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# AIR & SPACE FORCES

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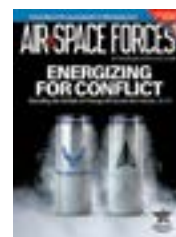
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Eric Lee/staff; Adobe Stock

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By Tobias Naegele

# Risk & Reward

**H**aving a ready military is like buying insurance. You hope you never have to use it, but having it helps you sleep at night. Almost all prefer security to risk.

Readiness projects strength, enhances diplomacy, attracts and reassures allies. Combined with the clear willingness to employ military force when necessary—call it backbone—it can deter war.

A nation that budgets more than \$840 billion for national defense has reason to believe it is well-insured. But circumstances change. What was good enough before may not be good enough for long.

Risk is rising. So too is the cost of insurance.

Start with risk. Iran lobbed 180 missiles at Israel in October, its second major salvo this year. The U.S. helped defend Israel against attack in both April and October. Both times the attack was anticipated, and forces were in place for protection. Iran is still burning over the embarrassment of Israel's July killing of a Hamas' political leader, Ismail Haniyeh, in Tehran, Hezbollah leader Hassan Nasrallah in Lebanon, and Hamas military mastermind Yahya Sinwar in Gaza on Oct. 16. Expect them to strike again.

In Europe, Russia is importing North Korean troops to aid its war on Ukraine. Russia is already dependent on North Korea for munitions, Iran for drones, and China for components and parts. Adding foreign troops turns the heat up for everyone and raises the question: What will North Korea do for Russia in return?

The longer Russia struggles in Ukraine, the more Vladimir Putin will work to destabilize the situation. North Korea provides a new vector.

Meanwhile, China bullies its neighbors: Chinese vessels intentionally ram Philippine Coast Guard ships; its military aircraft violate Japanese airspace; its bombers penetrate the U.S.-Canada air defense identification zone; mystery drones—most likely Chinese—overfly Langley Air Force Base, Va., peering at F-22s; and its cyber force hacks into enterprise software.

Secretary of the Air Force Frank Kendall said at AFA's Air, Space & Cyber Conference that he's instructed his staff "to stop referring to the Chinese Communist Party and the People's Liberation Army as a future or emerging or potential threat. China is not a future threat. China is a threat today."

China is spending "specifically to defeat the ability of the United States and its allies to project power in the western Pacific." It's developing space weapons, long-range hypersonic missiles, sophisticated counterair defenses, satellite-based targeting systems, nuclear arms, and cyber tools all with a focus on one foe: Us.

That is the threat picture. The insurance side isn't any better, because military readiness is slipping.

It isn't that America isn't willing to spend on defense. Rather that the United States' clear, asymmetric advantages in air and space are eroding, as China focuses with laser precision on how best to threaten or deny those capabilities.

The Air Force today fields the smallest, oldest force in its history. It is retiring aircraft faster than it chooses to acquire them, and therefore shrinking further, day by day. The Air Force dropped below 5,000 aircraft for the first time ever this year. It is programmed to plunge below 4,000 without any plan to stop—let alone reverse—the decline. It struggles with a chronic pilot shortage that has left it, consistently, some 2,000 pilots short of requirements. Leaders are quick to say that does not leave flying billets vacant, but it does put non-pilots in jobs that require pilot experience. That doesn't bode

well for strategic and operational planning.

Meanwhile, the vast majority of Air Force pilots in combat-coded squadrons are not flying enough sorties to be considered combat mission ready. None are qualified to execute all their potential missions. The Air Force keeps spending more on fighter sustainment, but spare parts shortages and maintenance backlogs undermine readiness such that mission capable rates for F-35 and F-22 fighters hover around 50 percent. The General Accountability Office, Congress' watchdog agency, criticized the Air Force, noting that operations and maintenance funding requests rose 27 percent from 2018 to 2023, while the needle hardly moved on mission capable rates.

No wonder: After factoring in inflation, that amounts to, at best, a 1 percent net increase over five years. Looking just at weapons systems sustainment—spare parts—the picture gets worse. For those same five years, that account rose 11.6 percent—which, after inflation, is a net cut of 15 percent.

The Air Force is struggling to buy new weapons. To sustain the fighter force and modernize, it should be buying 72 fighters annually. It achieved that in fiscal 2023 and 2024, split between F-35s and F-15EXs. Plans don't come close in 2025 or beyond.

The Space Force is in similar straits. U.S. space assets are undefended and vulnerable to attack. Yet those satellites are also required to fight in every imaginable region and domain. Counterspace capabilities are essential to hold adversaries at risk and deter war in the heavens.

Now suppose we do have a war with China, and that the People's Liberation Army Air Force and Space Force turn out to be reasonably capable. You can't order replacement jets or satellites on Amazon. It takes three years to go from approved funding to delivery of a fifth-generation fighter jet. It takes a minimum of a year and often far longer to put new satellites on orbit.

In the run-up to World War II, America was the world's leading industrial power, but half its factory capacity was still idle a decade after the start of the Great Depression. It was that overcapacity—and the available pool of underemployed workers eager to make a good wage—that built the so-called "arsenal of democracy." And in a war of attrition, it took four years for those factories to produce enough bombers and fighters for the Allies to finally destroy the German Luftwaffe.

America has no such excess capacity today, and the complexity of building today's fighter jets goes far beyond anything imaginable in World War II. Our supply chains are too small, too brittle. We don't produce enough steel, aluminum, titanium, or advanced carbon composites; we can't produce enough high-performance engines, let alone the materials that go into them; and we can't make computer chips fast enough.

War, it has been said, is too important to be left to generals. Jens Stoltenberg, the former Secretary General of NATO, offered a twist: Business is "too serious to be left to businessmen." Businesses operate on very short timelines, focusing on short-term profits. Generals may think strategically, but career incentives focus them on short-term results. Politicians focus on elections.

Yet a nation's security must be viewed across very long horizons—decades or more—and when they don't, they fail.

Americans must wake up and address our growing risk. We can't rewind the clock. But we can start working now. As Kendall said in February, "We are out of time."



**Risk is rising. So too is the cost of insurance.**

## Spaced Out

I struggled to understand Maj. Gen. Thomas Taverney's article ["Space Order of Battle: Beyond Domain Awareness" July/August, p. 44] and how it fits into the mission of our U.S. Space Force. To help with context I looked back at Secretary Frank Kendall's seven Operational Imperatives, and that made things worse.

Maj. Gen. Taverney's knowledge on the subject is without question. The problem is with USSF and Department of the Air Force communication with Americans writ large: articles like this are as far over our heads as satellites in low-Earth orbits. Present it to a congressman and watch their eyes gloss over.

Ask a USSF second lieutenant setting GPS operations where they fit into "The 5 Functions of Space Operations" and they'll be stumped. Use this article to get sister service support and they'll rightly ask, "What does this do for us?" And most importantly, for all American citizens, how can we support a separate service that can't speak to us in plain language that we can understand?

Ask any American what the Army, Navy, Air Force, Marines, and Coast Guard do; and nearly all will give a good answer.

Col. Robert A. Munson,  
USAF (Ret.)  
Monument, Colo.

## Things Change

I know many things have changed in the Air Force since I retired 50 years ago, but it wasn't until I read the piece about Air Force Specialty Codes [AFSCs] in the July/August issue [p. 50] that I realized just how much has changed. I held four different AFSCs during my 22-year career and only one specialty still exists—boom operator!

Our class was finishing up Tech School when a sergeant walked into the classroom and said, "I need 10 volunteers for flying status." I asked, "What's the job?" He didn't know, but added, "you'll get \$50/month flight pay." ... Ten hands went up! The job turned out to be In-flight refueling specialist, aka boom operator, or simply, boomer. We were crewed up at Randolph Air Force Base, Texas, and flew the B-29 for about 50 hours and then went on to fly the KC-97 tanker at Smokey Hill Air Force Base, Kan. In 1954 our crew went to Lincoln Air Force Base, Neb., to check out a new tanker squadron with B-29 crews returning from Korea. ... Those airplanes and both bases no longer exist!

After five years flying as a boomer, I applied for Officer Candidate School. Tough school, we started with 250 and graduated 114, but everybody got a brown bar, even the Anchor Man (me). That school no longer exists. I went to Navigator School at Waco, Texas, ... navigator specialty no longer exists, and James Connolly Air Force Base, Texas, has closed. Then I went to Advanced Navigation and Radar Bombing School at Mather Air Force Base, Calif., ... that specialty no longer exists and Mather has closed.

I selected B-52's and was assigned to a new base in Minot, N.D. I flew as navigator and then radar navigator for five-plus years. In 1967 I had been in the service for 15 years and hadn't heard a shot fired in anger. One way to solve the problem was sign up for the Recon field flying the new RF-4C. My wife didn't like it much, but she finally said OK. Flying the back seat was a whole new world for a guy that had been trapped in the belly of the BUFF for 1,200-plus hours!

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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.

## To accomplish this, we:

- **Educate** the public on the critical need for unrivaled aerospace power and a technically superior workforce to ensure national security.
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Flying reconnaissance meant switching from SAC to TAC, and I became a weapons systems officer (WSO). Both these commands no longer exist nor does the WSO specialty. Training at Mountain Home Air Force Base, Idaho, went OK, except for one bad day. While practicing defensive combat maneuvers, we got the bird in a very high descent rate with insufficient power setting and we had to bail out.

My tour in Vietnam went OK, 200 combat missions with 47 of them over North Vietnam and Laos. Nothing more than a bullet hole or two in bird, but six of our guys didn't make the Big Freedom flight home!

I put in a three-year tour at TAC Hq, Langley Air Force Base, Va., DOV and DOR. Back to Mountain Home to fly the right seat of the F-111 and believe it or not, while flying with an instructor pilot, we got the bird into a spin and it would not come out. We spun from 20,000 feet down to 12,000 and then had to punch out, again!

A lot has changed in the last 50 years, but a couple things have remained the same. Tanker crews are still on station ready to pass gas to anyone in need, and the venerable old Baker Five Two (B-52s) is still soldiering on!

I salute all you guys and gals in blue.

Maj. John Sinclair,  
USAF (Ret.)  
Placerville, Calif.

## Weather Related

In his article ["Weather Ops: The Air Force's Next Great Weapon," July/August, p. 36], David Roza explains how weather affects air and ground operations and strategic planning. He quotes Col. Patrick Williams as saying that weather impacts how much fuel pilots need, how many bombs they can carry and, how to get back safely.

As a former chief of targets at a tactical fighter-bomber wing, I agree that better weather forecasting capability could be helpful, but not overly necessary. Fuels were determined mainly by the distance to the targets and numbers of bombs were determined by the given types of bomb loads, targets, and aim points. If weather was an issue, it resulted in a unit request to the AOC to change the target (location), add alternate target(s) to eject unused bombs, change the air-ground mission, change the return base, and/or cancel the sortie(s).

In this day and age, though, I would think the ideal solution is to have "all-weather" GPS-guided stealthy weapon systems and munitions.

A good case in point are Tomahawks and other long-range air-, ground-, and sea-launched missiles.

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

A statement in the article, "Weather Ops: The Air Force's Next Great Weapon" got my attention. The author states that, "... only two of the military's 60-year-old weather satellites are still functioning. ..."

The statement is untrue and incomplete. While the military's satellite program has been in existence for over 60 years, no satellite has lasted half that long. A functioning 60-year-old satellite would represent a technological miracle. According to this magazine's recently published Almanac 2024, one of the Defense Meteorological Satellite Program (DMSP) birds actually lasted a record 22 years before being decommissioned in 2020.

The design life for this version was five years. The DMSP Factsheet published by USSF on the internet states that the current DMSP constellation consists of "two primary operational DMSP satellites." These satellites are operated by the National Oceanic and Atmospheric Administration (NOAA) that also operates complementary NOAA polar-orbiting satellites.

Col. Dennis Beebe,  
USAF (Ret.)  
Solvang, Calif.

**Editor's Note:** The comment provided by Colonel Beebe regarding the age of DMSP satellites on orbit is correct. The article should have stated, "...only two of the military's weather satellites of the 60-year-old program are currently operational." The DMSP program has been around since 1962 and the design of the satellite has continued to evolve over the decades. Most military satellites have a five to 10 year design life. In some fortunate cases, the actual operational life has lasted over 20 years.

## Who Me?

In reference to CMSgt. John P. Fedarko's comments about "a commander's style" ["Letters: Air Force Standards

2.0," July/August, p. 5]—I found the best solution to correcting customs and courtesies violations during my seven years as a base commander on four bases. I would simply ask the young officer or enlisted member his name and squadron.

When I got back to the office, I would call and invite the squadron commander and the officer or enlisted member to my office. I didn't chew out the offender, I talked only to the commander about his people while the offender listened.

The word got out pretty well.

Col. Charles G. Simpson,  
USAF (Ret.)  
Breckenridge, Colo.

## Group Think

I take exception to Gen. David Allvin's comments concerning group commanders as quoted in the article ["World, No More Ops & Maintenance Groups," July/August, p. 19]. He says, "If you're a group commander, what do you want to be when you grow up? A wing commander."

Ninety percent of them go into group command knowing they will never be a wing commander. There are no further promotions in their future and no selection for further command. These colonels are at the apex of their careers and simply want to do the best job they can as commanders before they retire.

Their concern for their squadrons does not keep them from failing in training. On the contrary, it helps them learn and prepares the next generation of group commanders.

Placing these colonels on wing staff will only accelerate the submission of retirement requests. There is no way a colonel wants to end a very successful career serving on the wing staff. Contrary to what General Allvin states, this will not prepare these colonels to become better joint leaders. They will never be around long enough for that.

Col. David Geuting,  
USAF (Ret.)  
Colorado Springs, Colo.

## Roles and Measures

I am somewhat surprised by the sympathetic response to Dennis Trynosky's letter ["Honored to Serve," May/June, p. 6] that appeared in the July/August issue.

Apparently, by the writer's sign-off, he was able to salvage some type of career with the Army. So what's the beef? Complain anyway. An assertion that there is a place for everyone, regardless of disability, and the military should approve any and all waivers, does not include wheel chair bound persons? What about legally blind? Suppose you need a respirator. Just where should the cutoff, if any, be?

The civil service within each military branch exists in some part, for just such allowable reasons. Military service could aggravate or even render a member immobile and helpless at a time when other members are depending on them to fulfill their job requirements. That could result in mission failure.

How are you going to explain to the parent of a fallen Soldier, you allowed in a person with a known serious disability or serious chronic condition that just happened to manifest itself in a critical situation?

Years ago, DOD initiated Project 100,000. It was an attempt to enlist lower- IQ individuals and perhaps improve their lives. It was a well-known costly disaster. Is Trynosky suggesting that we can afford to take chances with individuals who may not in times

of stress be able to even take care of themselves?

There is a world of difference between what he is suggesting, and veterans partially disabled after years of service who can still possibly contribute. As, he himself, has admitted, not all waivers or exceptions are granted.

Serving in the military is not a right protected by the Americans with Disabilities Act. The military is not, and should never be, a uniformed version of the Job Corps or any civilian agency.

MSgt. John Wolf,  
USAF (Ret.)  
Bethel, Pa.

### Accountability on Sentinel

As a career missile officer and a taxpayer, I am embarrassed and appalled by the recent report that "Sentinel ICBM Survives Pentagon Review as Costs Jump 81%." [World, July/August, p. 27]. How can a program exceed the estimates by 81 percent and someone not get fired? In private industry such an inept program management team would find their office contents in boxes in the parking lot with a severance check.

This is living proof of the comment by the recent Commission on National

Defense strategy which stated, "Despite years of attempted acquisition reform, the military remains hobbled by a ponderous procurement system that slows innovation and the fielding of new equipment."

The Minuteman ICBM (solid fueled) has been operational since 1962. It has seen countless mods and upgrades. Additionally, in the mid to late 1980s, the USAF developed and demonstrated Peacekeeper and a Small ICBM (both solid fueled) as options to upgrade the ICBM force.

Therefore, research has been done for over 60 years on land-based, solid-fueled ICBM, single and multiple warhead systems, both mobile and fixed based. However, today it appears that some program managers are making a career out of reinventing the wheel and demonstrating a task that apparently exceeds their ability. It makes you wonder if there is any "real" desire by DOD or the current administration for a new ICBM system.

The National Defense Authorization Act of 2007 directed modernization of the ICBM force. That was 17 years ago. Am I the only one embarrassed?

Col. Quentin M. Thomas,  
USAF (Ret.)  
Woodstock, Ga.

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# How to Get a Continuous ATO: The Secret to Success

By Adam Stone

Every time a government agency deploys a new piece of software, someone has to issue an Authority To Operate. It's a sort of Good Housekeeping seal of approval for secure, reliable software. It can also be a hurdle too high to enable frequent software updates.

It doesn't have to be.

In May, the Pentagon blessed a new methodology for supporting rapid software updates: The continuous ATO (cATO) requires a cultural and process change, but is ultimately a more secure and reliable alternative, according to the Continuous Authorization to Operate (cATO) Evaluation Criteria.

Bryon Kroger, Founder and CEO of Rise8 who coined the term and pioneered the first cATO at the Air Force software factory Kessel Run, said the concept is built on the Risk Management Framework developed by the National Institute of Standards and Technology and embodied in NIST 800-53.

A cATO ensures that "when we're ready to release software, it's already authorized," Kroger said.

As Chief Operating Officer at Kessel Run, Kroger led acquisitions, development, and operations for the enterprise-scale software factory. His team proved that cATO speeds software deployments and enhances security. But translating that pioneering success more broadly is anything but instant.

## OBSTACLES TO CATO SUCCESS

Adopting the agile processes and cultural mentality of DevSecOps, the software processes that combine development, operations, and security, are a tall order for any organization.

cATO "involves a lot of continuous monitoring," Kroger said, and that scares people off. Automation can ease that burden, with machines tackling much of the routine compliance work, but that too can be scary—requiring a level of trust, confidence, and commitment from all parties.

"People hem and haw about how bad RMF is," Kroger said. But having a framework is the first step to developing better processes. Rather than wringing one's hands over one more set of requirements, he said, project managers should just "Go understand the



**The Combined Air Operations Center (CAOC) at Al Udeid Air Base, Qatar, provides command and control of airpower throughout Iraq, Syria, Afghanistan, and 17 other nations. The team executes day-to-day combined air and space operations and provides rapid reaction, positive control, coordination, and de-confliction of weapon systems. The appearance of U.S. Department of Defense (DOD) visual information does not imply or constitute DOD endorsement.**

system, go read the RMF—it's a surprisingly good set of documentation."

Once a development team fully understands the Risk Management Framework, the door is opened to a more collaborative relationship with authorizing officials because now everyone is speaking the same language. That, in turn, can fuel the shift to cATO.

## SECRETS TO SUCCESS

All of Rise8's processes are geared to the cATO model. After years of work there and at Kessel Run, Bryon lays out the key factors to adopting a cATO culture.

Topping the list is "controls inheritance." With potentially hundreds of different controls at play within the development pipelines, app builders need a way to move forward consistently and efficiently as they strive for continuous authorization.

By inheriting the underlying controls, developers can streamline their processes, freeing them to focus on development and on their specific areas of concern. By adopting controls inheritance, "they're only truly responsible for their portion" of a program, reducing the number of controls they have to worry about from as many as 400 or 500 to a fraction, Kroger said.

Next comes the assessors' experience. Across the DoD, "we practice user-centered design with warfighters," Kroger said. That means building products and processes that meet a specific user's needs. If the user is pleased, the project is successful.

Likewise, the continuous assessment and monitoring process should take the assessors into account, since "they're the ones using

[and reviewing] this process."

The assessors "are doing one of the most important jobs in the military, which is making sure our software is secure," he said. So the processes that define a cATO ought to be built to meet their needs.

Ultimately, the Defense Department must change the conversation around authorizations. Rather than making exceptions for cATOs, the default option should be cATO and the conventional processes should become the exception.

In consideration of early presumptions that speedier software development would mean a higher-risk software, the truth is that when implemented with the RMF in mind, cATOs reduce risk by more rapidly fixing known problems. A vulnerability can be identified and mitigated in hours, rather than months or years, reducing risk.

"We need to do a better job of showing how what we're doing today is very risky," he said of conventional updating and ATO processes. "Going slow is a risk in and of itself."

Speed should be seen for what it is—a benefit rather than a liability.

"When we go fast, we actually are able to reduce some risks," he said. Security flaws get fixed faster, and the risk of under-provisioning warfighters is mitigated by more rapid software delivery.

Highlighting those benefits and the risks of sticking with a conventional go-slow approach can change the nature of the conversation. Agile software, delivered and improved incrementally, and authorized continuously, is better for everyone.

U.S. Air Force photo by Tech. Sgt. Joshua Strang

ENTLESS COMMITMENT  
EP-IN-STEP WE GO BEYOND  
CONTINUOUS IMPACT  
AL-WORLD SOLUTIONS  
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CONTINUOUS IMPACT  
AL-WORLD SOLUTIONS  
ACTICAL IMPLEMENTATION STRATEGIES  
STERING BRAVERAY  
EVERY IN PRODUCTION DEPLOYMENTS

# AHEAD OF THE FRONT

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# The Vast Interconnected Pacific

*The U.S. Air Force's focus in the Pacific has increased steadily over the past five years, as China has continued to modernize and expand its military capabilities with the goal of being able to seize Taiwan as soon as 2027. Gen. Kevin B. Schneider took command of Pacific Air Forces in February, where he is also the Combined Air Component Commander for U.S. Indo-Pacific Command. His command stretches from Hawaii and Alaska to Japan, South Korea, and the South Pacific. Pentagon Editor Chris Gordon interviewed Schneider during AFA's Air, Space & Cyber Conference in September.*



Mike Tsukamoto/ staff

**Q: We've seen China acting more aggressively in the South China Sea and other areas. What will you need to deter the Chinese militarily five and 10 years from now?**

A: There are two aspects to the picture. ... One is the behavior of potential adversaries out there, the challenges to the security situation. ... On the flip side of that picture is all the positive things that are taking place. And I'll still highlight the asymmetric advantages that we have, and it's the growing strength and relationship of allies and partners within the region, the professionalism of our force, and then the inherent strength of the United States joint force, which continues to work closer together every day.

Going forward, what will we need? First of all, our forces in the United States and those of our allies and partners are ready for the challenges that are in front of us, and we continue to watch what potential adversaries are doing—whether that's Beijing, Moscow, Pyongyang. My pushback to USAF and to senior leaders is, we must continue to modernize. We must continue to develop advanced capabilities that continue to keep us ahead of what adversaries or potential adversaries are doing.

**Q: You and other U.S. officials have in the past highlighted the dangerous Chinese interactions with Philippine vessels, as well as the close calls when Chinese People's Liberation Army (PLA) military aircraft intercept U.S. American military aircraft. Is China continuing to apply those tactics or have they become more safe in their intercepts of U.S. aircraft?**

A: Over time—and I've been able to watch this for a number of years—some of this behavior goes in cycles, and there will be rash and incidences of unsafe, unprofessional behavior, and then it will curtail for a while, and then it will come back. So you can look at this one of two ways: Either the basic skill sets and professionalism of their force isn't up to standards and norms, or the unsafe unprofessional behavior is directed from higher up and it's a form of messaging. We continue to watch and assess.

And while I'll say that over the last few months we, the United States, have not been on the receiving end of unsafe and unprofessional behavior from the PLA, at least in the air domain, our allies and partners have been on the receiving end ... and they continue to see that. ... You can draw your own conclusions as to why these things ebb and flow.

Gen. Kevin Schneider, Commander, Pacific Air Forces, delivers a keynote address: "Preparing & Prevailing in the Indo-Pacific" at the Air, Space & Cyber Conference on Sept. 17.

**Q: Would you like to at least be able to pick up the phone in case of an incident? We've seen that communication has opened up a bit at a high level between the Chinese military and the U.S. Do you see any prospect of being able to talk to your Chinese counterpart?**

A: I don't know if I see a prospect for me. [To] start at the beginning, I believe that a mil-to-mil dialogue is always good, regardless of who we're dealing with. The ability for military leaders and nations to pick up the phone and have an opportunity to talk to de-escalate a situation that is ramping up in its severity is beneficial for all. I am always encouraging mil-to-mil dialogues or a venue to have these mil-to-mil dialogues.

One of the things that has come out of the head of state [meeting between Chinese leader Xi Jinping and President Joe Biden in November 2023] was the MMCA dialogue—Military Maritime Consultative Agreement. That event took place at the O-6—at the colonel level—[in April] in Hawaii. We had not had one of those face-to-face, sit-down dialogues [since December 2021, which was a virtual meeting]. ... When these things happen, we do two iterations a year, usually one in the United States—in Hawaii—the other in China. We are still on track later this year to do the one in China.

[On Sept. 9], Adm. [Samuel] Paparo, [commander of U.S. Indo-Pacific Command] had a call with the Southern Theater Commander of the PLA. In terms of the substantive levels of discussion, that will continue to come out in terms of what was discussed. But I think just the fact that senior leaders on both sides have had that avenue for conversation is a positive step.

**Q: In July, Chinese and Russian bombers flew together, crossing into the Alaska Air Defense Identification Zone (ADIZ). How are China and Russia cooperating militarily? And how does that impact your plans and operations in the Pacific?**

A: We've watched the combined bomber operations between Russia and China. This was the first event since 2019, their eighth iteration of doing a combined bomber patrol. ...

I describe it as a relationship of convenience. ... By comparison, when I look at how the United States allies and partners

work together, it's on a foundation of trust. It's on a foundation of shared values—the respect for sovereignty, the respect for open economic systems, transparency in how we do business, and respect for human rights. I do not see that same foundation between the PRC and Russia. Outwardly, they describe their relationship with no limits. [But] I would seriously question if that really is the case. I think it is limited in terms of scope and their ability to trust each other the same way that the United States and our allies and partners have mutual trust and respect.

**Q: You deployed to South Korea as a young fighter pilot. Some analysts think there's a risk that conflict with China might take place at the same time as a North Korean attack. Do you think that's a risk? How do you assess the North Korean risk, and how are you preparing for that?**

A: I've used the word opportunists or opportunism to describe the governments in Beijing, Moscow, and Pyongyang. We have seen this play out as an example: While the world was distracted by COVID, Beijing made a move on Hong Kong—[seizing] an opportunity to push forward on their objectives. The case that you described, while hypothetical, is certainly something that we pay close attention to. Commanders at all levels are encouraged to pay attention to the interconnections between the potential threats that exist, not only in the theater but around the world.

**Q: Like China, North Korea is also helping Russia now, and perhaps getting something in return?**

A: That's certainly true, both on the military equipment side and the exchange of information.

Not to get too much into hypotheticals, but you could take this out a little bit further to go, "In times of conflict, could other players enter into the mix, or be other factors that we would have to consider?" But it is something that, again, we think through, we plan for. We don't put basically everything against one potential threat or one potential adversary and that will remain positioned to deal with things across the board.

**Q: Agile Combat Employment (ACE) is one way you are trying to respond to China's anti-access, area-denial (A2/AD) strategy. Where are you in terms of the number of runways you want? How much equipment is going to be pre-positioned?**

A: I have been thoroughly impressed with what the units have been doing to develop the capabilities, the tactics, techniques, and procedures, to be able to go out there and do the job that we ask them to do when it comes to Agile Combat Employment.

The command chief and I got to go to Guam and Tinian during an exercise a few months ago, and we got to see this in action. I was really impressed. It's a small number of people, led by kind of a midlevel officer and a lot of enlisted that were out there working in an austere environment, generating sorties, generating combat power with not a lot of kit, and showing that they could be survivable and adaptable in the environment. That's one example that takes place all across the theater, in each of the Numbered Air Forces. They're practicing Agile Combat Employment in Korea. They're doing it in Japan. They're doing it in Alaska.

The piece that we're building, we're adding, is doing this at scope and scale. Instead of individual units training, let's do them all together. Let's do a theaterwide, PACAF-focused event, and this is REFORPAC—Resolute Force Pacific—the exercise that we'll execute in '25. ... What Gen. [Mike] Minihan [former commander of Air Mobility Command] did with Mobility Guardian in 2023 was to bring the air mobility capability out to the theater at scope and scale. Now we're going to combine the air mobility supporting all of our unit-level exercises in the theater, and to surge capacity into

the Western Pacific. I'm really excited about what we're going to do.

PACAF and the United States Air Force have been doing this for a number of years. I remember talking about Agile Combat Employment when I was at PACAF in 2015, so we're going on the 10-year point. We are not standing by the assumptions that we had when we entered this a decade ago. So we're continuing to challenge the assumptions in terms of, "What are the bases from which we are going to operate? What are the missions that we're going to be asked to do? What are the resources we need? What are the capabilities we need? How do we build force packages?" I am really impressed that the staff and the units are not accepting status quo, and they're continuing to challenge the assumptions.

The other thing that has helped in that regard is Beijing's heavy-handedness [with its neighbors] is opening a lot of doors. I'm able to talk to counterparts in the region who are very welcoming, either in terms of access, basing, and overflight, and a desire to participate in our events and our exercises. It is literally opening up doors and avenues for us that did not exist a few years ago.

**Q: U.S. Forces Japan is going to be elevated. How is that going to work with PACAF?**

A: Admiral Paparo is taking a very measured and deliberate approach, and we are working hand in hand with the government of Japan to make sure that we are aligned and linked at every step of this. It is certainly a change, especially with the desire or intent to have a four-star headquarters at the end of this. We need success at every level of that incremental growth, and we'll work through the authorities piece as we do that. An elevation to a higher level will be a change, but at the same time, it's needed, it's wanted by both sides, and we'll continue to move forward, hand in hand with the government of Japan on this.

**Q: F-15EXs are heading to Kadena Air Base, Japan, to replace the rotational fighter presence and the F-15C/Ds. What has to happen regarding workups to ensure they're ready to be on the PACAF front line—in the first island chain on day one—and to be ACE-capable?**

A: The airplanes are new; the pilots, crews, and maintainers are not necessarily new. The Air Force has been doing Agile Combat Employment writ large, and we've certainly been doing it in PACAF. A lot of the men and women that are either sitting in the cockpits or launching the airplanes or providing all the enabling capabilities are already aware of the skill sets, if not steeped in the skill sets, that go along with Agile Combat Employment. There will be some learning as it comes to putting a new platform into these environments, and we'll probably learn a few lessons about the capabilities of the F-15EX—maybe there's different ways to handle it and different things that are required in an Agile Combat Employment environment, operating in austere locations—[but] I don't think it's going to be a significant transition.

**Q: The E-7 Wedgetail will provide you with a much-needed new capability starting, hopefully, in 2028. How are you filling the gap for command and control and battle management in the meantime?**

A: I cannot say enough about the teamwork of the Royal Australian Air Force, who provide E-7 capability to us, to the United States writ large, where and when we've asked for it. I was down at Exercise Pitch Black recently on Australia, we had an F-22 unit that was down there. ... There was fifth-generation integration that takes place, and I was really impressed. ...

To your question about command and control: As I look at the theater as big and as expansive as it is, I continue to articulate my requirements back to headquarters Air Force to build out more re-

silent command and control, battle management capability more forward in the theater. And we're certainly making progress on that.

It's also not just a U.S. Air Force problem to solve, so we're working with Army, Navy counterparts as well to figure out ways we all connect the joint force to build out this capability. And then there are partners and allies as well. Some of our command and control is based on sensing and forward-based radars, and we're able to do more and more in terms of air-domain awareness, information-sharing agreements, to tap into other people's equipment and other people's sensing capability, to help build out this picture.

**Q: You serve as the region's Area Air Defense Commander. Where are you with the Army on exactly figuring out who will do what in terms of air base air defense?**

A: On the third of September, I sat down with my counterpart from the Army, USARPAC Commander Gen. Charlie Flynn, and our staff. We do Agile Combat Employment, the U.S. Air Force, and the Army concept of operations, or CONOPS, is called Multi-Domain Operations. But if you look at the geography of the Pacific, which has not changed, we are both forces that project power from land. We operate in the air. The Army operates a little bit differently, but we're ... looking at the same real estate around parts of the theater. So it makes sense for us to find ways that we can team together. They bring capabilities ... base defense capabilities. They have offensive fires capabilities. They have command and control capabilities. They have logistics and sustainment capabilities. We have the same. Neither one of us probably has as much as we want, but if we're going to be operating forward in the theater, and if we go to the locations that are the same or nearby each other, now we can pool resources together. We can fill in gaps that we might have to cover those, and we can work a lot more effectively.

**Q: What are the challenges of meeting your current readiness needs?**

A: One of the challenges, and I have, as a younger guy, lived this, [is that] exercises help build readiness, but exercises also come with a cost. You can exercise so much that it actually starts to decrement your readiness, because you can't reconstitute. ... It's a fine balance, and I work with the wing commanders to understand how much is too much. When it comes to exercising, there's tremendous benefit that comes from it. There's also tremendous benefit from being able to just focus on the things you weren't able to do during an exercise: Take care of maintenance, take care of some of the other things, and make sure that your people and your equipment are healthy to be able to respond across the spectrum.

The other challenge in the macro sense is do you invest in today for readiness? Are you investing in tomorrow's modernization? The age-old question, and you know the friction that happens between operational commanders and probably combatant commanders who are on the front edge, maybe dealing with the realities of the situation right in front, versus services that are taking a longer-term approach, solving problems, five, 10, 20 years in the future.

**Q: What's your role in that conversation?**

A: It's two-hatted. ... One of my responsibilities is obviously to the Air Force. I sit on what I'll call the board of directors as we make budgetary decisions and we look at not only the upcoming fiscal year [Program Objective Memorandum budget document], but we look into the out-years to figure out, 'What it is the United States Air Force needs?' The challenge is that I have to try to be

nonparochial in those conversations. It's not just me throwing PACAF issues onto the table, but me having a wide enough aperture to look at the United States Air Force and to do that 20 years down the road.

At the same time, I'm responsible to Admiral Paparo for dealing with every challenge in front of us in the here and now, and to make sure that we are resourced and ready enough to handle those. And sometimes there's not enough money to do both.

**Q: You said during your keynote, 'We're in the business of sinking ships.' That is almost the genesis of the U.S. Air Force, if we go back to Billy Mitchell. How are you pursuing that?**

A: We're buying a lot of weaponry that gets after that business. One of my concerns is if there is a continuing resolution, it impacts our ability to buy and to field this anti-maritime capability, which is certainly needed for some of the conflicts that we may face in the Pacific. As with Global Strike Command, I give Gen. [Thomas A.] Bussiere and his team tremendous credit, whether it's the B-2, the B-1, or the B-52, they are continuing to find ways to be more survivable in an A2AD environment, but certainly to be more lethal and to be able to go after refining those techniques and ways that we get after the maritime or the anti-ship capability.

**Q: Long-Range Anti-Ship Missiles (LRASMs) cost millions of dollars apiece. And in some wargames of a U.S. fight against China, LRASMs will be depleted in 72 hours?**

A: Unless we buy more.

**Q: Would you like to see cheaper anti-ship weapons or other capabilities come along?**

A: Yes, there is a balance, like, with everything else. I think there's that high-end, exquisite capability that can do penetration into the most challenging of anti-access, area denial regions. But at the same time, there's a need for affordable mass because we probably don't have enough to get after that for 24/7/365, to do high-end all the time, that may be prohibitively expensive. There's a lot of value to affordable mass, to continue to keep the pressure on, to find lower-cost systems, to be able to impose cost on a potential adversary [with a weapon] that is less expensive, maybe less exquisite, but still causes the enemy to react to it or to deal with it.

**Q: Are those capabilities that exist now, or is this in the future?**

A: I think there's both—certainly stuff we're looking at, [Deputy Secretary of Defense Kathleen Hicks' initiative] Replicator is trying to get after some of that. ... These are capabilities that can be fielded in quantity in the very near term, which is what makes them very attractive to me.

**Q: What do you think the people might be overlooking in the Pacific?**

A: I've watched this ebb and flow over time, sometimes the public's understanding of the severity of the situation in the Pacific, especially as it applies to the People's Republic of China, and I'm not sure there's a good understanding within the American public about the dangers that poses. ... Our ability to endure in a conflict is based on the will of the people and the will of the people needs to be informed by the realities of the situation out there. And—this isn't a knock on the media, it's maybe a knock on how people get informed these days—I just don't think people are looking past TikTok or Facebook to understand [the world situation].

The risks for escalation are so high. It's the interconnectedness of all the security dynamics that are taking place thousands of miles away.

By John A. Tirpak

# Is China Prepared to Uncork the Nuclear Option?



Pan Yulong/China Ministry of Defense

A formation of mobile DF-31AG nuclear missiles participates in a military parade in Beijing. During a test on Sept. 25, 2024, a DF-31AG fitted with a dummy warhead was launched from Hainan Island and landed in the Pacific Ocean about 7,000 miles east near French Polynesia. The launch, the first since 1980, was viewed as a signal directed at the U.S. and its Pacific allies as regional tensions with China increase.

**C**hina could be more ready to launch a nuclear first-strike than the U.S. realizes, raising the specter of a "limited nuclear exchange" in the Pacific, experts warn, and increasing the risks should conflict breakout and escalate in the future.

The U.S. faces the "increased likelihood of a limited nuclear exchange in a future Indo-Pacific crisis scenario," notes a new report from the Atlantic Council. Based on a wargame plus analysis of China's public statements and internal machinations, the September report asserts that China would drop its "no-first-use" policy should an attempted invasion of Taiwan begin to fail.

U.S. "institutional assumptions" about how and when China might resort to nuclear weapons are "flawed," the authors said. The U.S. National Security and National Defense strategies need to consider China's burgeoning nuclear inventory and the chance that it could follow an unconventional nuclear strategy, unleashing theater nuclear weapons against U.S. forces in Guam should an attempted invasion begin to falter.

John Culver, a senior fellow with the Atlantic Council's Global China Hub and a longtime CIA analyst specializing in East Asian Affairs, said assumptions that nuclear powers will hold their fire rather than use nuclear weapons are unproven.

China is "prepared to 'go there,'" he said during a webinar releasing the study.

Culver, David O. Shullman, Kitsch Liao and Samantha Wong co-wrote the Atlantic report, titled "Adapting U.S. Strategy to Account for China's Transformation into a Peer Nuclear Power."

The report is based on a wargame set in 2032, in which China invades Taiwan but secures only a tenuous lodgment. When follow-on forces are destroyed by the U.S. and tougher-than-expected resistance by Taiwanese forces, China finds itself with "no credible off-ramp to claim victory." Faced with that challenge, Chinese President Xi Jinping must weigh the consequences of going nuclear or accepting defeat.

"The need to prevent such failure would likely justify the use of any and all measures, including nuclear employment, once the invasion is underway," the authors concluded.

In the wargame, the "Blue" U.S. force was surprised when the "Red" force "attacked Guam with two very large devices," Culver said. One struck the air base and the other attacked the naval base there, effectively taking Guam "off the board" as a launch pad for long-range strikes against China and as a logistical hub for sustaining allied forces in the Western Pacific.

The Red team had previously signaled the potential use of nuclear weapons, he said, firing long-range conventional weapons from ballistic missile submarines at U.S. forces and West Coast bases; at least one overflew Guam. The missiles were intercepted, but the

clear message was that these could just as well be nuclear weapons. The Red force also engaged in counterspace and cyberattacks, while the Blue force pressed the conventional fight.

Meanwhile, a "Green" team—representing regional allies—took significant hits and insisted that "nuclear security guarantees to them required that the U.S. respond proportionally." To preserve the credibility of its nuclear deterrence guarantees, the Blue force did so.

According to Culver, Xi believes the world is in the midst of a "tectonic shift," a reset akin to what followed the end of World War I, when major empires collapsed and a New World Order took shape.

Russia's invasion of Ukraine and other events have demonstrated to Xi, he said, that "major power war and even nuclear war are back on the table, after being off the table since the end of the Cold War."

In recent years, Xi elevated missile and nuclear forces to a full military service, seeing those as of increasing importance, Culver said. "It no longer suited China's interest to have a minimal deterrence capability now that a new, more dangerous world was emerging and the potential for war was rising, especially great power war," he said.

Having submitted to what it considers "nuclear blackmail ... at least three times in the past," Culver said, China has decided it will not do so again.

The U.S. government, meanwhile, has not awakened to the challenge posed by China's evolving strategy. U.S. strategists view China's nuclear program as building strategic forces to "sustain a minimal retaliatory posture," the report states, while "China now has a higher likelihood of using its newfound nuclear power to more actively deter or compel its opponents and safeguard its core interests."

Beijing is willing to use its power, however, to counter "perceived external threats that could negatively impact domestic political interests."

Meanwhile, the authors write, "structural issues within the U.S. government decision-making process" work against nuclear escalation. These include "fragmentation" and decision-making silos that could lead, in the face of crisis, to "disjointed and ... flawed recommendations."

The authors argue that "The misreading of China's core interests contained in these disjointed COAs [courses of action] leads to tension between the United States winning a conventional war and maintaining nuclear deterrence, and also creating uncertain trade-offs in scarce military resources."

In the end, American failure "to recognize that as China rapidly expands its nuclear arsenal and delivery capabilities, it will behave in a way consistent with the status of a nuclear peer power," poses the gravest risk: This "could translate into a false U.S. assumption that China would not contemplate" a first use of nuclear weapons, which could, in turn, lock the United States and China into an inadvertent escalation spiral that could ultimately trigger a nuclear war.

## ALLIES AND SIGNALS

In a hot war with China, Japan and South Korea are likely to pressure the U.S. "to ramp up nuclear signaling" and "escalate in the nuclear realm," the authors said—especially if those countries have already lost forces in the conflict and feel vulnerable to continuing attack.

Also complicating the strategy is China's relationship with Russia, which the authors said could "shape China's decision-making calculus on nuclear first use." Russia could seek to "exploit any crisis" in the Indo-Pacific for its own purposes elsewhere, they added, "exercising nuclear coercion to achieve its own ends."

U.S. nuclear theory is "informed by historical memory from the Cold War," the authors write, but dealing with China as a nuclear power requires a different playbook.

"While Russia's signaling has been aggressive, escalatory, and clearly communicated, China's signaling methods tend to be more subtle and ambiguous," they write. "China has intentionally created these ambiguous redlines, partially to exploit what they perceived as the risk-averse nature of the U.S. and allied decision-making process."

Beijing is tight-lipped about its nuclear forces, which the U.S. estimates will include more than 1,000 deliverable warheads by the end of the decade. Yet as China's nuclear inventory is still well below U.S. or Russian stockpiles, Beijing has ignored all invitations to participate in strategic arms talks.

"China's lack of nuclear transparency may ... be attributable to its historically inferior nuclear force," the report says. As China builds toward nuclear parity with the U.S. and Russia, however, it may yet "be persuaded to become more transparent about its nuclear capabilities and intentions."

The authors argue that for Beijing to "safely wield its newfound nuclear peer status to achieve national goals, it must increase transparency of its nuclear intentions and capability both before and during a crisis. More clarity is needed to close this gap between China's stated nuclear doctrine and its actual motivations, behavior, and intent."

Bonny Lin, director of the China Power Project and senior fellow at the Center for Strategic and International Studies, said on the webinar that the wargame underplayed the amount of coordination that would likely take place between China and Russia.

"China is not going to ask Russia for permission," she said. "China is not going to be telling Russia every single move. [But] I would expect support from Russia early on, even maybe before the invasion has started."

Lin said the exercise demonstrated a serious "lack of crisis communications" between China and the U.S., a concern U.S. leaders have raised with Beijing.

Eric Chan, senior nonresident fellow at the Global Taiwan Institute, who participated in the wargame, said he did not think a nuclear strike by China would "get either the U.S. or Taiwan to back off." Rather, he said, it would prompt them to accelerate the conventional campaign, and "really change the game" for Taiwan "in terms of how they resist the PRC."

The wargame suggests that Taiwan is right to stockpile weapons and enhance its readiness to fight a protracted war.

"Ukraine's readiness and resilience against [Vladimir] Putin's nuclear threats is one of the two reasons why Putin hasn't employed nuclear weapons against Ukraine," he said.

President Joe Biden "has quietly threatened Putin that if they were to use tactical nuclear weapons in Ukraine, then the U.S. would use conventional airpower to wipe out these forces in Ukraine." Also important is that "Ukraine hasn't shown any signs of being wobbly against Putin's nuclear use, and that decreases the threat from the nuclear use."

Culver noted in the webinar that most of the arms control treaties between the U.S. and Russia have been "swept away" in recent years except for the SALT II agreement, which comes up for renewal next year.

Russia has indicated it may not renew. Under SALT, Russia and the U.S. kept their deliverable warheads to 1,550, many of them "outmoded ... air-drop bombs," according to Culver.

China's rapid expansion of nuclear ICBM capacity changes the entire equation, and makes nuclear war now seem more possible than it has in decades.

"The whole panoply of things that allowed us to no longer 'think about the unthinkable,' ... is wearing thin," Culver said. China "owes an explanation" to its neighbors and opponents "about what it's doing."

## 'Gucci,' Out



David Roza/staff

"Old Big Sexy is going away, but rest assured that the 9th Air Refueling Squadron and the other tanker squadrons, they're still going to be bringing fuel to the fight in an upgraded capacity."

—**Master Sgt. Van Stewart Jr.**, the flight engineer on the KC-10 Extender's (nicknamed Gucci) last flight on Sept. 26.



Geralt/Pixabay

## Bets Down

"You have to maintain those relationships to make sure that we're all communicating, because when you are in an era of scarce resources, you can't afford to guess wrong."

—**Michael R. Gregg**, Director of Air Force Research Laboratories Aerospace Systems Directorate, on the need to maintain close communication with industry on what is technologically possible when new threats are being fielded rapidly.

# Need For Speed

"If I look at the future of conflict, one of the attributes I am focused on is speed—the speed of recognition, the speed of decisions, the speed of action. ... The ability for all of us to see and recognize the environment—to be able to work with each other and have the dialogue at the speed of the battle and operate as one—that will be the key. ... We need true interoperability... so we can all respond at speed."

—**Chief of Staff Gen. David W. Allvin** at the Air Force Forum in Tokyo, which included senior leaders from over 20 nations on Oct. 15.



Courtesy photo)

## FIGHT TONIGHT

"You can only train with what you have. We, the headquarters, are going to work those acquisition pieces and eventually provide that capability. But if it doesn't deliver until tomorrow, figuratively, it doesn't help those squadrons tonight. So we're going to focus on tonight."

—**New AMC boss Gen. John D. Lamontagne** on preparing Airmen to fight with what they have on hand [Oct. 3].

## STILL FIGHTING

"My hope is that I will have the opportunity to continue to serve. If not, you can be certain I will be working as hard as I can, for as long as I can, to prepare the Department of the Air Force for a conflict that is not inevitable but may be becoming more likely over time. ... I will spend whatever time I have left in public service, working as hard as I can to get the Department of the Air Force the resources that it needs to be successful and to successfully deter our adversaries, and if needed, to achieve victory."

—**Secretary of the Air Force Frank Kendall** during his keynote speech at AFA's 2024 ASC Conference [Sept. 16].



Mike Tsukamoto/staff

## Global Reach



Christian Turner/USAF

"This was a unique demonstration of the United States' ability to target facilities that our adversaries seek to keep out of reach, no matter how deeply buried underground, hardened, or fortified. ... The employment of U.S. Air Force B-2 Spirit long-range stealth bombers demonstrates U.S. global strike capabilities to take action against these targets, when necessary, anytime, anywhere."

—**Defense Secretary Lloyd Austin** after being directed by President Joe Biden to use Air Force B-2 Spirit bombers to bomb Iran-backed Houthi targets in Yemen on Oct. 17.

## EXCLUSIVE CLUB

"There are more countries in the world that can produce nuclear weapons than can produce high-performance, high-reliability jet engines."

—**Chris Flynn**, vice president, military development programs at Pratt & Whitney, commenting at ASC24 on the strength but fragility of the U.S. military engine "ecosystem," arguing that it needs to be sustained because the projects requiring such engines are diminishing and there are longer periods of time between them.



When B-52H 61-0028, known as “Wolfpack,” returned to the 49th Test and Evaluation Squadron at Barksdale Air Force Base, La., in late September, it sported a throwback paint scheme modeled after the 1959/1960 scheme from B-52 NB-52A 52-0003, known as “The High and Mighty One.” The paint scheme signaled Wolfpack’s role in testing for upgraded B-52s, which over the next decade will get new engines, cockpits, radars, and other upgrades.



Even 35 years after its first flight, the V-22 Bell, Boeing's tilt-rotor Osprey, can mesmerize onlookers. Uniquely capable of operating like a helicopter and a propeller-driven airplane, the Osprey has also been plagued with mechanical problems, especially regarding its complex transmission system. The Air Force has parked some of the aircraft to focus on keeping a smaller number flying, but even in deployed locations, Ospreys are restricted from operations where they are more than 30 minutes from a safe landing site. Here, a CV-22 from the Air Force's 20th Special Operations Squadron prepares to take on fuel from an MC-130 Commando II during night training at Cannon Air Force Base, N.M.



A SpaceX Falcon 9 lifted Space Force Col. Nick Hague and his Dragon spacecraft into space and toward his ultimate destination, the International Space Station—the first time a Guardian traveled from Earth to space. The spacecraft was launched from Cape Canaveral Space Force Station, Fla., which accounts for the majority of U.S. launches.



H. Darr Beiser for Air & Space Forces Association

General Atomics provided a life-size model of its proposed Collaborative Combat Aircraft for display at AFA's Air, Space & Cyber Conference in September.

# Why the Air Force Paused NGAD—and What's Next

By John A. Tirpak

NATIONAL HARBOR, Md.

**T**he Next-Generation Air Dominance (NGAD) combat jet—the centerpiece of the Air Force's future air superiority plans—faces a crucial design review between now and the end of the year. What kind of aircraft the Air Force needs, what it can afford, and how long it will be before that aircraft is available all hang in the balance. The threat NGAD must defeat is evolving faster than predicted, its unit cost is extremely high—though classified, estimates near \$300 million a copy—and new technologies make other approaches possible. Those factors drove Air Force Secretary Frank Kendall to “pause” the program over the summer. At AFA's 2024 Air, Space & Cyber Conference, he explained the Air Force must now take “a very hard look at whether we've got the right design concept or not.”

Time is short and the stakes are very high. Seeking a clear decision in less than three months, Kendall assembled a high-level panel of experts to help with the decision:

Kendall wants a decision before the Air Force submits its fiscal 2026 budget request in December.

NGAD had been gliding toward a contractor selection in September when Kendall pressed pause. The surprise decision triggered anxious speculation: Was the Air Force abandoning the air superiority mission? Would the crewed NGAD give way

to uncrewed alternatives? Kendall strenuously declared that no such fundamental changes are in play.

“We are not walking away from the core United States Air Force function of providing air superiority,” he said, repeating himself for emphasis.

The design concepts and requirements for NGAD are already “several years old,” Kendall explained, and new threats are evolving so quickly that those design requirements may now be outdated. NGAD was meant to replace the F-22 and intended “very much for a specific mission under a specific set of circumstances,” he noted, but the changing security landscape has not held steady, changing the calculus.

Because of “threat changes; because of financial constraints; because of the development of technology, including the introduction of CCAs [autonomous Collaborative Combat Aircraft],” he said, it would be imprudent to commit to a single design before reconsidering all available options.

Finances may pose the greatest hurdle. The Fiscal Responsibility Act of 2023 capped defense spending at a time when inflation had already taken a bite out of military buying power. The Air Force's other modernization priorities—the B-21 bomber, the T-7 trainer, and the E-7 early warning aircraft—are all demanding growing budget shares. On top of that, USAF must find about \$40 billion in the last half of this decade to cover mounting cost overruns on the Sentinel intercontinental ballistic missile system.



U.S. Govt.

**Paul Kaminski**, former undersecretary of defense for acquisition and technology from 1994 to 1997



**Retired Gen. Joseph Ralston**, Vice Chairman of the Joint Chiefs of Staff from 1996 to 2000



USAF

**Retired Gen. Norton Schwartz**, Chief of Staff from 2008 to 2012



U.S. Air Force Academy

**Natalie Crawford**, former vice president of RAND, and former director of Project Air Force



USAF

**Retired Gen. David Goldfein**, Air Force Chief of Staff from 2016 to 2020



USAF

**Retired Gen. John Jumper**, Air Force Chief of Staff from 2001 to 2005

All of that argues for a less-costly answer to air superiority than one coming in at what Kendall has characterized as “multiple hundreds of millions” of dollars per copy. In engagements over the course of the week, Kendall offered a thought experiment: “Given \$200 million, what would you buy: one NGAD, or one F-35 and four CCAs?”

The point was less about the specifics of the choice than an illustration of the problem: A zero-sum game in which the Air Force has to balance capability vs. affordability. What Kendall really wants is NGAD capability at a much lower cost, he told reporters.

How much lower? “We haven’t set a number or threshold,” he said, but the F-35’s \$80 million-plus cost “kind of represents, to me, the upper bounds of what we’d like to pay.” Then he added, “I’d like to go lower, though.”

Cost-cutting options include building a smaller aircraft, reducing the powerplant from one engine to two, off-loading some functions to other platforms, and reducing range and payload. A smaller aircraft, though, necessitates developing a stealthy aerial tanker to escort it into contested airspace.

Functions that could be off-loaded onto CCAs that would escort the NGAD into battle include radar, weapons carriage, and electronic warfare.

The centerpiece element of the NGAD “family of systems”—a crewed fighter—could potentially be replaced with an autonomous, uncrewed aircraft. That wasn’t plausible when the prototyping phase began a decade ago, but it may be plausible

now, he said.

While Kendall was clearly leaving all his options on the table, he did for the first time clearly link NGAD, the Next Generation Air-refueling System, or NGAS, and CCAs in his speech, saying the three collectively constitute the highest priority for the combat air forces.

The assessments now underway may find that NGAD must go forward as it has been structured all along, top Air Force officials acknowledged. But a senior industry official said Kendall’s talk of a jet with an F-35-like price tag “opened the door to a two-thirds cut in the cost of NGAD—I don’t see how he can walk that back.”

Whether such a price point is achievable is another question, however. The NGAD family of systems was to comprise a stealthy crewed airplane—sometimes known as the Penetrating Combat Aircraft, or PCA—along with uncrewed, autonomous CCAs and a network of airborne and space-based sensors for unprecedented situational awareness.

The CCAs are so entwined with NGAD that they share a budget line item. The Air Force has spent \$4 billion on NGAD systems, including CCAs, since fiscal 2023; \$3.6 billion of it on the crewed aircraft alone, not counting earlier research and development and prototyping efforts in partnership with the Defense Advanced Research Projects Agency. According to its fiscal 2025 budget request, the Air Force plans to spend \$19.6 billion on NGAD and \$8.9 billion on CCAs through the end of the decade.

Though highly classified, a few things are known about the program. Kendall has said he launched a technology demonstration



**A full-scale model of Anduril's "Fury," one of two competitors in the Air Force's Collaborative Combat Aircraft program, was on display at AFA's Air, Space & Cyber Conference.**

H. Darr Beiser/Air & Space Forces Association

## CCAs Under 'Tight Control'

Anduril Industries and General Atomics Aeronautics stole the technology show at AFA's Air, Space & Cyber Conference, as each displayed a full-scale model of its entry for Increment 1 of the Collaborative Combat Aircraft. General Atomics went a step further, also displaying its XQ-67A demonstrator—a real “X-plane,” which flew in June, and is a close cousin to the company's Increment 1 offering.

Autonomous CCAs could be game changers in air combat, providing added complexity to adversaries and greater flexibility and far greater numbers to USAF.

While the Air Force initially seemed to envision each crewed fighter directing three-to-five CCAs, that picture has now changed, said Air Force Secretary Frank Kendall.

“We're talking about bigger numbers than that, now,” he said. “So, we're moving toward greater reliance on uncrewed aircraft working with crewed platforms to achieve air superiority and to do other missions.”

If CCAs are “armed and lethal ... they must be under tight control,” he said, indicating they would operate within line-of-sight communications of the crewed fighters that control them.

“I think that that's an important thing to have in the mix: secure, reliable, line-of-sight communications,” he said. Once communications with a CCA are lost they must return to base, “which takes them out of the fight.”

Insisting on line-of-sight contact with a CCA limits how far apart a fighter and CCA could operate. But at 25,000 feet—the notional operating altitude for a CCA—that range is still significant at nearly 200 miles.

But what aircraft will control CCAs is still a “question mark,” Kendall said. The Next-Generation Air Dominance fighter might not necessarily control CCAs, he added, heightening speculation that one option is that the entire NGAD family will be uncrewed. That would suggest F-35s would take on control of CCAs.

CCA Increment 2 is also a question mark. USAF officials are still deciding whether it will be a less-sophisticated version—an “attributable” platform whose cost is low enough that losing one is

acceptable—or a more exquisite version, with extremely low observability and advanced mission systems. Senior officials glibly referred to a later “Increment 3” but offered no characteristics or timetable. Some have previously said that phase could involve close allies.

John Clark, head of Lockheed Martin's Skunk Works Advanced Development Programs division, said his company's Increment 1 concept aimed too high. Lockheed offered a “gold-plated” CCA with a high degree of stealth, a stark contrast from the nonstealthy designs from Anduril and General Atomics that feature large tail fins for stability.

For Increment 2, “something that has more expendable characteristics, and is at a much, much lower cost point seems to be a good place to go explore,” Clark said at a press conference. “And so that's where we're exploring and putting time and energy in.” Lockheed is still waiting to see “how the Air Force is going to go with their requirements,” he added, but that “is where we think it's going.”

However, the question is an open one, because without stealth, most CCAs “Aren't going to make it home,” Clark said. He sees room for multiple approaches, to include survivable aircraft that “make it home every time.”

Gen. Duke Richardson, head of Air Force Materiel Command, said all of his operating centers except the Nuclear Weapons Center will have input into the development and fielding of CCAs. They include Air Force Research Labs, and the Air Force Test Center and Sustainment Center, among others. For now, the program is being managed by the Program Executive Officer for fighters and advanced aircraft, Maj. Gen. Jason Voorheis. However, with the introduction of the new Integrated Capabilities Command and the Integrated Capabilities Office, it's still to be determined where the program will land, Richardson said.

The work of deciding what NGAD will be and the full role of CCAs is “all kind of coming together,” Kendall said. “We're going to have, hopefully, decisions on what that package of capability is going to look like” in the near future.

effort for what would become NGAD while he was undersecretary of defense for acquisition, technology and logistics during the Obama administration. Those “X-plane” demonstrators have flown, most likely developed by Boeing and Lockheed Martin. Northrop Grumman CEO Kathy Warden said in July 2023 that her company wasn't bidding on NGAD, though she indicated Northrop would compete for the Navy's next-generation fighter, dubbed FXX. That platform has a similar mission.

Chief of Naval Operations Adm. Lisa Franchetti told reporters in October that her service is “actually in source selection right now” for its version of NGAD, the F/A-XX. Boeing, Lockheed, and Northrop are all competing for that program.

Describing the crewed NGAD options the Air Force developed, Kendall remained cagey. “It's a fairly mature design concept,” he told reporters. “It's classified, but it's an F-22 replacement. You can make some inferences from that.”

The purpose of CCAs is “air superiority first and foremost,” he said. That means electronic warfare, detecting air-to-air targets and carrying air-to-air munitions.

“As we go forward, I expect there'll be a strike aspect of CCAs as well, but initially, we're focused on air superiority and how to use the CCAs in conjunction with the crewed aircraft to achieve air superiority,” Kendall said.

Getting a much lower price on NGAD depends on success

with CCAs, Kendall said.

“Once you start integrating CCAs and transferring some mission equipment and capabilities [and] functions to the CCAs, then you can talk about a different concept” for NGAD, he said.

Industry officials pointed out, though, that at roughly \$27 million or more per CCA—and, notionally, five or six of them in the NGAD formation—coupled with an \$80 million crewed fighter, the overall cost for a unit of action is in the range of the crewed fighter alone. Add a stealthy tanker to the mix and the costs rise higher, with increased sustainment and personnel costs. Greater redundancy might also be necessary to ensure the mission doesn't fail if a critical element is shot down.

Andrew Hunter, assistant secretary for acquisition and sustainment, said a lower price might be achievable if the NGAD “design concept” is revisited.

“Things that drive cost on an airplane [are] size, complexity, mission systems, [and] propulsion, which [are] related to size and complexity,” Hunter said. The combination of these factors determines overall cost.

“We want to get that right, and we're looking for an affordable design concept,” he said.

Hunter steered clear of defining the price target, but did say the Air Force needs an aircraft it can field in volume. NGAD must be “something we can field in sufficient numbers to meet the

need,” he said, suited for a “high intensity peer conflict, involving a substantial element of pace and scale and over long ranges. So that’s the puzzle we’ve got to solve. And, I grant you, it is a very challenging puzzle to solve.”

He noted the Pareto analysis—a chart which typically shows that just a few factors are responsible for most of the cost—does not settle on an obvious solution for NGAD.

“There are multiple points on that curve,” he said. It’s too soon to say whether finding a solution that costs even less than an F-35 is possible, “but we’ve got to do the work. We’ve got to do the analysis” and find out “what would be most advantageous,” Hunter said.

Does that mean NGAD is, in effect, starting over?

“It depends on what the answer is,” Hunter said. “There are different possible points of optimization. If those points are very close to where we already are, there may not need to be a huge change to our approach. If they are not close, there will have to be a significant change.”

Vice Chief of Staff Gen. James C. Slife, in a panel discussion, said the traditional ways of designing a fighter have to be set aside in view of what is now possible, particularly with regard to autonomous aircraft.

Until recently, he said, designing a fighter meant building its characteristics “around the platform—around the size of the radar you need, the range of the aircraft, how many G’s you wanted to pull. ... You optimize for all of those things inside of a platform.”

But modern technology is changing that picture. “We’ve gotten to a point where, [with] our systems-level integration, we have the ability to disaggregate these capabilities and look at air superiority more broadly,” Slife said. The radar, he said, may be on one aircraft, while the munitions “may be in another location.”

If successful, that could yield “an enduring source of competitive advantage for the United States military. ... A step change in American military capability.”

A decade ago, when Kendall launched what would become the GAD X-planes, there was “lengthy discussion” about whether a crewed aircraft was needed at all.

“My judgment at the time was that we weren’t quite ready to do that,” he said. He’s still not sure that time has come. “We’re probably going to do one more version, at least, of crewed, more traditional aircraft,” Kendall speculated. “I don’t know exactly what that aircraft will look like yet,” and “whether there’ll be variants that might be crewed or uncrewed is another question mark.”

That’s where Kendall’s blue-ribbon panel of experts comes into play. The group of former Air Force Chiefs and executives will be chaired by Maj. Gen. Luke Cropsey, who Kendall has also assigned to oversee and integrate the vast enterprise of its C3 Battle Management.

All the panelists have a close personal connection to stealth. Kaminski was the Pentagon’s director of low-observables technology in the 1980s when the F-117 and B-2 were being developed; Ralston was Kaminski’s military deputy and later headed the Joint Requirements Oversight Council as Vice Chairman of the Joint Chiefs of Staff. Jumper oversaw the introduction of the F-22 and learned to fly the stealth jet late in his tenure; Schwartz was involved in the force planning that led to the B-21 and NGAD; and Goldfein led the Air Force as it focused on China’s growing peer threat.

Today’s Air Force Chief of Staff, Gen. David W. Allvin, said the group’s role is to “really assess our assessments, look at the evaluations we’re doing, making sure we’re really not missing anything in our analysis, in how we understand the threat and how we understand the capabilities that are going to be required of our Air Force to meet that threat.”

Their job is not to tell the Air Force what to do, but to “give us feedback and insights ... that will help us do this analysis that we have to do in fairly short order.”

The group will make recommendations to Kendall and Allvin, who “get the final say on what will be proposed” to the Office of the Secretary of Defense, and, ultimately, Congress.

Kendall said that if the NGAD as already structured turns out to be “the most cost-effective operational answer”—which he said is “still a possibility”—then, “that’s what we’re going to do.”

But that option will deliver “small numbers,” he said.

“The more the airplane costs, the ... fewer you’re going to have,” he added. “Numbers do matter. So, it’s a trade-off.”

So the countdown to the decision is on. “We’ve got industry waiting for a decision. We’ve got the Congress waiting for feedback on what we expect to be done with the ’25 budget that they’re considering now, and we’re building the ’26 [Program Objective Memoranda] ... for the next administration,” Kendall said. “So we’re going to move pretty quickly on this. We’ve organized that work. It’s proceeding, but it’s too early to speculate about how it’s going to come out.”

This much is clear, however: Whatever the solution, it will be expensive. “How we’re going to pay for it,” Kendall said, “at the end of the day, [may] be our biggest problem.”



Mike Tsukamoto/staff

**General Atomics’ XQ-67A, shown here on display at AFA’s Air, Space & Cyber Conference, has already completed successful flight tests. The underlying aircraft is closely related to GA’s offering in the Collaborative Combat Aircraft competition.**

# Weaponizing Space

Space Force hints at offense, but details remain scant.

By Greg Hadley

**O**ffensive weapons to hold adversaries' space systems at risk are top priorities for both the U.S. Space Force and U.S. Space Command, leaders made clear at AFA's Air, Space & Cyber Conference in September.

Yet details on what kinds of weapons they want remain scarce, and the implications of a space war still gave some officials pause when discussing counterspace and space dominance—reflecting a persistent tension between deterrence, classification, and deep-rooted fears of weaponizing space.

For years, talk of developing, let alone using, offensive weapons in space was taboo in U.S. military circles. Although the U.S. was the first to demonstrate destructive power in space, official policy made clear such capabilities were for defensive purposes only, given the long-lasting effects of debris in orbit and the U.S. commitment to keeping space a peaceful domain. But as China and Russia have tested anti-satellite (ASAT) weapons and built up rival space capabilities designed to counter U.S. advantages in the heavens, those basic premises have changed.

The creation of the Space Force in 2019 cracked the door open for wider discussions about China's and Russia's militarization of space, and since his appointment as Chief of Space Operations in 2023, Gen. B. Chance Saltzman has shifted the conversation about establishing the structures and processes of a Space Force to the operational employment of space as a competitive, contested domain in which the United States must deter rivals from threatening U.S. advantages in space.

Saltzman made "responsible counterspace campaigning" part of his "Theory of Competitive Endurance" and said in September that his fiscal 2026 budget request will put dollars behind that theory.

"The priorities that we have submitted—still early in the deliberation process—are counterspace capabilities and the space domain awareness that underpins it," Saltzman said. "We have to understand what's going on in the domain to effectively employ counterspace capability."

Saltzman went on to classify six general types of counterspace weapons, three in orbit and three terrestrial:

- Kinetic, destructive weapons;
- Directed energy; and
- Radio frequency energy and jamming.

But when asked to discuss specifically what the Space Force is doing in offensive space, Saltzman demurred. The Space Force is comfortable talking about counterspace in theoretical terms, but not ready yet to speak openly about specifics.

As CSO, Saltzman is responsible for recruiting, training, and equipping Guardians to be effective space warfare operators. Applying their capabilities is the responsibility of U.S. Space Command—and its leaders want counterspace weapons too.

"For us to have the ability to get after somebody else's capability, so that they cannot use space to target our joint warfighters—how do we do that?" asked Lt. Gen. Douglas A. Schiess, commander of U.S. Space Forces-Space, the USSF component that presents forces to SPACECOM. "We need kit to be able to do that, to be able to keep those forces at bay."

Schiess noted that his boss at SPACECOM, Gen. Stephen N.



Mike Tsukamoto/staff

**Developing counterspace capabilities and strategies are among the top priorities for Chief of Space Operations Gen. B. Chance Saltzman. Critics say the Space Force must do more to articulate clear policies on how and when counterspace solutions might be used.**

Whiting, listed space fires at the top of his Integrated Priorities List, which he submitted to the Pentagon to summarize the operational needs of his combatant command.

"We have to be able to protect the Airmen that I have on the stage here from space-enabled attack," Schiess said, referring to the two Air Force three-star generals who were his co-panellists. "So our risk is, how fast can we get to the capabilities that we need?"

The risk is real, other officials noted. Space Force intelligence boss Maj. Gen. Gregory J. Gagnon noted at the conference that in the last few weeks, China launched its 1,000th active satellite into orbit. And just a few days before the conference, Vice Chief of Space Operations Gen. Michael A. Guetlein warned that China and Russia are fielding enough satellites to develop sophisticated "kill webs."

Yet like Saltzman, Schiess did not explain precisely what kinds of space fires SPACECOM wants.

Retired Gen. Kevin P. Chilton, Explorer Chair at the Mitchell Institute's Space Center of Excellence (MI-SPACE), told Air & Space Forces Magazine that leaders' reluctance to talk about offensive space in specifics undermines its value as a deterrent.

"You can't deter solely by defense," he said. "Defense is really important. Disaggregation [by increasing the number of satellites in a constellation] to make the problem harder for them to eliminate a capability, that's a really good way to go. ... But you also have to have offense if you really want to deter somebody. I can't think of a castle wall thick enough or high enough that it ever deterred an adversary from attacking it. It is offensive capability that deters them. It's the threat of losing their forces."

Whether it's policymakers or military leaders that are hold-

ing back in speaking more plainly about space weapons is not entirely clear. Whether military leaders are “being allowed” to field offensive space weapons is something Chilton wants brought out in the open. A nation can’t deter another without exposing some sense of its capability.

“No one is talking about capabilities that can do this beyond cyber,” he said. “I don’t think you should tell everybody everything, but they need to understand that we have the will to do this. We must have the will to do this, and then we can show them a little bit of capability.”

## OTHER WAYS

The requirement for U.S. Space Command to hold adversaries at risk in space does not need to be answered by the Space Force alone. This can be done from land, sea, air, and with cyber technology, as well.

“This is a joint military requirement,” Chilton said. “It’s something that we should have a naval option [for]. We should have an air option, a land-based option right, and a space-based option.”

Rear Adm. Heidi K. Berg, deputy commander of Navy Space Command, did not speak to any specific weapon her service is developing to target space assets, but she did endorse the need for offensive space and argued the Navy can provide U.S. Space Command with opportunities to use ground-based weapons for space operations.

“In accordance with deterrence theory, it makes good sense that you develop credible counterspace capabilities to deter your adversaries from the employment of those capabilities,” said Berg. “The Navy, we play the away game ... specifically in that forward deployment, and that allows for that terrestrial force to have the terrestrial point to be able to execute.”

Chilton said the key is to have options. “You can have multiple problem sets to present to the adversary: lasers, direct-ascent, co-orbital—they have to fear that the U.S. can actually gain and maintain space superiority.”

Space is a crucial enabler no matter the domain, and its use can be attacked in space, with electronic warfare by means of spectrum jamming, and by attacking the ground stations and networks needed to use them.

RAF Air Marshal Paul Godfrey, a British officer assigned to U.S. Space Force Headquarters as the first-ever assistant chief of space operations for future concepts and partnerships, said there will be times when the Army, Navy, Air Force, and Marine Corps will have to support USSPACECOM, rather than the other way around. “The other services need to understand the criticality of space in everything that they are doing on a daily basis, so that when asked to support and look at what they might need to target, then it does make an integrated priority list,” he said.

Schiess echoed that point in describing ways the terrestrial combatant commands can help Space Command attack adversaries’ counterspace weapons.

“One way for us to do that is to get really good at geo-locating where those jamming sources are coming and then putting them on a joint target list, for action by some of my other service components, to be able to get after so that we can get to attribution as quickly as possible,” he said. “Put them on a target list and then take them out, so that we can continue to be able to do our mission.”

## CONTINUED RELUCTANCE

But while Saltzman and Whiting call for space fires, others fear pushing the counterspace argument too far, too fast, at

the risk of befouling the domain with clouds of post-attack kinetic debris.

“When you start talking about the [anti-satellite] side of things, we are then reducing our own ability to work in space as well, because those debris clouds continue to orbit,” Godfrey warned. “It doesn’t mean you can’t think about these sorts of things or understand how the adversary might do these things, but I think collectively, we all need policy discussions, understanding the risk of throwing all of that debris out there. Do we really want to do that? And actually is that the element that deters anyone from going to war in space? And does that mean that we’re more aligned on the left-hand edge of the scale of reversible effects?”

Chilton points out that the choice facing a combatant commander could be between risking service members’ lives as a result of not defending against an adversary’s space-based attack and generating space debris as a result of that defense. The risk of potentially catastrophic economic and societal impacts of losing the GPS constellation raise the stakes higher.

Scientists have warned of excessive space debris for decades, but the growing threats in space are raising a whole new set of questions and discussions, Godfrey argued. And during a later panel he moderated on space dominance, industry officials seemed to agree.

“We’re very comfortable in the maritime domain and in the air domain with ‘deny, disrupt, and destroy,’ and we know what those mean ... in terms of policy, in terms of capability, and budgets,” said Dan Ourada, vice president at Amentum. “But when you mean to talk about those three items in the space domain, the unintended consequences, the second- and third-order effects have much greater implications. The policy just hasn’t kept up with it yet.”

The failure to develop clear policy and the weapons to back up that policy is itself a risk, however. “There’s a dearth of support for offensive counterspace capabilities, and I say ‘capabilities’ because it’s not just about satellites,” Chilton said. “Although it’s an important and easy target if you take out the satellite, you can interdict with electronic warfare, ... you could interdict their ability to track our satellites by going after their SOSI [Space Object Surveillance and Identification] networks, their ground-based and space-based networks that give them predictive information they need to launch their counterspace weapons.”

Without programs specifically designed to hold an adversary’s space assets at risk, the U.S. cedes options that could influence future conflict in its favor. “I don’t know of a single Air Force program coming down the acquisition pipeline designed specifically to hold at risk adversary space assets,” Chilton said. “The Air Force should be holding at risk adversary space assets, because there are some unique things about airplanes and counterspace.”

The U.S. demonstrated it could shoot down a satellite with an ASAT test in 1985, he noted, and in 2008, the U.S. Navy-guided missile cruiser Lake Erie fired a Standard Missile 3 into space to destroy a U.S. intelligence satellite that had failed to deploy as intended and was posing a potential threat to Earth. Dubbed Operation Burnt Frost, it was seen by some as a U.S. response to China’s ASAT test two years earlier.

“If you have them, you need to show a little bit,” Chilton said. “They have to fear that we can gain and maintain space superiority, not just survive their attack. And in order for them to fear, we have to be talking about it.”

To be effective, the U.S. needs a combination of land-, sea-,

air-, and space-based counterspace options under the control of U.S. Space Command, Chilton said. “You don’t want people willy-nilly shooting down satellites, you want that to be part of an integrated plan that’s supporting the regional commanders’ war plans in the event of war.”

## FROM MERCHANT MARINE TO NAVY

Since early this year, Saltzman has used the analogy of the U.S. Merchant Marine to explain the transition he’s trying to bring about with the Space Force. Prior to World War II, the Merchant Marine was a peaceful maritime service, but once the war was underway, it was effectively a part of the military operating in a hostile world.

Matt Brown, executive technical director for Air & Space Defense Systems at RTX, extended the metaphor in describing how the Space Force is learning to defend itself from attacks—and developing capabilities of its own.

“When I think about what’s happening in space, I think about the first carrier that we had, back in 1920 that, when we built it, we thought this is a great capability, and then we realized we have to defend it,” Brown said. “And so we had to come up with carrier strike groups. We had to build battleships. We had to build destroyers to support that mis-


sion. And I think that is about where we are in space today.”

Saltzman, for his part, also referenced the changes when talking about the Space Force’s budget and how it needs to grow in the coming years.

“The counterspace mission to overcome the space-enabled targeting that our adversaries have put in place is kind of a new mission. It’s a key aspect of space superiority. A new mission requires new resources, new funding,” he said.

Systems designated for counterspace purposes ranked low among all other mission areas in the Space Force 2025 budget request, according to an analysis by the Aerospace Center for Space Policy and Strategy.

That doesn’t necessarily mean the mission area is not a priority; classified programs remained at the top in terms of resources.

Offensive counterspace should not be seen as solely a Space Force mission, however. Chilton noted that the Air Force demonstrated nearly 40 years ago it could shoot a satellite from an aircraft, and the Navy proved its capability in 2008 with Operation Burnt Frost. Other options should be explored. “I think directed energy, executed off a high-altitude aircraft, has a real ability to degrade, deny, or destroy, without creating a lot of debris,” Chilton said. 

# Part-Time Military Service

## How the Space Force will run without a Guard or Reserve.

By David Roza

**I**nstead of a conventional Guard or Reserve force to supplement its ranks, the Space Force is moving out on something new—a part-time Guardian force—that could become a model other services can adopt.

“The Space Force is going to be a pathfinder on how to rethink the concept of full- and part-time work roles ... which may inform the way that the Department of Defense chooses to use full- and part-time work in the future,” said Katharine Kelley, deputy chief of space operations for human capital, at AFA’s Air, Space & Cyber Conference.

“It’s going to take us a little bit of time to really solidify how the work role distinctions lay out,” she added. “But we really want to make sure we get it right.”

The Space Force has five years to create a single system governing both full- and part-time Guardians under the Space Force Personnel Management Act (SFPMA or PMA). Signed into law last December, it frees USSF from the bureaucracy of operating a conventional reserve component.

“For those who have experienced the challenges of moving from one status to another, you know how administratively burdensome, how challenging that is: from points, contributions, time, complexity, administrative nature, paperwork, the whole thing,” Kelley said. “Basically, you know how painful it is.”

The goal is a system in which Guardians can switch easily between full-time and part-time (and back again), enabling Guardians to take a break from service to pursue advanced degrees, gain civilian work experience in commercial space or cyber, or take time off to care for family members.

Properly managed, the Space Force can change the conventional career landscape that features only a one-way exit door to Active service. Enabling the service to retain talent is a key

objective, said Chief Master Sgt. Todd Scott, senior advisor to the Chief Master Sergeant of the Space Force. “At the end of the day, it’s supposed to [improve] our ability to have a long-term relationship with the talent, so we can access it when we need and not force members to break the relationship with the Space Force.”

Chief Master Sgt. of the Space Force John F. Bentivegna sees this as answering “one of the age-old problems in the military: [that] the training, education, and experience that we invest in our military members makes them very valuable to other organizations,” he said. If the Space Force exercises its new authority effectively, it will take “that career-long investment and make sure it doesn’t walk out the door.”

Not all jobs will lend themselves to part-time work. Institutional support jobs, such as test and evaluation, training, education, doctrine development, and certain staff jobs might work well for part-time personnel. Chief of Space Operations Gen. B. Chance Saltzman said, “Pull them into the institutional force, where they know, ‘Hey, I work two days a week because I teach a class,’ or ‘I’m surging for two weeks to do a test for GPS or MILSATCOM,’ for example.”

Operator jobs, however, will be full-time work. “If you are employed in-place 24/7, that’s probably a full-time work role,” Kelley said. If you’re a commander of a unit, that’s probably a full-time work role.”

## ‘WE DO NOT WANT TO HURT ANYBODY’

Five full-time Air Force Reservists became Guardians earlier this year, a simple transfer much like those for thousands of Airmen, Sailors, Soldiers, and Marines since 2020.

But the process is not so straightforward for the part-time force, said Lt. Gen. John P. Healy, Chief of Air Force Reserve and commander of Air Force Reserve Command.

"The Active duty, whether it be the Air Force or the Space Force, is not accustomed to care and feeding for part-timers," he said. That's why SFPMA gave the service five years to make it work—"to give us a little bit more time to make sure all those systems are ready."

Unresolved details include whether part-timers should be paid by the day or by the hour; how many days they should work per week; how flexible are those arrangements; and what kind of work part-timers will do?

The Space Force is not taking "a squadron from the Air Force Reserve and have that squadron do the same thing" in the Space Force, Healy said. "It's that core set of skills that [Reservists] possess that are going to be utilized to the best of the ability of the Space Force as a Guardian."

More than 300 full-time Air Force Reservists have applied to join the Space Force full-time, Healy said. Another 1,400 Air Force Reservists are in space career fields and working at the 310th Space Wing in Colorado. Those billets will go away, but the missions will remain—in the Space Force. By 2028, the transition must be completed, Healy said.

Saltzman said the goal is to make the transition seamless and pain free. "We do not want to hurt anybody in the transition period," he said. "That is first and foremost in our minds. And when I say hurt, I mean, when you cross over, you don't get paid."

Reservists who want to remain in the Air Force Reserve will be accommodated as much as possible, said AFRC Command Chief Master Sgt. Israel Nuñez.

"They may look at it and say, 'Hey, I love doing the space mission, but the part-time service in the Space Force is going to look different than Reserve service,'" he said. "But maybe I want to retrain.' ... So we're providing them those options now, so they don't have to wait until 2028 to make that decision."

## GUARD DUTY

For space units in the Air National Guard, the situation is somewhat more complex. Most of those units are deployable, which clashes with the Space Force's vision for its part-time force, Saltzman said.

"When they deploy, you need them full-time. When they come back from deployment, you don't need them full time," he explained. "So suddenly the Guard model is a different operational model from a part-time force, because they do a different mission set than what our traditional Air Force Reserve counterparts did."

The relatively small number of Guardsmen doing space work has proved to be a political hot potato. Governors of 53 states and territories wrote in April to Defense Secretary Lloyd J. Austin III objecting to having Guard units absorbed into the Space Force without their consent.

An internal survey sent to the 14 ANG units across seven states that perform space missions found that 70 percent of respondents said they would prefer to retrain or retire rather than join the Space Force, according to the Guard. Some cited concerns that a transfer would force them to move.

"I love being here," said 1st Lt. Mao Lefiti of the Hawaii-based



Mike Tsukamoto/staff

**The first five Air Force Reservists who transferred to the Space Force and became Guardians earned a shout-out from the Chief at AFA's Air, Space & Cyber Conference: The are (left to right) Senior Master Sgt. Dominic Navarro, Master Sgt. Tyler Odenweller, Staff Sgt. Dustin Toth, Senior Airman Athena Reise, and Senior Airman Jesus Patricio Velez.**

150th Electromagnetic Warfare Squadron. "I don't want to leave. ... I'm kind of in a tactical role, and the uncertainty that I may be moved to who knows where is cause for concern."

Air Force Secretary Frank Kendall was unbothered by the criticism.

"I think when you go to people and say, 'Do you want to stay like you are or jump off a cliff?' They're going to stay like they are," he said at the time. "We're not asking them to jump off a cliff. We're asking them to go to another arrangement which will be very, very like the one that they're currently serving under. They're not going to see much change frankly, as I see it."

A draft version of the 2025 National Defense Authorization Act would allow Air National Guard units with space missions to transfer into the Space Force, but it would cap transfers at 580. An Air Force analysis found that only nine Air National Guard units would move into the Space Force, with 578 full-time and part-time billets. The measure would require the units to remain based in their current locations.

For members who prefer to stay in the Guard, the bill would require the Air Force to offer retraining and reassignment. The bill passed the House but has not cleared the Senate. Once the measure clears the Senate, the two bills would have to be reconciled at a conference.

Getting through all that resistance is hard, but "nothing that keeps me up at night," said Brig. Gen. Nathan D. Yates, mobilization assistant to the deputy chief of space operations for operations, cyber, and nuclear. He likened the process to climbing a mountain.

"You look up from the bottom, it seems very challenging, and halfway up, you're out of breath, your quads are burning, and your calves are seized up," he said. "But you keep going, and once you're at the top, you're like, 'Well, that was worth it!'"

Establishing part-time military service is similar. "It's brand-new," he said. "And that's challenging. But as far as challenges go, we've got the road map out in front of us. We just need to execute it."



JetZero illustration

A stealthy Next-Generation Air-refueling System (NGAS), shown here in a conceptual illustration, remains an aspirational answer to long-term needs. USAF seems unsettled on a near-term solution.

# Tanker Modernization

## How quickly can USAF develop a next-gen tanker?

By Rachel S. Cohen

NATIONAL HARBOR, Md.

**T**he U.S. Air Force's yearslong pursuit of a futuristic new tanker faces a new set of hurdles as the service rethinks its next-generation inventory and contemplates the potential for building a stealthy and possibly autonomous refueler as the crown jewel of the mobility enterprise.

Leaders want to begin buying a Next-Generation Aerial Refueling System, or "NGAS," by the mid-2030s. But waiting that long means relying on today's KC-135 fleet—airframes that average 60 years old—for at least another decade.

One solution: Launch NGAS sooner, eliminating the need for a one-for-one replacement of the KC-135, noted Assistant Secretary of the Air Force for Acquisition, Technology and Logistics Andrew P. Hunter, who told reporters Sept. 16 that USAF will need an interim solution.

"We think there's going to be some period, between when the current contract [for KC-46 tankers] ends and when we're truly into NGAS, where we're going to need to buy something to cover down continued tanker production," he said. "That construct is still the case, but it's critically dependent on ... how quickly we can get to NGAS."

NGAS began almost two years ago with an assessment of the Air Force's future options for aerial refueling. Ensuring those jets can survive in hostile airspace and that it can be more

energy-efficient than previous fleets are key requirements.

Lockheed Martin is competing with a partnership of prime contractors Northrop Grumman and startup JetZero, and both have released design concepts for the coming competition. The Air Force formally solicited industry's input in September, Secretary Frank Kendall said at AFA's 2024 ASC Conference, seeking potential mission systems for NGAS as a "first step in establishing competitive vendor pools."

A separate solicitation for airframes will follow, according to Hunter, once the service completes its requirements review.

Recently retired U.S. Transportation Command boss Gen. Jacqueline D. Van Ovost, whose command requested Air Force tankers for refueling missions around the world each day, promised that review would be completed soon. She predicted no surprises.

The analysis of alternatives (AOA) has explored how a tanker might fly into a contested environment where it could be shot down, how much fuel it would have to carry, and how it could become stealthier as needed, Van Ovost said.

The study is looking at how a tanker might refuel drones, and what extra requirements that might entail, as well as whether the tanker itself could be autonomous—a capability the Air Force does not have today. NGAS would also act as a communications relay node, part of the overall joint all-domain command and control systems used to share situational awareness on the ground, air and sea.

"I'm hoping that as this NGAS AOA comes out and we are

able to expose all of those technologies, that no matter the platform, I can start getting those technologies as soon as possible,” Van Ovost said at the conference.

NGAS is both dependent on what the Air Force wants in its Next-Generation Air Dominance platform and could influence what those requirements could be. The sixth-generation combat aircraft is envisioned as operating in concert with uncrewed Collaborative Combat Aircraft, and Kendall decided to pause making a decision on the program last summer, pending yet another study. In comments at AFA’s conference, Kendall suggested the ability to have a stealthy refueler could potentially reduce range requirements for NGAD, which could in turn make that aircraft less costly.

## CHANGING TIMES

The KC-135 was developed alongside the B-52 Stratofortress bomber in the 1950s, and it makes sense, Van Ovost said, that next-generation platforms should likewise be developed in concert with each other.

The Air Force had planned to seek industry proposals in fiscal 2025—ahead of NGAS’ arrival. But with the KC-135 aging and no solution near at hand, officials have begun to indicate they’d like to retire 15 KC-135s per year and replace them with an interim solution. This so-called “bridge tanker,” also sometimes called “KC-Y,” could be a new tanker or might mean buying additional KC-46s.

How many aircraft the Air Force needs will be a “critical driver” of what suppliers might offer, Hunter said. The smaller the potential buy, the less compelling the program will be. And the answer to that hangs on what that future, stealthy tanker requirement is and how soon it can be acquired.

“We need to understand the NGAS,” Hunter said, “to truly make additional progress on tanker recap.”

Abandoning a program comes with risks, too. In 2018, the Air Force scrapped an initiative to replace its E-8C Joint Surveillance Target Attack Radar jets with another airframe in favor of pursuing the Advanced Battle Management Network, a network of sensors and radars spread across other platforms. Critics accused the service of depriving service members of a critical airborne capability that had alerted ground troops to

enemy forces that might be lurking nearby.

Discussion of future tankers comes as the Air Force continues downsizing two of its three aerial refueling fleets and bringing on the troubled KC-46 Pegasus, the U.S. military’s first 21st-century tanker program.

The Air Force expects to own about 350 KC-135s and nearly 120 KC-46s in fiscal 2025. Airmen will bid farewell to the final KC-10 Extender in September, as the fleet ends more than 40 years in service.

Congress has mandated that the Air Force own no fewer than 466 tanker aircraft, a number Hunter said the service believes is still feasible.

“Our current intention is not to propose an alteration in the statutory requirements for tanker aircraft,” he said. “That’s not to say that could never happen, but we don’t have anything to suggest to us that that current number is wrong.”

Airmen would continue to repair KC-135R jets until the service can replace them with something more capable, Hunter said.

Asked whether she has concerns about the KC-135 fleet’s ability to support the joint force, Van Ovost said she will continue to push the Air Force to train its crews and keep its jets ready for a high-end fight.

The Stratotankers in fiscal 2023 logged a 69 percent mission capable rate, a metric that shows what percentage of aircraft are ready to fly and support troops at any given moment.

In the meantime, Van Ovost said TRANSCOM is considering how other tanker assets across the joint force and overseas could offer more aerial refueling coverage and take some pressure off of the Air Force.

That could mean relying more heavily on Navy F/A-18s, which handle refueling around aircraft carriers at sea, or MC-130J Commando II aircraft that conduct low-level refueling of Air Force special operations assets. Van Ovost wonders if a future swarm of drone wingmen could turn to MC-130Js for fuel, or whether tankers owned by foreign partners could shoulder some of the mission—particularly in a place as vast as the Pacific.

“How do you put that package together?” she said. “That’s the concept of operations that we’re trying to work with the Air Force, mainly, on.”



**A U.S. Air Force KC-135 Stratotanker prepares to refuel a KC-46 Pegasus during Mobility Guardian 23 over the Indo-Pacific. The Air Force may have to purchase additional KC-46s or another tanker to bridge between the 60-year-old KC-135s and a future tanker.**

Tech. Sgt. Heather Clements



Mike Tsukamoto/staff

Emphasizing his "One Air Force" theme, Gen. David W. Allvin, Chief of Staff of the Air Force in his Keynote Address on Sept. 16 said the entire Air Force must work together across all programs to create an ecosystem of integration.

# Training For the Big Fight

## Rethinking Train-as-You-Fight for large wars and peer conflict.

By Chris Gordon

NATIONAL HARBOR, Md.

**W**ith eyes on China in the Pacific and Russia in Europe and the Arctic, the Air Force is implementing its deployment rethink and returning to large-scale exercises not seen since the Cold War.

"We're starting at the right spot: how we intend to fight and then moving backward to ensure we have the organization and the training and the readiness to support that," said Air Force Chief of Staff Gen. David W. Allvin in his keynote address at AFA's Air, Space & Cyber Conference Sept. 16. "This is not an intellectual exercise. We're moving out."

The drive to shape two dozen "deployable combat wings" are at the heart of those plans. By organizing units that train together at home before they deploy to a combat zone, Air Force planners want to build the more cohesive units, with deep-seated relationships and trust, and to better communicate the risk vs. reward of deployment decisions when they go to the Secretary of Defense.

The Air Force Force Generation Model—known as AFFORGEN—provides the underlying pacing and structure for future deployments, putting units and their Airmen on a rotational cycle through four six-month phases, from training to ready to deployable and then reset.

AFFORGEN aims to provide Airmen and their families

with a sense of predictability, operational commands with an understandable and predictable schedule, and the Air Force staff with a means to better explain to combatant commands, the Joint Staff and the Defense Secretary the impact of a given deployment decision now and into the future.

"It really does help us to articulate capacity and risk when we get to the number of combat wings that are resourced to be independently deployable," said Lt. Gen. Adrian L. Spain, the deputy chief of staff for operations. "We're going to have a fixed number of those. ... We're going to be able to say, 'Hey, this is how many deployable combat wings that we have.' The number that we're working toward is 24."

The bottom line: Air Force and Defense Department leadership will at last have "a predictable and sustainable amount of forces for both rotational and crisis response."

The push to establish Deployable Combat Wings (DCWs) follows an evolutionary curve that began with so-called Expeditionary Air Bases (XABs), first deployed in fall 2023, and the newly introduced Air Task Forces (ATFs), the first of which will deploy in 2025. Deployable Combat Wings will follow in 2026, according to the Air Force, replacing both XABs and ATFs. Among the 24 DCWs, 16 will be in the Active-duty force and the remaining eight will come from the Guard and Reserve.

To complement the DCWs, the Air Force is also introducing Air Base Wings and Institutional Wings, furthering the idea that units are closer together and regularly train together. The aim is

to better facilitate effective command and control overseas by enabling wing commanders to build battle plans with familiar platforms and units, which becomes especially important when communications could be compromised in combat.

In recent times, a regional Combined Forces Air Component Commander directed operations, but in a more contested environment, that's not going to be possible, Spain said. Recalling his own time as commander of the 380th Air Expeditionary Wing at Al Dhafra Air Base in the United Arab Emirates from 2018-2019, he said, "We were getting tasking from the AOC and executing the daily flying schedule for the most part."

But in a fight with a peer, like China, that's not going to be possible all the time. "What we're going to ask our wing commanders and that command echelon to do in the future conflict against a peer adversary is significantly different," he explained. "You'll be under attack constantly, kinetically and nonkinetically. You'll be disconnected from your higher headquarters, probably on a more routine basis than we have [recently] seen, and you'll have to deal with that circumstance."

Air Component Commanders will provide subordinates his or her intent, through mission-type orders, and those subordinates will then have to be able to execute missions whether or not they can communicate.

"The next fight is going to be dramatically different," Spain said. "And so part of this unit of action is not only forming them in a certain way but training them to be prepared for that environment."

The Air Force tested the concept during Exercise Bamboo Eagle, in which a reconnaissance wing, preparing to deploy under the Air Task Force model, commanded fighters in a simulated conflict. Disconnects, such as how best to employ forces without the background of operating those forces, can be worked through, leaders say, by ensuring operational expertise is brought in at the staff, as well as at operational levels.

"I think the first thing is that we need to introduce it to all the Airmen and put them in the environment," Allvin said in a roundtable with reporters.

To exercise these new operational concepts, the Air Force is expanding the number and scale of operational exercises, including limited-notice, large-scale exercises that push the limits of the force. REFORPAC, a planned two-week exercise set to take place across the Pacific next summer, will integrate U.S. Air Force operational concepts into the joint U.S. Indo-Pacific Command's plans for operationally relevant training. It will require forces to disperse to an array of bases under simulated attack, with spotty communications, and also surprise elements to add stress and realism.

Modeled on the Cold War-era REFORGER exercises in Europe, where Army and Air Force units practiced defending Europe against potential Soviet attack, REFORPAC will build on recent larger-scale exercises such as Bamboo Eagle, led by Air Combat Command this year, and Mobility Guardian 2023, led by Air Mobility Command.

"The piece that we're building—that we're adding to—is doing this at scope and scale," said Gen. Kevin B. Schneider, commander of Pacific Air Forces, in an interview with Air & Space Forces Magazine. "Instead of individual units training, let's do them all together. Let's do a theaterwide, PACAF-focused event. This is REFORPAC—Resolute Force Pacific—the exercise that we'll execute in '25."

Schneider said the exercise will draw together multiple training events to something larger and more coordinated. "We're going to combine the air mobility supporting all of our unit-level exercises in the theater and be able to surge capacity into the

western Pacific at scope and scale," he said. "I'm really excited about what we're going to do with that."

Exercises like this one can also strengthen regional partnership and alliances, and help allies get used to working with U.S. Air Force and Space Force personnel—and vice versa.

But there are practical limitations to what's possible. There are only so many Airmen and aircraft, and there is only so much money available for training. Budgets squeezed by legislative caps, repeated continuing resolutions, and potential political paralysis following the presidential election could impact the scale of REFORPAC this first time around.

"One of the challenges—and as a younger guy, I lived this—is [that] exercises help build readiness, but exercises also come with a cost," Schneider added. "When it comes to exercising, there's tremendous benefit that comes from it. [But] there's also tremendous benefit from being able to just focus on the things you weren't able to do during an exercise: Take care of maintenance, take care of some of the other things, and make sure that your people and your equipment are healthy to be able to respond across the spectrum."

Flexibility remains a priority, and no one formula will work for every exercise, or every deployment. Leaders from across the spectrum recoil at a one-size-fits-all model. Some commands will have permanently assigned forces, such as U.S. Air Forces in Europe and Pacific Air Forces; others, such as Air Force Global Strike Command, which runs continuous bomber and ICBM operations, will largely operate in place.

"We don't have the luxury, as opposed to other long-range platforms, of being on a cyclical AFFORGEN two-year cycle. We are always on," said Col. Keith J. Butler, who commands the unique 509th Bomb Wing, which flies B-2s out of Whiteman Air Force Base, Mo. "Whiteman is the only place that has the B-2. We are absolutely low-density, high-demand. We're what's called a threshold force. We've got to be ready to go all the time."

B-2s flew a major combat operation in October, striking underground weapons bunkers in Yemen in a demonstrative show of force.

Wing commanders who oversee permanently assigned forces overseas, such as U.S. European Command, also noted that the Air Force's changes will apply differently to those units.

"The AFFORGEN model really doesn't apply to us as easily as it does in the United States," said Brig. Gen. Tad D. Clark, commander of the 31st Fighter Wing of F-16s, MQ-9s, HH-60s, and 5,000 Airmen, headquartered at Aviano Air Base, Italy. "The reason is our assets fall under a combatant command."

Secretary of the Air Force Frank Kendall acknowledged such differences in September. "The problem with implementing [AFFORGEN] that I've seen—and I think it's widely recognized now—is that one size doesn't fit all," Kendall said Sept. 6. "Every unit doesn't have the capability, just because of its mission requirements, to do that sort of a model cycle."

But if AFFORGEN can't precisely align with every command, it can be aligned in spirit, leaders say. Every unit will have a reason for why something won't work in their particular corner of the Air Force. But, at the same time, most should be able to adapt to the operational intent.

"What [Allvin] and I have been encouraging people to do is figure out what kind of a readiness creation and expenditure cycle makes sense for what you do, and then tailor around it," Kendall said. "So don't use just the one model and feel like you rigidly have to follow that or force it into your place where it may not be compatible."

Flexibility is and always has been the key to airpower, leaders say. Commanders just have to put that concept to work. ★



Airman Adam Enbal/USAF

The Air Force has begun testing RQ-4B Global Hawk aircraft north of the Arctic Circle. Complementing conventional surveillance with air assets could yield enhanced intelligence in the region.

# Drones Take on the Arctic

Uncrewed aircraft could complement satellites and ground-based radars in an increasingly contested region.

By Unshin Lee Harpley

**R**ussia's increasing Arctic presence and growing ties with China have Air Force leaders beginning to use unmanned aircraft to help monitor the region for situational awareness.

"We've been experimenting with the MQ-9s, with Global Hawks ... trying to go up farther north in the Arctic Circle, which we haven't done in the past," said Gen. James B. Hecker, commander of U.S. Air Forces in Europe.

The mission is a new one for the MQ-9 Reaper, but the hunter-killer's 27-hour endurance is well suited for long-endurance missions. The RQ-4 Global Hawk, which operates at higher altitudes and can stay aloft for 34 hours, could provide a persistent complement to satellites and manned aircraft. USAFE deployed an RQ-4 to RAF Fairford, U.K., in August, the first time the surveillance drone has operated there.

Uncrewed aircraft are a smart, cost-effective, and low-risk solution to address limited air and maritime surveillance in the region, said retired Air Force Maj. Gen. Larry Stutzriem, director of research at AFA's Mitchell Institute for Aerospace Studies.

Gen. Gregory M. Guillot, commander of the North American Air Defense Command and U.S. Northern Command, said the drones are a "gap filler" in the Arctic until future over-the-horizon radars come online. Experiments are necessary to adapt the drones' sensors and payloads to the region's brutal weather and he is intrigued with the work of the U.S. Air Force's Task Force 99 in the Central Command area of operations in the Middle East. The task force has experimented widely to

enhance ISR and logistics in the Middle East.

The Air Force is refurbishing older Global Hawk Block 20 and 30 models at Grand Forks Air Force Base, N.D.

Stutzriem said the experimentation makes use of the inherent flexibility in these uncrewed aircraft. "It's all about sensors for the Arctic mission," he said. "The UAVs can be configured for both air and maritime surveillance."

Electro-Optical/Infrared (EO/IR) sensors and Synthetic Aperture Radar (SAR) systems on the Reapers and Global Hawks enable them to sense through clouds and fog and could also be valuable in operating through prolonged low-light conditions during winter for monitoring weather and to track sea ice movement.

## EVOLVING THREATS, DELAYED CAPABILITIES

The Arctic is 1.5 times the size of the continental U.S. Though mostly international territory, much of the region belongs to Russia, which holds the largest share of coastline and an exclusive economic zone (EEZ). Hecker said Russia is now employing radars and satellites they "haven't used before" to expand its situational awareness across the region.

"They're getting a lot more information in that domain than they've had before, way up north," Hecker said. "That concerns us."

Norway, an Arctic neighbor, has also noted Russia's increased activity. "On average, per year, we intercept Russians once or twice per week, and we see their ships all the time," said Maj. Gen. Øivind Gunnerud, Chief of Royal Norwegian Air Force.

Russia's increased operations approached Alaska's coast

repeatedly in September, with planes entering Alaska's air defense identification zone (ADIZ) four times in five days. Lt. Gen. Case Cunningham, chief of Alaskan Command and U.S. Northern Command, said those recent flybys did not show a weapon profile, but Russian bombers in future missions could carry cruise missiles, posing a strategic risk.

"The Russians have modernized their cruise missile capabilities and have postured them in key regions," said Stutzriem. Russian Kalibr long-range precision missiles and hypersonic Zircon missiles, which can reach Mach 9, pose a particular challenge. "We don't have enough domain awareness to provide sufficient decision time to effectively dissuade or deter such threats," Stutzriem said. "That puts us at a significant disadvantage from a homeland security perspective."

Former NORAD boss retired Gen. Glen D. VanHerck sought better Arctic monitoring and increased funding to defend the High North, efforts that gained urgency after a Chinese spy balloon slipped past NORAD radars undetected in early 2023, drifting all the way across the U.S. before being shot down over the Atlantic.

But Cunningham said what is most concerning now "is Russia's cooperation with the PRC (People's Republic of China)."

In July, NORAD tracked two Chinese Xian H-6s and two Russian Tu-95s, escorted by Russian fighter jets, flying through the Alaskan ADIZ. It was the first appearance of Beijing's bombers in a combined patrol through the area.

U.S. experts said the flights marked the eighth time the two flew together since 2019, and while they don't signify true interoperability, they remain a "significant" concern.

"Russia is providing access to China," Cunningham said. "Those [Chinese] H-6K bombers took off from a Russian air base."

Guillot noted that "China spends a lot more time up there" in the Arctic today than it did in years past. "It shows, on a daily basis, that the Arctic is an area where a number of nations are



NORAD

**Chinese bombers have joined Russian aircraft in penetrating U.S. and Canadian Air Defense Identification Zones in recent months. In July, U.S. Air Force F-16 and F-35 fighters from Eielson Air Force Base, Alaska, intercepted a Chinese H-6K bomber, escorting the visitor out of the ADIZ.**

showing interest, not only for military purposes, but also for scientific purposes."

Since declaring itself a "near-Arctic State" in 2018, China has demonstrated its interest in the Arctic for both economic and strategic reasons. Beijing views melting ice caps as a gateway to new trade routes, and it may seek to leverage Russia's Arctic activities to bolster its own presence and awareness in the region.

Meanwhile, U.S. observers fret that the Air Force is dragging its feet on acquiring OTHR capability in the Arctic region. The service has pushed back its investment from 2024 to at least 2026.

Stutzriem said drones are not a replacement for that system, but a complement: Once the radar arrives, air-breathing sensing will remain "indispensable for real-time, detailed information gathering."



Screen grab from General Atomics video

**General Atomics validated an MQ-9B SkyGuardian in a cold weather test in 2023. Several Nordic partners are considering SkyGuardian for arctic intelligence, surveillance, and reconnaissance missions.**

“There’s always a need for aircraft to complement over-the-horizon radar (OTHR) and space-based sensors,” Stutzriem said. “While space-based sensing will grow over time, airborne sensors remain vital for focusing on specific areas, to provide higher-fidelity data, precise target location, and tactical, targeted operations.”

## DRONE VARIANTS

New variants of proven uncrewed airframes are now available. Among them: the Navy’s MQ-4C Triton, a variant of the high-altitude, long-endurance RQ-4, and MQ-9B SkyGuardian. Building on the features of the original Global Hawk and Reaper, these variants have upgraded “state-of-the-art de-icing systems,” for Arctic and NATO operations, Stutzriem said.

Northrop Grumman demonstrated the Triton’s de-icing capabilities in September, operating the drone for an ISR mission 50,000 feet about the Arctic Circle, the first time it was tested in the region. Earlier in 2023, General Atomics put SkyGuardian’s de-icing systems to the test, with a 12-hour “cold soak” followed by de-icing at minus-5 degrees Fahrenheit. Shortly after, the company secured a deal with Air Force Special Operations Command (AFSOC) to operationalize the drone.

The United Kingdom, Canada, and Belgium are also on board with the MQ-9B, and Norway has expressed interest in the Triton. Sweden is evaluating both aircraft, according to Stutzriem.

Other options are also attracting attention. Hecker said USAFE is “exploring” new solar-powered electric drones. For instance, the Airbus Zephyr has been tested by the U.S. Army

for ISR missions and can fly for months at 70,000 feet, making it a strong candidate for Arctic surveillance. Manufacturers like Boeing and AeroVironment are also investing in high-altitude solar-powered UAVs for defense and commercial use. These drones offer extended airborne capabilities as long as there’s sunlight, but they also come with challenges to consider.

“The effectiveness of these systems depends on the sensor payloads and the kind of data, accuracy, and resolution you require,” Stutzriem explained.

Solar UAVs are new and lack the power and payload capacity of conventionally powered systems. Solar power requires large surfaces, making such UAVs potentially more vulnerable to countermeasures, Stutzriem said. “While these are promising solutions that should be explored, the existing solutions, such as the SkyGuardian and Triton, are already well-tested, well-understood, and easy to control,” he added.

And with NATO now encompassing Sweden and Finland, both bordering Russia—those drones will now be able to extend surveillance even farther.

“C4ISR is easier for those nations when integrating with the infrastructure we have, which is crucial,” said Gunnerud.

Hecker said NATO wants to build a third Combined Air Operations Center (CAOC), in addition to existing ones in Spain and Germany, “fairly shortly.” That new CAOC might well be in a northern location, where it could oversee NATO’s air policing missions.

“The experience we get from the Arctic nations up north is just invaluable,” said Hecker. “We’re going to exploit that close relationship between the Arctic nations.”

# Airman Development Command Taking Shape

## AETC is getting more than a name change.

By David Roza

**E**ight months after the Air Force said it was renaming Air Education and Training Command (AETC) and expanding its mission, the future Airman Development Command (ADC) remains a work in progress.

In an interview with Air & Space Forces Magazine, AETC boss Lt. Gen. Brian S. Robinson outlined three major changes he envisions for the new command:

- Combining all force development under one command;
- Reducing the functional managers scattered across the Air Force; and
- Standing up new centers of excellence to centralize and guide training changes for certain groups of career fields.

The goal is to reach full operational capability by Oct. 1, 2025, and to focus efforts on five factors: accelerate feedback between operational and training units; enhance tech school training to make it more individualized; take a more deliberate and unified approach to adopting new training technologies; improve touch points with industry, academia, and other services; and simplify the steps needed to make changes across job specialties.



Lt. Gen. Brian Robinson, Commander of Air Education and Training Command said it will take a year to fully expand the mission of the new Air Development Command.

Mike Tsukamoto/staff

## ONE COMMANDER

Existing policy and work divisions mean training and education aren't really consolidated in AETC. They will be combined, however, in the revamped ADC.

"Experts can certainly bring their recommendations to the table, but you'll have a single commander that goes, 'this is the way we're going to go, based on the policy, strategy, and budget constraints that you receive from Air Force Headquarters,'" Robinson said.

Air Force Chief of Staff Gen. David W. Allvin made a similar point during his keynote address at AFA's Air, Space & Cyber Conference on Sept. 16.

"When we understand how we're going to project power, or learn from exercises that we need to change our training or need to change the way that we are developing our force, we need to do that at speed and scale," he said. "We have some of it in one command and some of it spread out to the other major commands—it doesn't happen at scale, at speed."

The Air Force has 1,600 functional managers at various commands and another 160 career field managers at the Majcoms and Headquarters Air Staff level. All have some sway over how the career field should prepare for operations.

"It's very disaggregated," Robinson said. "You have lots of chefs in the kitchen, and there's no, like, executive chef going 'Here's how the menu is supposed to look for the restaurant tonight.'"

Being a functional manager is not a full-time job, and Robinson said many spend as little as 15 percent of their time on that role. The Air Force is studying how many full-time functional managers could do the work of 1,600 part-timers.

"We're not thinking it's going to be a tremendously large number of people to do that," the general said. "It certainly won't be 1,600, and I think significantly lower than 1,600."

Some may still be based at major commands, but the bulk will move into ADC's numbered air forces, either 2nd Air Force, which oversees training for enlisted Airmen and nonflying officers, or 19th Air Force, which trains enlisted aircrew and rated officers—pilots, combat systems officers, and air battle managers.

Reducing the number of functional managers should knock down stovepipes. "Making this change to achieve 'mission over function' [creates] a command that is organized in a way to see across those functional boundaries," Robinson said.

## CENTERS OF EXCELLENCE

Several new "Centers of Excellence" (CoEs) will be created to develop curricula and best practices, each focusing on related career fields with similar attributes. For example, under 2nd Air Force, five CoEs will cover certain fields:

1. Logistics: Aircraft maintenance, materiel management.
2. Command and Control: Air traffic control, airfield management.
3. Institutional: Recruiting, special duty.
4. Information: Intelligence, cyber.
5. Combined operations: Special warfare, career enlisted aviator.

The 19th Air Force's Detachment 24 will become the CoE for aircrew training. The CoEs are meant to streamline the feedback between operational units and institutional training units. Institutional units fall under AETC, but training continues in operational units virtually every day an Airman isn't deployed or on a mission.

When an operational unit sees a need to change the way institutional units produce pilots or loadmasters, for example, it has not always been clear who should effect that change.

That's where the CoEs come in. "If [operational units] say



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TO THE NEW WORLD, HIS DEAR HE  
BIG LONG LETTER, I'LL WRITE  
WE'RE ALL OKAY AND IN PERFECT  
FORM, SO PLEASE DON'T WORRY—  
GIVE MY LOVE TO MOM + DAD AND  
EVERYONE. STAYING SOON ABOUT 100, BUT I  
WANT TO GET THIS RIGHT AWAY.  
ANY LOVE

MAY 12  
1944  
CO. 1

VIA

KOREA  
VETERAN

62

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 FORM, SO PLEASE DON'T WORRY—  
 GIVE MY LOVE TO MOM + DAD AND  
 EVERYONE. STAYING DOWN ABOUT 1000, BUT I  
 CAN'T GET THIS RIGHT AWAY.  
 ANY MORE

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TO THE NEW FRONTIER, HIS DEAR SON  
BIG LONG LETTER, I'LL WRITE  
WE'RE ALL OKAY AND IN PERFECT  
FORM, SO PLEASE DON'T WORRY—  
GIVE MY LOVE TO MOM + DAD AND  
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they need more work on these skills or competencies to be ready for what we need in our theater, we can pivot quickly on the training content and curricula redesign,” Robinson explained.

At the conference, Robinson cited Defender Next—a complete revamp of Security Forces training to increase the focus on combat skills—which officials described as the biggest shift in training Security Airmen in decades. Those changes were executed in just nine months, he added. But attempts to revise training in other fields can take from two to five years.

“That’s unacceptable,” he said, noting that AETC’s senior enlisted leader, Chief Master Sgt. Chad Bickley, has said that China “builds an island in the South China Sea in less time than that.”

The CoEs will also help drive a unified approach to preparing Airmen for Agile Combat Employment, a strategy where the Air Force seeks to generate airpower with smaller groups of Airmen so they can maneuver quickly to avoid enemy missile strikes. That means Airmen will have to pick up roles outside their usual job specialty to operate an airfield or refuel an aircraft. Today, that training doesn’t happen until after an Airman graduates initial tech school and gets to their operational unit, but ADC aims to start earlier.

“This integrated approach that we’re going to have [means] we can figure out sooner how to train Airmen on the common core tasks involved in operating an airfield and generating missions,” Robinson said. “We can bring all of that to the left in initial skills training.”

## SUPER CENTER OF EXCELLENCE

The new ADC comes about as technology is changing training in all kinds of ways. At Keesler Air Force Base, Miss., air traffic control simulators are installed in the dormitories so students can practice on their own time, slashing washout rates from the mid-20 percent range to just 6 percent, Robinson said.

Making course materials more widely available on a range of devices is helping trainees in other programs master the material more efficiently. Cyber Airmen now complete the curriculum more quickly than in the past, and maintenance students are performing better, thanks to virtual C-130 training.

There are so many opportunities, it can be hard to select the best opportunities to scale.

“Right now, with innovation, sometimes the way we do it as an Air Force breeds a very scattered, disaggregated approach,” he explained. “And then you have a hard time figuring out which of these 15 things that are trying to get after the same objective do we go with?”

Robinson said ADC will stand up a new Enterprise Learning Engineering Center of Excellence to help develop more effective systems for learning.

Equipped with 24 full-time staff, the center will test new technology and techniques and select the most promising for adoption. The Air Force will try not to invent everything from scratch, but reach out to the other military services, to academia, to industry, and to allied military services for ideas.

“It’s incredible what I’ve seen talking to the Singaporean Air Force, the Italian Air Force, the Finnish Air Force, the German Air Force, people that don’t have the budget that the DOD has and how they have solved problems,” the general said. “They’re incredibly insightful and effective, and they had to do it that way because they don’t have the money that the U.S. government or the Air Force has, and we ought to be thinking that way too.”



Vanessa Adame/USAF

**A Security Forces technical training student strikes a dummy during rifle-fighting training as part of the Defender Next initiative, where the career field is undertaking the largest shift in the schoolhouse in over two decades.**

## OFFICER DEVELOPMENT

ADC will aim to standardize more officer training, eliminating differences among graduates of the U.S. Air Force Academy, ROTC, and Officer Training School (OTS). At the new OTS-Victory program, candidates are fully qualified in the M-18 sidearm, Robinson said, but cadets in ROTC and USAFA only get familiarization training.

OTS now devotes more time to practicing mission command, where leaders have to fulfill objectives without being able to reach back to higher command for guidance. The other commissioning sources may not emphasize that as much—but they should, Robinson said.

“I can tell you from personal experience—command and control, mission command—you don’t become good at that just by reading books,” Robinson said.

The new Air Force Accessions Center will better align pre-commissioning training for officers and a “bi-directional liaison” between the center and the Academy, the one commissioning program that will remain outside ADC.

“In the training aspect for officers, you’ll see a more coherent and unified approach to how we train, how we conduct pre-commissioning officer or leadership training to cadets at ROTC, to officer trainees at OTS,” Robinson said. “You’ll see an element of that as well in the warrant officer school starting up here soon.”

On the highest end of the education spectrum, ADC will take on oversight of the Air Force’s Ph.D. Management Office, which assigns Ph.D. graduates to their next jobs, often at the Academy or the Air Force Research Laboratory.

“Those aren’t wrong decisions, but we don’t need to send them all there,” he said. “There’s something about having a Ph.D. in the operating squadron—you pick the specialty—who’s kind of going, ‘Well, why are we doing things this way?’”

At a time when the Air Force wants to change as fast as possible, Robinson sees training as “the one thing we can affect right now.”

“We’re not going out and acquiring a [Collaborative Combat Aircraft] that’s going to take a five-year development plan, right?” he said. “We need to be able to pivot quickly. And we can do that today.”

# Addressing the Changing EW Environment



Courtesy of BAE Systems

By Adam Stone

In conflicts with peer and near-peer adversaries, U.S. air crews will be contested in the air and on the airwaves. They'll face not just kinetic attacks, but also radars, advanced air defense systems, and other electromagnetic effects seeking to disrupt their missions.

"The threat is advancing faster than we've ever seen before," said Scott Bailie, who directs Advanced Electronic Warfare Solutions at BAE Systems. Adversaries have access to high-performance hardware, and they're developing reconfigurable software-based systems, allowing them to field a range of new capabilities. "We need to learn to be faster and be more agile—with less information," Bailie added.

That requires new programmatic approaches, Bailie said—and more collaboration.

"How we contract, how we award, how we compete," he said. "We need to be able to pivot, to adjust and adapt to the changing threat."

At BAE Systems, Bailie said, agility is a mindset that starts with engineering for flexibility. "We're looking to develop systems that are more open, more modular, more software-defined, as well as systems that can be upgraded in the field."

For EW solutions, the goal is to disconnect the capability from the platform. Loosening those bonds "lets us roll out changes more quickly and adapt to the threat, without hav-

ing to go through yearlong developmental test or operational test cycles," Bailie said.

Fewer steps mean fewer delays. And using an open architecture opens the way for faster insertion of emerging technologies and capabilities.

"Open architecture is a perfect example of how we're developing faster and deploying faster," Bailie said. "It also lets us take capabilities and move them across platforms faster. When we have standard interfaces, we're not starting from scratch, developing a capability from day one on each individual platform. We can deploy it across the fleet very quickly."

This open standards-based development strategy is accelerating the use of software-defined radios, for example. "It's a transceiver that has well-defined hardware, firmware, and software interfaces," Bailie said. It has a configurable analog RF front end, a processing element, and a transmitter. The capabilities of those components are brought to bear by modular software, where BAE Systems wants its software engineers to focus.

"They're spending their time developing algorithms, developing capabilities that we can deploy to the warfighter—not wasting it reinventing the wheel, understanding where to find data, how to transfer across interfaces," he said. Similarly, openness enables engineers to identify the third-party applications and other best-of-breed solutions, whether from traditional or non-traditional suppliers.

Commercial off-the-shelf hardware is also an opportunity to decrease timelines and save money. The electromagnetic spectrum is highly congested, and EW systems need to process a tremendous number of waveforms—both military and commercial—at any given instant. "That's a big reason why we might look for a higher-performance processing," Bailie said. "There's a time and a place for COTS. There are opportunities where we need to look hard at custom solutions that bring the performance we need."

Another way to speed the timeline is to design using models, which support more rapid iterative development. "Model-based system engineering is about defining requirements and capturing our design artifacts in a set of digital integrated tools," Bailie said, "rather than working with independent static documents. When a change happens on an interface, for example, that change can propagate its way through the design."

Automating that process means everyone knows about the change right away. But even if it's not fully automatically updated, the modelling and design tools will "flag inconsistencies or issues with the update you've made."

That heads off design errors that might have cost months or years of lost time in the past, solving those problems in minutes or days instead. The payoff is not just a more agile development process, Bailie said: It's getting greater capability in the hands of warfighters, sooner.

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# Launch: The Fundamental Prerequisite for Space Superiority

Why the Space Force Needs More Options.



United Launch Alliance

A United Launch Alliance Atlas V lifts off from Space Launch Complex-41 at Cape Canaveral Space Force Station, Fla. Patrick Space Force Base, Fla., is the busiest U.S. range, with 72 orbital launches in 2023 and a projected 111 missions in 2024.

By Col. Charles Galbreath, USSF (Ret.)

**W**ith U.S. military operations dependent on capabilities and effects delivered from space, ensuring continued access to the orbital domain requires a robust and reliable launch infrastructure as foundational to sustaining space superiority.

Despite a historic launch rate and multiple potential launch providers, America's National Security Space Launch (NSSL) capabilities are less robust than they should be. USSF can help reach its launch goals by diversifying launch providers, increasing launch sites, and investing in research and development for rocket technology, all while actively monitoring the launch supply chain. These efforts should be a national priority.

"For our service, space superiority is the first core function," Chief of Space Operations Gen B. Chance Saltzman said earlier this year at the Mitchell Institute Spacepower Security Forum. "It is the ability to contest and, when necessary,



**Col. Charles Galbreath, USSF (Ret.), is a Senior Fellow for Space Studies at the Mitchell Institute Spacepower Advantage Center of Excellence.** Download the entire report at <http://MitchellAerospacePower.org>

control the space domain at the time and place of our choosing."

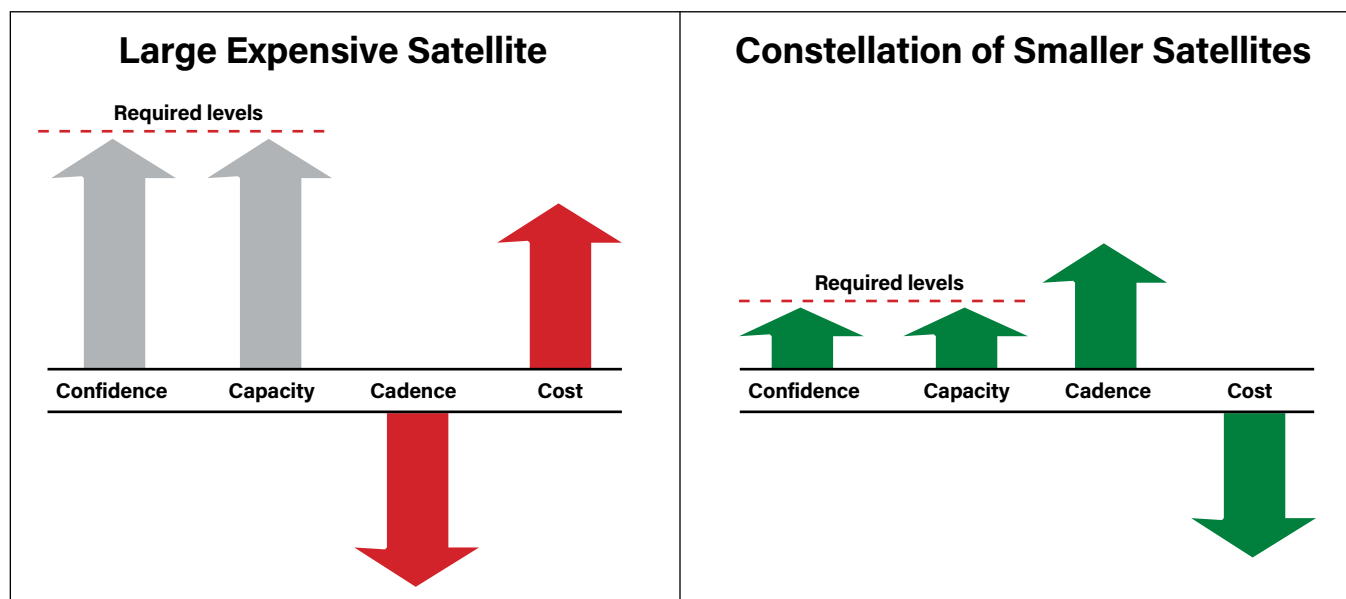
At the most fundamental level, this requires the Space Force to have assured access to space. The Space Force must retain a diverse stable of launch providers, while expanding options for launch locations to ensure that, in the event of natural or man-made disasters, access to space is never compromised, and it must continue to invest in new technologies and a healthy space technology supply chain.

To have a war-winning space architecture, the United States must have a war-winning launch infrastructure. Unfortunately despite multiple potential launch providers, the United States currently has just one certified provider—SpaceX—for medium and heavy national security space launch missions. This invites unnecessary risk.

The United States' has the on-orbit architecture it does because of available launch capabilities, especially when it comes to four key factors: confidence, capacity, cadence, and cost. There is tremendous interplay between these variables.

# Large vs. Small: How the Scale of a Satellite Alters the Launch Equation

Large, exquisite satellites require minimal risk in launch because of the enormous investments at stake. To minimize risk, costs rise and the number of launches declines. The paradigm shifts with constellations of small, low-cost satellites. Because the risk of loss is lessened, costs decline as the cadence increases.



Mitchell Institute

## The 4 C's of Space Launch

**Confidence**, or level of assurance, is the degree to which the risk of failure is minimized. Satellite owners who spend millions or billions of dollars and years of effort to build a satellite want to have a high degree of confidence it will reach the proper orbit.

**Capacity** is the size and mass limitations of the launch vehicle. With a combination of rocket performance and payload fairing dimensions, capacity creates upper limits on spacecraft size and capability. Until on-orbit manufacturing and assembly become routine, the majority of spacecraft must continue to follow the constraints dictated by the launch vehicle.

**Cadence**, or launch rate, is the time interval between launch opportunities. Planners of satellite constellations will factor launch cadence into the design life of vehicles and constellation size. More frequent launch opportunities can enable lower design life and a larger constellation size.

**Cost** is the capital required for the booster, fuel, range, and operations necessary to achieve orbit. Naturally, the goal is to increase confidence, capacity, and cadence while decreasing cost, all to an acceptable level.

To better understand how these factors interact, consider an example that starts with a notional large, billion-dollar satellite that took 10-plus years to design and manufacture. Such an investment heightens the importance of confidence and capacity when it comes to launch; in the face of such risk, increases in cost are acceptable to achieve greater size and mission assurance. Greater risk could increase the time needed to prepare the launch vehicle and to reduce the risk of failure, which, in turn, could decrease the cadence of follow-on launches. While acceptable for a one-of-a-kind satellite, such an approach could preclude the timely launch of a large constellation.

Consider next a large constellation of smaller, less costly satellites. The calculus shifts. Here, the focus is on decreasing cost and increasing cadence because the risk of any individual launch is only a fraction of the total needed. With smaller

satellites, the available launch options increase, as do the potential locations. This is because a large constellation of small satellites is only feasible if launch capabilities can sustain a cadence high enough and costs low enough to make the concept viable.

Now consider the relationship between confidence and cadence. It is a given that launches occasionally experience technical failure—some have even joked that “launch vehicles are the greatest natural predators to satellites.” Even successful launch providers suffer technical issues. Case in point: After over 300 successful launches, a SpaceX Falcon 9 rocket failed in July 2024, sending 20 Starlink satellites into an unusable, shallow orbit. The failure halted Falcon 9 operations for a month as crews researched the root cause and took corrective action. Similar delays have had even farther-reaching impact: The Space Shuttle program stood down for two years and eight months after the Challenger disaster and two years and five months after its second accident, when Columbia was destroyed on reentry. While these extended delays were driven by safety concerns related to human spaceflight, they clearly illustrate the fundamental relationship between confidence and cadence.

Notably, concerns about safety are not equal for all nations. While the United States values flight safety over cadence, its nearest launch competitor, China, does not. With four land-based and one sea-based launch site and a dozen variants of the Long March rocket, China boasts an impressive launch capability, but its satellites generate greater orbital debris, and many of its launch flight profiles travel over populated areas. China conducted 67 launches in 2023 and plans for 100 in 2024, according to published reports. In one recent launch that Chinese officials deemed a “complete success,” debris rained down on a village. In the first launch of a proliferated low-Earth orbit (pLEO) constellation in August 2024, a Chinese booster crumbled, casting more than 700 pieces of debris into space. In both cases, China continued to press forward rather than pause to correct an issue that, while messy, still managed to deliver the payload into orbit.

China is more intent on becoming a space leader than in being mindful of space debris.

This mindset suggests a potential fifth factor: The criticality placed by China on becoming a leader in space overrides other factors. The United States had a similar mindset in the early days of the Space Race in the 1950s and '60s. Establishing on-orbit capability in the race against the Soviet Union was a powerful motivator, driving the U.S. to persist in the face of multiple failures and great costs. The USSF today could similarly adopt a more aggressive approach and accept some inevitable failures as progress toward success. The safety concerns applied to missions carrying astronauts are not the same as those for satellites only, and clearly, some can tolerate greater risk than others. Considering the stakes in today's space race, the United States should be willing to accept responsible risk for launch, given that the consequence of ceding space superiority to China would be catastrophic.

## HISTORICAL CONTEXT

At the beginning of the Space Age, the United States adapted rockets developed as intercontinental ballistic missiles (ICBMs) to the duties of space launch. Systems like Atlas, Thor, and Titan were designed as ICBMs and converted into launch vehicles. (This was not the case for the Saturn IIB and Saturn V rockets used in the Apollo program). NASA developed the space shuttle in the 1970s, but not until the 1990s did Air Force Space Command develop a new class of evolved expendable launch vehicles (EELVs), which culminated in the Atlas V in 2002 and Delta IV in 2004. Lockheed Martin developed the Atlas V and Boeing the Delta IV before the two created the joint venture United Launch Alliance (ULA), which took over launch operations for both vehicles in 2006 to reduce overhead. Those systems provided the military's primary access to space until the mid-2010s, though other options, such as the Minotaur launch vehicle, which uses a Minuteman Missile as a first stage, were also available. Importantly, all of these launch designs were one-time-use systems—a key factor driving high launch costs.

The desire to lower cost and boost cadence leads many to pursue reusability. Concepts include reusable first stages, upper stages, and fully reusable systems. Results yielded varying degrees of success. From 1981 to 2011, the space shuttle was powered by reusable solid rocket boosters and orbiters. The air-launched Pegasus rocket effectively uses an aircraft as a reusable first stage. The Space Force's X-37B Orbital Test Vehicle is basically a reusable upper stage.

The current standard for reusability is SpaceX's Falcon 9 and Falcon Heavy, with reusable first-stage boosters. These vehicles have achieved significant decreases in cost and increased cadence. SpaceX is now pursuing a fully reusable superheavy launch vehicle, Starship, flown from Texas.

Regardless of the launch vehicle technology, the launch range is also a significant factor. U.S. geography enables over-ocean launches from both the East and West Coasts. The Eastern Range, located at Patrick Space Force Base, Fla., is the busiest U.S. range, with 72 orbital launches in 2023 and a projected 111 missions in 2024. The Western Range at Vandenberg Space Force Base, Calif., conducted 30 launches in 2023, with 34 planned in 2024. Launches from the Eastern Range use the Earth's rotation to gain a velocity boost; launching from the Western Range enables better access to polar orbits.

Weather is a limiting factor at both locations, with frequent tropical storms on the East Coast and low-visibility fog on the West Coast, both hampering cadence. From 1990 to 2008, weather caused an average of 21 launch delays annually at Kennedy Space Center on the Eastern Range.

## STATE OF MODERN LAUNCH

The current Space Force launch capability falls under two main programs: National Security Space Launch (NSSL) and Orbital Services Program contract (OSP-4). NSSL, formerly the EELV program, is now in its third phase and has contracted SpaceX, United Launch Alliance (ULA), and Blue Origin. SpaceX operates the Falcon 9 and Falcon Heavy, while ULA and Blue Origin are bringing on new rockets. ULA's Vulcan, an expendable rocket, had its first launch in January 2024, carrying a commercial lunar lander as a payload. Blue Ori-

**Firefly Aerospace's Alpha FLTA003 lifted off from Space Launch Complex 2 West at Vandenberg Space Force Base, Calif., in 2023. Vandenberg is the second busiest U.S. launch site, with 30 launches in 2023 and an estimated 34 in 2024.**



Firefly Aerospace

# Proliferating Launch Providers

The U.S. has never before had so many options for space launch. Four providers are operational today and eight others are currently in test.

Company	Rocket	Category	Status	Confidence	Capacity	Cadence	Cost	Website
SpaceX	Falcon 9 and Falcon Heavy	NSSL	Operational	***	***	***	*	<a href="https://www.spacex.com/">https://www.spacex.com/</a>
ULA	Vulcan	NSSL	Testing*					<a href="https://www.ulalaunch.com/">https://www.ulalaunch.com/</a>
Blue Origin	New Glenn	NSSL	Testing					<a href="https://www.blueorigin.com/">https://www.blueorigin.com/</a>
Rocket Lab	Electron	OSP-4	Operational	**	*	**	***	<a href="https://www.rocketlabusa.com/">https://www.rocketlabusa.com/</a>
Northrop Grumman	Minotaur	OSP-4	Operational	**	*	*	**	<a href="https://www.northropgrumman.com/space/minotaur-rocket">https://www.northropgrumman.com/space/minotaur-rocket</a>
Firefly	Alpha	OSP-4	Operational	*	*	*	***	<a href="https://fireflyspace.com/">https://fireflyspace.com/</a>
Relativity Space	Terran	OSP-4	Testing					<a href="https://www.relativityspace.com/">https://www.relativityspace.com/</a>
X-Bow	Bolt	OSP-4	Testing					<a href="https://www.xbowsystems.com/">https://www.xbowsystems.com/</a>
Stoke	Nova	OSP-4	Testing					<a href="https://www.stokespace.com/">https://www.stokespace.com/</a>
ABL Space Systems	RS1	OSP-4	Testing					<a href="https://ablspace.com/">https://ablspace.com/</a>
Aevum	RAVN X	OSP-4	Testing					<a href="https://www.aevumspace.com/space">https://www.aevumspace.com/space</a>
Astra	Rocket 4	OSP-4	Testing					<a href="https://astra.com/launch-services/">https://astra.com/launch-services/</a>

Confidence	High	***	<1/1000 chance of failure	Cadence	High	***	Frequent launches per week or per day
	Medium	**	<1/100 chance of failure		Medium	**	Launch on schedule, typically with weeks between launches
	Low	*	<1/10 chance of failure		Low	*	Infrequent launches, typically months between launches
Capacity	High	***	Supports largest/heaviest national security missions	Cost	High	*	>\$50M per launch
	Medium	**	Supports medium or multiple small payloads		Medium	**	<\$49M, and >\$10M per launch
	Low	*	Supports small satellites only		Low	***	<\$9M per launch

## Notes:

NSSL: National Security Space Launch for medium and heavy lift missions

OSP-4: Orbital Services Program Launch Contract for small lift missions

Status indicates whether the launch vehicle is still in development and testing or if it has delivered operational payloads to orbit.

Operational assessments represent a snapshot in time as of September 2024. Insufficient data exists to assess rockets still in testing.

\*On Oct. 4 2024, Vulcan completed its second required certification launch. Certification is pending with two operational launches planned by the end of 2024.

gin's New Glenn, a reusable design, is scheduled for its first launch in late 2024. ULA's Vulcan uses two BE-4 engines, and Blue Origin's New Glenn uses seven BE-4s.

To foster innovation and reduce cost, the NSSL established two tailored levels of mission assurance: a lower-cost level for missions that can accept higher risk and a higher-cost option for risk-averse missions.

OSP-4 has more options, supporting small launch vehicles at alternative launch sites. Intended for rapid launches of payloads as small as 400 pounds, it has a dozen companies under contract: Blue Origin, Stoke, ABL Space Systems, Aevum, Astra, Firefly, Northrop Grumman, Relativity Space, Rocket Lab, SpaceX, ULA, and X-Bow. Some are already demonstrating successful launches, while others have yet to achieve their first launch. The smaller class of booster enables launch operations from diverse locations, including Wallops Island, Va., and Kodiak, Alaska.

With so many providers today, the state of U.S. launch appears solid. But the reality is far more complex. Launch is literally "rocket science." Early failures in development are common, and catastrophic failures are always possible, potentially causing downstream ripple delays across multiple launch systems. Constant attention and investment are required to ensure the necessary levels of confidence, capacity, and cadence for U.S. space launch to deliver the on-orbit architecture the Space Force needs to deter conflict in the future—or win if deterrence fails.

Of the 12 launch providers on the OSP-4 and NSSL contracts, only four are currently placing operational payloads in orbit and only one is certified for National Security Space Launch missions.

Evaluating these four against the metrics of confidence, capacity, cadence, and costs makes clear that the robust launch infrastructure necessary to support a war-winning on-orbit architecture is not yet in place. To have a resilient team of providers capable of meeting the dynamic launch requirements, rather than a single provider fully addressing all the factors itself, is crucial to the long-term competitiveness of the U.S. military space program.

## RECOMMENDATIONS

### Continue to Increase Launch Provider Diversification:

Despite having three providers in NSSL and 12 in OSP-4, more launch providers are needed. Because the Vulcan and New Glenn are new boosters, challenges will likely emerge through continued testing and operations. Reliance on the same rocket engine for both raises concerns that problems with one could ground both; the fact that only six of 12 OSP-4 providers have conducted successful launches is also a concern.

By continuing to pursue multiple launch providers, the Space Force can increase confidence and cadence to meet the resulting demand. Alternate providers should also expand supply chains and diversify manufacturing processes, reducing the risk that one failure grounds all or most space launches.

Naturally, depending on the size and weight of a satellite, multiple launch providers may be able to offer the required capacity and cadence. If this is the case, satellite owners seeking to place multiple vehicles in orbit could leverage a diverse set of providers, increasing launch cadence over what is possible with a single provider.

Diversifying providers will also drive competitive pricing, pushing down costs. Competition encourages partnership and innovation, paying off for the customer. Novel approaches to launch processing and vehicle development can also lead to decreased costs.

**Diversify Launch Sites:** With two primary launch locations for most NSSL missions and two for smaller launches, members of the House Armed Services Committee are calling for greater launch site flexibility. They worry that an earthquake in California or a hurricane in Florida could severely impact the nation's access to space. Similarly, having just two major launch sites poses a risk in case of conflict with a near-peer, as an adversary might target the few launch complexes on which the nation depends. Risk mitigation measures, including emergency response and security, can help, but a greater number of launch sites is essential. Just as a proliferated on-orbit architecture increases resilience, so too would a more diverse set of launch sites ensure a resilient launch capability.

Perhaps most importantly, adding alternate launch sites would enable the U.S. to increase its launch cadence. Dispersed parallel processing and launch would reduce bottlenecks at single-digit launch pads. As confidence in the reliability of launch vehicles grows, additional flight paths over land could also augment operations at existing sites.

**Invest in Rocket Research and Development:** Achieving the next plateau of launch capability requires continual R&D, and breakthroughs in technologies and operational concepts require stable, continuous funding.

Two prime areas stand out for further development:

- Computer design and material manufacturing have started to transform the launch and space industry but are still in their initial stages. Additional advancement will promote design and assembly process innovation that can simultaneously increase confidence and decrease cost. Additional investments focusing on manufacturing to improve cadence and cost are needed; digital design can provide greater insight and modeling, speeding up certifications.

- Launch reusability remains key. The Falcon 9 has reached

a new level of launch cadence, but more progress is needed. While reusability for larger rockets, such as Starship and New Glenn, is a goal, reusability in smaller launch systems is also compelling. Small launch is already a much cheaper option for small satellites and typically has a faster cycle time than traditional expendable boosters. Integrating reusability into small vehicles could improve launch cadence and decrease costs. Smaller launch vehicles have smaller margins, however, and less capacity for fuel to use in recovery. Alternative methods to recover a small booster may be necessary.

**Monitor and Diversify the Supply Chain:** Even with launch provider diversification, there are common components and materials. Ensuring quality is an integral part of launch mission assurance. Government and independent third-party pedigree reviews and acceptance testing are common practices. Supply chain issues, such as quality breaches or low availability, become harder to track and manage when those reviews are waived. Timely delivery at a tempo to meet the required launch cadence is crucial. By maintaining a higher level of insight, the government can interject and provide corrective actions to avoid potential supply chain issues from derailing the nation's assured access to space.

## CONCLUSION

Space launch and the assured access to space that it represents are foundational to shaping and delivering the United States' space architecture. For the Space Force, having the right confidence, capacity, cadence, and cost in its launch enterprise is a prerequisite for space superiority and maintaining a distinct space advantage over competitor nations.

Space launch remains a technically challenging and often risky venture. The Space Force must retain a diverse set of launch providers, expand options for launch locations, continue to invest in rocket R&D, and maintain awareness of potentially crippling supply chain issues. Providing the Space Force with the resources and personnel to accomplish these recommendations should be a national priority. Failure to do so risks not just space launch but the entire set of space capabilities and services upon which the nation relies. 🇺🇸



SpaceX's Falcon Heavy rocket uses twin, reusable side boosters, shown here landing after the system's first National Security Space Launch at the Kennedy Space Center's Space Launch Complex in, 2022. The rocket's two side boosters were used again in January 2023. The Eastern Launch Range is the only place the Falcon Heavy can operate today.

SpaceX



# FACES OF THE FORCE



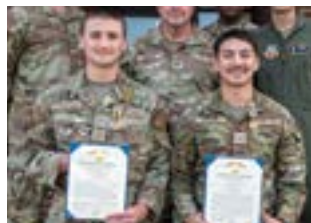
Senior Airman Natalie Doan

**Staff Sgt. Boston Postgate** and **Senior Airman Daniel Lowe** were kayaking at Eklutna Lake, Alaska, when they saw a man fall into the frigid waters. The Airmen quickly paddled toward him as he clung to his friend's kayak. While bringing the man back to shore, they learned he had accidentally tipped his friend into the water. The two rowed back to rescue the second man, while other kayakers helped the first. The man cried, "I can't feel my legs," as Postgate and Lowe battled the cold and their own fatigue during the strenuous 20-minute paddle. They finally reached shore and helped the hypothermic man to safety. "I knew that his life really depended on us," said Lowe. The two later were awarded Air & Space Force Commendation Medals for their heroic efforts.



Courtesy photo

**Maj. Alana Taylor** was flying home with her husband when she heard a flight attendant's call for medical assistance. A passenger named Ben Wagner, a firefighter, was experiencing severe dehydration, cramps, loss of speech, and excessive sweating midflight due to his previous firefighting assignment. Taylor, a nurse practitioner with the Missouri Air National Guard, rushed to help Wagner. She administered IV fluids and checked his blood sugar and oxygen levels. Wagner's condition improved steadily as Taylor and her husband remained by his side for the remainder of the flight. Once the flight landed, paramedics evaluated him and cleared him for travel. The Taylors and Wagner shared breakfast before parting ways. "I'm thankful we were there to help him get home to his family," said Taylor.



Senior Airman Leonid Soubbotine

At Panama City Beach, Fla., the crowd noticed a man had been thrown from his jet ski and disappeared beneath the waves. **Airmen 1st Class Trace Drugolenski** and **AIC Orlando Martinez** sprinted into the 65-degree water and swam 100 yards through choppy waves to the rescue. Drugolenski managed to restart the jet ski while Martinez searched for the victim. When they found the man, he was floating face down and unresponsive. The two Airmen struggled to get him onto the jet ski, but with another swimmer's assistance, they were able to get the man back to shore. After being in a coma for two months, the man eventually made a full recovery. Reflecting on the event, Drugolenski said his military training spurred him into action.



USAF courtesy photo

**Airman 1st Class Troy May** was hiking the High Rock Lookout Trail near Ashford, Wash., when he heard a cry for help. It was from 79-year-old Ursula Bannister, who was suffering from a broken ankle while descending the trail. While other hikers were making calls for help, May decided to carry her himself. "My first thought was if I could carry her down, I should carry her down—and get her there as quickly as I can," said May. With the help of his friend, he managed to bring her down the steep trail, despite the challenges of navigating the descent in cowboy boots. They then transported her to her car and drove her to a hospital, meeting search and rescue along the way. Bannister later personally thanked May and his friend for their help, calling them her "angels."



Senior Airman Kari Degraffenried

**Wendell Browne** of the 97th Air Mobility Wing, has dedicated 34 years to suicide prevention, including 19 years at Altus Air Force Base, Okla. He employs the "ACE" model (ask, care, escort) to teach individuals how to respond to signs of suicidal thoughts. As a full-time instructor, he teaches Airmen of all ranks to develop resilience and recognize mental health warning signs. Throughout his career, he has mentored many, including Senior Airman Luke Terry, who battled suicidal thoughts of his own. After attending one of Browne's classes, Terry found hope and later became a suicide prevention instructor. "I tried to do it on my own, and it got me nowhere," said Terry. "The biggest thing I have learned is that people need other people."

**Tell us who you think we should highlight here. Write to [afmag@afa.org](mailto:afmag@afa.org)**



Jaima Fogg/USAF

**Airman 1st Class Shawn Charles** of the 66th Medical Squadron received an urgent call from a patient seeking an OB-GYN referral while he was on his way to lunch. The pregnant patient was struggling to access care and had called the wrong number. Despite it being outside of Charles' usual duties, he decided to help her. He connected her with a case manager to ensure she received the much-needed medical assistance. His swift actions were able to prevent serious harm to her and the unborn child, as the patient was later diagnosed with cancer. "I'm glad she was able to get the care she needed," said Charles. He was later named a Trusted Care Hero for exemplifying the Air Force Medical Service's high reliability principles.



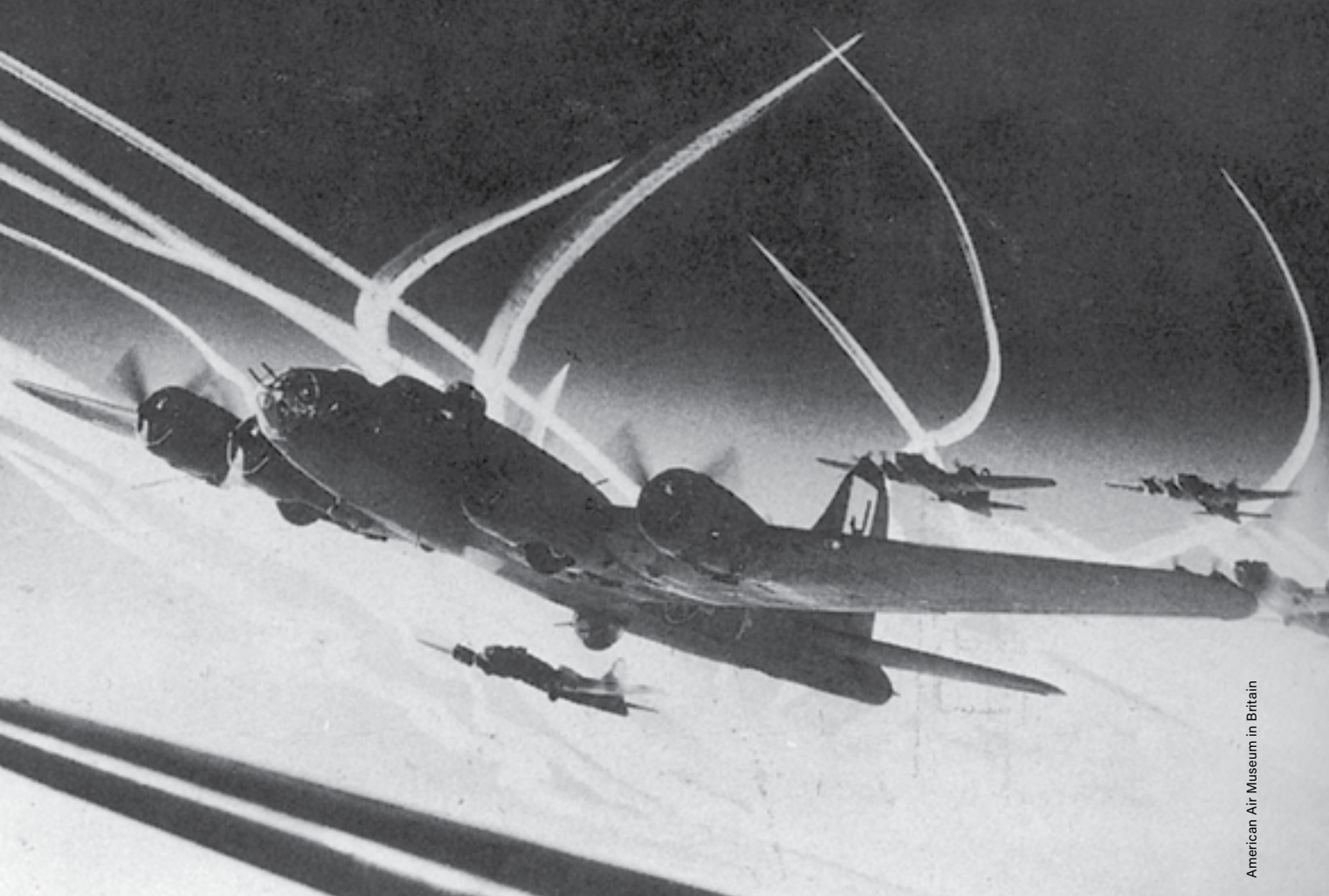
Tech. Sgt. Tyler Bolken

**Lt. Col. Timothy Mitchell** and **Capt. Dylan Vail** were on a two-ship formation training flight during a routine night mission in A-10s, with Vail receiving instructor pilot training from Mitchell. Suddenly, Vail began experiencing hypoxia—a condition that deprives the brain of oxygen—and struggled to maintain control of his aircraft. When Mitchell noticed this, he remained calm and provided instructions over the radio. "I could barely think straight," said Vail. "Mitchell was there every step of the way, simplifying everything, telling me exactly what I needed to do." With Mitchell's guidance, Vail landed safely. He emphasized that Mitchell's actions embodied a philosophy rooted in the A-10 community—one in which the mission and the safety of those involved are paramount.



Staff Sgt. Nicholas Ross

**Staff Sgts. Natanael Garcia** (left) and **Davin Marcotte** (not pictured) were walking to a bus stop in Seoul when they were alerted to a nearby apartment building fire. Garcia saw that an AC unit had caught fire and quickly found two fire extinguishers. With Marcotte, he tried to control the flames with the extinguishers and helped evacuate the building's tenants. Both men were exposed to heavy smoke and required medical attention afterward. "It was by chance that we were at the right place at the right time to help put out the fire," said Garcia. "I'm thankful that everyone got out safely." Garcia received a letter of appreciation from the Seoul Fire Department for his actions. He accepted the honors on behalf of both himself and Marcotte, who had separated from the Air Force before the recognition ceremony.



American Air Museum in Britain

The Airmen of the Eighth Air Force flew their B-17 Flying Fortresses into the teeth of German defenses, paying an inordinate price for America's victory in World War II.

# America's Air War in Europe

A reader's guide to better understanding the lessons of World War II.

By Phillip S. Meilinger

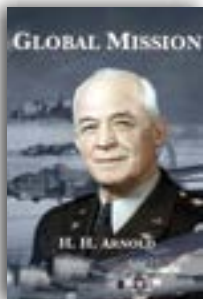
**P**rior to 1939, Airmen dreamed the airplane could eliminate the horrors of war. Instead of impaling a generation of young men on barbed wire in Flanders, airpower would humanize war, making it less likely to occur in the first place, and when it did, ensuring it would be over quickly. It was a false hope, in the end. The hecatomb of World War I was not avoided; the trenches were merely moved to 20,000 feet.

The history of the Army Air Forces (AAF) in World War II has been the subject of continuous review over the past seven decades, and has enjoyed a popular revival in 2024 with the airing of "Masters of the Air," a dramatic miniseries based on the book of the same title. The similarities to the international stressors that led to World War II and those of today have also given rise to increased interest in the period.

The starting point for studying airpower in World War II is the monumental official history, published

following the war. The AAF hired two highly respected academics, Wesley F. Craven and James L. Cate, to edit the outstanding seven-volume work, *The Army Air Forces in World War II* (University of Chicago Press, 1948-58). These cover all aspects of the air war. Gen. Henry H. "Hap" Arnold, the AAF's commanding general during the war and the only Airman to ever wear five stars, contributed his own valuable memoir, *Global Mission* (Harper & Brothers, 1949). His biographers added their share: Thomas M. Coffey, *Hap: General Henry H. "Hap" Arnold* (Viking Press, 1982) and Dik A. Daso, *Hap Arnold and the Evolution of American Airpower* (Smithsonian Books, 2000).

Following World War I, the U.S. retreated into an isolationist shell: America sought a return to normalcy, imposing hard times on the armed forces even before the Great Depression. The Army suffered budget cuts through the 1920s and '30s, and its nascent Air Service (renamed the Air Corps after 1926) suffered worse. Between the wars, the air branch received, on average, less than 12 percent of the Army's budget, and as late



as 1939 only one Airman had reached general officer rank on the permanent list. These slights so infuriated Col. Billy Mitchell that his ensuing outspoken condemnations of his superiors led to his court-martial. The air arm was severely deficient in combat aircraft, especially bombers, so that when war broke out in Europe in September 1939, the Air Corps possessed fewer than 30 B-17s. Mobilization was rapid; some 21,000 aircraft were purchased over the next two years, yet only 373—just 1.8 percent—were heavy bombers. For the interwar years, Maurer Maurer's *Aviation in the U.S. Army, 1919-1939* (Office of Air Force History, 1987) and DeWitt S. Copp's *A Few Great Captains* (Doubleday, 1980) tell the story. For procurement details see I.B. Holley, *Buying Aircraft: Materiel Procurement for the Army Air Forces* (GPO, 1964), and Jeffrey S. Underwood, *The Wings of Democracy: The Influence of Air Power on the Roosevelt Administration, 1933-1941* (Texas A&M University Press, 1991).

To redress deficiencies in the air arm, Billy Mitchell founded the Air Corps Tactical School (ACTS) at Maxwell Field, Ala.

Just about anyone who would be anyone in the air arm during World War II attended ACTS earlier in their careers; many taught there, including Hoyt Vandenberg, George Kenney, Muir "Santy" Fairchild, Pat Partridge, Larry Kuter (all of whom later became four-stars). Lieutenants and captains in their teaching days, they imbibed the heady ideas of their intellectual mentor, Billy Mitchell, and devised the theory of precision strategic bombing as a means to defeat an enemy's industrial capacity to win, to destroy its vital centers, rather than fight bloody land battles that consumed a country's youth by the millions. They would fly over these deadlocked armies and quickly achieve decisive results.

Air Corps doctrine relied on speculation, not experience, and war would expose its flaws. The best description of what went on at Maxwell is Stephen L. McFarland's *America's Pursuit of Precision Bombing, 1910-1945* (Smithsonian Books, 1995), but Maj. Gen. Haywood S. Hansell Jr.'s *The Air Plan that Defeated Hitler* (Higgins-McArthur, 1972), as well as *Lectures of the Air Corps Tactical School and American Strategic Bombing in World War II*, edited by Phil Haun (University Press of Kentucky, 2019), are also useful.

Before the war, U.S. political and military leaders had met with their British counterparts and agreed that if war came against Germany and Japan, the wisest

## OVERVIEW



## INTERWAR YEARS



course would be a "Europe First" strategy. Germany was the most powerful and dangerous foe, so it must be the focus of Allied efforts. But the "Day of Infamy"—the Dec. 7, 1941, attack on Pearl Harbor—threw that decision into question: Americans wanted revenge. As a result, they decided it would simultaneously fight Germany and Japan.

In the European theater, this meant an invasion of Axis-held North Africa in November 1942. Airpower would be crucial to any such amphibious landing, but there were precious few airplanes and crews to spare. The 8th Air Force, which was building in England to bomb targets in Germany, was denuded to supply the new 12th Air Force that would support Operation Torch in North Africa. The code name for the 12th, appropriately and cynically, was "Junior." Maj. Gen. Ira Eaker, commander of the 8th, protested this diversion of his resources, but was overruled.

American airpower worked closely with the Royal Air Force (RAF) to win air superiority and make Torch a success. But prewar tactical air doctrine proved deficient, and combat operations forged a new understanding between air and ground officers.

From there, the Allies moved across the Mediterranean to attack Sicily, a prelude to invading Italy proper. Italy was seen by some as a minor theater—the real enemy was Germany, which was most easily confronted in France. But the Allies were not yet ready for a French invasion and Italy was believed so weak that a determined shove could knock it out of the war. Indeed, after the bombing of Rome's rail yards in July 1943, Benito Mussolini, prime minister of Italy, was overthrown, prompting Germany to flood troops into Italy and take over. In the southern part of the peninsula, a new air force, the 15th, stood up to fly ground support and bomb Germany. For the story, see Robert S. Ehlers Jr., *The Mediterranean Air War: Airpower and Allied Victory in World War II* (University Press of Kansas, 2015), DeWitt S. Copp, *Forged in Fire* (Doubleday, 1982), and Christopher M. Rein, *The North African Campaign: U.S. Army Air Forces from El Alamein to Salerno* (University Press of Kansas, 2012).

The Mediterranean theater became famous for another reason. The Army Air Corps was still segregated and had no Black pilots, the prevailing view being Blacks were not capable of flying combat aircraft. But social and military pressure forced the Army to reconsider, and in July 1941, the Air Corps established



U.S. Army Air Forces 1st Lt. Charles Hall, seated in the cockpit of a Curtiss P-40L Warhawk with the 99th Fighter Squadron, was the first of the famous "Tuskegee Airmen" to shoot down an enemy airplane during World War II, on July 2, 1943. At the time the 99th was based at El Haouaria Airfield, Tunisia.

USAF

a flying school at Tuskegee, Ala., and began training Black pilots. The “Tuskegee Airmen” made up the 332nd Fighter Group and were commanded by Lt. Col. Benjamin Davis Jr.—a Black West Point graduate. The unit amassed an excellent combat record, paving the way for the full integration of the armed forces following the war. For their story, see J. Todd Moye, *Freedom Flyers: The Tuskegee Airmen of World War II* (Oxford University Press, 2015), or read Davis’ own moving memoir, *Benjamin Davis, American* (Smithsonian Books, 1990).

The heavy bombers of the 8th AF based in England were mostly B-17s. Because fighters of that era could not match bombers’ range, the bombers had to go it alone much of the time, flying in large formations of hundreds of bombers—each aircraft armed with 10 machine guns to combat enemy fighters. Antiaircraft artillery threw up flak that proved the bombers’ most dangerous threat, causing over 70 percent of bomber crew casualties, but was immune to the bombers’ defenses. For this story, see Edward B. Westermann, *Flak: German Anti-Aircraft Defenses, 1914-1945* (University Press of Kansas, 2001).

More men died in the 8th AF alone than in the entire U.S. Marine Corps during the entire Second World War. Air leaders devised a rotational plan that allowed crew members to return to the U.S. after completing 25 combat missions, but few accomplished the feat. A 1944 study of 2,051 crew members in four bomb groups found only 26.8 percent lived through 25 missions. At a 5 percent loss rate, survival required Airmen to beat the odds. Some missions resulted in losses of 20 percent.

A unique aspect of air warfare made coping even harder. Combat was episodic—crews experienced enemy fire for three or four hours, then returned home to repeat the ordeal a few days later. Bad weather could stretch down time to a week or more.

Each B-17 and B-24 carried 10 crew members: four officers (pilot, copilot, navigator and bombardier) and six enlisted men (engineer, radio operator, two waist gunners, the ball turret gunner and the tail gunner). Neither bomber was pressurized and the waist ports were uncovered. At altitude, temperatures plunged to 40 degrees below zero, adding hypothermia (particularly for the waist gunners) and hypoxia to the threats Airmen faced. Crew members received rudimentary, but essential first-aid training; the wounded were hastily bandaged and given morphine to hold them until landing in England. Donald L. Miller’s masterful *Masters of the Air* (Simon & Schuster, 2006) is the best of many books about the 8th AF, but there are others. Alan J. Levine, *The Strategic Bombing of Germany, 1940-1945* (Praeger, 1992), and, for a better understanding of the American daylight bombing compared to the RAF Bomber Command’s nighttime raids, the short but insightful Noble Frankland’s *The Bombing Offensive Against Germany: Outlines and Perspectives* (Faber & Faber, 1965) and Robin Neillands, *The Bomber War: The Allied Air Offensive Against Nazi Germany* (Overlook Press, 2001) are worth the time. For memoirs and biographies, consider Richard G. Davis’ *Carl A. Spaatz and the Air War in Europe* (Smithsonian Books, 1992), James Parton’s *“Air Force Spoken Here”: General Ira Eaker and the Command of the Air* (Adler & Adler, 1986), Gen. Jimmy Doolittle with Carroll V. Glines, *I Could Never*

*So Lucky Again* (Bantam, 1991), and Gen Curtis E. LeMay with MacKinlay Kantor, *Mission With LeMay* (Doubleday, 1965).

Fighter pilots always get the glamour, a fact established in the Great War and solidified in the Second. Aces—those with five aerial victories—became public heroes—in all countries. In Britain they were known as “The Few,” and in Germany they received special decorations, the highest being the Knight’s Cross with Oak Leaves, Swords and Diamonds. American aces were no less heralded. Although the top two U.S. aces flew in the Pacific, the European theater had its share of legends: Francis “Gabby” Gabreski, Robert Johnson, George Preddy, Hubert “Hub” Zemke, and Don Gentile among others.

Most of these men achieved their victories flying escort for bombers.

But protecting bombers implied a passive, defensive mission that would rob them of the initiative. Fighter instructors at ACTS, notably Claire Chennault and Hoyt Vandenberg, rejected the notion of escort. That was a mistake.

Bombers suffered horrendous losses in late 1943, demanding creative solutions. The answer proved surprisingly simple: Fighter planes were fitted with external fuel tanks under their wings. When the tanks ran dry, they were jettisoned—and the planes flew on with their full complement of internal fuel. Without tanks the P-47 could fly out 230 miles; with tanks range increased to 475 miles. When the P-51 Mustangs added drop tanks, range grew even more, from 475 to 850 miles. By the end of the war the Mustangs could fly all the way to Vienna—farther than B-17s!

When Maj. Gen. Jimmy Doolittle took over the 8th AF in early 1944, a sign at fighter headquarters read: “Your duty is to protect the bombers.” He replaced it with another: “The first duty of Eighth Air Force fighters is to destroy German fighters.” This semantic change made it the fighter pilots’ mission to aggressively seek out and destroy the enemy air force wherever and whenever they found it.

In February 1944, over six days of bombing missions deep into Germany, Luftwaffe fighters rose up to challenge the bomber armadas, only to face Jugs and Mustangs. By the end of “Big Week,” the Luftwaffe was irreparably broken. By D-Day, the Germans had barely 300 aircraft serviceable in the west, while the Allies had nearly 7,000—the Luftwaffe was outnumbered 20-to-1. The Allies flew 12,000 sorties that day; Germany flew fewer than 100. That is air supremacy.

The best books about tactical air are Richard P. Hallion’s *Strike from the Sky: The History of Battlefield Air Attack, 1911-1945* (Smithsonian Books, 1989), and Robert V. Brulle, *Angels Zero: P-47 Close Air Support*

*in Europe* (Smithsonian Books, 2000). For the air-to-air fight, see Stephen L. McFarland and Wesley P. Newton, *To Command the Sky: The Battle for Air Superiority Over Germany, 1942-1944* (Smithsonian Books, 1991).

Approximately 33,000 American Airmen were captured by Germany and Italy during the war, and these prisoners of war (POWs) were sent to camps called Stalag Lufts. The most famous of these, Stalag Luft III, held over 10,000 Allied air officers.

The rights of POWs had been specified in the Geneva Conventions of 1929. Prisoners had a right to send and receive mail and parcels, and to be fed, clothed, housed and given proper



medical care. It was prohibited to withhold food as punishment. The camps were to have fresh water, sanitation, heat, and room for exercise and recreation, and POWs were to have freedom of religion. Enlisted prisoners could be made to perform physical labor, but officers could not.

The Luftwaffe, which ran the camps for Allied Airmen, was less rigid than its ground counterparts. But when 80 men escaped in March 1944 from Stalag Luft III in the “Great Escape” of legend, only three of the men made it to Britain. Of the 77 remaining, all were recaptured and 50 were summarily executed by the Gestapo, the worst such atrocity of the war for Allied Airmen in Europe.

Life in the camps was defined by endless boredom and hunger. Sited in eastern Germany, the prisoners were herded west as the Soviet armies marched on Germany in early 1945; hundreds of the inmates of Stalag Luft IV died on their 600-mile forced march. For life in the camps, see Arthur A. Durand, *Stalag Luft III: The Secret Story* (Simon & Schuster, 1989), Lt. Gen. Albert P. Clark’s *33 Months as a POW in Stalag Luft III* (Fulcrum 2004), and Kenneth W. Simmons’ *Kriegie* (Lucknow Books, 2016).

Strategic bombing was a form of economic warfare, so it was necessary that air planners understand how the enemy economy functioned—and how to break it. Bombers could hit just about anything, but targeting was key.

Data showed that the better the weather, the better the accuracy: Electronic bombing aids were therefore essential because of the clouds that shrouded Germany. Nonetheless, bombing through weather never equaled visual bombing in accuracy. By October 1944, 41.5 percent of 8th AF bombs fell within 1,000 feet of the aim point when bombing visually, but only 5 percent did so when relying on radio or radar aids.

In one study, post-strike photographs revealed that bombing accuracy was enhanced if an entire group dropped when its leader did, rather than if each bombardier chose his own drop point. Another problem involved the relative danger of enemy interceptors versus flak. The worst situation existed for stragglers: When a bomber fell out of formation, typically due to flak damage, enemy fighters quickly pounced. Adding armor

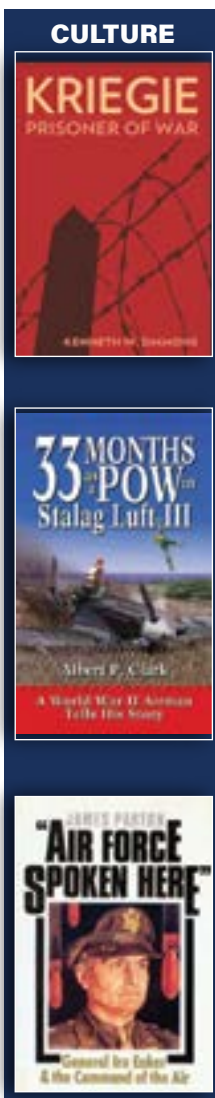
to the engines reduced the problem stragglers.

Operational research (OR) proved essential throughout the war, in part because of the muddled thinking that preceded it. Doctrine assumed that bombing enemy industry would have decisive results. Research provided guidance on how best to destroy specific parts of that infrastructure, but understanding the impact was less clear. The role of intelligence was crucial in all of this, specifically, the high-grade ciphers used by the Germans. The British had broken the Enigma codes early in the war and established a center at Bletchley Park near London to decode and analyze this Ultra intelligence. When the U.S. joined up, they shared this source. For insights into its use by the AAF, see Diane T. Putney, ed., *ULTRA and the Army Air Forces in World War II* (Office of Air Force History, 1987), and John F. Kreis, ed., *Piercing the Fog: Intelligence and Army Air Forces Operations in World War II* (Air Force History and Museums Program, 1996). For the history of Ultra Intelligence in general, see Ralph Bennett, *Ultra in the West: The Normandy Campaign, 1944-45* (Charles Scribner, 1980); Ronald Lewin, *Ultra Goes to War* (McGraw-Hill, 1978); and Stephen Budiansky, *Battle of Wits: The Complete Story of Codebreaking in World War II* (Free Press, 2000).

In the planning for the Normandy invasion in early 1944, American analysts argued that oil should become the top priority target. If the oil refineries and hydro-generation plants were knocked out, the enemy war machine would halt. RAF planners saw the German rail network as the primary focus. Troops, supplies, equipment and raw materials all moved primarily by train. If the rail lines were cut and trains stopped, especially in France, it would be difficult for the Germans to resupply the coast.

The question was resolved on March 25, 1944, when Gen. Dwight D. Eisenhower, the Operation Overlord commander, opted for the rail plan. The key factor to him was time: he wanted the beachhead isolated from German reinforcements before the invasion, not sometime in the months that followed.

There is a bit more to the story. In January 1945 the German rail system, which had been employing its own teletype network for transmitting status reports, began using the top-secret Enigma machine because its teletype system and landlines had been knocked out by bombing. Allied



B-17s of the 94th Bomb Group attacking the Focke-Wulf aircraft factory at Marienburg near Danzig, Oct. 9, 1944, which was one of the targets during the war.

USAF via Imperial War Museum

intelligence had ignored rail messages, believing them of little importance, but when it began using Enigma—not by design but necessity—analysts started paying attention. Enigma revealed the crucial role played by coal in the German economy, powering 90 percent of industrial production. More to the point, coal was moved largely by train. Since the rail plan had been in effect, coal shipments had slowed, causing a serious decline in German production. The implication was clear. To deliver a death blow to German industry and military capability, one had to stop the flow of coal, and that meant stopping the trains.

To understand the crucial oil vs. rail plan controversy, see Robert S. Ehlers Jr., *Targeting the Third Reich: Air Intelligence and the Allied Bombing Campaigns* (University Press of Kansas, 2009), Ronald C. Cooke and Roy Conyers Nesbit, *Target: Hitler's Oil* (William Kimber, 1985), Solly Zuckerman, *From Apes to Warlords* (Harper & Row, 1978), Walt W. Rostow, *Pre-Invasion Bombing Strategy* (University of Texas Press, 1981), Alfred Mierzejewski, *The Collapse of the German War Economy, 1939-1945: Allied Air Power and the German National Railway* (University Press of North Carolina, 1988), and Albert Speer, *Inside the Third Reich* (Macmillan, 1970).

The United States spent \$183 billion on armaments during World War II, and the AAF share was \$45 billion (24.6 percent). With that money it bought 230,175 aircraft, of which 34,625 were heavy bombers (15 percent). These bombers cost \$9.2 billion—20.4 percent of AAF expenditures and 5 percent of the U.S. total. Whether the taxpayer got his money's worth has been debated for decades, but the arguments shed more heat than light. There was, however, a massive effort conducted at the end of the war to answer the question of strategic airpower's effectiveness: the U.S. Strategic Bombing Survey (USSBS). Its findings are difficult to dispute because of the massive amounts of facts and details that were uncovered and recorded.

USSBS was the brainchild of Maj. Gen. Muir "Santy" Fairchild, who had been an instructor at ACTS in the 1930s. He remained keenly interested in the bombing offensive and its effect on the German war effort and in early 1944 believed a bombing survey was essential to answer questions regarding effectiveness. At the same time, General Spaatz in England was having similar thoughts and wrote Arnold suggesting a study, emphasizing it must be done by impartial civilians. President Franklin Roosevelt approved the formation of a bombing survey team on Sept. 9, 1944.

Franklin D'Olier, president of Prudential Insurance, led the project, which eventually included 1,600 officer, enlisted, and civilian personnel, all led by civilians. Most of these were picked for their specific expertise: a Standard Oil executive for the oil division, the director of U.S. Civil Aeronautics for the aircraft division, etc. The survey's military advisers included Gens. Omar Bradley and Lucius Clay and Adms. Richard Byrd and Robert Ghormley.

The survey concluded that "Allied airpower was decisive in the war in Western Europe," though not the sole

decisive factor. Soviet armies in the east were chewing up German divisions at an astonishing rate. The American and British forces in the west faced fewer German troops, but the Normandy invasion caught Germany in a vice it could not escape. Bombing had a catastrophic effect on the enemy economy and transportation system, which fatally impacted their armed forces.

USSBS presented scores of charts, graphs, and tables illustrating the impact of bombing. At its peak, the Allied air campaign employed 1.34 million personnel and over 27,000 aircraft. Bombers flew 1.44 million sorties and dropped 2.7 million tons of bombs—54.2 percent by the AAF and the remainder by the RAF. The bombing campaign was costly—nearly 160,000 Airmen were lost by the British and the Americans combined. Significantly, 85 percent of all bombs dropped by the AAF on Germany fell after D-Day. In truth, the Combined Bomber Offensive did not really begin until the summer of 1944—the third year of war for the Americans and fifth for the British.

Graphs regarding production in key German industries are dramatic—virtually every important commodity began a severe decline in the summer of 1944—long before Allied armies crossed into Germany and occupied its industrial areas. Production of aviation fuel, for example, plummeted from 316,000 tons/month to 107,000 tons in June and 17,000 tons by September. Synthetic fuel fell from 175,000 tons in April 1944 to 30,000 tons by July and just 5,000 tons in September—a 90 percent drop in four months. The largest oil refinery, Leuna, was bombed 22 times, reducing its output to 10 percent of its previous capacity. The effects of this fuel drought were felt throughout the Wehrmacht—aircraft stopped flying and tanks stopped rolling. In March 1945 the Soviets overran 1,200 German tanks that had run out of gas. Because of the aviation fuel shortage, new Luftwaffe pilots entered combat with perhaps 145 flying hours compared to 525 for the AAF.

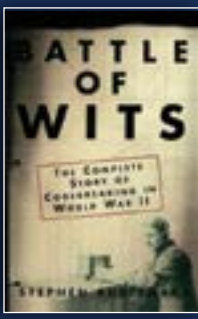
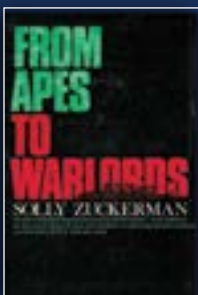
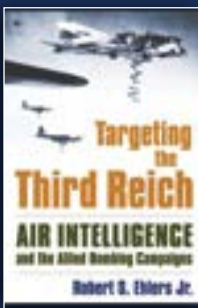
Bombing attacks on the German transportation system were critical: 40 percent of all rail traffic was coal—21,400 train carloads per day at the beginning of 1944, but by the end of the year that number had fallen to 9,000 cars daily. Rail traffic in general had nosedived 50 percent by mid-1944. Steel production suffered an 80 percent drop in three months.

The bombing campaign diverted the German labor force to "debris clearance, reconstruction and dispersal projects and other types of repair activity," and it broke the German will. "Its main psychological effects were defeatism, fear, hopelessness, fatalism, and apathy. It did little to stiffen resistance through the arousing of aggressive emotions of hate and anger." Nearly 5 million German civilians became refugees.

The survey argued that air superiority was essential to the bombing campaign's success. This air dominance was not achieved until early 1944 (the "Big Week" air campaign mentioned earlier), allowing the bombing campaign to achieve its dramatic results. Indeed, it is important to remember that the invasion of France was pushed back from 1942 to 1943 and finally occurred in June 1944—a major reason for this delay was that air superiority over the beachhead was deemed essential for success.

USSBS is a subject overlooked by most historians. A total of 215 reports were written for Europe, but only the

## INTELLIGENCE



overall summary report has been published by Air University Press and been readily available to interested observers. David MacIsaac, *Strategic Bombing in World War Two: The Story of the United States Strategic Bombing Survey* (Garland Publishing, 1976), wrote an excellent account of the survey apparatus itself. Garland then published seven volumes containing 31 of the most important reports, including summaries of the major targeting divisions: oil, aircraft, munitions, morale, etc. These are an invaluable source—if you can find them. For a comparison, see the bombing report done by the RAF, Sebastian Cox, ed., *The Strategic Air War Against Germany, 1939-1945* (Frank Cass, 1998).

The subjects of legality and morality often arise when discussing the bombing campaign. The two are separate, but related. Legally, the issue is surprisingly simple: There was no law specifically addressing bombing going into World War II. As a result, air commanders adapted existing laws dealing with war on land and sea.

An example was the legal maxim that armies could bombard a defended city or fortress even if it contained civilians. All of Nazi-occupied Europe was, in effect, a “defended fortress;” thus, all targets were open to attack.

The law also permitted navies to shell undefended fortresses and cities to destroy their military stores and facilities—even if this meant the death of civilians inside (Cherbourg). Because navies could not occupy a port as could an army, Sailors were given wider latitude in shelling civilians. Aircraft, like ships, could not occupy a city, so the permissive rules of sea warfare seemed more applicable to air war.

The morality of war is not as apparent. Nations at war tend to use whatever means are at their disposal to achieve victory, especially when survival is at stake. This was the case in World War II. In such instances, morality is often viewed as a luxury available only to those whose survival is not at risk. This leads political and military leaders down a precarious path. After the Luftwaffe leveled Coventry in November 1940, Prime Minister Winston Churchill ordered Bomber Command to aim for city

centers on its raids over Germany in retaliation.

Was that targeting strategy justified? Philosopher Michael Walzer examined the issue and decided it was—at least initially. British leaders argued that a combination of reprisal and military necessity made city bombing acceptable. Walzer considered the military necessity rationale. A Nazi triumph was too awful to contemplate, and he conceded that in the dark days of 1941, before Russia and America entered the war, the future looked bleak for Britain. Its army had been thrown off the continent at Dunkirk, and the Royal Navy was fighting for its life against Nazi submarines in the Battle of the Atlantic. Britain’s only hope of hurting Germany and achieving victory was through strategic bombing. Given the inaccuracy of Bomber Command’s night strikes, it was obvious thousands of civilians would die if such a strategy was employed. Viewing this as an instance of “supreme emergency,” Walzer concluded that such a strategy was morally acceptable. However, this justification declined as the war progressed and it was clear the Allies would eventually win.

How many noncombatants died? One expert states that of the 60 million people who died during the war, two-thirds were civilians. But statistics gathered by experts show that fewer than 2 million civilians died as a result of bombing—worldwide. If correct, that means 95 percent of all the noncombatants killed during the war were the result of land and sea operations, not air warfare. There is a rich literature on the subject, especially M.W. Royse’s *Aerial Bombardment and the International Regulation of Warfare* (Harold Vinal, 1928), Michael Howard’s *Restraints on War: Studies in the Limitation of Armed Conflict* (Oxford University Press, 1979), and Micheal Clodfelter, *Warfare and Armed Conflicts: A Statistical Reference to Casualties and Other Figures, 1618-1991* (McFarland & Co., 1992).

*Phillip Meilinger is a retired Air Force colonel and historian. The author of 10 books on Airmen and airpower, he has written more than 100 articles for this magazine and others.*



A P-51 Mustang with invasion stripes painted on its fuselage is serviced on a flight line assigned to the 355th Fighter Group at Steeple Morden, U.K. The 355th FG was a part of D-Day, June 6, 1944, in the first phase of Operation Overlord, the Allied invasion of occupied France.

Air Combat Command

## The Air Force Association's 12 Founders

**John S. Allard**  
Bronxville, N.Y.

**Everett R. Cook,**  
Memphis, Tenn.

**Edward P. Curtis**  
Rochester, N.Y.

**Jimmy Doolittle**  
Los Angeles

**W. Deering Howe**  
New York

**Rufus Rand**  
Sarasota, Fla.

**Sol A. Rosenblatt**  
New York

**Julian B. Rosenthal**  
New York

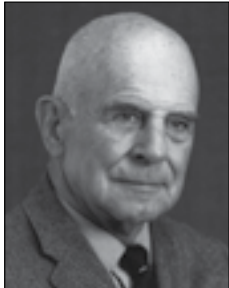
**James M. Stewart**  
Beverly Hills, Calif.

**Lowell P. Weicker**  
New York

**Cornelius Vanderbilt Whitney**  
New York

**John Hay Whitney**  
New York

## AFA Chairs of the Board<sup>1</sup>



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1948-50

**Robert S. Johnson**  
1949-51

**Carl A. Spaatz**  
1950-51

**Harold C. Stuart**  
1951-53

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1952-54

**George C. Kenney**  
1953-55

**John R. Alison**  
1954-56

**Gill Robb Wilson**  
1955-57

**John P. Henebry**  
1956-58

**Peter J. Schenk**  
1957-59

**James M. Trail**  
1958-59

**Howard T. Markey**  
1959-61

**Julian B. Rosenthal**  
1959-60

**Thos. F. Stack**  
1960-62

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1961-63

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1962-63

**W. Randolph Lovelace II**  
1963-65

**Jack B. Gross**  
1963-64

**Jess Larson**  
1964-71

**Robert W. Smart**  
1967-69

**George D. Hardy**  
1966-67, 1969-72

**Martin M. Ostrow**  
1971-75

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1972-76

**George M. Douglas**  
1975-79

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1976-79

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1986-90

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1988-92

**Oliver R. Crawford**  
1990-94

**James M. McCoy**  
1992-96

**Gene Smith**  
1994-98

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1996-2000

**Thomas J. McKee**  
1998-2002

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**Stephen P. Condon**  
2002-06

**Robert E. Largent**  
2004-08

**Joseph E. Sutter**  
2008-10

**S. Sanford Schlitt**  
2010-12

**George K. Muellner**  
2012-14

**Scott P. Van Cleef**  
2014-16

**F. Whitten Peters**  
2016-19

**Gerald R. Murray**  
2019-22



**Bernie Skoch**  
Chair, 2022-

<sup>1</sup>The Chair of the Board is a volunteer position and has been known by different titles over AFA's history. It was titled President until 2006.

## AFA President & CEOs<sup>2</sup>



**Willis S. Fitch**  
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1948-80

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1980-86

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1986-87

**John O. Gray**  
1987-90

**Charles L. Donnelly Jr.**  
1988-89

**Monroe W. Hatch Jr.**  
1990-95

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1995-2002

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2002-06/07

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2007-12

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2008-10

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2010-12

**Scott P. Van Cleef**  
2012-14

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2014-16

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2016-20

**Jim Simons**  
2020-23

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**Paul Hendricks**  
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2024-

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1979-82

**Sherman W. Wilkins**  
1982-85

**A. A. "Bud" West**  
1985-87

**Thomas J. McKee**  
1987-90

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1990-91

**Mary Ann Seibel**  
1991-94

**Mary Anne Thompson**  
1994-97

**William D. Croom Jr.**  
1997-2000

**Daniel C. Hendrickson**  
2000-03

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2003-06

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2006-09

**Joan Sell**  
2009-11

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2011-14

**Marvin L. Tooman**  
2014-15

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1946-47

**Julian B. Rosenthal**  
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**Joseph L. Hodges**  
1966-68

**Glenn D. Mishler**  
1968-70

**Nathan H. Mazer**  
1970-72

**Martin H. Harris**  
1972-76

**Jack C. Price**  
1976-79

### NATIONAL TREASURERS



**Charles L. Martin Jr.**  
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2020-

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1981-87

**William N. Webb**  
1987-95

**Charles H. Church Jr.**  
1995-2000

**Charles A. Nelson**  
2000-05

**Steven R. Lundgren**  
2005-10

**Leonard R. Vernamonti**  
2010-14

**Nora Ruebrook**  
2014-16

**Charles L. Martin Jr.**  
2016

**Steven R. Lundgren**  
2016-2020

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1946-47

**G. Warfield Hobbs**  
1947-49

**Benjamin Brinton**  
1949-52

**George H. Haddock**  
1952-53

**Samuel M. Hecht**  
1953-57

**Jack B. Gross**  
1957-62

**Paul S. Zuckerman**  
1962-66

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Education  
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2006-07

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2007-10

**George K. Muellner**  
2010-12

**Jerry E. White**  
2012-15

**Richard B. Bundy**  
2015-18

**James T. Hannam**  
2018-2021

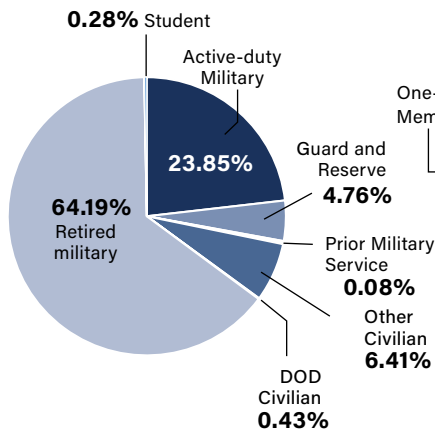
**Stephen K. Gourley**  
2021-2024

## AFA Membership

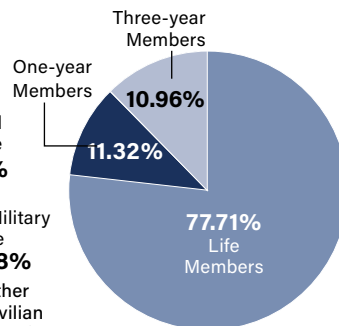
As of September 2024. Total 123,292. Numbers are rounded.

**AFA Membership** has grown steadily since 2021, in line with the growing attendance at AFA's major professional development events, the Air, Space & Cyber Conference in September and the AFA Warfare Symposium, now held in Denver each winter.

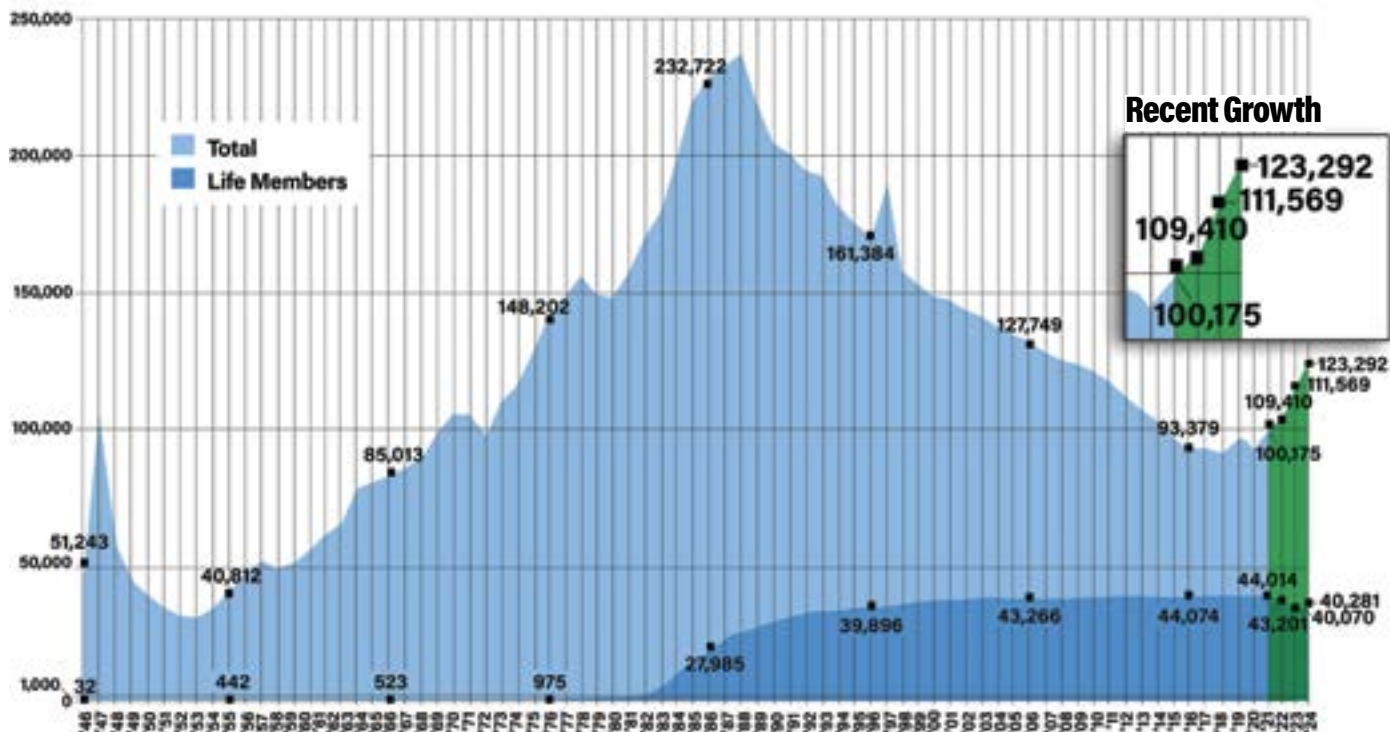
### MILITARY STATUS



### MEMBERSHIP CATEGORY

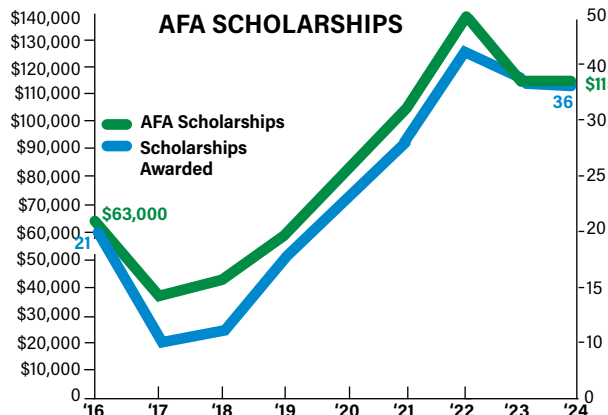


## AFA Membership Over The Years

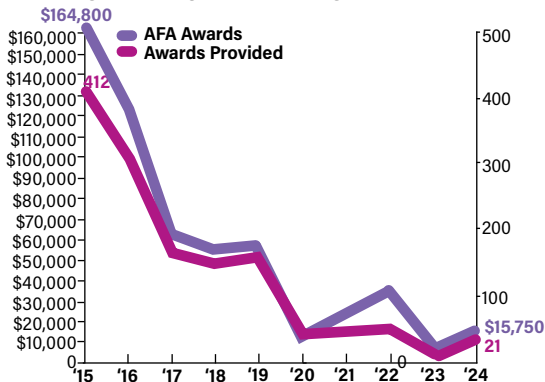


## Scholarships

AFA awards **scholarships**, to aspiring college students backed by funds from generous organizations and individuals. AFA also funds **Pitsenbarger** awards for Airmen who complete their associate degree through the Community College of the Air Force (CCAF) and intend to pursue a bachelor's degree.



### PITSENBARGER AWARDS



**Note:** Another round of scholarships will be awarded in the fall, causing the Pitsenbarger Scholarship totals to increase.



# National Aerospace Awards

## H.H. ARNOLD AWARD

Named for the World War II leader of the Army Air Forces, the H.H. Arnold Award has been presented annually in recognition of the most outstanding contributions in the field of aerospace activity. Since 1986, it has been AFA's highest honor to a member of the armed forces in the field of national defense.

Year	Award Recipient(s)	Year	Award Recipient(s)
1948	W. Stuart Symington, Secretary of the Air Force	1986	Gen. Charles A. Gabriel, USAF (Ret.), former Air Force Chief of Staff
1949	Maj. Gen. William H. Tunner and the men of the Berlin Airlift	1987	Adm. William J. Crowe Jr., USN, Chm., Joint Chiefs of Staff
1950	Airmen of the United Nations in the Far East	1988	Men and women of the Ground-Launched Cruise Missile team
1951	Gen. Curtis E. LeMay and the personnel of Strategic Air Command	1989	Gen. Larry D. Welch, Chief of Staff, USAF
1952	Sen. Lyndon B. Johnson and Sen. Joseph C. O'Mahoney	1990	Gen. John T. Chain, CINC, SAC
1953	Gen. Hoyt S. Vandenberg, USAF (Ret.), former Air Force Chief of Staff	1991	Lt. Gen. Charles A. Horner, Cmdr., CENTCOM Air Forces and 9th Air Force
1954	John Foster Dulles, Secretary of State	1992	Gen. Colin L. Powell, USA, Chm., Joint Chiefs of Staff
1955	Gen. Nathan F. Twining, Chief of Staff, USAF	1993	Gen. Merrill A. McPeak, Chief of Staff, USAF
1956	Sen. W. Stuart Symington	1994	Gen. John Michael Loh, Cmdr., Air Combat Command
1957	Edward P. Curtis, special assistant to the President	1995	World War II Army Air Forces veterans
1958	Maj. Gen. Bernard A. Schriever, Cmdr., Ballistic Missile Div., ARDC	1996	Gen. Ronald R. Fogleman, Chief of Staff, USAF
1959	Gen. Thomas S. Power, CINC, SAC	1997	Men and women of the United States Air Force
1960	Gen. Thomas D. White, Chief of Staff, USAF	1998	Gen. Richard E. Hawley, Cmdr., ACC
1961	Lyle S. Garlock, Assistant SECAF	1999	Lt. Gen. Michael C. Short, Cmdr., Allied Air Forces Southern Europe
1962	A. C. Dickieson and John R. Pierce, Bell Telephone Laboratories	2000	Gen. Michael E. Ryan, Chief of Staff, USAF
1963	The 363rd Tactical Recon. Wing and the 4080th Strategic Wing	2001	Gen. Joseph W. Ralston, CINC, EUCOM
1964	Gen. Curtis E. LeMay, Chief of Staff, USAF	2002	Gen. Richard B. Myers, USAF, Chm., Joint Chiefs of Staff
1965	The 2nd Air Division, PACAF	2003	Lt. Gen. T. Michael Moseley, Cmdr., air component, CENTCOM, and 9th Air Force
1966	The 8th, 12th, 355th, 366th, and 388th Tactical Fighter Wings and the 432nd and 460th TRWs	2004	Gen. John P. Jumper, Chief of Staff, USAF
1967	Gen. William W. Momyer, Cmdr., 7th Air Force, PACAF	2005	Gen. Gregory S. Martin, USAF (Ret.), former Cmdr., AFMC
1968	Col. Frank Borman, USAF; Capt. James Lovell, USN; and Lt. Col. William Anders, USAF, Apollo 8 crew	2006	Gen. Lance W. Lord, USAF (Ret.), former Cmdr., AFSPC
1969	(No presentation)	2007	Gen. Ronald E. Keys, Cmdr., ACC
1970	Apollo 11 team (J. L. Atwood; Lt. Gen. S. C. Phillips, USAF; and astronauts Neil Armstrong and USAF Cols. Buzz Aldrin and Michael Collins)	2008	Gen. Bruce Carlson, Cmdr., AFMC
1971	John S. Foster Jr., Dir. of Defense Research and Engineering	2009	Gen. John D. W. Corley, Cmdr., ACC
1972	Air units of the allied forces in Southeast Asia (Air Force, Navy, Army, Marine Corps, and the Vietnamese Air Force)	2010	Lt. Gen. David A. Deptula, USAF Deputy Chief of Staff, ISR
1973	Gen. John D. Ryan, USAF (Ret.), former Chief of Staff	2011	Gen. Duncan J. McNabb, Cmdr., TRANSCOM
1974	Gen. George S. Brown, USAF, Chm., Joint Chiefs of Staff	2012	Gen. Norton A. Schwartz, USAF (Ret.), former Chief of Staff
1975	James R. Schlesinger, Secretary of Defense	2013	Gen. Douglas M. Fraser, USAF (Ret.), former Cmdr., SOUTHCOM
1976	Sen. Barry M. Goldwater	2014	Gen. C. Robert Kehler, USAF (Ret.), former Cmdr., STRATCOM
1977	Sen. Howard W. Cannon	2015	Gen. Janet C. Wolfenbarger, USAF (Ret.), former Cmdr., AFMC
1978	Gen. Alexander M. Haig Jr., USA, Supreme Allied Commander, Europe	2016	Gen. Mark A. Welsh III, USAF (Ret.), former Chief of Staff
1979	Sen. John C. Stennis	2017	Lt. Gen. Christopher C. Bogdan, USAF (Ret.), former PEO, F-35 Prgm
1980	Gen. Richard H. Ellis, USAF, CINC, SAC	2018	Gen. Herbert J. Carlisle, USAF (Ret.), former Cmdr., AFMC
1981	Gen. David C. Jones, USAF, Chm., Joint Chiefs of Staff	2019	Gen. Ellen M. Pawlikowski, USAF (Ret.), former Cmdr., AFMC
1982	Gen. Lew Allen Jr., USAF (Ret.), former Chief of Staff	2020	Gen. David L. Goldfein, USAF (Ret.), former Chief of Staff, USAF
1983	Ronald W. Reagan, President of the United States	2021	Gen. John W. "Jay" Raymond, USSF, Chief of Space Operations
1984	The President's Commission on Strategic Forces (Scowcroft Commission)	2022	Gen. Tod D. Wolters, USAF (Ret.), former Cmdr., USEUCOM and NATO SACEUR
		2023	Gen. Glen D. VanHerck, Cmdr., NORTHCOM/NORAD
		2024	Gen. David Thompson, USSF (Ret.), former Vice Chief of Space Operations



Mike Tsukamoto/staff

**Retired Gen. David Thompson, USSF, former Vice Chief of Space Operations, accepts the H.H. Arnold Award from SECAF Frank Kendall, flanked by AFA Chair of the Board Bernie Koch, CSO Gen. B. Chance Saltzman, and AFA President Burt Field at ASC24.**

## W. STUART SYMINGTON AWARD

AFA's highest honor to a civilian in the field of national security, the award is named for the first Secretary of the Air Force.

Year	Award Recipient(s)	Year	Award Recipient(s)
1986	Caspar W. Weinberger, Secretary of Defense	2005	Rep. Duncan Hunter (R-Calif.)
1987	Edward C. Aldridge Jr., Secretary of the Air Force	2006	No Award Given
1988	George P. Schultz, Secretary of State	2007	Michael W. Wynne, SECAF
1989	Ronald W. Reagan, former President of the United States	2008	Gen. Barry R. McCaffrey, USA (Ret.)
1990	John J. Welch, Asst. SECAF (Acquisition)	2009	Sen. Orrin G. Hatch (R-Utah)
1991	George Bush, President of the United States	2010	John J. Hamre, Center for Strategic & International Studies
1992	Donald B. Rice, SECAF	2011	Rep. C. W. "Bill" Young (R-Fla.)
1993	Sen. John McCain (R-Ariz.)	2012	Gen. James L. Jones, USMC (Ret.)
1994	Rep. Ike Skelton (D-Mo.)	2013	Michael B. Donley, SECAF
1995	Sheila E. Widnall, SECAF	2014	Ashton B. Carter, former Deputy SECDEF
1996	Sen. Ted Stevens (R-Alaska)	2015	William A. LaPlante, Asst. SECAF (Acquisition)
1997	William Perry, former SECDEF	2016	Jamie M. Morin, Director, Cost Assessment & Prgm Evaluation
1998	Rep. Saxby Chambliss (R-Ga.) and Rep. Norman D. Dicks (D-Wash.)	2017	Lisa S. Disbrow, Undersecretary of the Air Force
1999	F. Whitten Peters, SECAF	2018	Deborah Lee James, former SECAF
2000	Rep. Floyd Spence (R-S.C.)	2019	Heather Wilson, former SECAF
2001	Sen. Michael Enzi (R-Wyo.) and Rep. Cliff Stearns (R-Fla.)	2020	Will Roper, Asst. SECAF (AT&L)
2002	Rep. James V. Hansen (R-Utah)	2021	Barbara Barrett, former SECAF
2003	James G. Roche, SECAF	2022	Sen. Jim Inhofe, Ranking Member, SASC
2004	Peter B. Teets, Undersecretary of the Air Force	2021	Barbara Barrett, former SECAF
		2024	Dr. Derek Tourneur, Director, Space Development Agency

## JOHN R. ALISON AWARD

AFA's highest honor for industrial leadership.

Year	Award Recipient(s)	Year	Award Recipient(s)
1992	Norman R. Augustine, Chairman, Martin Marietta	2005	Richard Branson, Chm., Virgin Atlantic Airways and Virgin Galactic
1993	Daniel M. Tellep, Chm. and CEO, Lockheed	2006	Ronald D. Sugar, Chm. and CEO, Northrop Grumman
1994	Kent Kresa, CEO, Northrop Grumman	2007	Boeing and Lockheed Martin
1995	C. Michael Armstrong, Chm. and CEO, Hughes Aircraft	2008	Bell Boeing CV-22 Team, Bell Helicopter Textron, and Boeing
1996	Harry Stonecipher, Pres. and CEO, McDonnell Douglas	2009	General Atomics Aeronautical Systems Inc.
1997	Dennis J. Picard, Chm. and CEO, Raytheon	2010	Raytheon
1998	Philip M. Condit, Chm. and CEO, Boeing	2011	United Launch Alliance
1999	Sam B. Williams, Chm. and CEO, Williams International	2012	Boeing
2000	Simon Ramo and Dean E. Wooldridge, missile pioneers	2013	X-51A WaveRider Program, Boeing, Aerojet Rocketdyne, and Air Force Research Laboratory
2001	George David, Chm. and CEO, United Technologies	2014	C-17 Globemaster III, Boeing
2002	Sydney Gillibrand, Chm., AMEC; and Jerry Morgensen, Pres. and CEO, Hensel Phelps Construction	2015	F-22 Raptor, Lockheed Martin
2003	Joint Direct Attack Munition Industry Team, Boeing	2016	SpaceX
2004	Thomas J. Cassidy Jr., Pres. and CEO, General Atomics Aeronautical Systems	2017	Northrop Grumman
		2018	Skunk Works, Lockheed Martin
		2019	Draken International
		2020	Marilyn Hewson
		2021	Tory Bruno, CEO, United Launch Alliance
		2022	Jeff Babione, COO, Sierra Space
		2023	Neal Blue, Chairman/CEO, and Linden Blue, Vice Chairman, General Atomics
		2024	Victus Nox (Space Sys. Command, Millennium Space, and Firefly Aerospace)

## AFA LIFETIME ACHIEVEMENT AWARD

The award recognizes a lifetime of work in the advancement of aerospace.

Year	Award Recipient(s)
2003	Maj. Gen. John R. Alison, USAF (Ret.); Sen. John H. Glenn Jr.; Maj. Gen. Jeanne M. Holm, USAF (Ret.); Col. Charles E. McGee, USAF (Ret.); Gen. Bernard A. Schriever, USAF (Ret.)
2004	Gen. Russell E. Dougherty, USAF (Ret.); Florene Miller Watson
2005	Sen. Daniel K. Inouye; William J. Perry; Patty Wagstaff
2007	CMSAF Paul W. Airey, USAF (Ret.)
2008	Col. George E. Day, USAF (Ret.); Gen. David C. Jones, USAF (Ret.); Harold Brown
2009	Doolittle Raiders; Tuskegee Airmen; James R. Schlesinger
2010	Col. Walter J. Boyne, USAF (Ret.); Andrew W. Marshall; Gen. Lawrence A. Skantze, USAF (Ret.); Women Airforce Service Pilots
2011	Natalie W. Crawford; Lt. Gen. Thomas P. Stafford, USAF (Ret.); Gen. Larry D. Welch, USAF (Ret.); Heavy Bombardment Crews of WWII; Commando Sabre Operation-Call Sign Misty
2012	Gen. James P. McCarthy, USAF (Ret.); Vietnam War POWs; Berlin Airlift Aircrews; Korean War Airmen; Fighter Pilots of World War II
2013	Maj. Gen. Joe H. Engle, USAF (Ret.); US Rep. Sam Johnson; The Arlington Committee of the Air Force Officers' Wives' Club—"The Arlington Ladies"
2014	Brig. Gen. James A. McDivitt, USAF (Ret.); Civil Air Patrol—World War II veterans; American Fighter Aces
2015	R. A. "Bob" Hoover; Eugene F. "Gene" Kranz; Gen. Michael V. Hayden, USAF (Ret.)
2016	Maj. Gen. Claude M. Bolton Jr., USAF (Ret.); Lt. Col. John T. Correll, USAF (Ret.); Gen. Charles A. Horner, USAF (Ret.); Lt. Gen. James M. Keck, USAF (Ret.); Gen. Richard B. Myers, USAF (Ret.)
2017	Gen. Ronald R. Fogleman, USAF (Ret.); Col. Clarence E. "Bud" Anderson, USAF (Ret.); Elinor Otto; Lafayette Escadrille Memorial Foundation
2018	Maj. Gen. Alfred K. Flowers, USAF (Ret.); Dan Friedkin; Air Force Scientific Advisory Board; Air Force Enlisted Village; Air Force Aid Society
2019	Gen. John A. Shaud, USAF (Ret.); Gen. T. Michael Moseley, USAF (Ret.); Dr. Benjamin Lambeth
2020	Gen. Lloyd "Fig" Newton, USAF (Ret.); Gen. John M. Loh, USAF (Ret.); Maj. Gen. Michael Collins, USAF (Ret.)
2021	CMSAF James M. McCoy, USAF (Ret.)
2022	Gen. Lance W. Lord, USAF (Ret.); Brig. Gen. Wilma Vaught, USAF (Ret.)
2023	Dr. Paul Kaminski, Chairman/CEO Technovation, Inc.; Pioneers of the Red Flag, presented to Lt. Gen. Glen "Wally" Moorehead, USAF (Ret.)
2024	Norman Augustine, Aerospace Businessman

## AFA CHAIR'S AEROSPACE EDUCATION ACHIEVEMENT AWARD

For long-term commitment to aerospace education, making a significant impact nationwide.

Year	Award Recipient(s)	Year	Award Recipient(s)
2009	ExxonMobil Foundation	2017	Analytical Graphics, Inc.
2010	USA Today	2018	Project Lead the Way
2011	The National Science Foundation	2019	Air Force Junior Reserve Officer Training Corps.
2012	The Military Channel	2020	Bernard K. "Bernie" Skoch
2013	The Civil Air Patrol Aerospace Education Program	2021	The Mitchell Institute for Aerospace Studies
2014	Department of Defense STARBASE Program	2022	Arnold Air Society and Silver Wings
2015	Northrop Grumman	2023	Rolls-Royce
2016	Harry Talbot	2024	No Award Given

## Inaugural Heritage Award

This award was created to recognize exceptionally meritorious volunteer service in the organization with the planning and execution of superior nationally prominent Air & Space Forces heritage events.

This year's award recipient was propelled by the exceptional drive and leadership of Col. Len Vernamonti, USAF (Ret.), holding the award. AFA is proud to award the Inaugural Heritage Award to AFA's Vietnam 50th Committee.



Mike Tsukamoto/staff

Recognizing the sacrifice of Vietnam veterans and their families on the occasion of the 50th anniversary of the cessation of combat operations of American forces in Southeast Asia.

## AFA Field Awards

### AFA MEMBER OF THE YEAR AWARD

State names refer to recipient's home state at the time of the award.

Year	Award Recipient(s)	Year	Award Recipient(s)
1953	Julian B. Rosenthal (N.Y.)	1988	Charles G. Durazo (Va.)
1954	George A. Anderl (Ill.)	1989	Oliver R. Crawford (Texas)
1955	Arthur C. Storz (Neb.)	1990	Cecil H. Hopper (Ohio)
1956	Thos. F. Stack (Calif.)	1991	George M. Douglas (Colo.)
1957	George D. Hardy (Md.)	1992	Jack C. Price (Utah)
1958	Jack B. Gross (Pa.)	1993	Lt. Col. James G. Clark (D.C.)
1959	Carl J. Long (Pa.)	1994	William A. Lafferty (Ariz.)
1960	O. Donald Olson (Colo.)	1995	William N. Webb (Okla.)
1961	Robert P. Stewart (Utah)	1996	Tommy G. Harrison (Fla.)
1962	(No presentation)	1997	James M. McCoy (Neb.)
1963	N. W. DeBerardinis (La.) and Joe L. Shosid (Texas)	1998	Ivan L. McKinney (La.)
1964	Maxwell A. Kriendler (N.Y.)	1999	Jack H. Steed (Ga.)
1965	Milton Caniff (N.Y.)	2000	Mary Anne Thompson (Va.)
1966	William W. Spruance (Del.)	2001	Charles H. Church Jr. (Kan.)
1967	Sam E. Keith Jr. (Texas)	2002	Thomas J. Kemp (Texas)
1968	Marjorie O. Hunt (Mich.)	2003	W. Ron Goerges (Ohio)
1969	(No presentation)	2004	Doyle E. Larson (Minn.)
1970	Lester C. Curl (Fla.)	2005	Charles A. Nelson (S.D.)
1971	Paul W. Gaillard (Neb.)	2006	Craig E. Allen (Utah)
1972	J. Raymond Bell (N.Y.) and Martin H. Harris (Fla.)	2007	William D. Croom Jr. (Texas)
1973	Joe Higgins (Calif.)	2008	John J. Politi (Texas)
1974	Howard T. Markey (D.C.)	2009	David R. Cummock (Fla.)
1975	Martin M. Ostrow (Calif.)	2010	L. Boyd Anderson (Utah)
1976	Victor R. Kregel (Texas)	2011	Steven R. Lundgren (Alaska)
1977	Edward A. Stearn (Calif.)	2012	S. Sanford Schlitt (Fla.)
1978	William J. Demas (N.J.)	2013	Tim Brock (Fla.)
1979	Alexander C. Field Jr. (Ill.)	2014	James W. Simons (N.D.)
1980	David C. Noerr (Calif.)	2015	James R. Lauducci (Va.)
1981	Daniel F. Callahan (Fla.)	2016	David T. Buckwalter (Texas)
1982	Thomas W. Anthony (Md.)	2017	James T. Hannam (Va.)
1983	Richard H. Becker (Ill.)	2018	Russell V. Lewey (Ala.)
1984	Earl D. Clark Jr. (Kan.)	2019	Susan Broderick Mallett (Ala.)
1985	George H. Chabbott (Del.) and Hugh L. Enyart (Ill.)	2020	Mark Tarpley (Okla.)
1986	John P. E. Kruse (N.J.)	2021	Gabrielle "Gabbe" Kearney (Alaska)
		2022	Linda McMahon (Va.)
		2023	Roberta "Bobi" Oates (Nev.)
		2024	Janelle Stafford (Okla.)

## Aerospace Education Achievement Award

Presented to chapters for outstanding achievement in aerospace education programming.

**Albuquerque Chapter, N.M.**  
*President Fred Harsany*

**Ak-Sar-Ben Chapter, Neb.**  
*President Chris Canada*

**Central Oklahoma Gerrity Chapter, Okla.**  
*President Walt Kula*

**Donald W. Steele Sr. Memorial Chapter, Va.**  
*President Michael Sinisi*

**East Georgia Chapter, Ga.**  
*President Laurie Orth*

**Gen. E.W. Rawlings Chapter, Minn.**  
*President Roman Hund*

**Hurlburt Chapter, Fla.**  
*President Dann Mattiza*

**Gen. Robert E. Huyser Chapter, Colo.**  
*President Michael Peterson*

**Lincoln Chapter, Neb.**  
*President Kenneth Brownell*

**Mel Harmon Chapter, Colo.**  
*President Michael Sumida*

**Mile High Chapter, Colo.**  
*President Cliff Klein*

**Northwest Texas Chapter, Texas**  
*President Vance Clarke*

**Paul Revere Chapter, Mass.**  
*President David DeNofrio*

**Scott Van Cleef Chapter, Va.**  
*President Robin Thompson*

**Sam Johnson Chapter, Texas**  
*President Ric Hammer*

**Space Coast Chapter, Fla.**  
*President Russ Lewey*

**Swamp Fox Chapter, S.C.**  
*President David Hanson*

**Tucson Chapter, Ariz.**  
*President Walter Saeger*

## GOLD LIFE MEMBER CARD

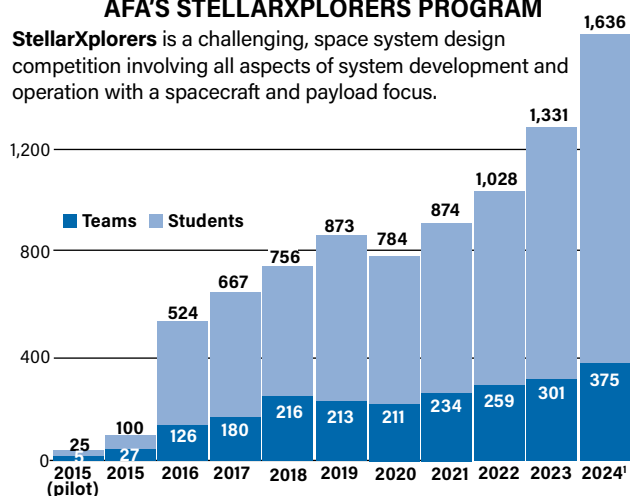
Awarded to members whose AFA record, production, and accomplishments on a national level have been outstanding over a period of years.

Name	Year	Card No.	Name	Year	Card No.
Gill Robb Wilson	1957	1	Edward A. Stearn	1992	13
Jimmy Doolittle	1959	2	Dorothy L. Flanagan	1994	14
Arthur C. Storz Sr.	1961	3	John O. Gray	1996	15
Julian B. Rosenthal	1962	4	Jack C. Price	1997	16
Jack B. Gross	1964	5	Nathan H. Mazer	2002	17
George D. Hardy	1965	6	John R. Alison	2004	18
Jess Larson	1967	7	Donald J. Harlin	2009	19
Robert W. Smart	1968	8	James M. McCoy	2013	20
Martin M. Ostrow	1973	9	George M. Douglas	2014	21
James H. Straubel	1980	10	John A. Shaud	2016	22
Martin H. Harris	1988	11	Mary Anne Thompson	2018	23
Sam E. Keith Jr.	1990	12	Bill Croom	2023	24

## STEM Programs

### AFA'S STELLARXPLORERS PROGRAM

**StellarXplorers** is a challenging, space system design competition involving all aspects of system development and operation with a spacecraft and payload focus.



## CyberPatriot Awards

### CyberPatriot Mentor of the Year

**Chase Larocque**

Knob Noster High School  
(Knob Noster, Mo.)

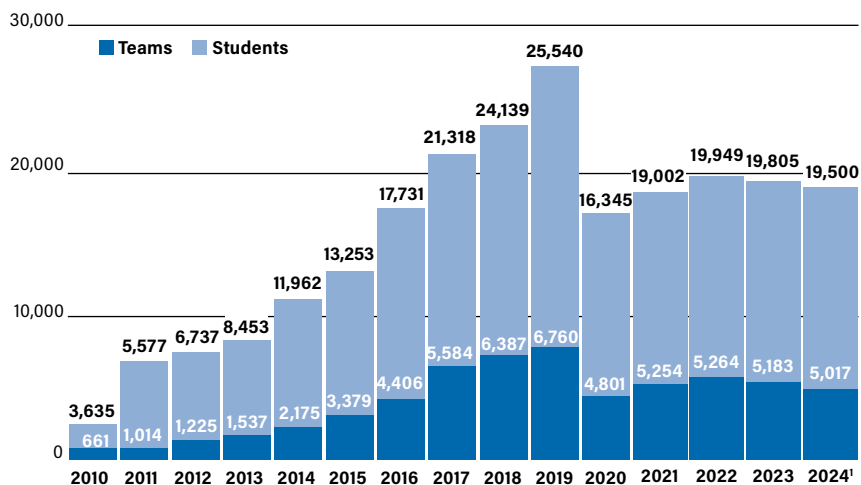
### CyberPatriot Coach of the Year

**Gerald Chung**

Old Scona Academic  
(Edmonton, Alberta)

### AFA'S CYBERPATRIOT PROGRAM

**CyberPatriot** is the National Youth Cyber Education Program created by AFA to inspire K-12 students toward careers in cybersecurity or other science, technology, engineering, and mathematics (STEM) disciplines.



\*Estimated—our competitor registration deadline is early November.

## DONALD W. STEELE SR. MEMORIAL AWARD

Air & Space Forces Association Unit of the Year.

Year	Award Recipient(s)	Year	Award Recipient(s)
1953	San Francisco Chapter	1987	Carl Vinson Memorial Chapter (Ga.)
1954	Santa Monica Area Chapter (Calif.)	1988	Gen. David C. Jones Chapter (N.D.)
1955	San Fernando Valley Chapter (Calif.)	1989	Thomas B. McGuire Jr. Chapter (N.J.)
1956	Utah State AFA	1990	Gen. E. W. Rawlings Chapter (Minn.)
1957	H. H. Arnold Chapter (N.Y.)	1991	Paul Revere Chapter (Mass.)
1958	San Diego Chapter	1992	Central Florida Chapter and Langley Chapter (Va.)
1959	Cleveland Chapter	1993	Green Valley Chapter (Ariz.)
1960	San Diego Chapter	1994	Langley Chapter (Va.)
1961	Chico Chapter (Calif.)	1995	Baton Rouge Chapter (La.)
1962	Fort Worth Chapter (Texas)	1996	Montgomery Chapter (Ala.)
1963	Colin P. Kelly Chapter (N.Y.)	1997	Central Florida Chapter
1964	Utah State AFA	1998	Ark-La-Tex Chapter (La.)
1965	Idaho State AFA	1999	Hurlburt Chapter (Fla.)
1966	New York State AFA	2000	Wright Memorial Chapter (Ohio)
1967	Utah State AFA	2001	Lance P. Sijan Chapter (Colo.)
1968	Utah State AFA	2002	Eglin Chapter (Fla.)
1969	(No presentation)	2003	Hurlburt Chapter (Fla.)
1970	Georgia State AFA	2004	Carl Vinson Memorial Chapter (Ga.)
1971	Middle Georgia Chapter	2005	Central Florida Chapter
1972	Utah State AFA	2006	Enid Chapter (Okla.)
1973	Langley Chapter (Va.)	2007	Central Oklahoma (Gerrity) Chapter
1974	Texas State AFA	2008	Lance P. Sijan Chapter (Colo.)
1975	Alamo Chapter (Texas) and San Bernardino Area Chapter (Calif.)	2009	Paul Revere Chapter (Mass.)
1976	Scott Memorial Chapter (Ill.)	2010	C. Farinha Gold Rush Chapter (Calif.)
1977	Thomas B. McGuire Jr. Chapter (N.J.)	2011	Lance P. Sijan Chapter (Colo.)
1978	Thomas B. McGuire Jr. Chapter (N.J.)	2012	Hurlburt Chapter (Fla.)
1979	Brig. Gen. Robert F. Travis Chapter (Calif.)	2013	Paul Revere Chapter (Mass.)
1980	Central Oklahoma (Gerrity) Chapter	2014	D. W. Steele Sr. Memorial Chapter (Va.)
1981	Alamo Chapter (Texas)	2015	Lance P. Sijan Chapter (Colo.)
1982	Chicagoland-O'Hare Chapter (Ill.)	2016	Paul Revere Chapter (Mass.)
1983	Charles A. Lindbergh Chapter (Conn.)	2017	Enid Chapter (Okla.)
1984	Scott Memorial Chapter (Ill.) and Colorado Springs/Lance Sijan P. Chapter (Colo.)	2018	Langley Chapter (Va.)
1985	Cape Canaveral Chapter (Fla.)	2019	Wright Memorial Chapter (Ohio)
1986	Charles A. Lindbergh Chapter (Conn.)	2020	Mile High Chapter (Colo.)
		2021	Paul Revere Chapter (Mass.)
		2022	Mel Harmon Chapter (Colo.)
		2023	Gen. Bernard A. Schriever Chapter (Calif.)
		2024	Wright Memorial Chapter (Ohio)

## Aerospace Education Excellence Award

Presented for excellence in aerospace education programming. To qualify, a chapter must have received the Aerospace Education Achievement Award this year.

### Small Chapter

**Mel Harmon Chapter, Colo.**

*President Michael Sumida*

### Medium Chapter

**Tucson Chapter, Ariz.**

*President Walter Saeger*

### Large Chapter

**Swamp Fox Chapter, S.C.**

*President David Hanson*

### Extra-Large Chapter

**Hurlburt Chapter, Fla.**

*President Dan Mattiza*

## AFA's 2024 Teacher of the Year Award

AFA named **David White** the 2024 Teacher of the Year sponsored by Rolls-Royce North America Defense. The annual award recognizes exceptional teachers who inspire their students through innovative approaches to science, technology, engineering, and math (STEM) education.

**David White**, awarded for his extraordinary work with students in his rural school and community. His rare blend of passion, creativity, and expertise has profoundly impacted the educational experiences of his students.



Mike Tsukamoto/staff

## Outstanding Chapters by Size

### Small Chapter

**Mel Harmon Chapter, Colo.**  
*President Michael Sumida*

### Medium Chapter

**Scott Van Cleef Chapter, Va.**  
*President Robin Thompson*

### Large Chapter

**Paul Revere Chapter, Mass.**  
*President David DeNofrio*

### Extra-Large Chapter

**Wright Memorial Chapter, Ohio**  
*President David Babcock*

## Chair, AFA Board of Directors Citation Award

Awarded to those individual AFA members whose distinguished contribution to AFA in a specific field has improved and elevated the effectiveness of the Association in a national sense.

**John "Soup" Campbell Russ Lewey Larry Sagstetter**

## Arthur C. Storz Sr. Membership Award

Presented to that AFA chapter which produces the highest number of new members during the 12-month period ending June 20, 2024, as a percentage of total chapter membership as of June 30, 2023.

### Mount Clemens Chapter, Mich.

*President Doug Slocum*

## Unit Exceptional Service Awards (ESA)

### ESA United Forces & Families

**Mile High Chapter, Colo.**  
*President Cliff Klein*

### ESA Best Single Program

**Hurlburt Chapter, Fla.**  
*President Dann Mattiza*

### ESA Communications

**Hurlburt Chapter, Fla.**  
*President Dan Mattiza*

### ESA Community Partners- Small Chapter

**Fairbanks Midnight Sun Chapter, Alaska**  
*President Jeff Putnam*

### ESA Community Partners- Medium Chapter

**Ute-Rocky Mountain Chapter, Utah**  
*President Scott Nowlin*

### ESA Community Partners- Large Chapter

**Northeast Texas Chapter, Texas**  
*President Vance Clarke*

### ESA Community Partners- Extra-Large Chapter

**Mount Clemens Chapter, Mich.**  
*President Doug Slocum*

### ESA Community Partners- Over 1,100

**Central Oklahoma Gerrity Chapter, Okla.**  
*President Walt Kula*

### ESA Community Relations

**Wright Memorial Chapter, Ohio**  
*President David Babcock*

### ESA Overall Programming

**Wright Memorial Chapter, Ohio**  
*President David Babcock*

### ESA Veterans Affairs

**Paul Revere Chapter, Mass.**  
*President David DeNofrio*

### ESA Unit AAS/SW Integration

**Scott Van Cleef Chapter, Va.**  
*President Robin Thompson*

## Jack Gross Award

Presented to the chapter in each size category with the highest number of new members as a percentage of chapter size at the beginning of the membership year. A minimum of 10 is required.

### Small Chapter

**MiG Alley Chapter, South Korea**  
*President Trenton Schreyer*

### Medium Chapter

**Golden Triangle Chapter, Miss.**  
*President Richard Johnson*

### Large Chapter

**Northeast Texas Chapter, Texas**  
*President Vance Clarke*

### Extra-Large Chapter

**Mount Clemens Chapter, Mich.**  
*President Doug Slocum*

### Chapter Size Larger Than 1,100

**Central Oklahoma Gerrity Chapter, Okla.**  
*President Walt Kula*

## Individual Awards by Region

Presented for outstanding service.

### Medal of Merit

Awarded for exceptional services in local, regional, or national fields and shall denote great initiative on the part of the recipient for specific achievements.

### Exceptional Service Award

Presented to those individual AFA members who have performed exceptional services for AFA in local, regional, or national fields.

#### Central East

##### Medal of Merit

Joe Burke  
Regina Giles  
Robert Mike Maxwell  
Brian McMahon  
Lloyd Swede  
Joseph Thompson

### Exceptional Service Award

Nikki Barry  
Robin Thompson

#### Far West

##### Medal of Merit

Robert Marohn  
Richard Reaser

#### Florida

##### Medal of Merit

Mark Chapman  
Emil Freidhauer  
Nicole Latropoulos  
Dave Wilson

### Exceptional Service Award

Nelson Arroyo  
Joe Kinego  
Barbara Walters-Phillips

#### Midwest

##### Medal of Merit

Fred Phelan

#### New England

##### Medal of Merit

Michael Harm  
Michael Kearns  
Lamorris McRae Jr.

#### North Central

##### Medal of Merit

Bonnie Goldschmidt  
Paul Goldschmidt  
Leah Vigevani  
Sarah Wise

### Exceptional Service Award

Roman Hund

#### Northeast

##### Medal of Merit

Vicent Acquaviva Jr.  
Wayne Fox  
Dwayne McCurry

### Exceptional Service Award

Joseph Abegg

#### Rocky Mountain

##### Exceptional Service Award

Kenneth Bowns  
Mark "Yak" Maryak  
Cathy Rozema  
Patricia Swan

#### South Central

##### Medal of Merit

Bill Elder  
Scott Key  
Ken Philippart

#### Southwest

##### Medal of Merit

George Castle  
Stephanie Myer  
Roger Newell  
Edward Ryder

### Exceptional Service Award

Bryan Foulk

#### Texoma

##### Medal of Merit

Zach Hill  
Alfonzo Ortega

### Exceptional Service Award

Terry Cox  
Bill Harding

## AFA Lifetime Achievement Award

Norman Augustine spent decades of service enhancing national security and the aerospace industry. He served as Undersecretary and Acting Secretary of the Army, as well as CEO of Martin Marietta and Lockheed Martin Corps. Augustine was also Chairman of AFA's StellarXplorers, and the Library of Congress deems him one our 50 Great Americans.



Mike Tsukamoto/Air & Space Forces Magazine

(L-R): AFA Chair of the Board Brig Gen. Bernie Skoch, honoree Norman Augustine, Secretary of the Air Force Frank Kendall, and AFA President and CEO Lt. Gen. Burt Field at ASC24 on Sept. 18.

# Community Partner Awards

## GOLD AWARD

Presented to chapters whose Community Partners represent at least 6 percent of overall chapter membership, with a minimum number of Community Partners. The minimum number is determined by chapter size.

Cheyenne Cowboy Chapter, Wyo.	Mel Harmon Chapter, Colo.
Fairbanks Midnight Sun Chapter, Alaska	Meridian Chapter, Miss.
Lincoln Chapter, Neb.	Northeast Texas Chapter, Texas
	Ute-Rocky Mountain Chapter, Utah

## ACHIEVEMENT AWARD

Presented in the field to chapters whose Community Partners represent at least 3 percent of overall chapter membership, with a minimum number of Community Partners. The minimum number is determined by chapter size.

David D. Terry Chapter, Ariz.	Swamp Fox Chapter, S.C.
Golden Triangle Chapter, Miss.	Tennessee Valley Chapter, Ala.
Hurlburt Chapter, Fla.	

# Special Recognition Membership Awards

## STATE GROWTH

This state has realized a growth in total membership from June 2023 to June 2024:

Alaska	Georgia	Montana	Pennsylvania
Alabama	Hawaii	Nevada	South Carolina
Arizona	Iowa	New Jersey	Tennessee
Arkansas	Idaho	New Mexico	Texas
Colorado	Louisiana	New York	Utah
Delaware	Maryland	North Carolina	Virginia
District of Columbia	Michigan	North Dakota	Washington
Florida	Mississippi	Oklahoma	Wyoming
	Missouri	Oregon	

## REGION GROWTH

This region has realized a growth in total membership from June 2023 to June 2024:

Central East Region	New England Region	Rocky Mountain Region
European Region	North Central Region	South Central Region
Far West Region	Northeast Region	Southeast Region
Florida Region	Northwest Region	Southwest Region
Midwest Region	Pacific Region	Texoma Region

## CHAPTER GROWTH

These chapters have realized a growth in total membership from June 2023 to June 2024:

Abilene Chapter, Texas	East Georgia Chapter, Ga.	Hurlburt Chapter, Fla.	San Jacinto Chapter, Texas
Alamo Chapter, Texas	Edward J. Monaghan Chapter, Alaska	Inland Empire Chapter, Wash.	Sam Johnson Chapter, Texas
Albany-Hudson Valley Chapter, N.Y.	Eglin Chapter, Fla.	Joe-Walker-Mon Valley Chapter, Pa.	Scott Berkeley Chapter, N.C.
Albuquerque Chapter, N.M.	Enid Chapter, Okla.	Keystone Chapter, Japan	Scott Memorial Chapter, Ill.
Altus Chapter, Okla.	Everett R. Cook, Tenn.	Lake Superior Northland Chapter, Mich.	Scott Van Cleef Chapter, Va.
Ark-La-Tex Chapter, La.	Fairbanks Midnight Sun Chapter, Alaska	Lance P Sijan Chapter, Colo.	Snake River Valley Chapter, Idaho
Austin Chapter, Texas	Falcon Chapter, Fla.	Langley Chapter, Va.	South Alabama Chapter, Ala.
BG Frederick W. Castle Chapter, N.J.	Florida West Coast Chapter, Fla.	L.D. Bell Niagara Frontier Chapter, N.Y.	South Georgia Chapter, Ga.
BG Harrison R. Thyng Chapter, N.H.	Fort Meade Chapter, Md.	Llano Estacado Chapter, N.M.	Space Coast Chapter, Fla.
Big Sky Chapter, Mont.	Frank Luke Chapter, Ariz.	Lloyd R. Leavitt Jr. Chapter, Mich.	Spangdahlem Chapter, Germany
Blue Ridge Chapter, N.C.	Gen. James R. McCarthy Chapter, Fla.	Long Island Chapter, N.Y.	Stan Hryn Monterey Bay Chapter, Calif.
Bob Newman Cape Fear Chapter, N.C.	Gen. Bernard A. Schriever LA Chapter, Calif.	Lt. Col. B.D. Buzz Wagner Chapter, Pa.	Steel Valley Chapter, Ohio
Brig. Gen. Bill Spruance Chapter, Del.	Gen. Bruce K. Holloway Chapter, Tenn.	Lt. Erwin R. Bleckley Chapter, Kan.	Swamp Fox Chapter, S.C.
Capt. Eddie Rickenbacker Memorial Chapter, Ohio	Gen. Carl A. Spaatz Chapter, N.Y.	Maj. Gen. Oris B. Johnson Chapter, La.	Tennessee Ernie Ford Chapter, Calif.
Carl Vinson Memorial Chapter, Ga.	Gen. Charles L. Donnelly Jr. Chapter, Texas	Martin H. Harris Chapter, Fla.	Tennessee Valley Chapter, Ala.
Central Maryland Chapter, Md.	Gen. Charles A. Gabriel Chapter, Va.	McChord Field Chapter, Wash.	The Red Tail Memorial Chapter, Fla.
Central Oklahoma Gerrity Chapter, Okla.	Gen. David C. Jones Chapter, N.D.	Mel Harmon Chapter, Colo.	Thomas W. Anthony Chapter, Md.
Charlemagne Chapter, Germany	Gen. Doolittle LA Area Chapter, Calif.	Meridian Chapter, Miss.	Thunderbird Chapter, Nev.
Charleston Chapter, S.C.	Gen. H. H. Arnold Memorial Chapter, Tenn.	Miami-Homestead Chapter, Fla.	Tucson Chapter, Ariz.
Cheyenne Cowboy Chapter, Wyo.	Gen. Robert F. Travis Chapter, Calif.	MiG Alley Chapter, Korea	Tulsa Chapter, Okla.
Col. Bud West Chapter, Fla.	Gen. Russell E. Dougherty Chapter, Ky.	Mile High Chapter, Colo.	Tyndall Chapter, Fla.
Columbia Gorge Chapter, Ore.	Gold Coast Chapter, Fla.	Montgomery Chapter, Ala.	United Kingdom Chapter, Europe
Columbia Palmetto Chapter, S.C.	Golden Gate Chapter, Calif.	Mount Clemens Chapter, Mich.	Ute-Rocky Mountain Chapter, Utah
Cochise Chapter, Ariz.	Golden Triangle Chapter, Miss.	Nation's Capital Chapter, D.C.	Waterman-Twining Chapter, Fla.
Concho Chapter, Texas	Harry S. Truman Chapter, Mo.	Northern Utah Chapter, Utah	White Sands Chapter, N.M.
David D. Terry Jr. Chapter, Ariz.	Hawaii Chapter, Hawaii	Ramstein Chapter, Germany	Whiteman Chapter, Mo.
Del Rio Chapter, Texas		Red River Valley Chapter, N.D.	William J. 'Pete' Knight Chapter, Calif.
Delaware Galaxy Chapter, Del.		Richard I. Bong Chapter, Minn.	Wright Memorial Chapter, Ohio
Dobbins Chapter, Ga.		Richmond Chapter, Va.	York-Lancaster Chapter, Pa.
Dolomiti Chapter, Italy		Robert H. Goddard Chapter, Calif.	
Donald W. Steele Sr. Memorial Chapter, Va.		Rushmore Chapter, S.D.	
		Salt Lake City Chapter, Utah	
		San Diego Chapter, Calif.	

# AFA Chapter Members by Region, State, and Chapter

These figures indicate the number of affiliated members as of August 2024. Listed below the name of each region is the Region President.

<b>CENTRAL EAST REGION</b>	<b>18,472</b>	Lloyd R. Leavitt Jr. . . . .	277	Shooting Star . . . . .	147	<b>SOUTHEAST REGION</b>	<b>7,060</b>
Linda McMahon		Mount Clemens . . . . .	964	Thomas B. McGuire Jr. . . . .	317	Mike Trotter	
<b>Delaware</b>	<b>425</b>	<b>Ohio</b>	<b>4,240</b>	<b>New York</b>	<b>1,799</b>	<b>Georgia</b>	<b>3,080</b>
Brig. Gen. Bill Spruance. . . . .	119	Capt. Eddie Rickenbacker Memorial*. . . . .	487	Albany-Hudson Valley*. . . . .	270	Carl Vinson Memorial . . . . .	1,105
Delaware Galaxy . . . . .	306	Frank P. Lahm . . . . .	309	Finger Lakes . . . . .	318	Dobbins . . . . .	1,291
<b>District of Columbia</b>	<b>2,255</b>	Gen. Joseph W. Ralston . . . . .	403	Gen. Carl A. Spaatz . . . . .	113	East Georgia . . . . .	433
Nation's Capital . . . . .	2,255	North Coast*. . . . .	158	Genesee Valley. . . . .	156	South Georgia . . . . .	1,251
<b>Maryland</b>	<b>3,784</b>	Steel Valley . . . . .	105	Iron Gate . . . . .	199	<b>North Carolina</b>	<b>2,151</b>
Central Maryland . . . . .	585	Wright Memorial*. . . . .	2,778	L. D. Bell-Niagara Frontier . . . . .	250	Blue Ridge . . . . .	358
Fort Meade . . . . .	1,355	<b>MIDWEST REGION</b>	<b>5,496</b>	Long Island . . . . .	393	Bob Newman Cape Fear . . . . .	195
Thomas W. Anthony . . . . .	1,844	Fred Niblock		Pride of the Adirondacks . . . . .	100	Kitty Hawk . . . . .	38
<b>Virginia</b>	<b>11,803</b>	<b>Illinois</b>	<b>2,064</b>	<b>Pennsylvania</b>	<b>1,823</b>	Pope . . . . .	606
Donald W. Steele Sr. Memorial. . . . .	6,042	Chicagoland-O'Hare. . . . .	717	Altoona . . . . .	108	Scott Berkeley . . . . .	328
Gen. Charles A. Gabriel . . . . .	2,763	Scott Memorial. . . . .	1,347	Joe Walker-Mon Valley . . . . .	147	Tarheel . . . . .	626
Langley . . . . .	2,068	<b>Iowa</b>	<b>422</b>	Lehigh Valley . . . . .	120	<b>South Carolina</b>	<b>1,829</b>
Richmond. . . . .	630	Fort Dodge . . . . .	24	Liberty Bell . . . . .	456	Charleston . . . . .	572
Scott Van Cleef . . . . .	300	Gen. Charles A. Horner . . . . .	149	Lt. Col. B. D. "Buzz" Wagner. . . . .	82	Columbia Palmetto . . . . .	377
<b>West Virginia</b>	<b>205</b>	Northeast Iowa. . . . .	211	Mifflin County*. . . . .	78	Strom Thurmond. . . . .	344
Chuck Yeager. . . . .	205	Richard D. Kisling . . . . .	38	Olmsted . . . . .	213	Swamp Fox . . . . .	536
<b>FAR WEST REGION</b>	<b>8,103</b>	<b>Kansas</b>	<b>525</b>	Pocono Northeast . . . . .	138	<b>SOUTHWEST REGION</b>	<b>6,485</b>
Wayne Kauffman		Lt. Erwin R. Bleckley. . . . .	361	Total Force . . . . .	287	Alan Berg	
<b>California</b>	<b>7,193</b>	Maj. Gen. Edward R. Fry. . . . .	164	York-Lancaster . . . . .	194	<b>Arizona</b>	<b>3,121</b>
Bob Hope . . . . .	442	<b>Missouri</b>	<b>1,364</b>	<b>NORTHWEST REGION</b>	<b>3,916</b>	Cochise . . . . .	109
Brig. Gen. Robert Cardenas San Diego . . . . .	751	Harry S. Truman . . . . .	450	Bill Striegel		Frank Luke . . . . .	1,686
Brig. Gen. Robert F. Travis. . . . .	487	Spirit of St. Louis. . . . .	480	<b>Alaska</b>	<b>621</b>	Prescott/Goldwater . . . . .	265
C. Farinha Gold Rush . . . . .	697	Whiteman. . . . .	434	Edward J. Monaghan . . . . .	466	Tucson . . . . .	1,061
David J. Price/Beale . . . . .	260	<b>Nebraska</b>	<b>1,121</b>	Fairbanks Midnight Sun . . . . .	155	<b>Nevada</b>	<b>1,718</b>
Fresno*. . . . .	358	Ak-Sar-Ben . . . . .	926	<b>Idaho</b>	<b>433</b>	Thunderbird . . . . .	1,718
Gen. B. A. Schriever Los Angeles . . . . .	834	Lincoln . . . . .	198	Snake River Valley . . . . .	433	<b>New Mexico</b>	<b>1,646</b>
General Doolittle Los Angeles Area*. . . . .	735	<b>NEW ENGLAND REGION</b>	<b>2,795</b>	<b>Oregon</b>	<b>640</b>	Albuquerque . . . . .	1,087
Golden Gate*. . . . .	481	David DeNofrio		Bill Harris . . . . .	161	Llano Estacado. . . . .	205
High Desert. . . . .	87	<b>Connecticut</b>	<b>531</b>	Columbia Gorge*. . . . .	479	White Sands . . . . .	354
Orange County/Gen. Curtis E. LeMay. . . . .	525	Flying Yankees/Gen. George C. Kenney . . . . .	282	<b>Washington</b>	<b>2,222</b>	<b>TEXOMA REGION</b>	<b>12,821</b>
Palm Springs . . . . .	245	Lindbergh/Sikorsky . . . . .	249	Greater Seattle . . . . .	650	Norm King	
Robert H. Goddard. . . . .	432	<b>Massachusetts</b>	<b>1,362</b>	Inland Empire . . . . .	602	<b>Oklahoma</b>	<b>2,098</b>
Stan Hryn Monterey Bay . . . . .	124	Minuteman . . . . .	247	McChord Field . . . . .	970	Altus . . . . .	257
Tennessee Ernie Ford . . . . .	376	Otis. . . . .	204	<b>ROCKY MOUNTAIN REGION</b>	<b>6,957</b>	Central Oklahoma (Gerrity). . . . .	1,339
William J. "Pete" Knight . . . . .	359	Paul Reverse. . . . .	701	Fran Bradshaw		Enid . . . . .	203
<b>Hawaii</b>	<b>910</b>	Pioneer Valley . . . . .	210	<b>Colorado</b>	<b>5,225</b>	Tulsa . . . . .	299
Hawaii*. . . . .	910	<b>New Hampshire</b>	<b>532</b>	Gen. Robert E. Huyser. . . . .	109	<b>Texas</b>	<b>10,722</b>
<b>FLORIDA REGION</b>	<b>8,584</b>	Brig. Gen. Harrison R. Thyng . . . . .	532	Lance P. Sijan. . . . .	2,943	Abilene . . . . .	377
Dwyer Dennis		<b>Rhode Island</b>	<b>171</b>	Mel Harmon . . . . .	125	Aggieland. . . . .	175
<b>Florida</b>	<b>8,584</b>	Metro Rhode Island . . . . .	135	Mile High . . . . .	2,048	Alamo . . . . .	4,659
Gen. James R. McCarthy . . . . .	5	Newport Blue & Gold . . . . .	36	<b>Utah</b>	<b>1,310</b>	Austin . . . . .	1,032
Col. H. M. "Bud" West . . . . .	181	<b>Vermont</b>	<b>199</b>	Northern Utah . . . . .	444	Concho . . . . .	335
Eglin . . . . .	1,356	Green Mountain . . . . .	199	Salt Lake City. . . . .	410	Del Rio. . . . .	168
Falcon . . . . .	510	<b>NORTH CENTRAL REGION</b>	<b>2,713</b>	Ute-Rocky Mountain. . . . .	456	Fort Worth . . . . .	1,211
Florida Highlands . . . . .	9	Dan Murphy		<b>Wyoming</b>	<b>422</b>	Gen. Charles L. Donnelly Jr. . . . .	295
Florida West Coast. . . . .	503	<b>Minnesota</b>	<b>769</b>	Cheyenne Cowboy. . . . .	422	Northeast Texas . . . . .	442
Gold Coast . . . . .	531	Gen. E. W. Rawlings . . . . .	639	<b>SOUTH CENTRAL REGION</b>	<b>6,602</b>	Sam Johnston . . . . .	1,191
Hurlburt. . . . .	1,057	Richard I. Bong. . . . .	130	Susan Mallett		San Jacinto . . . . .	837
Martin H. Harris . . . . .	942	<b>Montana</b>	<b>340</b>	<b>Alabama</b>	<b>2,441</b>	<b>OVERSEAS CHAPTERS</b>	<b>1,285</b>
Miami-Homestead. . . . .	334	Big Sky . . . . .	277	Birmingham . . . . .	265	<b>US Air Forces in Europe</b>	<b>819</b>
Red Tail Memorial . . . . .	403	Bozeman . . . . .	63	Montgomery . . . . .	1,313	Erin LeFever (Special Assistant)	
Space Coast . . . . .	1,155	<b>North Dakota</b>	<b>485</b>	South Alabama. . . . .	172	Charlemagne: Geilenkirchen, Germany. . . . .	21
Tyndall. . . . .	420	Gen. David C. Jones . . . . .	253	Tennessee Valley . . . . .	691	Dolomiti: Aviano AB, Italy. . . . .	190
Waterman-Twining . . . . .	1,178	Happy Hooligan . . . . .	63	<b>Arkansas</b>	<b>784</b>	Ramstein: Ramstein AB, Germany. . . . .	381
<b>GREAT LAKES REGION</b>	<b>7,254</b>	Red River Valley . . . . .	169	David D. Terry Jr. . . . .	496	Spangdahlem: Spangdahlem AB, Germany 104	
Craig Spanburg		<b>South Dakota</b>	<b>428</b>	Lewis E. Lyle . . . . .	288	United Kingdom: RAF Lakenheath, U.K. . . . .	123
<b>Indiana</b>	<b>1,017</b>	Dacotah . . . . .	174	<b>Louisiana</b>	<b>1,017</b>	<b>Pacific Air Forces</b>	<b>466</b>
Central Indiana. . . . .	344	Rushmore. . . . .	254	Ark-La-Tex. . . . .	657	Jeremy Nickel (Special Assistant)	
Fort Wayne . . . . .	105	<b>Wisconsin</b>	<b>691</b>	Maj. Gen. Oris B. Johnson . . . . .	360	Keystone: Kadena AB, Japan . . . . .	163
Grisson Memorial . . . . .	183	Billy Mitchell . . . . .	691	<b>Mississippi</b>	<b>911</b>	MiG Alley: Osan AB, South Korea . . . . .	228
Lawrence D. Bell Museum . . . . .	185	<b>NORTHEAST REGION</b>	<b>4,663</b>	Golden Triangle . . . . .	294	Tokyo: Tokyo . . . . .	75
P-47 Memorial Chapter . . . . .	94	Patrick Kon		Meridian. . . . .	149		
Southern Indiana . . . . .	106	<b>New Jersey</b>	<b>1,041</b>	Mississippi Gulf Coast. . . . .	468		
<b>Kentucky</b>	<b>559</b>	Brig. Gen. Frederick W. Castle . . . . .	169	<b>Tennessee</b>	<b>1,449</b>		
Gen. Russell E. Dougherty . . . . .	342	Hangar One. . . . .	113	Everett R. Cook . . . . .	276		
Lexington . . . . .	217	Highpoint . . . . .	43	Gen. Bruce K. Holloway . . . . .	606		
<b>Michigan</b>	<b>1,438</b>	Mercer County . . . . .	80	Gen. H. H. Arnold Memorial. . . . .	146		
Ann Arbor . . . . .	44	Sal Capriglione. . . . .	172	Maj. Gen. Dan F. Callahan. . . . .	421		
Battle Creek. . . . .	16						
Lake Superior Northland . . . . .	137						

\*These chapters were chartered before Dec. 31, 1948, and are considered original charter chapters. Ohio's North Coast Chapter was formerly the Cleveland Chapter; Oregon's Columbia Gorge Chapter was formerly the Portland Chapter.

# The Memorial to Memorial Ride Grows

The third annual Memorial-to-Memorial Ride started with more than 200 riders at the Wright Brothers Memorial in Kitty Hawk, N.C. Cyclists traveled 340 miles to the Air Force Memorial in Arlington, Va., celebrating Air Force Heritage.



Courtesy photo

**T**he Air Force Cycling Team converged at the Wright Brothers Memorial in Kitty Hawk, N.C., to begin a four-day, 340-mile bike ride to the Air Force Memorial in Arlington, Va. This year, 225 riders set off on the Memorial to Memorial (M2M) Ride from Sept. 12 to 15. The ride raised more than \$40,000 for AFA's Wounded Airmen and Guardians Program.

Conceived by former Chief of Staff of the Air Force Gen. David L. Goldfein and retired Brig. Gen. Robert "Surf" Beletic, the event launched three years ago with three objectives: Celebrate Air Force heritage, promote fitness and recruiting, and support Wounded Airmen and Guardians. Reflecting the true feeling of teamwork that embodies the event, both Beletic and Goldfein don't just organize the ride, they participate in the entire journey too.

This year's ride featured nearly 100 more riders and raised twice the funds as 2023. The ride has grown almost entirely by word of mouth, Beletic said. Many of the riders indicated they were convinced to join this year after a friend or colleague had done so last year. And though each rider made the journey in support of AFA's Wounded Airmen and Guardians Program, many also had personal motivations. For some, it was an opportunity to test themselves in a physical challenge. Others came in honor or support of a wounded Airman they personally knew. Many joined as a means of reconnecting with the Air Force after retiring.

Paula Roy, formerly AFA's Director of Airmen and Family Programs, said she has supported the event every year since its inception "for the cause and for the Air Force family to support the needs and funds for those that have given so much of themselves."

While the riders' motivations were as unique as the individuals themselves, one consistent theme cut across the entire peloton: fun! Not surprisingly, most riders were already cycling enthusiasts, so the chance to bike for hours at a time through serene landscapes while connecting with other Airmen and Guardians was too great to pass up. Even

after coming into a rest stop 91 miles into a 106-mile route with heads covered in sweat, the smiles on their faces were eclipsed only by the determination to push through the last 15 miles of the day.

The entire event is marked with camaraderie, support, and enthusiasm—even from spectators. Motorists and other cyclists cheered or gave a fist pump to the riders as soon as they saw their Air or Space Force insignia on their kits. By the end of the journey, all the riders had forged new friendships.

AFA sponsored two wounded Airmen from the Air Force Wounded Warrior (AFW2) Program to participate in the ride. They shared their stories with their fellow riders and supporters both to inspire everyone to push to the last mile and to remember that, amid all the fun, is a great cause they are supporting.

## BEATING CANCER AND STEREOTYPES

Senior Master Sgt. Nikki Favuzza and her family were eagerly awaiting the arrival of their third child in 2018 persistent headaches and a lump on the hard palate in her mouth led her doctors to order screening tests. Then, just before she went into labor, they delivered the news: She had cancer. Not one to back down from a challenge, her focus immediately shifted to recovery. "Everything moved so quickly," she recalled about hearing the news. "I didn't really have a lot of time to think. I just looked to the doctor and asked, 'What's next?'"

Favuzza's daughter was born without incident, but her journey to recovery was just beginning. Diagnosed with adenoid cystic carcinoma, a rare form of cancer in the salivary glands, Favuzza and her husband had to juggle treatment and three young children at home. She underwent 30 rounds of radiation, twice-a-day injections, and a 10-hour surgery to remove parts of her jaw. After her maxillectomy, she would have to learn to eat and speak again.

But perhaps the worst part of her treatment was the time she missed out on with her baby. "I couldn't hold her be-



**Participating in cycling helped Senior Master Sgt. Nikki Favuzza manage through cancer treatment, giving her both energy and focus.**

cause of the radiation,” she said. “But I’m spending all my days making up for it now.”

Favuzza was automatically enrolled in the Air Force Wounded Warrior (AFW2) Program. At first, she admits now that, she was “bitter” about having yet another obligation to tend to in between all her medical appointments. When she learned of the adaptive sports though, her outlook changed. She would rediscover her love for sports and even pick up some new ones, including archery, rifle shooting, powerlifting, and of course, cycling.

What excites Favuzza the most about cycling and the M2M ride is that it’s a team sport. “It’s almost symbolic of people who have gone through major adversities because whenever you feel like you’ve hit that wall and you’re running out of fuel, you can just drop off and someone else will pick up that slack,” she said.

Favuzza views the ride as a means of giving back to organizations that helped her through a difficult time. “My whole purpose is to thank everyone. I wouldn’t be where I am today without the program.” Favuzza set up a fundraiser page for the M2M ride and even brought her oncologist along to join the ride. Next year she hopes to talk her husband, an athlete himself, into joining as well.

Favuzza believes her optimistic attitude was key to her recovery and that this confident, upbeat mindset can help other patients or wounded warriors get through their struggles too. While the type of cancer she has is never truly cured, her condition is currently classified as NED, or no evidence of disease. “I don’t live with cancer,” she said. “Cancer lives with me.”

## TEAMWORK IN TRAUMA

Retired MSgt. Chris Jachimiec’s positive attitude belies a painful past. Starting in July 2017 and in the span of just nine months, Jachimiec faced a rapid succession of losses and no time to properly grieve. On Independence Day, he first learned about the death of a close friend and fellow Airman. Shortly after, he received an urgent message from his stepmother. When he called her back, he learned his brother had died by suicide.

Jachimiec soon learned that another close friend and colleague had also chosen suicide. In what would be his breaking point, on the very day of this friend’s funeral, he learned that yet another colleague had just died by suicide too. Reliving his story, he pondered, “What more can one human being go through?”

Soon Jachimiec found himself spiraling. “I coped with work and alcohol. I couldn’t stop,” he recalls. “I felt like the job was the distraction from me processing my emotions and when I got home, the alcohol was what fueled me from processing all the trauma and grief that were bubbling up.”

He is very open about his experiences because he focuses

on the eventual positive outcome. “All of that is just part of the story. But it’s like, what’s the good that came of that? That’s where my mind goes.”

In early 2019 Jachimiec enrolled in the Wounded Warrior Program to help cope with his post-traumatic stress disorder (PTSD) where he met with other wounded Airmen who would become the basis of his recovery. Being able to share his ordeals with sympathetic ears finally provided him the outlet he needed to begin working through his trauma. “Those were the better therapists than actual mental health therapists, that peer-to-peer support.”

The program rekindled a passion for sports and gave him something to drive toward. He resumed cycling and later found out about M2M through his involvement in AFW2. He sees in cycling the same teamwork that got him through his recovery, emphasizing that Airmen do not need to go through their recovery alone. He sums up his advice to other wounded warriors in just seven words: “A pain shared is a pain halved.”

Now retired, Jachimiec’s Air Force career didn’t end the way he would have liked, but he stays connected to the Air Force through AFA and events like M2M. He also uses opportunities such as M2M to tell his story, give those around him an extra push to succeed, and ultimately, to just spread joy. “You never know who you’re going to inspire and make that day better for somebody.”



Courtesy photos

**Retired Master Sgt. Chris Jachimiec found catharsis in Wounded Warrior events to help overcome PTSD. He rode in M2M as a way to inspire others.**

## RIDE WITH US

The M2M ride has grown steadily each year, both in ridership and funds raised, with no sign of stopping now. If you’re interested in joining the community, visit [afccycling.com/m2m-ride](https://afccycling.com/m2m-ride).

If you’d like to support Air and Space Forces Wounded Warriors like Nikki Favuzza and Chris Jachimiec, make a donation by scanning the QR code.



# Atherton High School Rocket Competition



Courtesy photo

Atherton's Rocket Launch Team (left to right) are AFA's Gen. Russell E. Dougherty Chapter President Jeff Decker, Jackson Hardin, Kaelin Johnson, Brian Fuentes, Ruby Korman, and 2023 State and Chapter Teacher of the Year Alan Williams.

**O**n April 18, 2024, the AFA Gen. Russell Dougherty Chapter 407 Teacher of the Year for 2023, Alan Williams hosted the Second Annual Rocket Launch Competition for high school teams residing in Louisville, Ky. Ten teams from Atherton High School brought their rockets out for the opportunity to display their design and appearance skills along with incorporating individual "fine tuning." There were 22 teams altogether. Other high schools involved in the competition were Mercy, Shawnee, and Moore. Around 300 students and observers maintained a keen eye on the launches and assisted with recovery efforts.



Courtesy photo

Atherton Launch Team rockets in action. Each team designed, built, and launched their own rockets.

The competition evaluated the rocket's exterior assembly, painting "theme," and the best altitude of two launching opportunities. Weather conditions were sunny and slightly windy with only two rockets "off-course" and landing in trees located at the Atherton launch site.

Once the rockets were recovered, the judging team completed their scoring with the all-important maximum altitude recorded via the installed altimeter. One of Atherton's entries, "McQueen," achieved the best altitude for the competition, reaching 1,050 feet! Another of Williams' rocket team entries, "Magic Mike," won the overall contest. The judging cadre included representatives from the Kentucky Department of Aviation, University of Louisville, ROTC instructors, and the AFA Chapter #407 President Jeffrey Decker.

Atherton also has a newly formed Rocket Drone team, where the students race drones through obstacle courses. Formal recognition of Atherton's Rocket Launch Team occurred at the chapter's quarterly luncheon on June 29, 2024.

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# Frank M. Andrews

**Andrews laid the bricks to build an effective (and strategic) air arm.**

**F**rank Andrews, generally called “Andy,” was an American Airman who seemed destined for greatness when he died in a plane crash in Iceland in May 1943.

From a patrician Tennessee background, Andrews graduated West Point in 1906 and joined the cavalry. He transferred to the Air Service in 1917 as a major, but stayed in the States during the World War to help organize and administer the rapid buildup of the air arm. After the Armistice, he went to Europe as part of the Occupation Force, and upon returning to the U.S. in 1923, served in various command and staff positions over the next 12 years.

Andrews was generally described as tall, handsome, urbane, and possessed of a calm confidence that made him trusted by those around him. He rose through the ranks as a contemporary of Henry “Hap” Arnold, and although the two held each in mutual respect, they were not great friends. Both, however, believed in airpower and the promise of strategic bombing.

In 1935 Andrews was promoted to brigadier general and given command of the GHQ Air Force. This unit was to be semi-autonomous within the Air Corps and contained most of its combat aircraft. Andrews was soon promoted to temporary major general, the same rank as the Chief of the Air Corps, Oscar Westover. Their relationship was rocky because although Andrews controlled the operational assets of the Air Corps, he was dependent on the supply, logistics, and personnel assets controlled by Westover. It was a confused chain of command.

During peacetime, the GHQ Air Force served under the Army Chief of Staff; in time of war it would work for the theater commander. Allowed to buy 13 of the new B-17s as test aircraft—but only 13—the GHQ Air Force used them extensively in wargames, exercises, and long-distance flights to demonstrate their range, capability, and potential. Andrews became an outspoken advocate for airpower and the need to put the B-17 into mass production. The General Staff instead bought medium bombers, like the B-18, because they were cheaper.

In September 1938, Westover died in a plane crash, and Andrews was a prime candidate to take his place. When interviewed for the job by the Army Chief of Staff, Gen. Malin Craig, Andrews was pointedly asked if he would stop lobbying for more big bombers if he became Chief of the Air Corps. He said no. He did not get the top job, but was instead sent to Fort Sam Houston in Texas to be the air officer for the VIII Corps. He reverted to his permanent rank of colonel. It was hardly a coincidence that this was the same job and the same office to which Billy Mitchell had been exiled when he took on the General Staff 14 years earlier.

Fortunately for the country, a few months later the new Army Chief, Gen. George C. Marshall, brought Andrews to Washington, promoted him back to brigadier general, and made him his deputy chief of staff for plans and operations. This was the most important position on the General Staff, and Andrews was the first Airman to hold it. There he began preparing the Army for the war that all sensed was coming. He pushed immediately and relentlessly for two weapons the General Staff had steadfastly resisted up till then—the tank and the airplane.

After Pearl Harbor, Andrews, now a lieutenant general, was made commander of the Caribbean Defense Command. Another first for



U.S. Army photo via National Archives

**Lt. Gen. Frank Andrews at his desk at U.S. Army headquarters in England on Feb. 5, 1943. Andrews, a native of Nashville, Tenn., recently had become commander of all United States forces in the European theater of operations.**

an Airman, Andrews as a joint theater commander was responsible for the safety and defense of the Panama Canal.

Two more theater commands would follow over the next year: first was the Mediterranean and then in January 1943 he took over the European theater where he was responsible for the buildup of the Operation Overlord invasion forces.

On May 3, 1943, Andrews boarded a B-24 bound for the States. En route when attempting to land in bad weather at Keflavik, Iceland, the plane hit a mountain, killing Andrews and all but the tail gunner. It has been a matter of endless speculation as to why he was flying back to the States. There are no clear answers. Some speculate that he was to be offered command for the Overlord invasion, but most see that as unlikely—he had not yet held a combat command despite his high rank. Marshall later said that he had been grooming Andrews for great things; hence, his positions at G-3 and theater commands where he worked with not only the Army and Navy, but also the British. Unfortunately, Marshall never elaborated.

Andrews died when he appeared to be on the cusp of greatness. It has been difficult to write his biography because he left behind few papers. There have been articles and book chapters here and there, but finally there is an excellent biography by Kathy Wilson, **“Marshall’s Great Captain: Lieutenant General Frank Andrews”** (University Press of Kentucky, 2024).



# Practical Applications for AI in Military Operations

By Adam Stone

Everyone is talking about artificial intelligence, but actual no-kidding military applications can be hard to identify.

"If you have a data problem, or if you can make a problem into a data problem, it's probably a good fit for AI," says Angela Sheffield, an internationally recognized expert in nuclear nonproliferation and applications of AI for national security.

Sheffield has been cited for "transforming" the National Nuclear Security Agency's Office of Defense Nuclear Nonproliferation with innovative AI research and development. There, as Senior Program Manager for AI and Data Science, Sheffield developed next-generation tools for detecting early indicators of illicit nuclear weapons development.

Now Sheffield has a new role as director of AI programs at SAIC, a leading systems integrator and solutions provider for federal and defense applications. A former Air Force intelligence officer, she sees numerous opportunities to bring AI to a host of defense requirements and says getting started is often the hardest part, because it means getting past all the reasons not to move forward.

"We will forever have legacy systems," Sheffield says. "We will always have fragmented and siloed data repositories. Those aren't things that we can wish away."

But they also don't need to be barriers to automation. Whether one is tackling a complex problem like Combined Joint All Domain Command and Control, major initiatives to modernize weapon systems, or efforts to automate Tasking, Collection, Processing, Exploitation, and Dissemination (TCPED), mundane tasks that involve routine work can be automated to reduce the human cognitive load.

"There are a lot of other applications ripe for opportunity, for modernization and innovation and AI," Sheffield said. And it doesn't have to be the hard, super complex use cases: Business operations and other



Image courtesy of SAIC

routine operational tasks "are really great opportunities for us to leverage AI. Automation can free up our Airmen and our other service members and civilians ... to tackle the challenges DOD faces today."

In some ways, that is beginning to happen. Enterprise IT is gaining a foothold with AI-driven capabilities integrated into email and other collaboration activities.

"We're beginning to expect that as the part of the services that we get from our enterprise IT," Sheffield said. AI can also support efficiencies, she added, in business operations and mission execution "to fulfill requirements in computing, in managing disparate data sources."

This is where an integrator can be especially valuable. "SAIC is part of bringing those solutions to the Air Force and the rest of the joint force, with concepts like data layers that interconnect stove-piped or fragmented data systems," she said.

Once data can be shared across systems, everyone benefits: "You can get a single-site picture or a single understanding of all of your resources captured in those different repositories," she said, enabling AI-supported process automation, enhanced analytics, and informed, accelerated decision-making.

Users will not necessarily buy into automation easily, she said. Trust must be

earned—and built—over time to ensure users gain confidence in intelligent systems. They need to see that the software works, Sheffield said, and "to understand how it is working, if it's performing within the intended envelope." And they need to be confident that the AI is not generating erroneous "hallucinations," she said.

AI must be a primary driver for enabling CJADC2 because without it the data sets are too large, the problems too demanding, to maintain an information advantage at the speed of modern warfare. CJADC2 demands real-time sharing of data across service, national, and digital boundaries.

That means overcoming legacy IT roadblocks and information systems that can't talk to each other. Interoperable databases and

AI-driven automation are part of the solution. "CJADC2 will happen as a result of that modernization in a way that's even more powerful than what we're beginning to see in pilot demonstrations," Sheffield predicts.

For example, Indo-Pacific Command's Joint Fires Network, a Battle Management System delivers real-time actionable threat data to joint, partner, and allied forces. SAIC is involved in that pilot, and Sheffield foresees more AI-driven implementations like it, "where we're closing kill chains faster and achieving those successes."

Disparate systems and technologies, often purpose-built with proprietary technology, must be integrated to make them work. "That's where an integrator like SAIC can help," she said.

As a federal program manager, she recalled, "I often relied on my contractors or performers to provide that visibility — lessons learned from one agency to another," she said. Commercial partners "helped me have that visibility of what's happening across the interagency."

That's exactly the value Sheffield says she brings to her work at SAIC. "Looking across our multi-mission portfolio and bringing the best solutions for DOD's missions is something they can rely on us to do," she said.



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