argument against that,” Welsh said. “You don’t get to the fight without air power. You don’t get the ISR you need to prepare for the fight without air power and space power. They work together, even if they’re different forces now, they still work together. And when required, air power can be the decisive force on the battlefield.”

Of course, he adds, there are things air power cannot do, like occupy some piece of territory, or set up and support a mayor in a small village. But these capabilities are not mutually exclusive.

“The idea that nobody’s been attacked from the air since the Korean War that’s an astonishing fact,” Welsh said. “It’s because air power and air supremacy provides freedom to attack and freedom to maneuver. It gives you the ability to be the greatest Army, the greatest Marine Corps on the planet.” Without it, those other advantages erode quickly. Investing in air power is therefore an investment in the Total Force. “If you are fighting against the U.S. Air Force, supported by Naval aviation and Marine Corps aviation, you’d have a problem,” Welsh said, because “it is and can be a dominant force.”

The question the nation must answer is whether that is something it still values. “Can we provide air superiority everywhere these days with the amount of force structure we have? Of course not,” Welsh considered. “But where we choose to have it, we can have it.” ★

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Rebuilding America's Air Power

The U.S. must reverse decades of underfunding its Air Force.

Staff Sgt. John Linzmeier/ANG

A Royal Australian Air Force E-7A Wedgetail flies in formation with Hawaii Air National Guard F-22 Raptors during exercise Pacific Edge 21. The Wedgetail is expected to replace the E-3 AWACS, but won't join the Air Force inventory until fiscal 2027.

By Lt. Gen. David Deptula, USAF (Ret.) and Col. Mark Gunzinger, USAF (Ret.)

The 2018 National Defense Authorization Act directed the Pentagon to conduct three independent analyses to determine the number and mix of aircraft the U.S. Air Force would need by 2030 to meet National Defense Strategy requirements. All three analyses concluded the Air Force must grow its forces by at least 25 percent. The Air Force described “the Air Force we need” as 386 operational squadrons, up from 312, including seven more fighter squadrons than currently exist and five additional bomber squadrons. This, along with modernization, would create the minimum force needed to deter and defeat Chinese aggression, defend the U.S. homeland, deter nuclear threats, and fulfill the service’s other global operational requirements.

However, five years later, the Air Force still lacks a force structure with the requisite lethality, survivability, and capacity. The average age of the Air Force’s aircraft inventory is now an unprecedented 29 years. Its B-52 bombers and KC-135 tankers have been in service for over 60 years, three aircraft types



Gen. Deptula is Dean of AFA's Mitchell Institute for Aerospace Studies. Col. Gunzinger, a former deputy assistant secretary of defense, is Mitchell's Director of Future Aerospace Concepts and Capabilities Assessments. Download the entire report at <http://MitchellAerospacePower.org>.

have been operational for more than 50 years, and 13 other types average 30 to 50 years old. Air Force aircraft like the E-8 Joint Surveillance Target Attack Radar System, E-3 airborne warning and control system (AWACS), B-1B bombers, and F-15C fighters are worn out after decades of high operational tempos. Many of these aircraft are not mission capable—and in some cases are no longer safe to fly.

It is also the smallest force the Air Force has ever had, and on its way to becoming smaller. Over the next five years the Air Force plans to divest another 1,463 aircraft while acquiring just 467. This amounts to a net loss of 996 airframes. Capacity is as important as capability—a force that is sized to fight a war with China in the vast expanses of the Indo-Pacific region, the Department of Defense pacing threat, will be very different than a force that is sized to operate in the relatively smaller and less threatening battlespaces of Iraq, Afghanistan, and even Iran and North Korea. Bluntly stated, the Air Force of 2022 is a high-risk force that is not sized to fight a major conflict with China and meet its other global operational requirements established by the National Defense Strategy. This is not just about the Air Force because no U.S. military joint

force operation can be conducted without some element of the Air Force being involved.

HOW DID WE GET HERE?

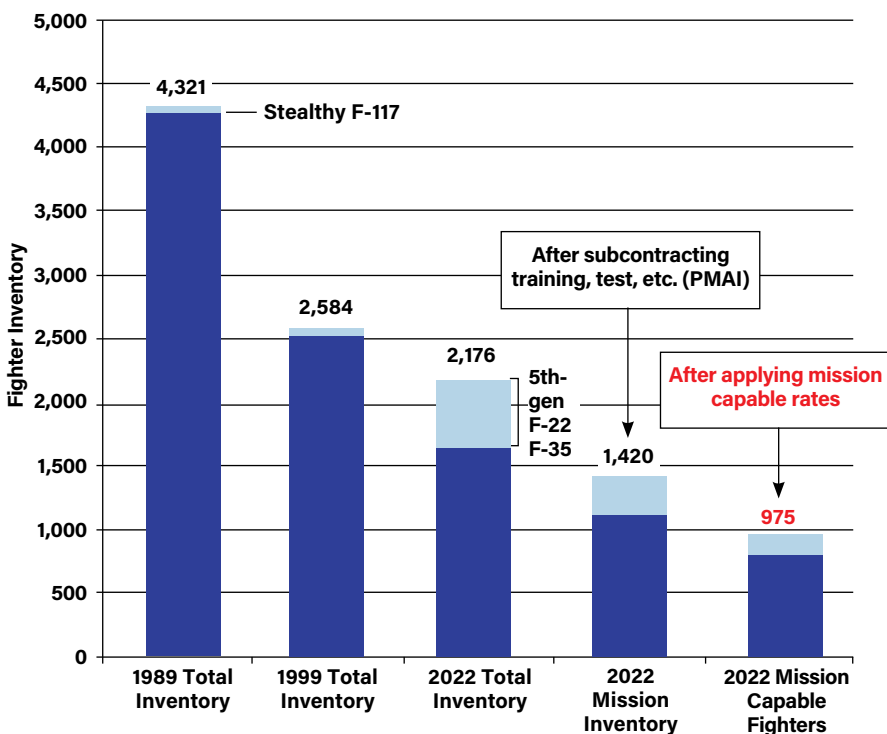
At the end of the Cold War, the Air Force had a robust force that proved its value in the first Gulf War. So successful was the Air Force in that campaign, in fact, that leaders were confident it could absorb reductions with acceptable risk. Without the Soviet Union as a peer threat, U.S. defense policy shifted toward reduced defense spending and a focus on lesser regional aggressors, leading to the prioritization of capability over capacity. The B-2 bomber program, for example, was slashed from its planned 132 aircraft to just 21 in 1992.

The 1993 Bottom-Up Defense Review determined that roughly 40 percent of the Air Force's "fighter wing equivalents" and 31 percent of its bombers were no longer needed. The 1997 Quadrennial Defense Review (QDR) continued the trend, throttling back on investment in fifth-generation fighter jets. Then-Secretary of Defense William Cohen directed the Air Force to reduce the planned buy of stealthy F-22 air superiority fighters, intended to replace its F-15C/D jets, arguing his decision was "consistent with [the F-22's] much greater capability compared to the F-15." A decade later, Secretary of Defense Robert M. Gates would cut the force in half again, ending F-22 procurement at 187 aircraft—less than 50 percent of its validated military requirement. This decision was partly based on an underestimation of the Chinese threat and was extremely near-sighted, leaving the Air Force with an F-22 force too small to generate the kind of sustained numbers of sorties needed for joint operations in a fight with China.

DOD-directed force cuts continued nearly unabated in the 2000s and 2010s, even as China accelerated its military buildup. Like the Bottom-Up Review, these budget-driven reductions were made in the belief that upgrading old instead of buying new would maintain the U.S. military's overmatch over lesser adversaries like Iran and North Korea. The Air Force's 2009 combat air forces reduction, or "CAF Redux," divested about 250 F-15s, F-16s, and A-10s in response to then-Secretary of Defense Gates' guidance to "eliminate excessive overmatch in force structure" and redistribute savings to "modernize and equip a smaller, more flexible, capable, and lethal force." While some of the CAF Redux savings were used to buy MQ-1 and MQ-9 remotely piloted aircraft and other capabilities to support counterterrorism operations, most were lost by the Air Force as a result of the 2011 Budget Control Act (BCA).

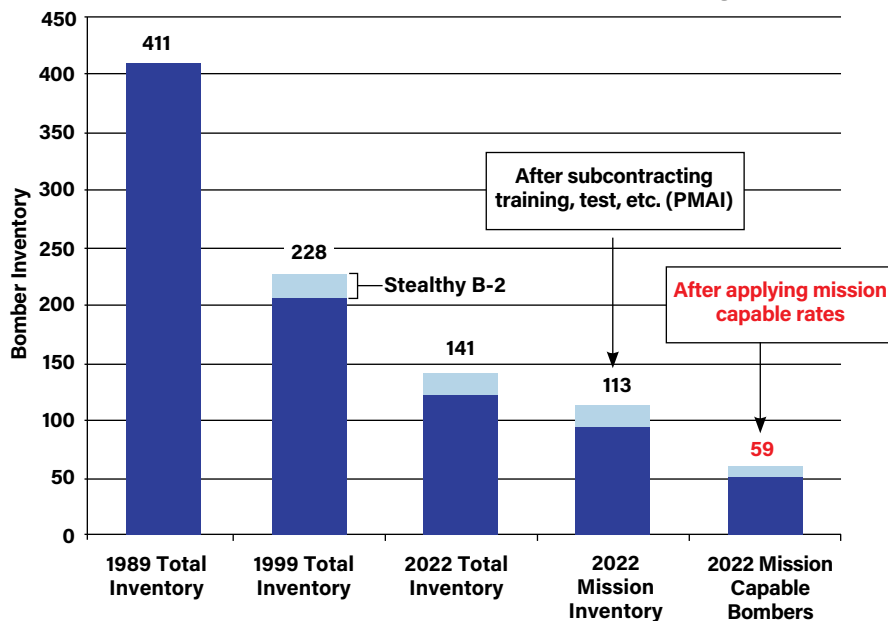
Today, the Air Force's fighter jet inventory is less than half the size of the fighter force in 1989, while demands by the combatant commanders for Air Force fighters capable of winning air superiority and performing other missions are increasing.

30 Years of Cuts to Fighters ...



Sources: Mitchell Institute. Inventory data provided by the U.S. Air Force and mission capable rates from a U.S. Air Force database current as of October 19, 2021. Lockheed Martin provided the mission capable rate for F-35As. Also see John A. Tirpak, "Fighter Mission Capable Rates Fell in 2021," *Air Force Magazine*, Nov. 22, 2021.

... And Bombers, Diminish Combat Capacity



Sources: Mitchell Institute. Inventory data provided by the U.S. Air Force and mission capable rates from a U.S. Air Force database current as of Oct. 19, 2021.

Moreover, canceled programs and curtailed procurement have stymied the Air Force's long-sought modernization goals to develop a 5th-generation combat force with the right mix of stealthy aircraft capable of surviving in high-end fights.

BOMBER SHORTAGE

The Air Force provides the free-world's only long-range strike capability with its B-1B, B-52H, and B-2 bombers, which possess global reach, can attack dozens of targets on



a single sortie, and offer combatant commanders critical options. Yet the Air Force’s inventory includes only 20 B-2s, 45 B-1Bs, and 76 B-52Hs—one-third of the force that deterred the Soviet Union. Importantly, Air Force bomber retirements over the years were primarily the result of budget pressures, not declining operational demand.

The Air Force completed its purchase of 100 B-1 bombers in the late 1980s, largely on schedule and within cost estimates. This force remained above 90 total aircraft until 2002, then declined by about a third within several years. Yet operational demand for B-1s did not decline. Their multi-mission capability, global range, and large weapons payload capacity made them the workhorse of USAF’s counterinsurgency and counterterrorism operations in the 2000s and 2010s. However, years of flying these aircraft in nonstop operations broke the health of the fleet; some B-1s were so damaged they were no longer safe. The Air Force decided to retire 17 B-1s in fiscal 2021 to concentrate funding on sustaining the health of its remaining bombers. Today, the B-1 force consists of just 40 mission aircraft.

After accounting for noncombat-rated aircraft and mission capable rates, the actual number of available bombers on any given day is just 59. Operationally, this means only about 15 bombers could be engaging in one theater at any one time, assuming 15 bombers recovering, 15 enroute, and 14 regenerating for another sortie. USAF’s 20 B-2s—one was lost in a 2008 accident on Guam—are now the nation’s only combat aircraft that have the long range, payload capacity, survivability, and other attributes needed to strike deep into highly contested environments. B-52Hs and B-1Bs are limited to “stand-off” strikes from beyond the reach of advanced, long-range air

defense systems, and are less effective than “stand-in” strikes conducted by stealth bombers that can penetrate contested areas, and hit hardened and deeply buried military facilities and highly mobile targets, like ballistic missile transporter-erector-launchers. Overall, the bomber inventory falls far short of the Air Force’s stated future requirement of 225 total

bomber aircraft which is still less than required by the national defense strategy.

The Air Force’s E-3 Airborne Warning and Control Systems force suffered a similar decline. USAF’s fiscal 2023 budget proposes retiring 15 of its 31 E-3 AWACs aircraft, which are now approaching 50 years old. Since joining the force in the 1970s, E-3s have provided airborne battle management and command and control, a real-time picture of the battlespace, and information on enemy actions to joint and coalition forces.

USAF Suffers Deepest Cuts

The cumulative change in total obligational authority plunged for all military departments from 1989 to 2001, but the Air Force suffered the deepest cuts to people, weapons, and research and development when compared to the Army and Navy.

BUDGET CATEGORY	DEPARTMENT OF THE AIR FORCE	DEPARTMENT OF THE NAVY	DEPARTMENT OF THE ARMY
Military Personnel	- 37.9%	- 31.8%	- 34.3%
Operations & Maintenance	- 9.4%	- 26.1%	- 22.1%
Procurement	- 48.7%	- 32.0%	- 34.4%
RDT&E	- 37.3%	- 16.7%	- 7.8%
Total Change in TOA	- 31.2%	- 28.2%	- 28.9%

Gray shaded blocks = most significant reductions for each budget category.
Sources: Mitchell Institute. Air Force blue-only budget data in table was provided to the authors by the U.S. Air Force. Other data is from OUSD(C) Greenbook. The Greenbook reports the Air Force’s TOA without subtracting pass-through funding.

After so much continuous use and delays in recapitalizing them, many of these aircraft are now unreliable. Lt. Gen. Joseph T. Guastella, the Air Force’s most recent Deputy Chief of Staff for Operations, told Congress this spring: “The aircraft is exhausted ... it’s been deployed continuously—much of the Air Force’s fleet is in that condition. It’s not maintainable out there in the field, and it has significant capability gaps.” Air Force Deputy Chief of Staff for Plans and Programs Lt. Gen. David S. Nahom added, “We struggle to keep roughly half that fleet airborne” because of “significant maintainability challenges.”

After years of delay, the Air Force is now buying new commercial derivative E-7 aircraft—called “Wedgetail” because of its large, top-mounted Multi-Role Electronically Scanned Array (MESA) radar—to replace its E-3s. But the first Wedgetail will not join the inventory until fiscal 2027, leaving an unavoidable gap for battle management and command and

Fewer Planes, Please: Air Force Budget Seeks More Cuts in FY23

AIRCRAFT	FY23 DIVESTITURES	FY23 PROCUREMENT	NOTES
A-10	21		
F-22	33		Block 20 aircraft
E-3 AWACS	15		Leaves 16 E-3s in the force
E-8 Joint Stars	8		Plan retires another 4 in FY24
C-130	12 C-130H		
Aerial refueling tankers	13 KC-135	15 KC-46	
MQ-9 remotely piloted aircraft	100		Transfer to a USG agency
T-1 trainer	50		
F-35A 5th-generation fighter		33	
F-15EX 4th-generation fighter		24	
HH-60W combat search & rescue		10	
MH-139 multi-mission helicopter		5	
Total	252 divested	87 added	

Source: Based on U.S. Air Force FY23 budget documents

control aircraft. As with the Air Force's other compromised aircraft inventories, this is the direct result of insufficient modernization investment. The ultimate cost of that delay is a significant shortfall in both military capability and capacity.

LEARNING FROM THE PAST

The DOD decisions to repeatedly curtail or cancel aircraft procurement and modernization after the Cold War all contributed to a 2022 Air Force that is out of balance with the present threat environment. For over 30 years the defense budget has driven the national defense strategy, not the other way around. This has forced the Air Force to adopt a "divest to invest" budget-driven approach. In other words, since the Air Force is consistently underfunded the only way it can obtain money to invest in modern systems is to retire current operational systems. This situation has eliminated any force structure hedge the Air Force once had, as did the "capability over capacity" mantra with which DOD justified its force cuts. Three decades of budget cuts yield clear lessons learned that must be applied to inform future investment decisions to reverse its spiral toward an even smaller, older, and less capable force:

- Major USAF force cuts since the Cold War were driven by a lack of resources and a desire to reduce defense spending, not strategic priorities.

- Savings from the USAF's force cuts were not enough to significantly increase its capacity to fight a high-end war. Forces divested by the Air Force to generate savings were never fully replaced by new systems.

- Claims that force structure reductions would help the Air Force modernize and equip a smaller, more flexible, capable, and lethal force proved incorrect. The current force is not more flexible and lacks the lethality needed for a conflict with China.

- Force modernization delays enabled China to catch up and even surpass some of the Air Force's technological advantages.

In the face of continued budget pressures, and over three decades of underfunding, the Air Force is being forced to "divest to invest" once again. This is not a war-winning approach, but rather one that increases the probability of losing the next major regional conflict.

TODAY'S AIR FORCE PLANS

Despite growing requirements, however, the Air Force plans to cut 252 more aging aircraft in fiscal 2023, while acquiring just 87 new aircraft, including 33 F-35s and 24 F-15EXs. Over the Future Years Defense Program (FYDP), the Air Force has proposed retiring a total of 1,463 aircraft and buying only 467. This would be a net loss of 996 aircraft, or a force reduction of about 25 percent. These proposed cuts continue the post-Cold War divestment trend, which successfully created a smaller Air Force, while failing to deliver a "more capable" force.

Yet, force size is critical to prevailing in a conflict against China in the vast Indo-Pacific region. It is crucial to creating massed effects, like killing thousands of enemy targets in hundreds of hours or surveilling large areas of a highly contested battlespace. This can only be provided by air forces that are sized to sustain such operations and that have the right mix of long ranges, mission persistence, payload capacity, and survivability. Only air power can provide this response on day one of a conflict with the mass and precision needed to blunt and then halt an invasion before it can succeed. Defeating a Chinese or Russian fait accompli campaign, deterring a second lesser aggressor, deterring nuclear attacks, and defending the homeland are all National Defense Strategy requirements.

The 2022 Air Force lacks the flexibility, lethality, and enough next-generation capabilities to accomplish the National Defense Strategy requirements. Not only are its forces increasingly antique and fragile, but they also lack the reserves to absorb the kind of aircraft and aircrew losses that should be expected in a major peer conflict.

Both China and Russia recognize these shortfalls, potentially leading them to conclude they have a window of opportunity to launch fait accompli attacks that the United States cannot defeat. The nadir in the Air Force's force capabilities and capacity will occur within the next six years, around the same time officials believe China could become capable and ready to assault Taiwan to force its reunification. Director of National Intelligence Avril Haines told Congress in May 2022 that the threat to Taiwan is "acute between now and 2030." A budget-driven force design strategy that continues to trade USAF force structure to fund future modernization ignores this reality and the Air Force's pressing need for increased next-generation capabilities and capacity to counter the threats identified in the National Defense Strategy.

AIR FORCE BUDGET REALITY

Inadequate budgets and the lack of other resources have had an outsized role in under-sizing and misshaping the U.S. Air Force for over three decades. Understanding the magnitude of the shortfall requires an explanation of "pass-through funding," an outdated DOD budget reporting practice that masks the true Air Force budget from Congress and the general public.

Each year, DOD submits its budget request to Congress as part of the President's Budget. Pass-through funding in 2023 adds over \$40 billion per year to the Air Force's budget that really goes to other DOD agencies—the Air Force has no control or access to any of that money. \$40 billion would be enough to buy 400 F-35As per year. This practice paints a false picture of the resources the Air Force can use to organize, train, and equip its forces. It also masks how resources are allocated across the services. Since 1991, \$988 billion has passed through the Air Force budget to fund other DOD agencies.

The President's fiscal year 2023 Budget Request appears to allocate \$234.1 billion for the Department of the Air Force, \$180.5 billion for the Navy, and \$177.5 billion for the Army. In fact, however, \$40.1 billion—17.1 percent—of the Air Force budget goes to other DOD agencies. Accounting for the \$24.5 billion share that will fund the U.S. Space Force, that leaves \$169.5 billion for the Air Force if allocated by Congress, putting it behind the Army, the Navy, and other DOD agencies.

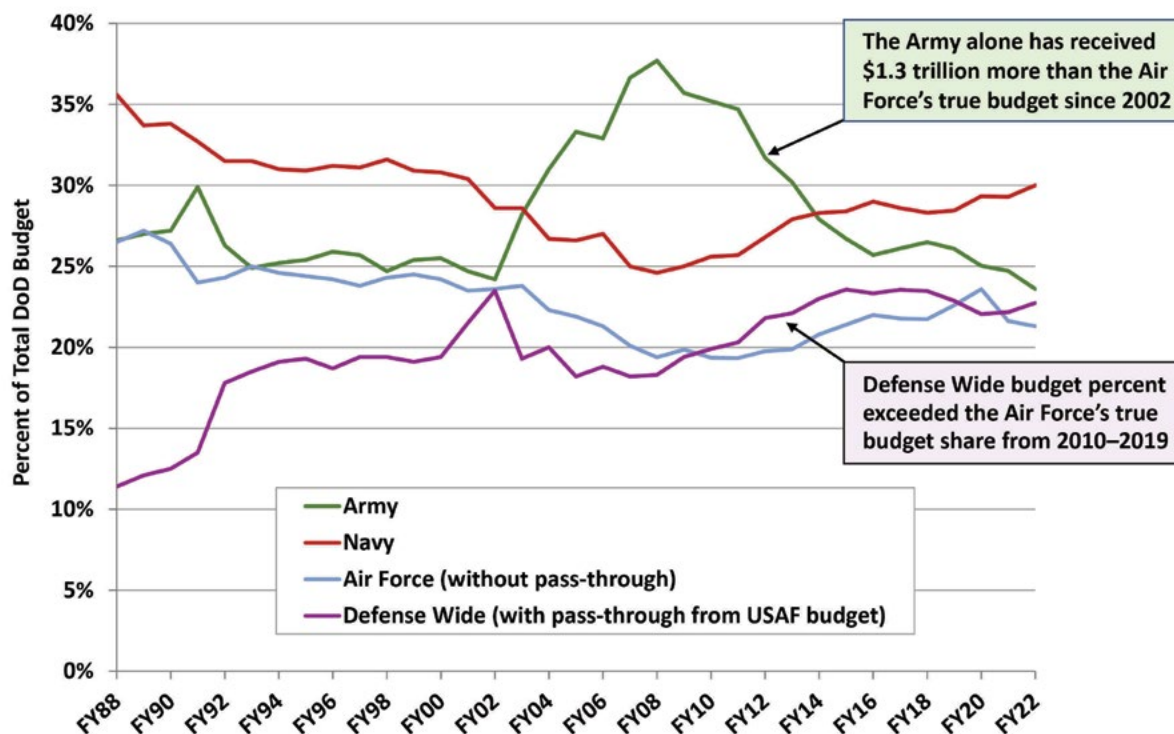
Obscuring the Air Force's real budget misleads and complicates the work of decision-makers in Congress, the Office of Management and Budget (OMB), the Department of Defense, and the White House. Achieving transparency is an imperative to correctly allocate limited resources and optimally prepare for a fight with China.

Solving the pass-through should not be complicated, as that funding line could easily be moved from the Air Force account to DOD's "defensewide" budget category, which includes DOD's agencies and other non-service organizations.

Excluding funding that passes through the Air Force reveals that Air Force budgets have been smaller than both the Army and Navy's budgets for over the last 30 years in a row, and less than other DOD agencies from 2010 to 2019. It also shows the Air Force sustained the most significant budget cuts among the armed services over that period. The Air Force's 2001 procurement budget was about half its 1989 spending,

USAF's Share of the Budget Lags Behind Other Services

The Air Force's actual share of annual defense spending has been less than the Army's and Navy's since at least 1989 when pass-through spending is subtracted. Spending by other defense agencies has surpassed USAF in all but one year since 2010.



Sources: Mitchell Institute. Data from OUSD(C) Greenbook and U.S. Air Force

compared to reductions in the Army and Navy that were only about one-third. The Air Force also absorbed the largest cuts in percentage terms to its military personnel and research, development, test, and engineering (RDT&E) accounts.

HOLLOWING THE AIR FORCE TO FUND THE ARMY

The Sept. 11, 2001, terrorist attacks on New York City and Washington, DC., drove a dramatic shift in U.S. military spending, a shift that altered the balance of spending across the services. The Army's annual budget grew nearly 250 percent from fiscal 2001 to fiscal 2008, while the Air Force's budget increased by a far more modest amount.

A significant part of additional funding the Air Force received during this period went to supporting the high operational tempo of its forces conducting strikes, providing persistent overwatch of the battlespace, and performing other counterterrorism-related missions in the Middle East—all paid for to the exclusion of modernizing its forces for high-end warfare. The Air Force's O&M spending growth also consumed much of the additional funding it received, while RDT&E and procurement remained anemic. What small procurement funding increase it had, the Air Force invested in remotely piloted aircraft; increased capacity to process, exploit, and to disseminate intelligence to allied forces engaging terrorists; and recapitalize part of its airlift force—all important capabilities, but investments better suited for operations in permissive environments, not peer conflicts that are now DOD's highest priority.

In the face of these facts, it is fair to say that the 10 years following September 2001 was a period of hollow growth. Today, the time wasted and risks created by imprudent defense

acquisition decisions in the past cannot be quickly resolved in a future crisis. As U.S. Secretary of War Harry H. Woodring said on the eve of World War II, "We are not prepared for conflict. Billions appropriated today cannot be converted into preparedness tomorrow."

From 2008 onward, the Air Force acquisition budget remained flat, and O&M costs continued to grow, fueled by sustained high operational tempo and the increased costs of maintaining an aging force. That trend continues. DOD's request of \$169.5 billion for the Air Force in FY23 is well below the Navy (\$180.5 billion) and the Army (\$177.5 billion) requests and is even below other DOD agencies (\$170.8 billion). The Marine Corps' \$50.3 billion fiscal 2023 budget request, included in the Navy total, is more than double the Space Force's \$24.5 billion request. These disparities are even more stunning considering so many of Air Force and Space Force missions—like air superiority, aerial refueling, air mobility, airborne and space-based communications and ISR—support and benefit all joint force operations. No U.S. joint force operation can be conducted without involving some element of the Department of the Air Force. This cannot be said about any other military department.

DECADES OF BEING THE LEAST-FUNDED SERVICE

On the surface, the Air Force appears to be funded at a level of parity with the Army and Navy. However, shifting pass-through funding out of the Air Force's budget reveals it has lagged, not led, the Navy and Army's budgets for over 30 years in a row, and all but one year since 1990. Insufficient budget resourcing forced the Air Force to make tradeoffs between force size, readiness, and modernization investments that

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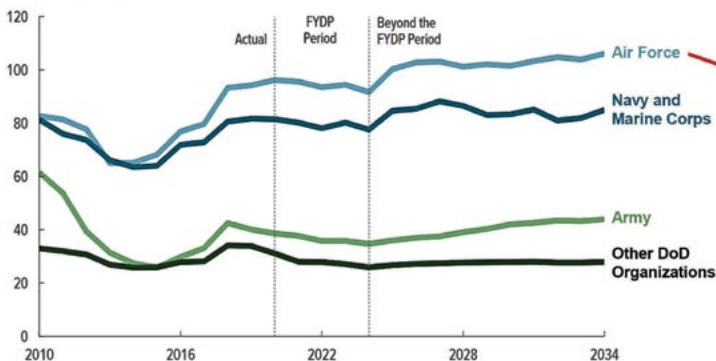
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How the Pass-Through Inflates Air Force Acquisition Spending

In 2019, the Congressional Budget Office included pass-through spending in a comparison of the military departments acquisition funding. In 2022, however, it removed pass-through funds to make the same comparison. How those two analyses compared:

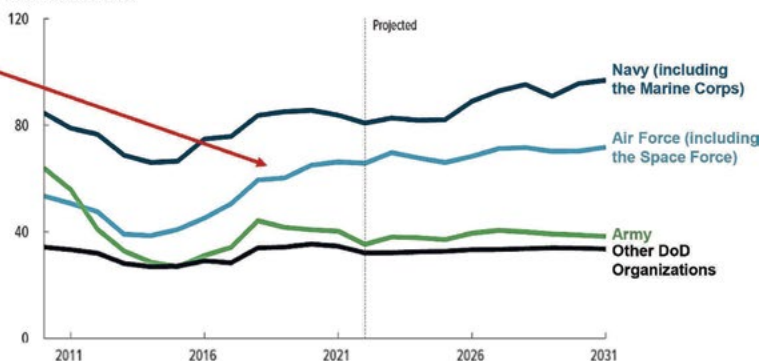
DoD's Acquisition Funding, by Military Service

Billions of 2020 Dollars



DoD's Acquisition Costs, by Military Department, 2010 to 2031

Billions of 2022 Dollars



Sources: Congressional Budget Office (CBO), Long-Term Implications of the 2020 Future Years Defense Program (Washington, DC: CBO, August 2019), page 17; and CBO, Long-Term Costs of the Administration's 2022 Defense Budget (Washington, DC: CBO, January, 2022), page 10.

eroded its ability to fight and win. In fact, between 2002 and 2021, the Army and Navy received about \$1.3 trillion dollars and \$914 billion dollars more, respectively, than the Air Force. In the Army's case, that averages to about \$66 billion more per year than the USAF. The cumulative effect of over 30 years of underfunding is what has resulted in today's Air Force being the oldest, smallest, and least ready in its history.

This is also a reason that USAF acquisition of new aircraft has lagged the Navy's aircraft buys for 16 of the past 21 years. This is true despite the fact that Navy aircraft are primarily deployed and controlled from a small number of carriers to defend Navy priorities, whereas Air Force aircraft provide more options and flexibility to meet the demands of joint force combatant commanders. The lag in Air Force procurement denies planners and combatant commanders of the critical air power capabilities they require.

The Air Force's consistent small budget share relative to the Army and Navy is the leading reason for its modernization deficit and its inability to acquire next-generation technologies in the numbers needed to fight and win a major peer conflict. As the former Commander of the Air Force's Air Combat Command Gen. John D. Corley explained, "If it's always about 'program next,' you'll never have a program at all."

While budget trends that favored the Army were understandable given its predominant role during counterinsurgency and counterterrorism operations in Iraq and Afghanistan, those conflicts are over. To reverse the shrinking size, capability, and readiness of the Air Force renewed investment is essential—not just for the sake of the service itself, but for all U.S. forces that depend on the enabling capabilities air and space forces provide. Allocating even half the amount invested in the Army over those 20 years could fund the B-21 bomber program, recapitalize the Air Force's Intercontinental Ballistic Missile forces, increase acquisition of fifth-generation fighters, and develop new air-to-air and air-to-ground munitions suitable for high-end warfare in contested environments.

GROW THE AIR FORCE'S BUDGET

Solving the Air Force budget challenge will require 3 to 5 percent annual real budget growth on top of inflation for a decade or more. Without that, the gap between the modernized forces the Air Force can bring to the fight and the National

Defense Strategy's requirements will only grow. This risks incentivizing China, Russia, and other adversaries to pursue increasingly aggressive behavior. Stated more bluntly, if we do not recapitalize and modernize the Air Force, we risk losing a future war.

Redistributing resources among the armed services—while painful—is not a new practice. Most recently it was done between 2001 and 2021 when funding for the Army was increased by shifting budget share from the other services to compensate for the increased demand for land forces in Iraq and Afghanistan. It is now time to apply that same logic to rebuild the Air Force to ensure that the entire DOD has the options it will require to deter, and if necessary, win in a fight against peer threats.

Accordingly, Congress and DOD should take the following actions:

- Remove pass-through funding from the Air Force's budget and shift the overall amount to a budget line in the existing "defense-wide" budget category to ensure transparency in how DOD allocates resources among the services.

- Develop a force-sizing construct for the Air Force that ensures the service's size is determined by the National Defense Strategy, not arbitrarily set budgets or available funding.

- Resolve the imbalance in DOD budget allocation to reverse the declining age, size, and readiness of the Air Force in order to meet the demands of the National Defense Strategy.

- Increase the Air Force's budget by 3 to 5 percent annually, above inflation, to fund modernization and provide the force capacity it needs to win.

- Reduce risk in the near-term and mid-term by increasing the Air Force's acquisition of next-generation capabilities including F-35As, B-21s, and advanced precision-guided munitions designed to strike in contested operational environments.

The current Air Force Chief of Staff coined the motto of, "accelerate change or lose." The current Secretary of the Air Force has defined his top three priorities as "China, China, China." Without a shift in DOD resources to the Department of the Air Force soon, what the DOD risks accelerating is not "change," but its potential of losing to China. It's time to change that slogan to, "Increase the Department of the Air Force budget share or lose."

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OUTSTANDING AIRMEN OF THE YEAR

The Outstanding Airman Program annually recognizes 12 enlisted members for superior leadership, job performance, community involvement, and personal achievements.



The Air Force Association drove the creation of the Outstanding Airmen of the Year program, which debuted at AFA's 10th annual convention in 1956. Airmen selected receive the Outstanding Airman of the Year ribbon with bronze service star device; they also wear the Outstanding Airman badge for a full year. This year's honorees were chosen by a selection board from among nominees advanced by commands in the Air Force and Space Force.

SMSGT MEGAN A. HARPER

Security Forces Manager

701st Munitions Support Squadron, Kleine Brogel Air Force Base, Belgium (ACC)

Home of Record: Mesquite, Texas

Senior Master Sergeant Megan Harper led 372 Total Force Defenders in full-spectrum force protection intelligence and base defense operations for the largest expeditionary wing, comprised of 9,000



coalition forces and 72 Protection Level resources. Her leadership was pivotal in the response to a C-17 aircraft that was hijacked from Hamid Karzai International Airport, Afghanistan, enroute to al-Udeid Air Base, Qatar. Harper's

team secured the aircrew and all 823 passengers aboard without further incident. As the operations superintendent, she directed 588 joint force protection Airmen, Soldiers, Sailors, and Marines as they ensured the safe passage of 57,000 Afghan evacuees. Additionally, she was the recipient of the Distinguished Graduate, Academic Achievement, and Commandant Awards at the Senior NonCommissioned Officer Academy and established al-Udeid Air Base's first female Defender mentorship group.

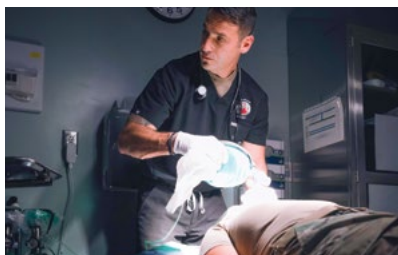
MSGT BRANDON S. BLAKE

Detachment Superintendent

Detachment 1, 720th Operations Support Squadron, Birmingham, Ala. (AFSOC)

Home of Record: Sheppard Air Force Base, Texas

Master Sergeant Brandon Blake led a six-member team in support of Operation Allies Refuge, during which his team supported 5,100 U.S. personnel, treated 71 wounded, enabled seven surgeries, and was one of three medical teams on the final flight out of Hamid Karzai International Airport, Afghanistan. Both the 82nd Airborne



Division commander and Marine Corps Commandant lauded his performance during the Air Force's largest mass casualty event in 10 years and the largest evacuation in U.S. history. Additionally, Blake

responded to a vehicle accident while off-duty where he evaluated emergent trauma, alerted 911, and stabilized the patient for transport ultimately saving a civilian's life. Finally, he earned the Distinguished Graduate and Commandant Awards at the in-residence Noncommissioned Officer Academy, all while finishing his dual master's degrees in Healthcare Administration and Public Health.

MSGT KADE N. FORRESTER

Infrastructure Flight Section Chief

11th Contracting Squadron, Joint Base Anacostia-Bolling, D.C. (AFDW)

Home of Record: Paterson, N.J.

Master Sergeant Kade Forrester successfully led two flights in his squadron to stand up the Air Force's newest wing and execute the first lead service transfer in Department of Defense history for joint basing. His credibility within his functional community was unmatched, and he was selected by the Career Field Manager for



executive leadership development to shape the future of the contracting workforce in the Air Force. Forrester launched the \$111 million Simplified Acquisition Base Engineer program, which slashed acquisition timelines by 70 percent on 24 highly visible projects and saved over 1,000 labor hours across the wing. Finally, his leadership, technical acumen, and innovative mindset

culminated in him earning the Department of Air Force's Contracting Ninja of the Year and Air Force District of Washington Innovation in Contracting Individual of the Year Awards in 2021.

TSGT BRIANNE E. KELLEHER

Command Language Program Manager

655th Intelligence, Surveillance, and Reconnaissance Group, Wright-Patterson Air Force Base, Ohio (AFRC)

Home of Record: Wyoming Valley, Pa.

Technical Sergeant Brianne Kelleher deployed to Task Force Holloman supporting Operation Allies Welcome as the noncommissioned officer in charge of a 23-member Linguist Cell. She received 95 aircraft and processed more than 3,500 refugees through medical and visa procedures. During the deployment,



she developed a lost child alert system, which distributed information in four languages, reuniting more than 300 children with their families. Furthermore, Kelleher volunteers with local organizations providing support and teaches English to Afghan and North African migrants in the Dayton, Ohio, area.

TSGT ALEXANDER W. MESSINGER

Noncommissioned Officer in Charge, Standardization Evaluation
802nd Security Forces Squadron, Joint Base San Antonio-Lackland, Texas (AETC)
Home of Record: Mebane, N.C.

Technical Sergeant Alexander Messinger led a four-member quality-assurance team overseeing 396 evaluations and 829



field exercises for 462 military and civilian personnel, leading to his selection as the Air Force Security Forces Support Staff NCO of the Year. He piloted his unit through a Vertical Inspection and Unit Effective Inspection while managing 33 pro-

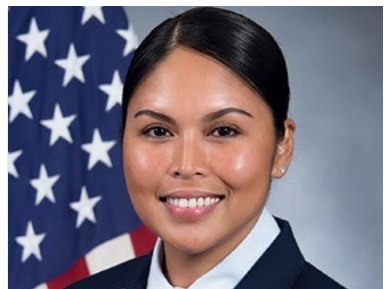
grams and 65 checklists. His leadership earned the squadron two "Highly Effective" ratings with zero discrepancies, five strengths, 26 Professional Performers awards, and he was selected as the unit's sole Superior Performer. Messinger's guidance provided security validation in direct support of the President's humanitarian border mission, ensuring safe relocation of more than 1,000 migrant children to permanent family homes. Finally, he was the only NCO selected for a Flight Commander training course, where his leadership propelled his team to winning seven annual awards at various levels.

TSGT JENNIFER G. THOMAS

Vehicle Deployment Manager

441st Vehicle Support Chain Operations Squadron, Joint Base Langley-Eustis, Va. (AFMC)
Home of Record: Delano, Calif.

Technical Sergeant Jennifer Thomas was instrumental in delivering precision logistics in support of Operation Allies Welcome. Her quick response was vital in developing a 57-vehicle package supporting two locations and 15,000 Afghan evacuees. Additionally, she led the Air Force Central Command's mission drawdown by redistributing 680 vehicles throughout 18 locations saving \$35 million in acquisition costs. Her expertise was vital in the backing of the Department



of Homeland Security where she deployed four assets in less than 48 hours to aid the transfer of 3,000 Haitian migrants. Furthermore, Thomas was the Wing 5/6 Vice President, Group Combined Federal Campaign Representative, and

Squadron Booster Club President overseeing 12 committees. She coordinated 27 volunteer events that raised \$121,000 and earned the Volunteer Unit of the Year Award.

SSGT STEVEN C. PETERS

Paramedic

60th Medical Group, Travis Air Force Base, Calif. (AMC)
Home of Record: Los Angeles

Staff Sergeant Steven Peters demonstrated exceptional bravery and leadership by heading a team in patient recovery while under enemy fire during his deployment in Operation Allies Refuge. His team confronted an incoming attack at the flight line to ensure that nine critically injured service members were stabilized and securely transported to a treatment facility. He



also coordinated with the Norwegian Armed Forces and a non-government organization to reunite displaced Afghan children with their families at a Qatar Air Base. Peters completed the rigorous and intensive six-month Paramedic Course at Pima College in Tucson, Ariz.

SRA DEMARION N. DAVIS

Wing TEMPEST Manager

48th Communications Squadron, RAF Lakenheath, U.K. (USAFE-AFA)
Home of Record: Saint Augustine, Fla.

Senior Airman DeMarion Davis dominated his E-5 position for over a year amid a 40 percent personnel shortage. He drove the certification of 54 NATO classified processing sites and expedited the emergency approval for the 336th Fighter Squadron's opera-



tions desk in response to Russian aggression in a matter of four days versus the three-month standard, enabling an additional 496 combat sorties. He was lauded by the U.S. Air Forces in Europe commander after he converted the enlisted club into a tem-

porary classified area facilitating the nuclear SATAF summit. Additionally, Davis stepped up as the Air Force Ball subcommittee lead and showcased his unrivaled leadership amongst senior enlisted members by steering the \$52,000 budget to host a flawless event for 1,000 attendees. Finally, he drove the approval for the wing's wireless initiative, "Wi-Fi the Wing," enabling base-wide alternate network capabilities, which saved 2.6 million man-hours per year across the Air Force.

SRA MONICA A. FIGUEROA SANTOS

Senior Nuclear Command and Control Emergency Actions Controller

341st Missile Wing Command Post, Malmstrom Air Force Base, Mont. (AFGSC)

Home of Record: Ponce, Puerto Rico

Senior Airman Monica Figueroa Santos was endorsed for a noncommissioned officer position by the wing commander. She authenticated targeting for 712 sorties and led a four-member



team validating the President to launch control center link for a Chairman of the Joint Chiefs of Staff Nuclear Command, Control, and Communication exercise. She also steered support for six civilian search-and-rescue missions by synchronizing 11 organizations. Her efforts

helped save two lives. Figueroa Santos' subject-matter expertise was recognized during the no-fail Nuclear Surety Inspection by acing a three-hour higher headquarters scenario and exam, yielding zero write-ups and being recognized as a Superior Performer by the Air Force Global Strike Command Inspector General. Finally, her quick thinking enabled her to avert wing mission failure by generating 74 emergency alerts, briefing four organizations and securing \$17.1 billion worth of assets spread across a 13,800-mile area of responsibility.

SRA KRISTINA L. SCHNEIDER

Fire Protection Journeyman

179th Airlift Wing, Ohio Air National Guard, Mansfield Lahm Airport, Mansfield, Ohio (ANG)

Home of Record: Strongsville, Ohio

Senior Airman Kristina Schneider deployed in support of Operations Spartan Shield and Allies Refuge to assist with the emergency medical response of Afghan refugees. She operated as lead paramedic on an Emergency Response Team, utilizing her knowledge and experience as a full-time civilian paramedic to provide emergency medical care. Schneider personally treated more than 30 critical adult patients and four unconscious children, all exposed to harsh conditions while evacuating Afghanistan. Her emergency response team was a key component to the success of the medical mission that treated and cared for more than 54,000 Afghan refugees in the largest airlift evacuation mission in history.



SRA CADEN A. SOPER

F-15 Avionics Journeyman

18th Aircraft Maintenance Squadron, 48th Maintenance Group, RAF Lakenheath, U.K. (PACAF)

Home of Record: Columbus, Kan.

Senior Airman Caden Soper showed superior professionalism at his previous duty station through his efforts with the Dorm Council, which was lauded by the command chief master sergeant of the 18th Wing, Kadena Air Base, Okinawa, Japan. His dedication to the council made a positive impact for the Airmen in the commu-



nity. Additionally, Soper sought to increase his knowledge within his occupational specialty and was noted by leaders for his drive to improve unit-wide physical fitness. He was instrumental in the mentoring and training of Airmen on the diagnostics and repair of 26

F-15 Avionics Systems. He helped generate more than 1,100 sorties, which enabled sustainment of combat capabilities and training for 62 pilots across the 67th Fighter Squadron.

SRA CHRISTOPHER T. THAO

Network Operations Technician

65th Air Base Squadron, Lajes Field, Portugal (Airmen supporting USSF)

Home of Record: Warwick, R.I.

Senior Airman Christopher Thao deployed to the 405th Air Expeditionary Group as a security analyst in support of Operation Allies Welcome. He provided direct support for 9,000 medical evacuations that distributed 175,000 pounds of aid to 70,000 evacuees. Thao was selected to lead a \$1.2 million Desktop Infrastructure



overhaul where he rebuilt nine servers and 480 workstations. His efforts eliminated weekly network outages and propelled systems' availability rate to 99 percent for 2,000 personnel, enabling the \$71 billion mission for 14 geographically separated units and 15 Special Access Programs within the Space

Base Delta 1 Peterson-Schriever Garrison area. As president, Thao revived the Airmen's Council by organizing mock promotion boards for 10 noncommissioned officers and 13 Airmen, which led to five Below-the-Zone selections and his recognition by the Chief Master Sergeant of the Air Force.

Teaching STEM to Kids in Need, AFA's National Teacher of the Year: Nancy Parra-Quinlan

Nancy Parra-Quinlan was nearly two decades into her teaching career when she introduced STEM to her students and changed her school—and her own life—for good.

A 7th and 8th grade science, STEM, and Career and Technical Education (CTE) teacher at Kino Junior High School in Mesa, Ariz., Parra-Quinlan (or “Mrs. P-Q” as her students call her) was named the Air & Space Forces Association's 2022 National Teacher of the Year (TOY). The award is sponsored by Rolls-Royce North America.

Parra-Quinlan's first STEM class was an elective in 2011 and interest was so strong that within two years, her entire curriculum six-period schedule was nothing but STEM electives, including robotic programming, 3D modeling, DNA comparison, and aeronautic engineering.

“I’ve even taught on my prep period in past years, and taught seven out of seven periods, because we’ve had so many kids that want to be in the programs,” Parra-Quinlan said.

She attributes the students' enthusiasm to their natural desire to be hands-on learners. STEM classes provide an outlet for students to not just sit and listen, but engage with the material and their classmates, practice leadership, and learn how to apply knowledge as they acquire it.

Traditional classes are tailored to certain kinds of students, she said. “If you’re not an auditory [learner], you lose interest very quickly.” Not in her STEM classes, though, where “students get to talk to other people. They get to move around. They get to use things with their hands.”

Parra-Quinlan said such opportunities are especially important at Kino Junior High, a Title I school in an economically disadvantaged area of Mesa. Title I schools are schools with high number of students from low-income families who may have a high risk of failing State academic standards. Her classes offer a glimpse into careers that might not even be imagined in such challenged communities.

“They need to see that there's a little bit more beyond their neighborhood,” Parra-Quinlan said. “Our kids don't have a lot of experiences,



Arizona Educational Foundation/Mesa Public Schools via Facebook

AFA 2022 National Teacher of the Year

whether it's what their parents do for a living ... or what kinds of activities they do outside of school. So we have to find an opportunity for them to be exposed to those things.”

Parra-Quinlan creates opportunities for her students both inside and outside of the classroom, too. “RoboKols,” for example, is an extracurricular robotics team she coaches for Kino Junior High students participating in the national FIRST LEGO League. They compete with other schools to build and program LEGO robots while simultaneously building their own research projects and engaging with one another as a team.

Another extracurricular program Parra-Quinlan teaches: Aerospace Academy, a two-week summer camp that exposes students throughout the Phoenix metropolitan area to STEM careers. Parra-Quinlan's campers have taken tours of Boeing's AH-64 Apache helicopter factory and a Southwest Airlines maintenance hangar, and they have also met air traffic controllers and other Federal Aviation Administration staff at Phoenix Sky Harbor International Airport.

“The kids got to see that being in aviation or being in aerospace doesn't mean just being a pilot or being an astronaut,” she said. “There's more out there for them to explore if they're interested.”

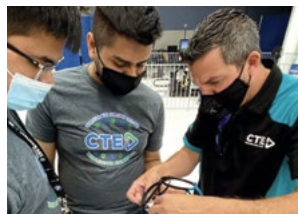
As a captain in the Civil Air Patrol, Parra-Quinlan is an Aerospace Education Officer and helps cadets pursue aerospace career goals, while helping local teachers access CAP's considerable STEM resources.

That kind of communal support and involvement is the heart of being a teacher, whether teaching students, cadets, or other teachers.

“You need to find your tribe,” she proclaimed. “It's super important that you find people who can be a resource for you.” Parra-Quinlan's goal as the 2022 AFA Teacher of the Year is to help other teachers at disadvantaged schools around the country provide their students sustainable, equitable opportunities to engage with STEM education. ✪

Second-Place: Robbie Ferguson

Robbie Ferguson teaches aerospace engineering and computer science to 9th-12th grade students at Westminster High School in Westminster, Colo. His passion for STEM and aviation has led him to partner with NASA and the Spartan College of Aeronautics and Technology to develop and define his robust aerospace program. Ferguson's newest course, “Drone Operations and Robotics,” gives students the opportunity to earn college credits and obtain their FAA Part 107 Commercial Remote Pilots License. It's all part of his mission to help “students to obtain even more industry certifications so that they can transfer these skills toward post-secondary education or join the aerospace workforce right out of high school.” ✪

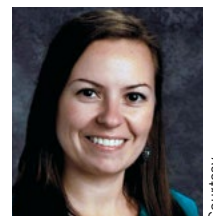


Courtesy

Robert “Robbie” Ferguson and students prepare a quad-copter for U.S. Drone Soccer.

Third-Place: Dr. Marina Mosneaguta

Dr. Marina Mosneaguta teaches 6th-8th grade math and is the STEM lead at Alice Drive Middle School in Sumter, S.C. She leads the Students Spaceflight Experiments Program, helping them conduct real scientific research, and organizes virtual meetings between her classes and STEM professionals, including aerospace engineers, astronauts, and even Vice Chief of Space Operations Gen. David D. Thompson. “Providing students with global education opportunities allows them to compete for jobs both nationally and internationally,” Mosneaguta said. “As a result, students develop global competence and STEM knowledge needed to understand and participate in a globally connected world.” She is also the adviser for the Student STEM Ambassadors Program for outstanding students in all disciplines and is the National STEM Honors Society Chapter adviser. ✪



Courtesy

Dr. Marina Mosneaguta



FACES OF THE FORCE



Staff Sgt. Alexander Cook

Staff Sgt. William Au and **Airman 1st Class Kade Jones**, of MacDill Air Force Base, Fla., acted on a "gut feeling" when they went on patrol in Tampa Bay in June. Their vigilance proved life-saving when they encountered a capsize boat and eight civilians in the water, with a bull shark circling the vessel. They called for backup, and **Airmen 1st Class Samari Rivera-Rodriguez** and **Savin Venable** responded quickly. Together, the four Airmen were able to get the civilians out of the water and into their own boats to level out weight distribution.



Timothy Sandland/USAF

Sisters—and Cadet Colonels—**Leah Grace Vigeveni** and **Sarah Ashley Vigeveni** reached the highest levels of the Civil Air Patrol, receiving the coveted General Carl A. Spaatz Award in an August ceremony. Brig. Gen. Virginia Gaglio, commander and chief of staff of the Massachusetts Air National Guard, said the sisters both receiving the award simultaneously was "nothing short of amazing." Roughly five out of every 1,000 cadets receives the Spaatz Award, named after the Air Force's first Chief of Staff. Both sisters will be attending the University of North Dakota.



Staff Sgt. Clayton Wear/ANG

In the aftermath of historic flooding in eastern Kentucky this July, **Airmen from the Kentucky ANG's 123rd Special Tactics Squadron** deployed to assist with search and rescue operations. Over the course of four days, the 23-person team rescued 19 individuals stranded by the floods as well as two dogs. The squadron also led command and control efforts that coordinated 29 rotary aircraft missions, recovered four bodies and helped direct operations, assisted by MWD Callie, the only certified search-and-rescue canine in the U.S. military.



Tech. Sgt. Chelsea Smith/ANG

Senior Master Sgt. Jonathan Sotomayor, of the 202nd RED HORSE unit of the Florida ANG, was recently selected as the 2022 Outstanding First Sergeant of the Year. A former crew chief for the F-15E, Sotomayor joined the 202nd RED HORSE and quickly led a complete rebuild of the awards and decorations program, significantly boosting unit morale. He also worked to promote Air Force awareness campaigns and professional military education programs, resulting in a 10 percent increase in participation.



Courtesy

Senior Airman Bryan Post, **Staff Sgt. Zachary Pennington**, and **Tech. Sgt. Johnathan Page** of the 775th Explosive Ordnance Flight, took home the title of EOD Team of the Year in July in Indiana. Teams were placed in "realistic, unfamiliar urban environments" to test different mission areas and scenarios. As the winners, the 775th EOD Flight will represent the Air Force at the U.S. Bomb Technician Association's Top Bomb Technician Competition in November.



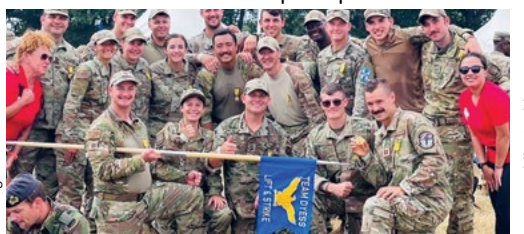
Senior Airman Erica Webster

Senior Master Sgt. Edward Lewis was awarded the Bronze Star Medal in a July ceremony at Hill AFB, Utah, in support of Operation Inherent Resolve in 2021. Lewis served as Superintendent of the Aerial Port Flight at Erbil International Airport in Iraq, helping to move 12,000 passengers and 8,000 tons of cargo enduring over 1,700 combat missions, all while being exposed to imminent danger from 57 unmanned aerial threats. His team of 42 Airmen and civilians also had a 100 percent on-time take-off rate.



Staff Sgt. Isaiah Soliz

Senior Airman Alexander Rowe, was selected as the 2022 Service Member of the Year for United States Forces Korea. Rowe had previously been named Airman of the Year for USFK and was also named Guardsman of the Quarter while performing Honor Guard duties. During a real-world event, Rowe's training kicked in and his swift actions drew praise from peers and supervisors. He also serves as a trainer for other security forces. Rowe was able to meet with senior leaders of USFK for a "one-on-one style interview."



1st Lt. Kaitlin Cashin

Eighteen Airmen with the **Rapid Airman Development (RAD) Team** out of Dyess Air Force Base, Texas, earned the Vierdaagse 4 Days March Foreign Military Medal this July. The medal is given to those who complete the International Nijmegen Four Days March in the Netherlands, which dates back to 1909. Military participants in particular must march 40 kilometers, nearly 25 miles a day, while in uniform and carrying a 10-kilogram (22-pound) pack. Those who successfully complete the march receive a medal they are authorized to wear in uniform. The RAD team's mission is to build skills in cultural competency, joint and foreign military training challenges, and professional growth.

Tell us who you think we should highlight here. Write to afmag@afa.org.

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