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THE PACING THREAT

The Chinese Communist Party and its quest to remake the global order through military might. 34

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September 2023, Vol. 106, No. 9 airandspaceforces.com

Senior Airman Zachary Rufus

DEPARTMENTS

FEATURES

U.S. Air Force Lt. Col. Christopher Finkenstadt, the 64th Aggressor Squadron commander, performs preflight inspections before launching out for a Red Flag-Nellis 23-2 mission in Nevada in March. See "Answering the China Challenge," p. 39.

ON THE COVER

China Ministry of Defense

A Chinese J-10 fighter jet from the PLA Southern Theater Command soars into the sky during a live-fire training exercise.

Air & Space Forces Magazine (ISSN 0730-6784) September 2023 (Vol. 106, No. 9) is published monthly, except for two double issues in January/February and June/July, by the Air & Space Forces Association, 1501 Langston Blvd, Arlington, VA 22209-1198. Phone (703) 247-5800. Periodical postage paid at Arlington, Va., and additional mailing offices. **Membership Rate:** $50 per year; $35 e-Membership; $125 for three-year membership. **Subscription Rate:** $50 per year; $29 per year additional for postage to foreign addresses (except Canada and Mexico, which are $10 per year additional). Regular issues $8 each. USAF Almanac issue $18 each. **Change of address** requires four weeks' notice. Please include mailing label. **POSTMASTER:** Send changes of address to Air & Space Forces Association, 1501 Langston Blvd, Arlington, VA 22209-1198. Publisher assumes no responsibility for unsolicited material.

By Tobias Naegele

China Syndrome

Today's National Defense Strategy, like the Cold War strategy that drove strategic thinking from the 1950s through the 1980s, is dominated by one threat actor—China—which both informs and enables all of the other major threats on the horizon—Russia, Iran, and North Korea.

As in the Cold War era, we are now engaged in a competition with our lone rival, one that extends past politics, economics, and technological achievement. We are also in a modern-day arms race, in some cases playing catch-up, and we are competing to win friends and influence nations worldwide.

In those Cold War years, the goal was to contain the spread of communism and the Soviet sphere. The Iron Curtain that fell across Europe after World War II worked both ways: While the Soviets used it to keep their people trapped in a broken system, the West was aided by a system that made it hard to do business with the East.

That worked to America's advantage.

The U.S. and China relationship is much more complicated because the world's two largest economies are closely intertwined. American businesses have deep ties in China, and Chinese companies are pervasive here, too. China's TikTok is the most popular social media channel in the U.S. today, and it's a foreign enterprise.

Today's challenge has its roots in 1989. That year the Berlin Wall came down and one communist regime after another fell, ending Soviet domination in East Europe as Poland, Hungary, East Germany, and Czechoslovakia embraced democracy. By 1992, the Soviet Union was dissolved.

China, meanwhile, suffered its own struggles. The 1989 Tiananmen Square massacre preceded the collapse of communism in Europe by nearly six months. For a time, it looked like the Chinese Communist Party's grip on power might fail. But as student protests spread from Beijing to some 400 cities across China, the Chinese Communist Party's People's Liberation Army flooded onto Beijing's streets, killing hundreds if not thousands.

By 1991, it was hard to see two national trajectories more different than those of the United States and China. America was victorious, and after the Gulf War, clearly dominant, a singular global power broker. China, by contrast, was little more than the world's biggest "Third World" country.

How quickly fortunes change. America cashed in its "peace dividend" and broke up its military like a losing baseball team at the trade deadline. Weapons systems were retired, programs were canceled and delayed, and troops were paid to quit. On the plus side, interest rates declined and the economy grew. Hard as it is to imagine in this age of $1.5 trillion annual budget deficits, we were looking at surpluses by the turn of the century. Not only was "the era of big government over," as President Bill Clinton said, but when George W. Bush succeeded him as President, the nation was so flush that it looked like our entire debt would be retired by the end of the decade.

It was not to be. The terrorist attacks on Sept. 11, 2001, and the decisions and choices that followed changed everything. The 2003 invasion of Iraq was especially tragic, taxing America's international alliances and squandering our moral high ground. As on 9/11, our intelligence agencies saw shadows but missed the facts. Rather than discover weapons of mass destruction, as retired Lt. Gen. David Deptula says, "America entered an era of mass distraction." It became consumed with counterinsurgency warfare in Iraq and Afghanistan to the exclusion of the peer threat of China that was looming on the horizon.

China took advantage, modernizing every aspect of its military in the years that followed. It has amassed counterspace weapons and long-range missiles designed to counter U.S. advantages in space, in the air, and on the surface. It has made itself a formidable cyber power and developed (or stolen) stealth technology that now appears in its fighter jets. China continues to rapidly iterate designs and to focus on home-grown design and manufacturing.

Many saw what was coming. Former Air Force Chief of Staff Gen. T. Michael "Buzz" Moseley fought a losing battle to ensure the Air Force would have the aircraft and weapons in place to counter China's rise. Instead of recognition, however, Moseley's stiff-necked insistence that the Air Force must prepare for "the high-end fight" cost him his job.

Now the China threat is established wisdom. "It's become the oxygen we live and breathe in the Department of Defense," says Maria Karlin, the acting Deputy Under Secretary of Defense for Policy at the Pentagon. It's the context for every new weapons program, every new initiative, almost every military exercise.

In the Soviet era, there was some level of security about knowing who our enemy was, what was at stake, how the game was played. That is not the case today. Instead, we are entering a dangerous new era of dynamic and increased risk.

China's recent decline raises new uncertainties —and dangers.

Because China is in decline, we now see added uncertainty. Just as 9/11 threw the United States off its stride, COVID-19 fomented greater uncertainty in China. Unlike the United States, which rebounded quickly, China has discovered systemic cracks in its economic engine. Its population is on the decline. Its housing stock is overbuilt. Too much money is owed to foreign investors. Youth unemployment is approaching 20 percent.

From the start, China lied about COVID. Its official statistics, promulgated from China to the World Health Organization, acknowledge less than 121,000 deaths out of some 99 million COVID-19 cases since the outbreak began four years ago. By contrast, a new study published in the Journal of the American Medical Association exposes the reality. Ph.D. Researchers Hong Xiao and Joseph Unger analyzed mortality data published by Chinese universities and captured on the internet. Their peer-reviewed paper, published in August, asserts China suffered some 1.87 million excess deaths between December 2022 and January 2023, the months that followed China's reopening of society following its extended COVID-19 lockdown.

China's decline raises new uncertainty and risk. For all its size and power, China has proven to be brittle, and very possibly at the end of its juggernaut growth period. Its long-planned rise may never be achieved. This is what makes China more dangerous today. Just as Russia's kleptocracy drove its post-Soviet growth into an inevitable decline, leading to its misguided invasion of Ukraine, China's shaky future may prompt President Xi Jinping to take unwise risks in Taiwan or elsewhere.

Vigilance now is every bit as essential as it was in 1980. Today, as then, America is only slightly removed from two long and unsuccessful foreign wars. Our long-delayed revamping of our strategic military assets is only now gaining traction. Our military is only beginning to regain strength and confidence. The right strategic choices now will pay dividends in the future.

China has thought for years that the American century is over, and that China's rise is inevitable. America can—and must—prove them wrong.

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LETTERS

Versatile Bronco

Darrel Whitcomb's article ["Flying the Last Missions in Cambodia," August, p. 50] really resonated with me. My first choice of aircraft was the OV-10 when I graduated from UPT Class 71-03 at Reese Air Force Base, Texas. I missed the assignment as one of my classmates selected the only OV-10 just ahead of me in the selection process. I often think of how my life would have changed had I been given the opportunity to pick the "Bronco."

However, I was afforded some insight into that "alternative" life when I met Chief Master Sgt. Ronald Dandeneau, USAF (Ret.) at HQ USAF, the Pentagon, during a Reserve assignment. As a fluent French speaking Airman he was selected as a backseat translator to facilitate communication between the Cambodians and the forward air controller pilots. Ron was one of the Rustics. He was awarded the Distinguished Flying Cross for "extraordinary achievement on Nov. 23, 1970, while participating in aerial flights in Southeast Asia."

When the missions in which he participated were declassified he was able to share his experiences with me. I often think I could have been his aircraft commander but for one of my UPT classmates taking that OV-10.

Col. Jon S. Meyer,
USAFR (Ret.)
Baltimore

I enjoyed Darrel Whitcomb's article on the last days of the Southeast Asia (SEA) war in Cambodia, Thailand, and Laos "Flying the Last Missions in Cambodia" and was pleased to be reminded of Lt. Col. Howie Pearson.

Howie was an instructor pilot at Craig Air Force Base, Ala., when I was a student in class 68-H at Craig.

I ran into Howie when I was on my second SEA tour flying A-37's at Bien Hoa and he was an adviser to the VNAF A-37 Wing at one of their bases; then saw him at Shaw Air Force Base, S.C., and the last time I saw him was at the BX at Davis-Monthan Air Force Base, Ariz., where he was promoting his lovely wife's book. I was there at DM in the 23rd Tactical Air Support Squadron putting together the OA-37 program and proudly carrying the call sign "Nail 13."

Howie was a natural leader, a thinker, a warrior. The guy you would go to war with. My kind of leader.

Maj. John H. Lamb,
USAF (Ret.)
Parker, Colo.

I was a young two-striper when I arrived at Hurlburt Field, Fla., in February 1970, following weapons mechanic tech school at Lowry Air Force Base, Colo. I was instructed on weapons systems of F-100s, F-4s, F-105s and a mock-up of the F-111. When I arrived at Hurlburt and was introduced to the aircraft I would be working on, to my surprise, it was the OV-10. "But it has propellers!" I said.

But what a great airplane she was, and I grew to love her. I even got to fly once and was duly impressed as we did a navigation run over that part of Florida, with spins from altitude and touch-and-goes.

My follow-on assignment was to Korat RTAFB, Thailand, as a weapons

WRITE TO US

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

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loader on F-4s and then F-105Gs. One of our Thuds IFE'd (In-Flight Emergency) into Nakhon Phanom Air Base, and I led a team of weapons guys to go fetch her. While we were doing an engine change out at the end of the runway, an OV-10 taxied out for takeoff. I now know that airplane belonged to the 23rd TASS, mentioned in the article, and I have a nice photo of her.

Now that I am twice retired (33 years Active duty and 14 as a contractor for the AF) I volunteer at the National Museum of the United States Air Force (NMUSAF). When I started volunteering in 2007, I noticed our OV-10 had no guns, and I asked why. I was informed that there was no gun hardware in those sponsons. I made a few calls and found a company in Mesa, Ariz., that was refurbing OV-10s for various uses, none of which required guns.

They had the necessary hardware for the guns and with a quick trade of some drawings, the company provided two sponsons with all the required bits. I then told the director of restoration here at the NMUSAF that I sure would like to help install the guns when the airplane was ready.

Then, at the appointed time, as the guns were being delivered through the hangar doors, I opened up the left sponson and 40 years came rushing back at me. It was a real pleasure to work on the good ol' Bronco one more time!

Col. Frank Alfter,
USAF (Ret.)
Beavercreek, Ohio

Old-School

We now have a Diversity, Equity, and Inclusion (DEI) office in the Pentagon. Noble concepts when taken individually. However, when slammed down a service member's throat, not so much. Those concepts are being imposed on the military supposedly to give everyone a voice. For straight, White males, however, there is an implicit vilification. Has the Service that I loved given way to pronouns, victims, diversity, CRT (critial race theory), and the like? Those ill-conceived notions destroy unit cohesion and promote a ruinous victimhood. And they discount and denigrate personal efforts, dedication, and merit.

Admittedly, since I left the service in 1995, I am writing from an "old-school" perspective. We wonder why patriotism is at a low for younger people. We wonder why we can't meet recruiting goals. Why our senior leaders apparently don't understand what unit cohesiveness is all about.

Old-school? I'll take the LeMays, the Doolittles, the Shauds, the Foglemans, over any of this current crop of officers. Perhaps we should return to old-school thinking. It seemed to work better than today's well-meaning, but ineffective efforts.

Col. Art Cole,
USAF (Ret.)
Brevard, N.C.

In the Know

What an excellent issue August was. If anyone wanted to know what is going on in the Air Force war preparation effort today, it was covered in a precise, terse, comprehensive (yet unclassified) manner. Well done!

Lt. Col. C.J. Letzelter II,
USAF (Ret.)
Denver

Unit Reunion:
51st Bomb Squadron (SAC, B-52s),
Seymour Johnson, AFB, N.C., from 1963 to 1982. A reunion will be held in Goldsboro, N.C., from **Oct. 31 to Nov. 3, 2023.**
Contact: Greg Gorniak (51stbsq@gmail.com).

By John A. Tirpak

USAF Explores Blended-Wing Body Jet

USAF graphic

JetZero, a Long Beach, Calif., startup, will build the Air Force a KC-46-size blended-wing body flight demonstrator. The concept allows 30 to 50 percent range gains versus tube-and-wing aircraft and will inform future tanker or airlifter designs.

The Air Force picked JetZero, a California startup, to design, fabricate, and test a new blended-wing body (BWB) aircraft. Neither a prototype nor an "X-plane," the as-yet-unnamed technology demonstrator aircraft seeks to inform the design of future cargo and/or tanker jets.

The new design concept promises greater fuel efficiency, and therefore range, and reduced runway requirements. It also seeks to prove new materials and a new approach to rapid prototyping. It could play a crucial role in shaping the upcoming analysis of alternatives for the Next-Generation Air-refueling System, or NGAS, a future tanker project.

Air Force Secretary Frank Kendall kicked off the program at a public rollout event at the Air & Space Forces Association in August. "It is intended to accelerate the next generation of the large aircraft the Air Force needs in the future," Kendall said. "There's a real potential in this technology to help increase fuel efficiency significantly. That's going to lead to improvements in not just the efficiency and capability of our force, but also in our impact on the climate."

These are heady goals. Intended to be about the size of the KC-46 tanker, the planned aircraft aims to cut fuel consumption by 30 percent and increase range by the same amount compared to conventional cylinder-and-wing designs. JetZero's aims are even more ambitious, its website suggesting 50 percent improvement is possible. The ability to operate from much smaller airfields than existing mobility aircraft could bolster USAF's Agile Combat Employment concept, which anticipates rapidly dispersing forces to remote or austere bases.

The blended-wing body aircraft is to be powered by Pratt & Whitney turbofan engines mounted above and to the rear of the airframe, making operations around the aircraft at ground level easier and sharply reducing noise, which will be deflected above and away from the aircraft, rather than down to the ground.

JetZero, of Long Beach, Calif., is working with Scaled Composites—a subsidiary of Northrop Grumman—which will build the aircraft at its Mojave, Calif., plant. They aim to complete the build in 2026, with flight testing to begin in 2027.

USAF and its industry partners are sharing the cost. The Air Force is putting up $40 million in fiscal 2024, and up to $230 million over its five-year future years defense plan. JetZero co-founder Tom O'Leary said in an interview that the company and other investors will at least match that, and probably invest significantly more. He declined to estimate a final figure.

Partnering with Northrop gives JetZero a proven partner with a history of building unusual and stealthy aircraft. The technology involved could lend itself to NGAS, should Northrop pursue that program. NGAS calls for a stealthy tanker by the mid-to-late 2030s.

FUEL SAVINGS

Mobility aircraft account for about 60 percent of all the fuel consumed by the Air Force, already the largest fuel consumer in the Defense Department, which in turn is the largest user in the federal government.

Ravi Chaudhary, assistant Secretary of the Air Force for installations, energy, and the environment, said savings changes the nature of operations.

"Greater range increases lethality," he said. "Fuel efficiency conserves our energy resources and allows us to generate more sorties; a smaller noise footprint [improves] survivability; and seamless ground ops reduce ground time, and gets us airborne quicker in an era when our installations will no longer be the sanctuary they were in previous conflicts."

But interest is not limited to the military market. Kendall cited "a lot of commercial interest in this technology," and O'Leary sug-

gested some airlines are investing in the program.

To Kendall, it's also about global competition. The BWB can help in "maintaining our edge over China."

The environmental and commercial implications drove other changes to the Air Force's approach. Instead of being led by Air Force Materiel Command's Life Cycle Management Center or the Air Force Research Lab, this project falls under the auspices of Chaudhary's office.

"We have direction from Congress to be the lead organization for this," Chaudhary told Air & Space Forces Magazine. "This is an operational energy issue that we have to address as a service."

The ability to fuel aircraft, ships, and vehicles and to power the comfort and computing needs of a military force is arguably the most crucial piece of the entire logistics chain. That "is going to be the margin of victory in great power competition," Chaudhary said.

"Operational energy ... is about saving gas," he said. "Ultimately, that portfolio is where the Deputy Secretary of Defense and Congress thought would be appropriate to address this issue."

"Developing a blended-wing body is "connected to the administration's greenhouse gas reduction goals," Chaudhary said. "But ultimately, ... mission action is climate action."

Others contributing to the project include the Defense Innovation Unit, NASA, Georgia Tech, the Pentagon's Office of Strategic Capital, and operational requirements staff from Air Mobility Command. Other "oversight and interaction" will come from Air Force A5 (Plans and Integration) and acquisition experts, Chaudhary said.

Roberto I. Guerrero, Chaudhary's deputy, an aerospace engineer, will oversee the effort for the Air Force.

Chaudhary wouldn't say who else competed for the program, but, "what we essentially did was look at the best opportunity to iterate to our design goals as quickly as possible. ... Ultimately, it came down to design choices that were preferred."

The competition was announced a year ago, in July 2022, when the Defense Innovation Unit solicited industry about a BWB aircraft, with further details included in USAF's Climate Action Plan last October.

The BWB concept isn't new. Boeing's X-48, a subscale prototype, flew from 2007 to 2013, but neither the Air Force nor airlines rushed to embrace it. Spiking fuel costs, however, have spurred new interest, and O'Leary asserted that the effects of climate change "can no longer be ignored."

Recent technology advancements "in structural design, materials technology, manufacturing, and other areas" are making the BWB possible now, the Air Force said in a release. Those advances make "large-scale production achievable.

One reason tube-and-wing aircraft have remained the standard is because a cylinder is the classic shape for a pressure vessel. But achieving pressurization with right angles has been done "for some time now," a government source said, and can now be achieved on a production line.

The key to BWB, O'Leary said, is that it offers tremendous lift. That, in turn, makes it possible to reduce weight in other parts of the aircraft, such as control surfaces.

For takeoff, O'Leary added, the nose gear will have a spring-like function, pushing the nose up, and allowing the overall platform's lift to do the work of climbing, without heavy control surface inflection.

"We have a lifting body, and a sleek airframe. And it's going to be made from composite materials, state of the art," he said. "And when we combine all that, the net effects ... are phenomenal."

FUTURE TANKER?

Maj. Gen. Albert G. Miller, AMC's director of strategy, plans, requirements, and programs said a BWB tanker offers the potential to venture further forward to get fuel to a critical receiver. "So ... what this blended-wing body prototype brings is very interesting to Air Mobility Command because of the increased lethality it brings for the joint force and increased maneuver capability," he said.

Miller cautioned that "there's no presumption ... that this is necessarily the answer for NGAS." Rather, he said, "We think that it could be informative in this process" both for that future tanker and the Next-Generation Airlifter.

The demonstrator will help determine what kind of range is possible, what runway lengths are feasible, and what kind of signature management might be needed, all crucial questions for NGAS, which will have to operate "in threat environments that we've never had to operate in before."

The analysis of alternatives period for NGAS is "very short," he said. "We need this effort to move fast ... we're going to have to learn what we learn very rapidly."

COMMERCIAL APPLICATIONS

Both commercial passenger and freight customers are interested in the BWB concept, O'Leary said. The project was sized "to build the biggest blended wing we could, using a single-aisle engine that is available today," he said. He declined to specify which of Pratt's geared turbofan engines will be used.

"There is no mid-market airplane in the market today," O'Leary said. "It's in kind of an awkward space between single-aisles and twin-aisles, where the geometry of 'the tube' breaks down, from an efficiency standpoint. The BWB would fit that space."

In the passenger realm, that's an aircraft that could carry 200 to 250 passengers. JetZero and others have published artwork depicting BWB airliners with wide rows, some with video displays showing the scene outside the aircraft in place of windows. Airline demand is urgent, he said: "We feel the need for speed."

Future BWB iterations could include folding wings, so that more such aircraft could get closer to airline terminals at once, and require less ramp space at forward bases.

The prototype will include neither a side-loading cargo door nor a fold-down rear ramp, nor will it have folding wings. That would come later, once the concept is proven. "That's why we're working with Northrop Grumman," O'Leary said: "To develop the mission systems that would be used on this platform."

Initially JetZero is "just focused on proving out the technology; what the [lift over drag] is of this new, ultra-efficient airframe, and then, after that's proven out, then there will be years and years of development."

Miller said the prototype could be tried in exercises and experiments to explore its value and see "what Airmen make of it."

As a major in 2007, Chaudhary wrote a paper in the Air and Space Power Journal, arguing that the cost, in political and maintenance terms, of operating "lily pads"—enroute stops in other countries—was too great. More fuel-efficient aircraft, he said, could yield great savings, increase direct flights, and accelerate air mobility. BWBs could break that mold, he said then, and could complicate an enemy's targeting problem, one of the foundational ideas in ACE.

In Chaudhary's job interview with Kendall, he recalled, the Secretary asked, "What do you know about blended-wing technology?" Chaudhary smiled and replied, "Wow, maybe we've come together to meet the moment on a pretty tough problem."

The blended-wing body is right for the moment, he said.

The stakes couldn't be higher. ... In the Indo-Pacific, everything is a little bit further, requires a little more capacity, and expends a little more gas. If we're going to be successful, we've got to come together—government, industry, academia—all with a sense of urgency. Because if we don't, our adversaries will."

QUESTIONS & ANSWERS

Talking Strategy

Dr. Mara E. Karlin is acting deputy undersecretary of defense for policy, the Department of Defense's No. 2 policy role. Karlin was one of the primary developers of the 2022 National Defense Strategy, which redefined China as the "pacing challenge" for the U.S. military. Karlin discussed the NDS and the Air Force's and Space Force's roles with Pentagon Editor Chris Gordon in an interview in August. This transcript has been edited for space.

Staff Sgt. John Wright

Mara Karlin, acting deputy undersecretary of defense for policy, talks about building the warfighter advantage through synchronized efforts.

Q: In the year since the unclassified National Defense Strategy has come out, what specific steps have you taken to turn it into reality? And what's your plan for the next two years?

A: We've had a really robust implementation effort since putting out the National Defense Strategy (NDS). It's probably the most robust implementation effort I've seen for a National Defense Strategy. It has tried to ensure that every part of the department is kind of deeply socialized with what the strategy says and also understands how to see themselves in it.

When we've gone through program budget review, for example, making sure that there's a really tight strategy to resources connection and that it's loud noise in the background as we are debating resourcing issues. When there are discussions on force development or force employment, it's making sure that that strategy is again that sort of loud noise and trying to direct us in the right way.

Process wise, we've implemented the strategy by ensuring the Secretary and the Deputy Secretary are touching the key priorities on a consistent basis [and] also ensuring that senior leaders across the department have to update the Secretary consistently on how they're changing their strategies and policies and plans in line with the strategy, by calling out a number of key tasks within the strategy and closely tracking to make sure that those are getting achieved. It's become the oxygen we live and breathe in the Department of Defense.

Q: Is there a mismatch in what the NDS prioritizes and what you're able to resource? For example, some members of the commission on the 2018 NDS called for 5 percent real growth.

A: I think we've had a really tight strategy-to-resources linkage bias. … We put out the request for $842 billion. And I think what's special about that request is just how tightly it is linked to the key elements of the strategy. For example, this emphasis on multidomain investments: You've got a President's budget that's really focused on a procurement budget. How do we make sure we get the things? It looks at issues that for a while we watched that had been orphaned. … Historically, that hasn't been the case with munitions. And yet, I think we're maximizing procurement of a couple of key munitions within the latest President's budget.

Whether it's the National Defense Strategy commission emphasis on 3 to 5 percent or other folks looking at specifically the number—it's a lot more important in my mind for us to really hone in on what are we buying for that money.

Q: In the past, you didn't have to worry about someone taking out a satellite. Now you do. What concerns you most about space resilience and capacity of our space assets today?

A: The National Defense Strategy talks about the importance of making sure that we have a resilient space architecture. And, in fact, this notion of resilience, I would expand. … I would note that the concept of resilience is a real throughline in the strategy. It's figuring out, as shocks happen to the system, either expected or unexpected, how do you make sure that you can ride out those shocks and still realize your strategy? Within the National Defense Strategy, it looks at deterrence by denial, deterrence by cost imposition, and then also deterrence by resilience. Space is so interesting here because you do want to really build up this resilient architecture. Obviously, what we see within the commercial world is really, really notable.

I think there's also been some important lessons learned from Russia's terrible war on Ukraine in terms of how to understand the role of space, and how to be effective in the role of space. We've seen the profound impact it's had for Ukraine's military.

Q: Can you define campaigning, which is a theme of the National Defense Strategy?

A: Campaigning is building warfighting advantage, closing warfighting vulnerabilities, and it is a way in which we are logically linking and synchronizing these efforts. Campaigning is not just go do a bunch of stuff. It is not competing in and of itself. It has to have a real purpose. …

What we're trying to push that's a bit of a different approach is this idea of bringing the entire department together. Let's just take a case study, for example. We know that having a resilient, distributed posture across the Indo-Pacific can build warfighting advantages. When you want to build that posture and exercise that posture, that actually requires a whole bunch of different parts of the Department of Defense to become involved. …

The Air Force, [has] got some really interesting concepts along these lines as they relate to Indo-Pacific posture. Obviously, combatant commands are tremendously relevant—INDOPACOM, of course. But you can also see the role of TRANSCOM, CYBERCOM, SPACECOM, just to offer a few, as you were thinking about that posture. You're looking at the role of the Office of the Secretary of Defense in the way that posture is organized in a policy manner. …

The infrastructure piece would involve the Office of the Under-

secretary for Acquisition and Sustainment. What you're hearing from me is that you are touching all of these different parts of the department to try to be able to build warfighting advantage.

Q: Does campaigning mean doing something for a reason?

A: A warfighting reason. … The phases of conflict often felt very binary to folks. I think what campaigning recognizes is that when you are not in the throes of a contingency, you want to be really smart about how and in what ways you are preparing your future force and by using today's force, and you want to logically link all of these different pieces of what the force is doing and how it's doing it for a greater goal.

Q: What is the Air Force role in campaigning?

A: This idea of agile combat employment that the Air Force talks a lot about, I think that's a really neat example of the Air Force's relevance in campaigning and in realizing the goals of the National Defense Strategy effectively. The Air Force wants to be able to jump in and out of a bunch of locations across the Indo-Pacific. That seems in line with a distributed, resilient, hardened posture.

Q: The Marine Corps, Army, Navy, Air Force, and Space Force all have their own future operating concepts that are on different timelines. Who is pulling this all together?

A: A really important point is the importance of ensuring that as each of the military services modernize, there is also a joint approach to that modernization and to concept development. …

If we were in a phase where folks didn't see broad agreement on the security environment today and where it's headed, and the urgent need to focus, then I would probably be more worried. But there's an extraordinary amount of concurrence on what the force needs to be able to do, and how to help it get there. There's a lot of energy being thrown at that around the entire department. … I'm hard-pressed to look around and find folks who disagree with the premise of the strategy, or how best to realize it.

Q: The NDS prioritizes China and Russia. How are they responding to it and attempting to frustrate it? How will you know if you're successful in deterring China and Russia?

A: Russia's unprovoked invasion of Ukraine occurred while we were finishing up the strategy. Obviously, we had Russia's playbook beforehand. It is striking just how much the Russians did to support the strategy's focus.

The really tragic events of the last year and a half have also shown that the strategy's emphasis on allies and partners as our center of gravity has made a lot of sense, as has the emphasis on a multidomain approach and an integrated deterrence approach. I can't tell you how the Russians interpreted the National Defense Strategy. But looking back on where we were when that invasion occurred and where we are now, I think we're in a heck of a better place.

We have briefed—I have briefed—the People's Republic of China on our National Defense Strategy. ... I think our National Defense Strategy's focus has been pretty clear to the PRC. I think our tremendous success at implementing it, whether it was through the resource investments, or through the really tremendous and historic posture investments over the last year have helped demonstrate that our focus on Indo-Pacific security and stability is real and meaningful. And it's not just the U.S. focus, it's actually the focus of a whole lot of other allies and partners.

Q: It's not a two-war NDS. But we're seeing some confluence between China and Russia. We saw naval drills with the PRC and Russia near Alaska—they're doing joint military drills and they're both trying to poke the U.S. in the eye at the same time—whether Russia in Syria or China in the South China Sea. Does the NDS properly account for deterring Russia and China together or properly account for a situation in which they worked together against the U.S.?

A: I would say yes, absolutely. We were cognizant of that. As you know, just because we have a priority doesn't mean we get to kind of shift the entire Department of Defense to focusing just on that. We also need to make sure that we are mitigating the threats or challenges posed by others—whether that's violent extremists or Iran or North Korea or Moscow—which we see as posing an acute threat. We have thought hard about who else might be supportive of those actors that I just delineated and how and in what ways they might be.

Q: How do you hedge against threats in the Middle East and prevent that from boiling over as you shift the focus to the Indo-Pacific?

A: Our approach to the Middle East is especially focused on bringing our partners together in key ways. So integrated air and missile defense is a great example, maritime security. You might say, 'Yeah, but haven't we tried to do that for a while?' And yes, that is exactly right. … The difference is the dynamics around the region have shifted pretty meaningfully. I think those shifts are really meaningful, both the increasing kind of concurrence on the security environment and the threats and the increasing willingness to work together on dealing with those. … Look, you cannot write any region of the world off of the list of things for the U.S. to be involved with. It becomes a question of how and in what way should we be engaging this region? What is it that we have that's special to contribute to regional security? And what can others do as well?

Q: Does the Air Force play a particularly important role in campaigning as a flexible force?

A: The Air Force has done an especially spectacular job in the last few years of being able to realize the idea of dynamic force employment, being able to show that it can get anywhere at any time in a meaningful way. That conveys a message of deterrence, particularly because it conveys the kind of tremendous power and capabilities of the U.S. military. So, yes.

Q: What role does the Space Force play in deterrence, given that it is less visible?

A: We rely so heavily on the Space Force and it's been just really intriguing to watch how the Space Force has found its legs. The capabilities have been key. But watching the way that having the Space Force at the table kind of reshapes and shifts conversations is notable.

Q: So how do you maintain that advantage—the U.S. advantage in space?

A: Part of it is by giving the Space Force a seat at the table, frankly, and giving it a voice. A few years ago, that wasn't the case. And you now have just a different bureaucratic environment because of the construct of the Space Force. That might sound like it's not interesting, but it actually is. In a department that is run by process and bureaucracy, having a voice now in all of the key fora, having someone whose concurrence or nonconcurrence you have to seek out, that actually ends up being tremendously powerful. ... There's obviously a lot of investment that one wants to have there. We want to see it really under the rubric of being resilient and in diverse constellations, and you're investing in space sensing. It's also important that when we talk about collaborating with allies and partners, ... that's not just the domains that folks naturally think of, but also space.

FACES OF THE FORCE

SrA. Dakota Raub/USSF

When **Space Force Lt. Col. Garrett Duff** became 45th Comptroller Squadron commander at Patrick Space Force Base, Fla., on June 23, he was the first and only Guardian commander of a comptroller squadron. Before arriving at the base, Duff was chosen for the Financial Management Leadership Program while also choosing between staying in the Air Force or switching to the Space Force. "I could not resist the chance to start a whole new service," Duff said. "You really feel like you can make a big impact on a small organization when it is just getting started. It is something you can leave a fingerprint on."

A1C Dieondiere Jefferies

Staff Sgt. Jonathan Tillmon, a 3rd Airlift Squadron C-17 Globemaster III loadmaster at Dover Air Force Base, Del., recently became the first enlisted member from Dover to graduate from Air Force Weapons School. The school trains system experts, weapons instructors, and leaders to exploit air, space and cyberspace on behalf of the joint force. Most enlisted graduates are from bases that conduct airdrop missions, but Tillmon was an exception. "The first few months in the course I felt like I was out of my league," Tillmon said. "Everyone is capable of doing things that they thought they couldn't."

USAF

Since November 2022, **Tech. Sgt. Haleigh Irby**, Air Force Reserve's 908th Airlift Wing's (Ala.) 25th Aerial Port Squadron training manager, has been writing curriculum for Space Force's Basic Military Training. On temporary duty with the 1st Delta Operations Squadron, JBSA-Lackland, Texas, Irby works with the squadron's contracting personnel on requests for proposals to vendors to create a learning management system—one useful for BMT, but also one that captures Guardian training records for the duration of their career. "They know what they want a Guardian to be," Irby said, "and it's my job to put it on paper."

Master Sgt. Mirelle Merilice-Roberts/ONG

For the second straight year, Oklahoma National Guard members, including three **137th Special Operations Communications Squadron Airmen**, won first place at the two-week Cyber Shield 2023 cyber defense exercise held June 2 to 16. Focused on industrial control and protection, the exercise included a virtual capture the flag competition to test each team's ability to capture key information regarding enemy activity on a network. "Cyberspace dominance is paramount to effectively projecting global air and space power," said Maj. Tyler Davis, 137th SOCS commander. "The Airmen of the 137th Special Operations Communications Squadron are at the leading edge."

A1C Michelle Ferrari

The **49th Civil Engineering Squadron "Dirt Boyz,"** Holloman Air Force Base, N.M., use a unique approach to environmental stewardship, showcasing their potential for creativity, sustainability, and community-building through innovative projects. Key responsibilities include airfield damage repair and constructing and maintaining expeditionary air bases. "We do a lot of groundwork, from setting up for asphalt, concrete pads, trenching, excavation, digging down, flattening, leveling," said Airman 1st Class Joshua Feagin, a pavements and construction equipment apprentice with the 49th. By involving local communities in the construction process, the Dirt Boyz have empowered individuals, fostering a sense of ownership and pride in their surroundings.

Ethan Johnson/USSF

Space Force Brig. Gen. Timothy Sejba assumed leadership of Space Training and Readiness Command (STARCOM) at Peterson Space Force Base, Colo., on July 20. A former Program Executive Officer for Battle Management and Command, Control, and Communications at Los Angeles Air Force Base, Calif., Sejba's program strategies expertise makes him well-suited for the role. "We must push forward to increase our capacity and capability to field combat-ready forces," Sejba said. "We must foster the Guardian spirit in our institutional training and role-model it."

Sharon Singleton/USAF

Airman First Class Reynaldy Reynoso-Peralta was one of five 16th Air Force cyber Airmen to teach at AFA's CyperPatriot Summer Camp in San Antonio this July. The discussions covered cyber safety, setting career goals, and interests of the local middle and high school students. He and the other instructors also emphasized cyber ethics, computer functions, and online safety. Reynosa-Peralta said, "It is essential the military supports programs like this because this is the next generation to serve this country. We want to invest in the future."

Courtesy photo

After growing up in Sri Lanka, **Airman 1st Class Theja R. Ranasingha Randhunu Mudhiyanselage**, never thought she would be where she is now. A finance customer service specialist with the 78th Comptroller Squadron at Robins Air Force Base, Ga., Mudhiyanselage moved to the United States in 2017 joining the Air Force in 2022. "I was really nervous when I first got here because I didn't know anyone," she said. She shared her struggle in technical school, as English is not her first language, but her third. Still, she persevered and became a distinguished technical school graduate in March.

Tell us who you think we should highlight here. Write to afmag@afa.org.

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Capt. Chase Todd, a pilot with the 40th Helicopter Squadron, practices underwater maneuvers at Malmstrom Air Force Base, Mont. Aircrew are required to complete egress training every three years. The squadron flies UH-1 Hueys today in support of the 341st Missile Wing but will eventually transition to the MH-139A Grey Wolf, adapted from the Agusta-Westland AW139 utility helicopter. Once in service, the Grey Wolf promises double the range of its predecessor and capacity for 5,000 more pounds of cargo. It can also fly higher and faster—in all kinds of weather—offering commanders and crew more options when responding to a crisis.

Senior Airman Mary Bowers

Global Positioning System signals are ubiquitous, among the United States great gifts to the world's population, but it is not invulnerable. Space Force Sgt. Jonathan Ojeda, of the 527th Space Aggressors Squadron, adjusts an electromagnetic interference system to block GPS signals for an exercise at Schriever Space Force Base, Colo., in July. The 527th's mission is to prepare joint and coalition forces to fight in contested space environments by teaching and replicating the way adversaries seek to deny GPS to U.S. forces. The same jamming techniques can also be used to deny GPS to adversaries seeking to leverage precision navigation and timing signals against U.S. or allied forces.

Ethan Johnson/USSF

A South Korean F-35A Lightning II and a U.S. Air Force F-16 Fighting Falcon drop bombs during a live-fire training mission near the west coast of South Korea. The United States, South Korea, and Japan agreed in August to strengthen defense collaboration by increasing ballistic missile defense, sharing intelligence about North Korea, and holding annual joint multidomain exercises. The agreement was announced at the end of a trilateral meeting at Camp David, where President Joe Biden hosted South Korean President Yoon Suk Yeol and Japanese Prime Minister Kishida Fumio—the first-ever official summit of the three nations' leaders.

Senior Master Sgt. Kwan-Young Hong

Fueling the Future High-End Fight with the Joint Simulation Environment

The U.S. Air Force is all-in on the Joint Simulation Environment (JSE) to revolutionize the way warfighters train for the future fight.

JSE—and HII's Mission Technologies division, a contributor to the evolution of JSE—will be a central component in the Air Force's mission to increase force readiness, one of the top operational imperatives outlined by Secretary of the Air Force Frank Kendall.

Master Sgt. Ben Mota

Two F-35 Lightning II's bank after receiving fuel over the Midwest Sept. 19, 2019. The two aircraft were in route to the 158th Fighter Wing out of the Vermont Air National Guard Base, South Burlington, Vt., the first Air National Guard unit to receive the aircraft.

"JSE embraces an enterprise approach, meaning it is built using common, non-proprietary solutions for joint all-domain operational training challenges," said Mike Aldinger, vice president of the U.S. Air Force portfolio in Mission Technologies' Live, Virtual, Constructive (LVC) Solutions business group. "Enterprise approaches are central to HII's business strategy and an element of the Air Force Material Command's strategic plan. A primary advantage of the JSE solution is to provide a single, unified, high-fidelity environment that generates conditions like weather, weapons effects and electronic warfare (EW). The upshot is a common simulated battlespace where multiple simulators can interact using next-gen platforms like the F-35 and Next Generation Air Dominance."

Plans are in place for the JSE to be integrated into the Virtual Training and Testing Center (VTTC) at Nellis Air Force Base in Nevada by 2028. The initial instantiation will comprise eight F-35, four F-22 and eight virtual air threats. HII is supporting the evolution of this new technology at Nellis, working on-site to integrate systems and models, as well as performing software development to ensure that the simulated environment reflects real-world changes as they develop.

"JSE is a common environment that all of the training platforms query for results," Aldinger said. "An input (weapon engagement) is transmitted into this common environment that then provides the adjudication to figure out [whether] it was successful or not, and this is then reflected across battlespace participants."

Aldinger said that today's distributed training environments are comprised of disparate systems connected over wide area networks, which can result in segmented training environments. These segmented environments impact training interoperability, and at times result in the use of dated battlespace parameters (e.g., models, threats, EW) due to the lengthy process for updating the many training systems.

"JSE includes a set of systems and processes to allow the U.S. Air Force to rapidly update models, such as radar models [and] threat models," Aldinger said. "As our peer adversaries evolve, we can rapidly update this JSE architecture so that when we train with future platforms and current fifth-gen, they [accurately] represent what the near peer adversary we'll be up against."

John Bell, technical director of HII's LVC Solutions business group, said the concept is to provide a common architecture for the simulated environment that all the models can use.

"In particular, the Air Force and the Navy, who are developing JSE together, can build a common set of models such as the Next Generation Threat System (NGTS), which is providing the constructed simulation component of the JSE," Bell said. "We are, as of this year, beginning a new software development effort at the VTTC to develop new threat models and new weapons system models in NGTS, specifically using data that we are given from the National Air and Space Intel Center. The concept is: We get [new] data that's been collected about real-world threats, and within a period of months, we're able to implement that data. Depending on the nature of the data and the nature of the threat, it may be a matter of weeks before we can implement that data in the new threat system."

Aldinger and Bell both said JSE is a "Train as you Fight" solution, giving warfighters the high-fidelity, real-world experience they need with the full range of fifth-gen (and Next-Gen Air Dominance) platforms. An F-35 pilot, for instance, can turn on all their sensors in the JSE that they wouldn't be able to on a range without exposing capabilities to adversaries.

"This is a different approach to how they're training today in USAF Distributed Mission Operation," Aldinger said. "The training platforms [will] include the Operational Flight Program. What's in the air is being fully represented in the VTTC, so you're getting the most realistic training possible with this JSE approach."

That streamlined, high-fidelity and efficient solution to training wouldn't be possible without Mission Technologies' LVC expertise. HII's enterprise solutions and support are imperative in the Air Force's pursuit of JSE, a revolutionary force multiplier that's preparing today's warfighters for tomorrow's fight.

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HII.com

An artist rendering of a Lockheed Martin LMXT tanker refueling an F-35 Lightning II fighter.

KC-135 Recapitalization Requirements

By John A. Tirpak

DAYTON, Ohio

What is now officially known as the KC-135 Tanker Recapitalization Program—formerly called KC-Y or the "bridge tanker"—should clear the Pentagon's joint requirements process by the end of September, at which time the Air Force will issue a Request for Information (RFI) to industry for potential solutions, Scott Boyd, USAF's deputy program manager for mobility aircraft, told reporters July 31.

The Air Force will complete an acquisition strategy for the KC-135 recap tanker in the third quarter of fiscal 2024, based on an analysis of alternatives that will also launch this fall.

Boyd said the service is not yet ready to discuss the timing and exact number of aircraft in the program, which will depend on the success and timing of the Next Generation Air-refueling System, or NGAS, which will come after it.

The KC-135 recap effort should clear the Joint Capabilities Integration and Development System (JCIDS) process next month, after which the RFI will be published, Boyd said during Air Force Materiel Command's annual Life Cycle Industry Days conference.

"As soon as I get a systems requirement document," the program will get underway, Boyd said. It will be the first official requirements statement for the program and will translate the requirements "into the language of industry," he said. No additional time will be needed to write the RFI because the Air Force already has all the information that went into the requirements and no changes are expected, he pointed out. Responses to the RFI would be due next year.

Boyd said no particular airplane has been ruled in or out. Senior Air Force leaders have said they are leaning toward buying more KC-46s from Boeing, but Boyd said the Air Force still has time to do "market research."

Lockheed Martin is offering a tanker based on the Airbus A330 Multi-Role Tanker Transport, dubbed LMXT, and company officials have argued NGAS will likely not be ready by 2035, the Air Force's target date.

When NGAS enters the fleet will affect how many tankers the Air Force buys under the KC-135 recap program.

Air Force Secretary Frank Kendall says the service needs to get the NGAS as soon as possible. The original plan called for the future tanker—expected to be small, stealthy,

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and capable of accompanying combat aircraft in contested airspace—around 2040, but Kendall has said, 'no,' we need to go faster because it's that NGAS capability ... that scares China," Boyd said.

Air Force acquisition executive Andrew Hunter said in March he thinks the KC-135 recap will consist of around 75 airplanes, half of the prior estimate. Lockheed officials, doubt the faster NGAS timeline, anticipating a need for more than 75.

Lawmakers from states where Lockheed would assemble its LMXT offering have tried to mandate competition through legislation.

Despite all this, "I've honestly not felt pressure from Congress or from within the Air Force to do anything different than what we were already doing," Boyd said.

Boyd offered little indication about forthcoming requirements. He said the JCIDS document for the recapitalization program will not include anything "revolutionary" and could "potentially be satisfied" by continued buys of KC-46s.

Nonetheless, he also noted the document "is not going to declare that we cannot create a new logistics" tail for the airplane to be acquired—which LMXT would require, because there is no similar airplane in USAF's inventory.

"It may speak to sustainability of the weapon system in ways that tell you that I probably don't want to create a new [logistics and support train], but it's not going to be clear that you can't," Boyd said. "It's going to come down [to] ... the business-case analysis that we're doing, and the final market research that we do to decide what is the best value approach for the Air Force. And that'll be our recommendation."

There will also be lessons learned from the KC-46's troubled development—Boeing agreed to a fixed-price development and production program on the KC-46, but so far has borne more than $7 billion in overages on the project, noted Col. Leigh Ottati, chief of the KC-46 program office.

"Everyone needs to understand" the scope of a program like a new tanker, Ottati said. The KC-46, originally thought to be a simple conversion of a cargo jet into a tanker, turned out to be "more development than everyone thought," and Boyd said that lesson will be front of mind as the Air Force pursues the KC-135 recap and NGAS.

Industry and government need to both understand "the scope of what's being asked," Boyd indicated.

USAF Wants to Complete E-7 Fleet Faster

By Greg Hadley

Neither intense interest nor extra funding can move up the 2027 date when the Air Force takes possession of its first E-7 Wedgetail. But USAF acquisition officials said July 31 that actions taken now could help them acquire the 26-plane fleet more quickly.

"There's a lot of fixation on how fast we can produce the first one," Steven Wert, program executive officer for the digital directorate, said at the Life Cycle Industry Days conference. "[But] there are limitations to that. Boeing has to build a green aircraft and then they have to convert it to a configuration that can support the radar, and then the mission systems, and then you have to test and certify airworthiness and those things. There's only so fast you can do the first one."

How fast the Air Force can get the rest of its new E-7s, however, has been a topic of intense interest since USAF announced its decision to replace its aging E-3 airborne early warning and control aircraft with the Wedgetail.

Acquiring planes faster is still possible, said Thomas Ramsey, airborne warning and control system (AWACS) division chief.

"The rapid prototyping, the first two, we're going as fast as we can," he noted. "The way to fill the fleet faster is to do it through production. Advanced procurement of the 737, the radar, the reinforced section will let us jump-start each block buy by a year. So there's definitely benefit there. And then the other way to go faster is to buy more per year."

The Air Force fiscal 2024 budget request did not include that advanced procurement, but USAF did list a $600 million requirement on its unfunded priorities list for Congress. The funds would pay for long-lead items and help Northrop Grumman ramp up production capacity for the Wedgetail's Multi-Role Electronically Scanned Array (MESA) radar.

Boeing illustration

An artist rendering depicts the Boeing E-7 Airborne Early Warning & Control (AEW&C) aircraft, a combat-proven force multiplier that provides abilities to enable joint force integrations.

Congress seems split on the matter. The House version of the 2024 National Defense Authorization bill included half that amount, $300 million; the Senate version includes none.

Air Force Secretary Frank Kendall told lawmakers in 2022 "there are things that we could do ... to maybe get access to aircraft earlier one way or another." Just how was never clear.

Australia has six E-7s in operation, and the United Kingdom is in the process of buying three. At last year's Life Cycle Industry Days conference, Wert suggested that "we see

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tremendous opportunities to accelerate test and evaluation, given that we're buying a system very similar to the U.K. E-7. Much of the testing can actually be done on a U.K. E-7."

The U.S., British, and Australian air chiefs signed a "joint vision statement" in July, pledging to work together to develop and deploy the E-7 Wedgetail, and noting a collective desire to "accelerate E-7 capability delivery."

But that deal is mostly focused on long-term enhancements, not short-term deliveries, Wert said.

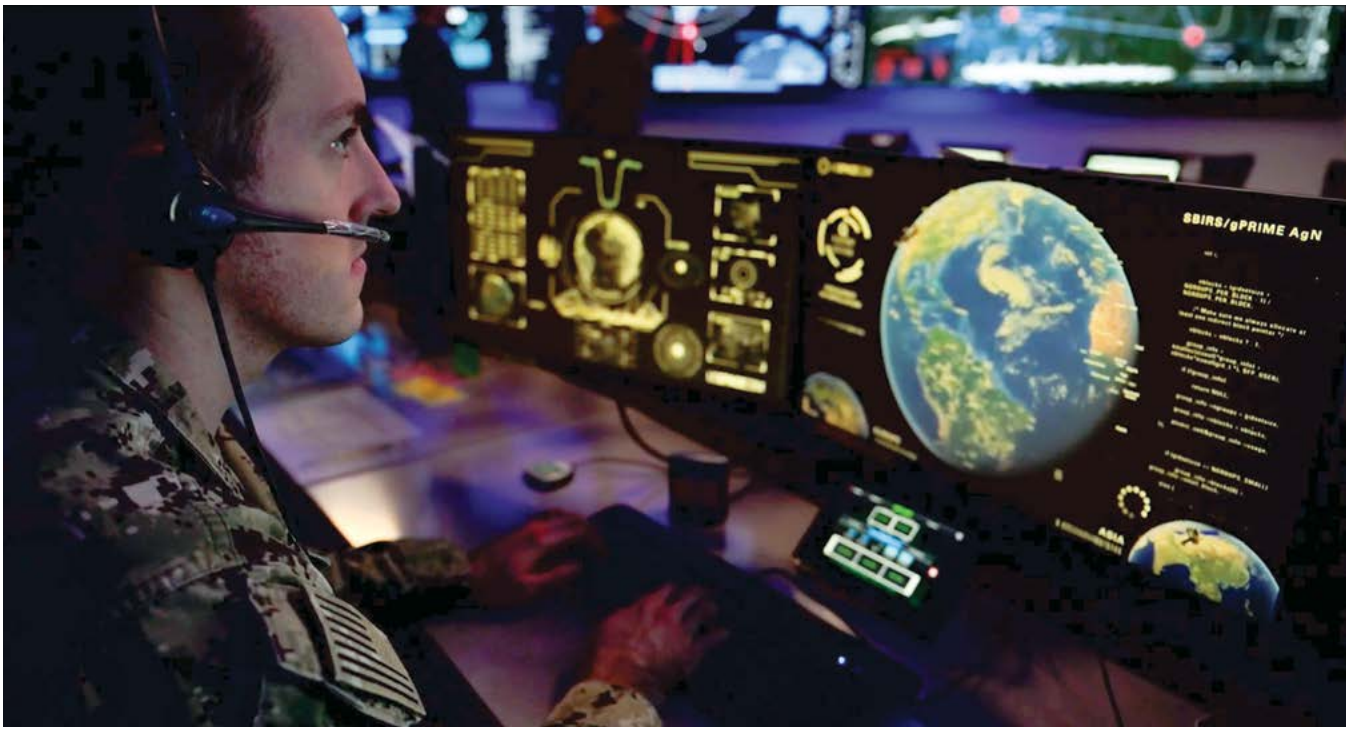
"The intent of that statement is looking to the future," he said. "We expect, for example, Australia to leverage the work we're doing on open mission systems on our rapid prototyping aircraft. So it's looking at the future of modernization across the three fleets and how we can work together to leverage each other's investments or even a coordinated program at some point."

The urgency of the need to replace the E-3 AWACS fleet is no secret. The age and deterioration of the U.S. AWACS fleet makes the old Boeing 707-based aircraft hard to maintain.

But while simply acquiring new E-7s into service as quickly as possible remains the top priority, Air Materiel Command is also keeping an eye on future enhancements. "I believe some of their future requirements will be things like even more improved radar, which some level of development funding Australia has already, ... but it would need to be further developed."

Ramsey said communications enhancements are also likely. "Every battle management platform will always need more advanced communications—bigger pipes and more bandwidth and more radios to get information on and off," he said.

SPACE



Christopher DeWitt/USSF

The U.S. Space Command Joint Operations Center, Peterson Space Force Base, Colo.

Biden Says Space Command Will Stay in Colorado

By Chris Gordon

President Joe Biden has selected Colorado as the permanent headquarters for U.S. Space Command, reversing a previous decision by his predecessor to move the combatant command to Alabama, the administration announced July 31.

"This decision is in the best interest of our national security and reflects the President's commitment to ensuring peak readiness in the space domain over the next decade," National Security Council spokesperson Adrienne Watson told Air & Space Forces Magazine.

Secretary of Defense Lloyd J. Austin III, Secretary of the Air Force Frank Kendall, and SPACECOM commander Army Gen. James Dickinson all supported Biden's decision, according to a statement by Pentagon Press Secretary Air Force Brig. Gen. Patrick S. Ryder.

The White House said the decision to keep SPACECOM at its provisional headquarters at Peterson Space Force Base in Colorado Springs rather than making a cross-country move

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to Alabama would safeguard the readiness of U.S. space operations and made the most practical sense.

"U.S. Space Command headquarters is expected to achieve full operational capability at Colorado Springs soon," Watson said. "Maintaining the headquarters at its current location ensures no risk of disruption to Space Command's mission and personnel, and avoids a transition that could impact readiness at a critical time given the challenges we continue to face."

The fight to host Space Command's headquarters has been politically charged from the start. In his final days in office, then-President Donald J. Trump announced SPACECOM would take up permanent residence at Redstone Arsenal, near Huntsville, Ala.

Critics cried foul and the Biden administration launched a review of the matter early in Biden's tenure. That left the question of where the command's permanent home would be in limbo. Colorado and Alabama congressional delegations postured for advantage, with Colorado lawmakers trying to connect the debate to issues like abortion access.

Rep. Mike Rogers (R-Ala.), Chairman of the House Armed Services Committee, accused the Biden administration in a statement of "political meddling in our national security." He promised to investigate whether the Biden administration "intentionally misled" Congress on its decision.

"This fight is far from over," Rogers said.

Colorado's Senate delegation, Democrats John Hickenlooper and Michael Bennet, praised the decision, saying it was grounded in the best interest of national security.

"Today's decision restores integrity to the Pentagon's basing process and sends a strong message that national security and the readiness of our Armed Forces drive our military decisions," Bennet said in a statement.

The Government Accountability Office faulted the Trump administration in a 2022 review, saying the decision to move USSPACECOM to Alabama had "significant shortfalls in its transparency and credibility." But GAO did not directly challenge the outcome.

In reversing that decision, Ryder said the Biden administration and the Pentagon "worked diligently to ensure the basing decision resulted from an objective and deliberate process informed by data and analysis, in compliance with federal law and DOD policy" in its final selection.

U.S. Space Command was established in the fall of 2019 as a geographic combatant command responsible for military operations 100 kilometers above sea level and beyond. In December of that year, the Space Force was established as an independent military branch.

The USSF's service component to SPACECOM, Space Operations Command, is also located at Peterson Space Force Base. The state is home to much of America's existing military space infrastructure.

Space Force Lt. Gen. Stephen N. Whiting, nominated to lead SPACECOM, is the current head of Space Operations Command.

Ryder said that keeping SPACECOM in Colorado will allow it "to most effectively plan, execute, and integrate military spacepower into multi-domain global operations in order to deter aggression and defend national interests."

Space Force Gets Its First Targeting Squadron. Here's What It Will Do

By David Roza

A new unit activated recently at Peterson Space Force Base, Colo., is the branch's first-ever targeting squadron, designed to scope out adversary space capabilities and present options to the joint force on how to neutralize them.

"Today is a monumental time in the history of our service," Lt. Col. Travis Anderson, commander of the 75th Intelligence, Surveillance, and Reconnaissance Squadron (ISRS), said in a press release about its Aug. 11 activation. "The idea of this unit began four years ago on paper and has probably been in the minds of several U.S. Air Force intelligence officers even longer."

Space systems are made up of three elements: the satellite, the ground station that commands and controls it, and the signal that connects the two, retired Space Force Col. Charles Galbreath, senior resident fellow for space studies at the Mitchell Institute, told Air & Space Forces Magazine.

"My interpretation of space targeting is understanding all of those elements for an adversary system and then being able to make recommendations on what would be the best way to counteract that threat system," he said. "In some cases, that may mean sending a jamming signal from our Counter Communications System, or it could mean putting a JDAM on a building somewhere to destroy the command and control or the end user."

The 75th ISRS is part of Space Delta 7, the operational intelligence, surveillance, and reconnaissance component of the Space Force. While its sister squadrons also perform ISR and likely have targeting elements, the 75th consolidates targeting expertise and acts as a focal point for stakeholders who need that information, Galbreath said.

Before the Space Force launched in December 2019, Air Force intelligence officers often served just a single assignment in space, which precluded a robust corps of experts in the field, he said. The 75th is likely one of several new stand-ups to occur in the near future as the Space Force develops ranks of specialized experts.

"Having a squadron like this creates an opportunity for true depths of understanding of the threat environment," he said.

Assessing space systems can be a difficult task. For example, dual-use satellites may present a challenge for intelligence officers trying to assess threats—China may claim that a robotic arm attached to a satellite is intended for space debris removal, but it could also be used to grab and disrupt other satellites.

Air Force space operators-turned commercial space executives expressed a similar concern during a panel discussion hosted by the Hudson Institute in July.

"Commercial operators become targets when they support the DOD," Even Rogers, former Air Force space operator and CEO of the space technology company True Anomaly, said at the discussion. "In fact, I suspect that there are some incentives that would cause commercial operators to be targeted first as a strategic off-ramp in a broader conflict, because it

is a gray zone, there is uncertainty about whether the United States intends to defend and protect … commercial providers."

Other challenges include locating a satellite and its ground station and determining what information its crew needs to operate and where its orders come from. Working together, the 75th ISRS and other intelligence organizations can fuse "a consolidated picture of what makes an adversary threat system tick, and therefore determine how can we best defeat it?" Galbreath said.

As adversary space capabilities become more sophisticated, so too must U.S. counterspace capabilities. Future operators may need to use cyber or electromagnetic spectrum weapons to target enemy satellites, especially when ground stations are tucked away behind an anti-access/area-denial environment such as mainland China. The problem is that the U.S. does not have many counterspace weapons at its disposal, especially compared to its main rival.

"China has already fielded an alarming array of operational counterspace weaponry" including ground-launched kinetic weapons and lasers, cyber capabilities, and electronic warfare weapons, Galbreath wrote in a June paper on counterspace capabilities. The Chinese People's Liberation Army is also developing space weapons that could attack with robotic arms, electronic warfare, or lasers.

The U.S. defense against such weapons must include establishing international norms of behavior in space, resilient space system architecture that can withstand attack, and exceptional space domain awareness, Galbreath said. But it must also include strong counterspace capabilities.

"The United States has largely shunned the thought of fielding space weapons since the end of the Cold War," the retired colonel wrote. "However, recognizing space as a warfighting domain means any serious effort to achieve space security must include space weapons."

Airman 1st Class Cody Friend/USSF

The 75th ISR Squadron patch includes a reaper inside a red triangle, signifying the squadron's targeting mission; the Polaris Star, for its constant presence and guiding light.

At least one such system is on the way. In April, Chief of Space Operations Gen. B. Chance Saltzman promised Congress a "substantial on-orbit capability … in full spectrum operations" by 2026, though he did not provide many details on what that capability might look like. Galbreath argued that the U.S. needs an architecture of multiple new counterspace systems to protect its space enterprise.

In the meantime, the 75th ISRS will analyze existing threats and how to counter them—the latest addition to the "mighty watchful eye" lauded in the Space Force official song.

If You Did Space Ops, You Could Become a 'Legacy Guardian'

By Greg Hadley

Before the Space Force was founded in December 2019, Airmen ruled the heavens, at least as far as most military space activities were concerned. For decades tens and perhaps hundreds of thousands of Airmen controlled and acquired satellites, managed communications and intelligence, and performed other space missions. Air Force Space Command claimed more than 26,000 personnel at one point.

A bipartisan group of lawmakers are close to giving some of those Airmen a chance to claim at least an honorary part of the newest military service.

The "Space Force Legacy Guardian Recognition Act" is included in the House version of the National Defense Authorization bill, but not the Senate version. The measure would allow the Secretary of the Air Force to establish a process for veteran space professionals to be designated as honorary members of the Space Force. They would be called "Legacy Guardians."

Legacy Guardians would be eligible for "a certificate, approved device, or other insignia of such designation," the bill states. They would not, however, be eligible for any additional benefits.

The the measure would apply to anyone "whom the Secretary of the Air Force determines served in support of space operations as a member of the Air Force." Space operators from the other services need not apply. Lawmakers have also introduced the matter as stand-alone legislation, but its best hope is that House and Senate conferees include it in the final compromise version of the NDAA now under construction.

A staffer for Rep. Don Bacon, the retired Air Force brigadier general who introduced the legislation, told Air & Space Forces Magazine that lawmakers won't distinguish among specialties, however. Space acquisition, intelligence, and other career fields could all qualify potentially—that decision would be left to the Department of the Air Force.

Bacon's bill is co-sponsored by four House members, all from the Space Force caucus, including Reps. Salud Carbajal (D-Calif.), Brian Babin (R-Texas), Doug Lamborn (R-Colo.), and Ted Lieu (D-Calif.).

Bacon was not a space operator, but he and the veterans on his staff felt strongly about recognizing the legacy of space operators who paved the way for the Space Force.

"Veterans of a service are important for a community as well," the staffer said. "They're representative of that service."

The staffer noted that as things currently stand, it will take years, if not decades, for the Space Force to develop a veteran community.

Staff Sgt. J.T. Armstrong/USSF

Chief of Space Operations Gen. John "Jay" Raymond established Space Operations Command (SpOC), the U.S. Space Force's first of three Field Commands, during a ceremony at Peterson Air Force Base, Colo., in October 2020. Those who supported space operations as a member of the Air Force, may now be Legacy Guardians.

Since first introducing the legislation in the NDAA, Bacon's office has received positive feedback from veteran space operators and current Guardians alike, the staffer claimed.

"This designation would not only bring together our space operations veterans with those who currently serve in the Space Force," Lieu said in a statement. "It would appropriately honor the dedicated veterans and culture of service of the Air Force Space Command."

"I'm proud to stand alongside my colleagues in acknowledging the contributions of our nation's Air Force Space Operators who laid the foundation upon which our current Space Force is built," Babin said in a statement. "Their expertise and devotion to a country pushed us upward and outward, establishing and ensuring America's military dominance in space."

A Department of the Air Force spokeswoman told Air & Space Forces Magazine that department leadership was not involved in crafting the legislation and is not tracking if or how many retired space operators have requested honorary or retroactive status in the Space Force.

The Space Force Association endorsed the measure in an Aug. 9 release.

PERSONNEL

New Rules for Speeding Up Mental Health Care Referrals

By Greg Hadley

Airman and Guardians seeking mental health care have access to a new referral system intended to accelerate access, the Department of the Air Force announced Aug. 7.

Under the new system, made possible by the Brandon Act, signed into law last December, service members can request a mental health referral for any reason by notifying their commander or an enlisted supervisor at the E-6 paygrade or higher. Commanders or supervisors must immediately contact the mental health clinic and request an appointment for the member by the following day, according to an Air Force release. Appointments can be in-person, online, or over the phone.

Details of the Brandon Act "Commander/Supervisor Facilitated Referral Program" first appeared in a memo posted to the unofficial Air Force amn/nco/snco Facebook page. An Air Force spokeswoman confirmed the memo's veracity to Air & Space Forces Magazine.

According to the July 28 memo signed by Secretary Frank Kendall, the program will be implemented in phases. Phase 1 applies to all Active-duty service members, including Guard and Reserve members on orders of more than 30 days. Phase 2 applies to Guardsmen and Reservists on orders of 30 days or less.

Phase 1 is already implemented, the Air Force spokeswoman told Air & Space Forces Magazine. She said more guidance is needed from the Office of the Secretary of Defense before the Phase II can launch.

The memo states all requests for mental health evaluation referrals must be honored, regardless of impact on mission or location, and service members do not have to tell their commander or supervisor why they are requesting the referral, though the commander can speak with the member when they make their request.

There is no limit on the number of referrals a service member can ask for, and the results of the evaluation will not be disclosed to a supervisor unless there is a "safety, readiness, or duty concern," the memo said.

The new program does not require Airmen and Guardians to go to their commanders to get mental health help—they are free to seek independent self-referrals on their own. And it doesn't change commanders' and supervisors' ability to direct subordinates for mandatory evaluations.

All referrals under the Brandon Act must be fulfilled by a "privileged [mental health] professional," according to the memo, not a chaplain or a military and family life counselor.

The Brandon Act is named after Navy Aviation Electrician's Mate 3rd Class Brandon Caserta, who died by suicide in 2018. His parents were driving forces in crafting and passing the legislation through Congress, and Undersecretary of Defense for Personnel and Readiness Gilbert Cisneros Jr. signed a policy in May directing the services to implement the law.

"I spoke with the Caserta family and listened to their experience," Kendall said in a statement. "They bravely shared the story of their son in hopes to help save others. We must honor their spirit and remind every supervisor and leader in the Air Force and Space Force of their duty and legal obligation to help fellow teammates who ask for assistance."

"As leaders and supervisors learn about the Brandon Act, we hope it lifts the stigma that some have when asking for help," said Patrick Caserta, father of Petty Officer Caserta. "Asking for help is an act of courage and mature judgment—in our call with Secretary Kendall, we believe we have the right leaders to help lead the change and improve our military and save lives. We want to thank Secretary Kendall for embracing and implementing the Brandon Act. We appreciate the hard work that he has and continues to do for our Airmen and Guardians."

The Navy and Marine Corps announced they were implementing the Brandon Act in July. The Army has yet to announce that it has fully implemented a program.

Suicide prevention and mental health continue to be a pressing concern for the Air Force and Space Force, along with the rest of the military. Defense Secretary Lloyd J. Austin III implemented recommendations from an independent review committee this March, and the Department of the Air Force has a cross-functional team responsible to identify barriers to mental health and resilience for Airmen and Guardians.

TECHNOLOGY

Department of the Air Force Gets a New CIO

By Greg Hadley

The Department of the Air Force has a new Chief Information Officer, responsible for leading the department's wide-ranging information technology efforts.

Venice Goodwine started the CIO job in August, succeeding Lauren Knausenberger, who departed in June after more than two years in the position. Winston Beauchamp, deputy CIO, served as the acting CIO in the interim.

As CIO, Goodwine will oversee a portfolio worth $17 billion with more than 20,000 cyber operations and support personnel. And she'll be tasked with spearheading everything from improvements to the Department's much-maligned IT networks to connectivity for the ambitious DAF Battle Network plan to connect sensors and shooters around the globe.

JoAnne Sorrentino/USSF

Venice Goodwine, the new DAF CIO.

Prior to taking the CIO job, Goodwine served as director of enterprise information technology under Knausenberger. Air Force IT has been undergoing a transition in recent years, with plans to outsource basic IT tasks across the entire enterprise to a contractor—dubbed "Enterprise IT as a Service" or EITaaS.

Service officials have claimed EITaaS will save money and provide faster connectivity, while freeing up cyber and information-focused Airmen from day-to-day IT tasks to focus on warfighting missions.

VERBATIM

Comfort Zone

Staff Sgt. Mikaley Kline

"Change is uncomfortable. We're all comfortable not changing. But ... I'd rather be uncomfortable changing today than lose tomorrow. You must get comfortable being uncomfortable."

—Air Force Chief of Staff and incoming Chairman of the Joint Chiefs of Staff Gen. Charles Q. Brown Jr., on the need for acceptance of nontraditional approaches to organizing, training and equipping in an Air Force Life Cycle Industry Days speech, July 31.

China Ministry of Defense

No Big Deal

"The first time they do something it's 'Oh, my God! Oh, my God!' But after they've done it five times, it's 'Oh, yeah, it's routine, no big deal.' But the trends should be a big deal."

—Maj. Kenneth W. Allen, retired U.S. Air Force officer who researches the Chinese air force and its activities around Taiwan [The New York Times, Aug. 1].

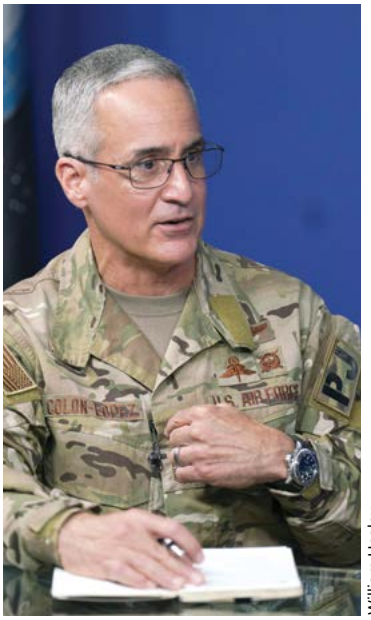
Rebuilding Cold War Base Resiliency

Courtesy Photo

"Before the Cold War ended, we had a lot of air bases [in Europe]. .... Back then, if I flew a fighter into any one of those bases, when I landed, no matter what country it was, they could give you gas, they could change your tires ... and some could even load up weapons on your aircraft. Well, we lost that after the Cold War. That atrophied over the last 30 years. So we are working to get that back. ... We're looking at ... 20 to 25 [airfields] and of course I'm not going to tell you where they're at ...but they're in strategic locations around Europe. And then we're going to put equipment in there. ... We're going to work with the nations and their maintenance so that we can get interoperable on different kinds of aircraft, like we were able to do 34 years ago."

—Gen. James B. Hecker, commander, U.S. Air Forces Europe and Commander, U.S. Air Forces Africa, on Agile Component Employment plans for the European theater [Defense Writers Group, Aug. 18].

Accentuate the Positive



William Healey

"Whether it's [claiming] that our Soldiers, Sailors, Airmen, Marines and Guardians are racist, that our junior enlisted members are going hungry because they're not being compensated enough, ... that we're woke ... that our focus is on everything else other than warfighting. All of those damaging narratives are impacting the way that people think. ... All [many people] hear is that negative narrative. I think that as a nation, we can help each other out and start talking about the value of service."

—Senior Enlisted Advisor to the Chairman Ramon Colon-Lopez at an AFA Warfighters in Action Session speaking about the value of service to one's country and finding ways to remind the public, as well as young Americans.

Decisive Deterrence

"I, like everybody else, don't think this war is inevitable ... But, you know, the deterrent factor is born from readiness —as is the decisive victory."

—Gen. Michael A. Minihan on Air Mobility Command training for a possible conflict with China [Washington Post, July 29].

Lifesaver

Senior Airman Haley Stevens

"An MQ-9 Reaper does not have a mom or a dad. It doesn't go to school, play video games, or prefer Domino's to Pizza Hut. It's a drone. ... If a state loses a drone, there is no great public outcry to rescue a lost brother or sister. So, drones are both easier to deploy and easier to destroy."

—Zachary Kallenborn, a drone expert, tells Popular Mechanics in response to Russia's harassment of U.S. drones in July over Syria. [Jul. 31].

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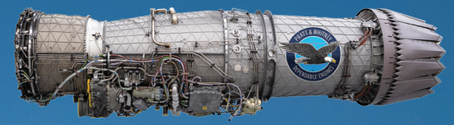

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Qiang Teng/China Ministry of Defense

China has rapidly modernized its air force, with iterative generations of fighter aircraft. A YY-20 tanker refueled two J-10 fighter jets in July. The J-10 is an indigenous design, part of China's drive to be self sufficient as its own high-end weapons supplier.

The China Threat

Understanding the strategy driving the Chinese Communist Party and its People's Liberation Army.

By Daniel C. Rice

When Secretary of the Air Force Frank Kendall said in 2021 that his top concerns were "China, China, and China," it wasn't exactly a surprise. Kendall came back into government specifically because of his growing concern over competition with China, which he saw in terms of the Cold War competition between the U.S. and the Soviet Union. The 2022 U.S. National Defense Strategy (NDS) pinpointed China as the nation's pacing threat. Indeed, in May of 2022, U.S. Secretary of State Anthony Blinken described China as "the only country with both the intent to reshape the international order, and, increasingly, the economic, diplomatic, military, and technological power to do it."

Beijing's multifaceted approach to changing the global world order is increasingly underpinned by military might. But the People's Liberation Army (PLA) did not just rise to near-peer status overnight. Unless you are a China analyst or policy wonk—spending your waking hours digging through the annual DOD China Military Power Report—you might not know very much at all about the People's Liberation Army, the People's Liberation Army Air Force, and the other components of China's military.

Beijing's multifaceted approach to changing the global political order is increasingly underpinned by military might.

The PLA began a period of accelerated growth around 2015, with the intended goal to reach near-parity with the U.S. military. From fielding the world's largest surface fleet to developing fifth-generation fighter aircraft and hypersonic missiles, the PLA rapidly transformed itself. An army that used human wave tactics to "defeat" Vietnam in 1979 now looks radically different in 2023. China's leader, Chinese Communist Party (CCP) General Secretary Xi Jinping, has repeatedly set 2049 as the target by which he intends China to surpass the United States in comprehensive power.

How did we get to this point today? And what will the PLA look like in the future?

MECHANIZATION OF THE PLA

Many PLA analysts point to the 1990-91 Gulf War as the moment when Chinese Communist Party leadership woke up to understand China's critical lack of

military power. China and the U.S. had suffered a tremendous falling out over the 1989 Tiananmen Square massacre and Sino-U.S. relations were still extremely tense as Desert Storm kicked off. The U.S.-led intervention to expel Iraq from Kuwait raised concern in China—about its place in a world where the U.S. was now the sole superpower. As American F-117s crossed the border into Iraq and the U.S. military carried out a joint campaign enabled by precision-guided munitions, crushing the Iraqi Republican Army in short order, Chinese Premier Deng Xiaoping and the rest of the CCP leadership realized that the PLA was effectively defenseless against such weapons. China would need to make significant changes to ensure it could defeat a Desert Storm-style attack on Beijing.

Broadly speaking, the PLA has been pursuing a modernization effort in what is known as the three "izations:" mechanization, informationization, and intelligentization. Each of these buzzwords has been added over time. The three represent both successive and complementary phases of overall modernization:

- Mechanization refers to augmenting human capabilities with hardware and platforms;
- Informationization means transitioning hardware from analog systems to digital systems and developing the network and connectivity between systems to capitalize on the information battlespace; and
- Intelligentization refers to integrating artificial intelligence and "smart" systems into the military to primarily speed up the PLA's combat decision-making.

These modernization ambitions have been augmented through time with specific military reforms to accelerate the PLA's modernization goals.

The PLA is fundamentally a party army. The top leadership of the CCP and the CCP's Central Military Commission (CMC) are responsible for guiding the development of the PLA. Reforms tend to start at the top of this hierarchy, often by policies or strategies put forth by the General Secretary of the CCP, who is normally also the Chairman of the CMC. In a December 2004 speech, then-CCP General Secretary Hu Jintao put forth what became known as the PLA's "New Historic Missions." Hu emphasized leveraging technology to accelerate the modernization of the military to achieve mechanization and informationization, to accelerate the training and organizational structure of the military, to step up the establishment of a joint command combat system, and to prepare the PLA for safeguarding Chinese national interests at home and abroad. A radical departure from the past protect-the-homeland philosophy, the New Historic Missions paved the way for many of the PLA's developments that we see today, and the impetus to begin developing overseas capabilities.

During the period 2005 to 2015, military modernization under Hu's guiding principles saw the PLA make significant progress on mechanization. The CMC downsized the PLA's ground forces and expanded the roles of the PLA Navy (PLAN) and Air Force (PLAAF), began transitioning the PLA Second Artillery Force into the PLA Rocket Force (PLARF), a separate service branch.

Technologically, China pursued the tried-and-true strategy of duplicating and iterating military technologies from other countries. However, unlike the past, when China relied on acquiring capabilities from the Soviet Union, France, Israel and even the United States, China began instead to emphasize buying platforms, reverse engineering them, and building its own domestic production capability and capacity. The aim was to reduce Chinese reliance on foreign technology and to gain near-complete control of the production chain for numerous military platforms.

Among the standout results are China's 3.5- and fourth-generation combat aircraft. Justin Bronk of the Royal Uniformed Studies Institute described this as China "rely[ing] on the Su-27/30 'Flanker' family of combat aircraft and their various derivatives," to produce domestically China's J-11 and J-16 and their variants. According to the 2023 edition of the International Institute for Strategic Studies' The Military Balance, China possesses 535 airframes in this category, roughly half of the PLAAF's fourth-generation fighter and multirole aircraft inventory. Both combat aircraft were reverse-engineered and iterated from Russian designs and domestically produced.

The other half of the fourth-generation fleet came in the form of the indigenously designed and produced J-10. Like the J-11 and J-16, the PLAAF's primary medium-lift transport aircraft the Y-8, a derivative of the Soviet An-12, began domestic production in China. Chinese built Y-8s paved the way for a variety of different platforms iterated from this airframe, including aircraft intended to perform electronic warfare, airborne early warning and control, tanker, and ISR missions.

Cui Baoliang/China Ministry of Defense

The J-16 fighter is an indigenously produced derivative Russia's Su-27/30 Flanker family. China has some 535 J-16s and J-11s in this class.

Wang Weidong/People's Liberation Army

China's J-20 is its first fifth-generation aircraft, a stealth fighter developed in China. It is the testbed for future Chinese advances and is envisioned as the core of the Peoples Liberation Army Air Forces fleet. China has built 200 of the jets so far.

The PLAN and PLARF also modernized. In 2005, the PLAN began producing Type 054A (Jiangkai II) guided-missile frigates. Outfitted with 32-cell vertical launch systems (VLS) and anti-ship and anti-air capabilities, these were for a short while the bruisers of the PLAN's fleets. In 2012, however, the PLAN started producing 64-cell VLS Type 052D (Luyang III) destroyers, and two years later, 112-cell VLS Type 055 (Renai) destroyers. Both greatly surpassed the Type 054A in firepower.

Meanwhile, another capability was taking shape: aircraft carriers. China bought the partially completed and dilapidated hull of the Soviet Varyag ski-jump-style Kuznetsov-class aircraft carrier in 1998, along with blueprints for the massive vessel. Under the guise of converting the hull to a hotel and casino, the Varyag entered PLAN drydocks in 2005, and later commissioned as the Type 001 Liaoning in 2012. The Liaoning became the testbed for PLAN shipborne tactics, techniques, and procedures, as well as the proving ground for Chinese shipbuilding capabilities. China has since built two more carriers, the ski-jump-style Type 002 Shandong and the Type 003 Fujian aircraft carrier, with an electro-magnetic launch system.

During the "New Historic Missions" era, PLA missile technology also drastically improved. Through a combination of indigenous research and development and overseas acquisitions, the PLA began to build and field longer-range air-to-air, surface-to-air, shore-to-ship, and land-attack missiles. For the PLARF, modernization included expanding the service's intermediate- and medium-range ballistic missiles and diversifying the kinds of targets they could attack.

Still, the PLA lagged in other areas, particularly in creating a joint command combat system and the "informationization" of PLA forces. During the 18th National Party Congress, Hu's last public hurrah as the CCP's General Secretary, he pushed for his successor to further modernize the PLA and to "attach great importance to maritime, space, and cyberspace security, and make active plans for the use of military forces in peacetime, expand, as well as intensify military preparedness, and enhance the capability to accomplish a wide range of military tasks." Strengthening China's hand in space and cyberspace aimed to achieve what Hu called "winning local wars under informatized conditions."

JOINT OPERATIONS AND INFORMATIONIZATION

When Xi rose to power in 2012, he launched a series of purges of Chinese civil and military leadership and military reforms. The purges sought to eliminate competition for the CCP's top spot and to consolidate CCP control of the military. Xi's reforms focused on modernizing the organizational structure of the PLA to build a "world-class fighting force" capable of "fighting and winning local wars."

Xi radically changed the way that the PLA operates. He reorganized the PLA's command structure from service-centric, mostly ground-based military regions to joint theater commands (TC). From 2014 to 2016, the seven military regions were consolidated into five Theater Commands, listed in rank order of importance by China's Ministry of National Defense: Eastern, Southern, Western, Northern, and Central. Each TC would be the joint operations command with TC subordinate service headquarters for relevant branches of the PLA. The Western and Central TCs did not have individual PLAN headquarters, as they lacked coastlines. In the Central TC, service-level headquarters, remained in a train and equip role. This overall structure, like the U.S. geographic combatant command structure, has enabled the PLA to better integrate joint operations into their exercises and, in wartime, would enable power projection from the Chinese homeland to the East and South China Seas. To support joint operations and strategic capabilities, several new services were formed. In 2015, the PLA formed the Strategic Support Force (PLASSF), responsible for space, cyber, and electromagnetic capabilities. In 2016, it added the PLA Rocket Force and PLA Joint Logistics Support Force (PLAJLSF). The PLARF was a rebranding and consolidation of strategic ballistic and nuclear missile force into a full service, while the quasi-service PLAJLSF was formed to consolidate strategic macro-management of logistics for the five TCs.

The PLASSF, PLAJLSF, and the nuclear component of the PLARF are all directly subordinate to the Central Military Commission, giving the CCP direct control over these capabilities. In practice, the PLARF operates as a separate service with an administrative headquarters and forces subordinate to the theater commands while the PLASSF and the PLAJLSF contribute their capabilities to individual TCs on an as-needed basis, somewhat like U.S. strategic level combatant commands. However, unlike the U.S. non-geographic unified commands, the PLARF, PLASSF, and PLAJLSF's military assets are held by the individual forces.

Underpinning the overall PLA power-projection capabilities has been a diversification and increase in munitions capabilities. The PLA fields a wide variety of both conventional and ballistic missiles, with the bulk of conventional missiles being roughly analogous to U.S. and Western missile systems with some notable exceptions.

China's PLARF's ballistic missile capabilities include novel missile systems unique in technology and enabled by China's geopolitical circumstances. The bulk of China's ballistic missile systems come from the Dong Feng (DF) series of missiles. Under the PLARF, the DF series encompasses short- and long-range ballistic missiles, as well as land-attack and anti-ship variants. According to the 2022 DOD China Military Power Report (CMPR), DFs are labeled numerically: Sub-10 denotes intercontinental ballistic missiles with ranges exceeding 13,000 km; 10 to 19 are short- to medium-range ballistic missiles with ranges under 2,500 km; 20 to 29 denotes medium- and intermediate-range ballistic missiles with ranges under 8,000 km. The DF 31 is China's new road-mobile ICBM, capable of reaching 11,000+ km, and the DF-41 is capable of ranges from 12,000 to 15,000 km.

Notably, the conventional DF-21 and DF-26, as well as the hypersonic DF-17, come in both land-attack and anti-ship variants. Many of the medium- and longer-range DF missiles can carry both conventional and nuclear warheads. According to the 2022 CMPR, the PLARF is expanding its DF-21 and DF-26 missile inventories, with an estimated 500 launchers and 750+ missiles in its medium- and intermediate-range ballistic missile inventories. According to a Blue Path Labs report on the PLARF published through the U.S. Air Force's China Aerospace Studies Institute, China's defense industrial base is poised to continue building these capabilities while also expanding the ICBM inventory for strategic deterrence and the hypersonic glide vehicle inventory for tactical advantage.

China's naval systems are also advancing. The PLAN surface fleet's VLS systems on frigates and destroyers provides the PLAN with a variety of loadout options, including anti-air, land-attack, and anti-ship capabilities. The YJ-21 hypersonic anti-ship ballistic missile, the YJ-18 cruise missile, and the HHQ-9B long-range surface to air missile are among the most advanced capabilities. The YJ-21 is one of the newest missiles in the PLA inventory with ground, air, and sea-launched variants. According to Zachary Williams of The Diplomat, the YJ-21 has a range of roughly 1,500 km for both the ground-and ship-launched variants, and an unknown range in the YJ-21E air-launched variant. YJ-21 boasts a terminal velocity of Mach 10.

According to the Center for International and Strategic Studies, the YJ-18 has a range of up to 540 km, a cruising speed of Mach .8 and with terminal velocity of Mach 2.5-3.0. The HHQ-9B is the VLS-capable ship-launched variant of the HQ-9 long-range surface-to-air missile system. With an effective range of 250 km, the HHQ-9B is the rough equivalent of the Russian S-300 SAM system. These three weapons systems are just a snapshot of some of the most capable in the PLAN. For its surface fleet, the primary force of the PLAN, China now fields the most surface combatants in the world. The PLAN has three fleets, the Northern, Eastern and Southern Sea Fleets, within which the Type 055 and Type 052D destroyers are the largest and most heavily armed warships followed by the Type 054A guided-missile frigate. The PLAN fields eight Type 055, 25 Type 052D, and 30 Type 054A warships spread across the three theater commands, and has a total of 340 surface combatants. Included in this number are the three aircraft carriers, outfitted with J-15 fourth generation multi-role aircraft. Beyond the surface fleet, the PLAN also fields the YJ-12B and YJ-62 ground-launched anti-ship cruise missiles within its Coastal Defense Force, providing land-based coverage of sea targets around China's periphery.

In the air, the PLAAF has also undergone several technological developments under Xi. China is now able to fully produce indigenous aircraft. From 2005 onward, the third-/fourth-generation J-10 became the test case for China's indigenous aircraft production capabilities. Only engine technology remains a severe issue for China's aerospace sector, with the PLA forced to rely on imported Russian engines for its aircraft. The J-10 is the third primary third-/fourth-generation aircraft in the PLAAF inventory, numbering over 602 airframes, and powered by Russian engines. Combined with the J-11B, the mostly indigenously built variant of the J-11, and the J-16, China's third-/fourth-generation fighter fleet numbers roughly 1,100 airframes. Notably, multiple sources say the newest J-10C, and the J-11B, J-15, and J-16 have all been observed flying with China's first successful indigenous engine, the WS-10 series. The successful integration of the WS-10A, B and C variants into the J-10B, J-11B, J-15, J-16, and J-20 now means that China is capable of fully building its own aircraft without relying on external supply. China has leveraged this in its production of its first fifth-generation fighter, the J-20.

The J-20 represents the future vision of the PLAAF. J-20's fully indigenous production, from design to manufacturing, and incorporation of first- and second-generation stealth capabilities makes it both the testbed for these capabilities as well as the envisioned core of an evolving PLAAF combat fleet. While the J-20's stealth capabilities are still being iterated and improved upon, according to Justin Bronk, "The threat of J-20s with long-range PL-15 missiles operating within the background chaos would be a major headache for U.S. planners attempting to protect critical tanker and ISR orbits within useful range of the area of operations." China has built over 200 J-20s after four production runs according to PLAAF analyst Andreas Rupprecht. In the future, the PLA will likely adopt lessons learned from the J-20 program to accelerate the buildout of its J-30 and J-35, the envisioned next-gen Chinese PLAAF and PLAN naval aviation fighter.

INFORMATIONIZATION THROUGH AIR AND SPACE

Through modernization efforts, the PLA has managed to effectively build capabilities that support a home-defense mission, and that are geared toward a potential conflict over Taiwan. However, Taiwan is not the only problem set that the PLA is responsible for, the PLA is also tasked with protecting Chinese overseas interests. This mission set requires the capability to project power out from Chinese shores into and beyond the first and second island chains. For the PLAN this means shifting from a green-water navy, with an operating area on the periphery of mainland China, to a blue-water navy with the capability of operating for extended durations abroad. The PLAN's Type 903A resupply ships and aircraft carriers are getting after this problem. For the PLAAF, this means further developing its aerial refueling capabilities and long-range strike. Production of the YY-20 aerial refueling variant of the Y-20 heavy-lift transport, the newer H-6K

strategic bombers, and the future H-20 fifth-generation strategic bomber are intended to fill these capabilities. Despite an aggressive push toward modernizing different military technology, or so-called "mechanization," the PLA still lags in the necessary connectivity and command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) capabilities needed to really integrate all its power projection capabilities. According to the 2023 RAND "Gaining Victory in Systems Warfare" report, "The PLA sees itself as the weaker side in the military balance [with the U.S.], largely because it has made only limited progress in informatization and system-of-systems-based operations." Put simply, while the PLA has the stuff, it does not yet have the supporting systems to make it all work together. Herein lies the PLA's future direction and the importance of aerospace, building out the connective tissue to enable its power projection capabilities.

Back in 2013, prior to the standup of China's PLASSF, its designated space domain force, the PLA Academy of Military Science published "Lectures on the Science of Space Operations," in which the authors state: "In future informationized wars, space operations will permeate each level—tactical, campaign, and strategic—of military action carried out by joint operations units. It can be foreseen that in the near future, the forms, scopes, and effects of actions in space operations will undergo major changes, and space strengths will become important strategic strengths for defending national security and winning future wars." The establishment of the PLASSF in 2015 provided an avenue for the PLA to enhance and build its C4ISR capabilities necessary for its joint operations. The PLASSF is made up of two departments: The Space Systems Department—which controls assets on orbit, satellite launch, and training facilities; and the Network Systems Department, which is primarily responsible for cyber and electronic warfare.

Since the Strategic Support Force establishment, China has completed its 48 satellite BeiDou constellation for position, navigation, and timing (PNT), expanded its communications and ISR satellites in geosynchronous-Earth orbit (GEO) and has aggressively expanded its low-Earth orbit (LEO) satellites for communications, electronic, signals, and geospatial intelligence. Further rapid expansion of Chinese space capabilities, especially in LEO, are intended to create a robust, redundant, and integrated C4ISR network.

According to a December 2022 forecast of China's satellite internet industry from the web-based Chinese Future Think Tank, China and the PLA intend to create an integrated multidomain network that spans three primary levels: the surface-based network, near-Earth telecommunications, and space-based communications. Surface-based networks consist of satellite ground stations, 5G relay stations, ground-based stations, and sea-based network nodes. Near-Earth telecommunications consists of a layer of unmanned aerial vehicles (UAV), low-air platforms and high-altitude platforms (such as the recent weather balloon). In the space layer, the author of the report separates it into two buckets, LEO and higher orbits.

As China continues down its informationization path, each of these layers will become more populated. As of now, China is planning a 13,000-strong LEO satellite constellation known as the "National Net Constellation" or "GW Constellation," of which several hundred C4ISR satellites are currently on orbit. China has also been proliferating its UAV capabilities with a range of medium-altitude long-endurance (MALE) and high-altitude long-endurance (HALE) ISR UAVs. Most recently, the PLA YouTube channel published several videos demonstrating the use of smaller UAVs for targeting data for its land-based rocket artillery. According to the 2015 RAND's "Emerging Trends in China's Development of Unmanned Systems" report, "Unmanned aerial vehicles paired with an enhanced satellite network would improve China's capability for long-range strike system targeting." Additionally, when outfitted with communications systems and data relays, can provide more redundancy and fidelity in the PLA's command and control systems. Based on the PLASSF's trajectory, building out the air and space layers of this network appears to be one primary goal for the future of the PLA.

QUEST FOR JOINTNESS

Over the past several decades the PLA has undergone a radical transformation in both the military hardware that it fields as well as the industrial base that supports the military. While these achievements are no small feat, the PLA still lacks some of the key technology and supporting systems necessary to achieve "true jointness." In addition, to achieve its goal of having a fully modern military by 2030 and a world class military by 2049, there is still much work to be done. Beyond hardware, the PLA will need to train with and develop the tactics, techniques, and procedures to employ their weapons systems. The August 2022 exercises in response to then-U.S. House Speaker Nancy Pelosi's visit to Taiwan and the April 2023 Joint Sword exercises are one glimpse into the PLA's efforts on the training front. There are many more, smaller exercises that the PLA is conducting to gain proficiency and service interoperability, but short of war, large-scale exercises like the two aforementioned will likely be the best opportunity for the PLA to rehearse large-scale joint operations and for the U.S. to observe what PLA "jointness" may look like.

Although Xi has laid claim to completing mechanization of the PLA in 2020, there will still likely be a strong push for the PLA to achieve full custody of production chains, across services, to develop independence in its military industrial complex. This may include a further buildup of indigenously produced military hardware in conventional domains. However, without the development of a more robust C4ISR network, and the integration of disparate military technology under this network, the PLA's reach and capabilities may be somewhat limited. As part of the informationization process moving forward, the PLA is likely to further build out its space capabilities including LEO constellations, satellite ground stations, and responsive launch capabilities. China may also attempt to build ground stations in Belt and Road Initiative countries to provide it better fidelity in its satellites' chain of custody.

Informationization will be a relatively long and arduous process. In the interim period, when the PLA has a lot of bang, but still a questionable ability to coordinate and accurately employ its arsenal, the U.S. and Taiwan have a strategic window of opportunity. During this time, we should ensure that both Taiwan and the U.S. are soberly assessing the threat posed by China, that we are educating our service members and the public on the threat, and that we are actively taking steps toward adopting the appropriate strategy for addressing a Taiwan contingency. This includes making acquisition decisions now that will provide our military with the appropriate equipment to blunt potential Chinese aggression in the Taiwan Strait. As we adopt these measures, we will need to wake up to the fact that the PLA's presence in the region and around the globe, whether in the form of ISR balloons or naval flotillas, will become increasingly part of the new normal in our international security environment.

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An F-35 takes on fuel before the beginning of this year's Red Flag training exercise in the Pacific. Using F-35s during training provides more realistic opponents and brings about greater lessons learned.

Answering the China Challenge

USAF exercises take on a Pacific flavor, as Red Flag and Mobility Guardian ready the force for a new kind of conflict.

By Chris Gordon

Over the Pacific Ocean

An F-35 pulled up to a KC-135 at 24,000 feet off the coast of California to take on a few thousand pounds of fuel before peeling right in training area W-291.

The fight was on and so was a new chapter of Red Flag.

Established in 1975 to better prepare Air Force pilots due to the lessons from Vietnam, Red Flag has been conducted at Nellis Air Force Base in Nevada for decades. But with the Pentagon's new focus on China, the exercise has been changing, including by expanding over the Pacific.

"This is what we've been told to do, which is prioritize the pacing challenge of China," said Maj. Gen. Case Cunningham, the head of the U.S. Air Force Warfare Center, which runs Red Flag, as jets roared over his office.

In addition to the novelty of flying over water, the February exercise featured forces from some of America's closest allies, Australia and the U.K., as well as Marine F-35 fighters, requiring the Air Force to "speak Navy," noted Col. Jared Hutchinson, then-commander of the 414th Combat Training Squadron (CTS), which runs Red Flag.

The February exercise, Red Flag 23-1, was not the first time the Warfare Center, the Air Force's high-end combat training school, has sent aircraft missions over the ocean. But it was a first for Red Flag, which has broadened its training areas to include the range west of the Baja Peninsula south of San Diego.

"This is a small step forward," Hutchinson said the day before the inaugural February maritime sorties. "Make no mistake, the logistical challenges are real, the tyranny of distance. You can't just hand wave solving that problem."

TACKLING NEW CHALLENGES

Red Flag's expanded reach is part of a broader transformation underway in the Air Force's training establishment. In 2018, the Pentagon's National Defense Strategy (NDS) said that great power competition with China was the main focus following decades of counter-insurgency operations in the Middle East and South Asia.

Other exercises are also taking on a Pacific flavor and increasingly including international and joint force partners. Air Mobility Command's Mobility Guardian '23 used to be a domestic exercise. This year's edition spread out across the Pacific.

The Air Force is using these exercises to drill Airmen in new operational concepts, such as agile combat employment, which emphasizes the ability to work from dispersed and sometimes austere locations.

At Nellis, the Pentagon's new priority is apparent from the

photos of Chinese aircraft, including a J-20 stealth fighter, on Cunningham's desk, which are positioned next to quotes from Air Force Chief of Staff Charles Q. Brown Jr., and Secretary of the Air Force Frank Kendall on the importance of modernizing to deter China.

"Here's why it matters: because there's lots of people that want the Warfare Center to do any number of things," Cunningham said of the NDS. "We do not have the time, the resources, or the people to get at every challenge and against every single adversary that we could potentially face."

To prepare for the new challenge, the Air Force's training establishment has adjusted too. A map of the Pacific is posted on the wall of Cunningham's office next to maps of the Nevada Test and Training Range, the Utah Test and Training Range, and the R-2508 Complex—a training range used by Naval Air Weapons Station China Lake, National Training Center, and Edwards Air Force Base, Calif.—and also the training area off the California coast.

"The airspace has to get bigger," Cunningham said. "The capabilities that we're replicating get more complex."

The new emphasis on the Pacific is not the only reason to expand the scope of the training. Advancing technology is another factor. The fifth-generation F-35 Lightning II jets can sense over longer distances and can operate when a wingman might not even be in sight.

"You are actually beyond the visual range," Cunningham explained.

Flying over the Pacific has other advantages, including fewer constraints than exercises conducted over the United States and the realism of flying over a blue floor.

"There are less restrictions on our airspace usage there," Cunningham said. "We're pulling these together to provide the capability to extend the fight."

MOBILITY GUARDIAN

AMC moved its biennial signature exercise from the continental U.S. to the Pacific this year, bringing together some 70 aircraft and 3,000 personnel to operate at bases in Hawaii, Guam, Australia, and Japan.

"If you do an exercise in the continental United States, you don't have to go through that in reality, you just have to simulate it," said Maj. Gen. Darren Cole, Air Mobility Command's director of operations, strategic deterrence, and nuclear integration and exercise director of this year's Mobility Guardian.

AMC's boss, Gen. Mike Minihan, has been one of the service's most ardent proponents for meeting the challenge from Beijing, going so far as to say war might erupt in 2025. Minihan has been blunt saying the U.S. military is not currently postured well enough to fight inside the so-called first island chain of the Pacific, the string of islands running from the Japanese archipelago to the Philippines. So, Mobility Guardian was designed to put the logistics of operating over the vast Pacific to the test.

"If you want to hit the easy button, you don't do that," Cole said.

The Army, Marine Corps, Navy, Air Force, and the Space Force have also been practicing how they would operate in the Pacific this summer in joint and multinational drills. Allies see the virtue of Pacific operations as well.

"The U.K., from a government-down level, has started to pivot over into looking into that region of the world," Air Commodore Howard Edwards, Royal Air Force Combat Air Force commander, said during Red Flag's February iteration, which featured RAF Typhoon fighters and Voyager refueling aircraft.

The RAF also brought those aircraft to Mobility Guardian. Emphasizing the "tyranny of distance" in U.S. parlance, a British A400 airlifter flew over 20 straight hours to get to the Pacific from the U.K.

"We need to be able to operate and fight in that environment, and we haven't traditionally done so certainly in a very, very long time," Edwards said of the Pacific.

But Red Flag is the Air Force's premier training event, with lessons that will ripple through the service.

Senior Airman Zachary Rufus

U.S. Air Force Lt. Col. Christopher Finkenstadt, the 64th Aggressor Squadron commander, performs preflight inspections before launching out for a Red Flag-Nellis 23-2 mission in Nevada in March.

KNOW YOUR ENEMY

The task of simulating the adversary in Red Flag falls to the "Red" aggressor pilots who mimic tactics U.S. foes might carry out against "Blue" allied forces.

To replicate the threat presented by potential foes, the Nellis 64th Aggressor Squadron of F-16s and 65th Aggressor Squadron of F-35s have dedicated subject-matter experts in the adversaries' doctrine and tactics, down to the capabilities of specific missiles and aircraft.

The use of F-35s is another recent step toward making the enemy threat more realistic, and the aggressors are also looking at ways to improve their capability through the use of other systems, such as upping their electronic warfare capabilities. To drive the training home, the aggressors are quick to respond if the Blue Force makes mistakes.

"You have to be willing to punish a tactical error to provide a lesson there," said Lt. Col. Brandon Nauta, an F-35 pilot who commands the 65th Aggressor Squadron.

"We have a mantra here in the aggressor nation. It's called: Know, Teach, Replicate. We're constantly studying our enemies," added Lt. Col. Chris Finkenstadt, who led the 64th Aggressor Squadron before relinquishing command in June. "Day One, you'd like to punch Blue in the face to make them bloody. The best part is, there are times where we get lost in the shuffle during a fight and that's when we're able to create a lot of lessons learned."

Typically conducted three times a year, Red Flag-Nellis has iterations with so-called Five Eyes partners with which the U.S. shares intelligence, a broader international exercise, and a U.S.-only mission.

"I think ACC has done a really good job at shifting our focus and our priorities," said 1st Lt. Kassidi Nudd, an intelligence officer with 355th Operations Support Squadron at Davis–Monthan Air Force Base, Ariz., who is a veteran of multiple Red Flags and works with Blue pilots. "We're hitting our books, and we're doing analysis on the daily so that way, when we come here to Red flag, it's not new information."

On the February mission, three KC-135s lumbered down the runway, taking off seconds after each other. For now, the present-day fight still requires some of the Air Force's tried and true assets, including the tankers that were first produced during the Eisenhower administration.

Each day, Red Flag usually flies two missions: one during the day and one at night. To simulate the foe, the two aggressor squadrons are complemented by simulated surface to threats on the ranges. During the daytime mission, things seemed to go well for some of the Blue pilots.

"Blue participants will be tasked to defend five critical assets for 90 minutes. They'll also be tasked to go destroy 10 to 15 of the enemy's critical assets every training period," Hutchinson said of Red Flag 23-1. "They'll be tasked to destroy the enemy's simulated integrated air defense system every time that we go out there. And they'll also be tasked to fight the most advanced Chinese air threats that are available every single time they go up."

Air & Space Forces Magazine had a view of training from one of the tankers that was operating over the Pacific, Gulf 07. As the exercise unfolded, an aggressor F-16 hooked up with the tanker only to return within the hour. The Red F-16 had been "killed," but to keep the exercise going needed to get back into the fight again.

By the time Gulf 07 landed back at Nellis six hours later, the sky was dark, but the skies were still busy as the radio buzzed with call signs of "Raptor" and "Janet" flights—the latter belonging to a government airline that serves the Nevada Test and Training Range and the former assigned to Blue F-22s.

For all of its intensity, the Blue team has also been careful not to display all its capabilities and tactics out in the open, conscious that they might be monitored by adversary satellites or other forms of observation.

"We inject virtual tracks to replicate other capabilities that we would have—more exquisite capabilities that may trigger the adversary to do something or react a certain way," Hutchinson said cryptically. "And we obviously don't fly that kind of stuff airborne."

One platform that participated in Red Flag from the ground was the B-2 Spirit stealth bomber, which was on a safety pause at the time due to a mishap in December 2022. Air Force officials declined to say what missions the crews had been planning to fly. But B-2 personnel at Nellis participated in the training and had "superior performers at that flag for mission planning and intelligence gathering," according to Maj. Gen. Andrew Gebara, then-commander of the 8th Air Force, which controls the nation's strategic bomber fleet.

Pilots say the training has been challenging.

"The threat, it's been evolving, and it's about training to a much more dangerous threat than we have been in the past several years, because that's where we're going," said Capt. Jared Helm, a new F-22 pilot from the 94th Fighter Squadron who experienced his first Red Flag in February.

"There's going to be something every single time you fly that will make you scratch your head."

The February training, with around 3,000 personnel, was followed in July and August by exercises that were heavy integrated with U.S. Navy. All told, Red Flag's summer iteration brought together more than 2,000 Air Force, Space Force, Marine Corps, Navy, and Air National Guard personnel, who operated out of Nellis as well as bases in Southern California and Navy facilities.

The focus was on "realistic scenarios," according to the 414th CTS, including maritime air-to-air and air-to-surface combat, and working command and control among the diverse participants—all necessary components of possible fight with China.

"The best way to put it is that we put together air-to-air, air-to-surface, and [command and control] in an environment that provided significantly longer distances than in our typical overland scenarios," said Col. Eric Winterbottom, who took over command of the 414th CTS from Hutchinson in June. "From an exercise management perspective, this applies to running the scenario and collecting data for the debrief. From the execution perspective the distances affect the pacing, communications, fuel planning, and command and control."

At the end of it all, everyone is on the same side.

"You land and really the initial part of the debrief as a big whole Red Flag group is all about reconstructing the fight in a way that makes sense to everyone that was involved," Helm said.

"Secrets kept are not constructive," he added. "We'll go through and we'll watch what happened. What we did, who shot who, and at what time."

Winterbottom noted that this year's missions were just a preview of what was to come.

"As the new commander, my priority for future Red Flag exercises is to ensure realism and relevance," Winterbottom said in August. "Red Flag will continue to expand into long-range, dispersed, joint and coalition, peer contested training scenarios."

Next-Gen Fighter Engines

America's fighter advantage has long been powered by superior engines. Here's what the future holds.

Staff Sgt. Kaitlyn Ergish

The F135 engines that power the F-35A Lightning IIs are most likely getting a core engine upgrade. But that's not the end of the story—more change and advances are in store.

By John A. Tirpak

The Air Force is now planning to pass on fitting its F-35A fighters with all-new engines, choosing instead to upgrade the engine core. While Congress could still change that plan, USAF has opted to wait to apply advanced Adaptive Engine Technology to its Next-Generation Air Dominance (NGAD) Fighter.

There's not much time to get the job done. The NGAD is slated to be operational around 2030, meaning test flights will need to start circa 2028 or sooner, so its the Next Generation Adaptive Propulsion (NGAP) engine needs to take shape quickly.

"With the way we're funded, we think we can carry both" GE Aerospace and Pratt & Whitney, "through prototype, and both are leaning-in fully," said John R. Sneden, propulsion director for Air Force's Life Cycle Management Center.

Speaking with the press at Air Force Materiel Command's Life Cycle Industry Days in July, Sneden said the Air Force will contract for a prototype NGAP from each of the two fighter engine companies. It may then keep both in the competition through preliminary design review, or pick one early if it proves to be the obvious superior performer.

"We're doing the detailed design activities right now. And within the next couple of years, we'll be moving into prototyping and testing." —AFLCMC Propulsion Director John Sneden

"We still have that opportunity to do a downselect if we start seeing ... [a] huge separation between the two," in terms of performance, Sneden said. A previous plan had called for picking the NGAP contractor based on digital proposals alone, and while it will still be designed that way—Sneden said it will be the first digitally-designed engine in USAF's fleet—there will be physical prototypes.

Sneden said aircraft primes Boeing, Lockheed Martin, and Northrop Grumman all received nearly billion-dollar NGAP contracts last year—as did GE and Pratt—to harmonize the engines' performance with NGAD airframes. The work will ensure there's "an interface methodology between the airframe

company and the propulsion company," he said. Northrop affirmed in August, though, that it will not bid on NGAD.

While he wouldn't provide details of the NGAP's timeline, Sneden said "we're doing the detailed design activities right now. And within the next couple of years, we'll be moving into prototyping and testing."

The Air Force requested nearly $600 million for NGAP work in fiscal 2024, an increase of $375 million versus the fiscal 2023 amount.

NGAP will build on the technologies developed by GE and Pratt in their Adaptive Engine Transition Program (AETP) engines; respectively, the XA100 and XA101. Those engines—which pioneer a new, third-stream air path that allows efficient switching between fuel-efficient cruise and high-performance thrust—were developed over a decade ago with an Air Force investment of more than $4 billion. The idea—now nixed—was to put them in the F-35, to upgrade its performance, range and reliability at the midpoint of the fighter's service life.

The adaptive airflow concepts, ceramic matrix materials, advanced composites, thermal management improvements and additive manufacturing technologies for critical components developed in AETP will "port" directly to the NGAP, Sneden said.

"It's not lost," he said, "it just gets incorporated." Had there been no AETP, there would be no NGAP, he said.

The NGAP engines will be "differently sized" than the AETP, Sneden said. The revolutionary F100, which powered the early F-15s and F-16s, had a fan diameter of 34.8 inches, but the diameter of the F135 and the AETP is 46 inches. The AETP was meant to fit in the F-35.

Asked to elaborate, Sneden later relayed through a spokesperson that "as with any new weapon system development, the NGAP propulsion systems will be sized appropriately to meet thrust, weight, and other integration requirements."

But the "technology baseline" for NGAP and AETP "is essentially the same."

TOUGH CHOICES

The AETP engines would have delivered the most improvement in fighter engine technology in a generation, with double-digit gains in on-demand thrust and about 30 percent improvement in fuel efficiency. They were intended to provide the F-35 with the thrust, persistence, and electrical power that fighter will need for its Block 4 upgrade.

But the Air Force opted instead for Pratt's Engine Core Upgrade, or ECU, along with a Power and Thermal Management System (PTMS) improvement.

The ECU and PTMS are supposed to be ready for installation circa 2030, about the same time NGAP must be ready for production.

Passing on AETP wasn't easy, Air Force Secretary Frank Kendall said in March, and the choice still concerns him.

Choosing the ECU over the AETP "was the right decision, given the constraints we have," but one that "I worry about, a little bit," Kendall said. He called the AETP "unaffordable" because "the only service that wants the new technology is the Air Force right now, and we can't afford it by ourselves."

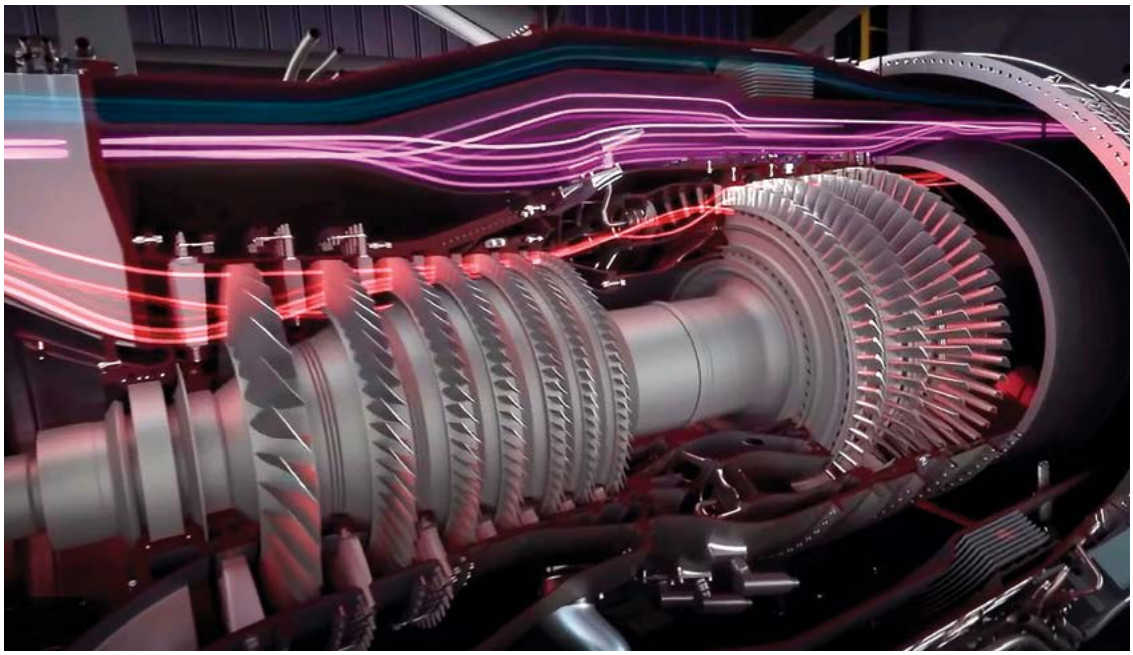
The agreements covering the F-35 program's 10 international partners as well as the U.S. Air Force, Marine Corps and Navy require any user that wants a unique capability on its F-35s to bear the cost of developing and integrating it.

Kendall said in 2022 that he tried unsuccessfully to talk Navy Secretary Carlos del Toro into coming in on AETP. Radical redesign would be needed to make an AETP fit the Marine Corps F-35B—which has a unique vertical landing system—and significant revision would be needed for the Navy's carrier-landing F-35C variant, as well.

Still, Kendall said, "if we had the opportunity to reconsider that, I think that would be something I'd like to have another shot at.

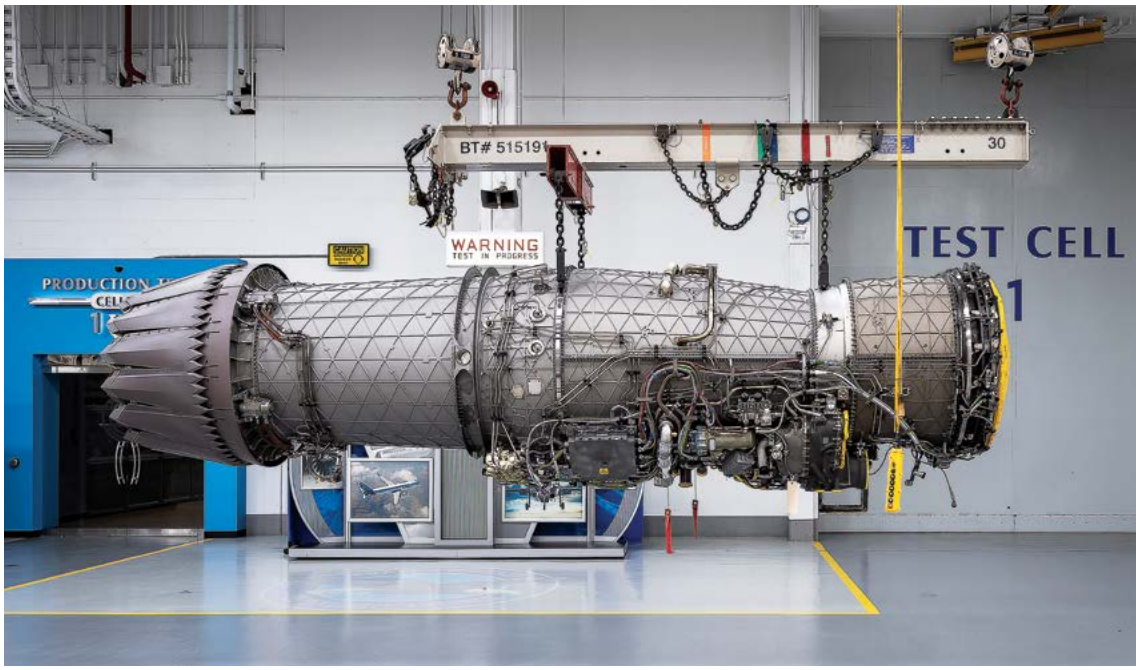
The F-35 Joint Program Office (JPO) endorsed the ECU as the least disruptive and most economical choice for the bulk of F-35 users, as it would avoid the need for a new and separate logistics train and parts inventory that an AETP would require. In a statement to Air & Space Forces Magazine, the JPO said it "stands behind our in-depth business case analysis, conducted in partnership with industry, that helped inform" the Pentagon's choice. And even if the AETP had been chosen, the Power and Thermal Management System (PTMS) would still be needed.

The JPO held an industry conference in June to discuss



GE Aerospace and Pratt & Whitney both developed adaptive propulsion systems under the Air Force's Adaptive Engine Technology Program. Both offer more range and efficiency, as well as more power and cooling. GE wanted its XA100 to be used in the F-35A, but the Air Force was unable to find the funds to pay for it.

Image from GE Aerospace video



Karsten Moran/Pratt & Whitney

Pratt & Whitney's F135 engine is the only engine available for F-35s of every stripe. Pratt offered an engine core upgrade that can meet the near-term needs of the F-35's Block 4 upgrades.

a possible competition for the follow-on system, needed to improve engine life and to cool the electronics-intensive elements of the Block 4 upgrade.

The ECU and PTMS "restores engine life"—which has been burning up faster than expected because of the way the F-35 is used—and meets F-35 user needs for cooling and power, as well as their "budgetary…requirements," the JPO said. The upgrades will "ensure the F-35's propulsion system is prepared for future demands that will be necessary to stay ahead of our near-peers."

FAMILY FEUD

A heated row erupted between F-35 prime Lockheed Martin and Pratt following the Paris Air Show in June, when Lockheed Aeronautics Executive Vice President Greg Ulmer broke the company's long silence about its power preferences for the F-35.

The F-35 will undoubtedly undergo not just a Block 4 upgrade but a "Block 5, 6, 7, and 8," Ulmer told defense reporters, as it will likely serve into the 2070s or beyond. It will need steep performance improvements, arguing that the threat, not the cost, should drive F-35's power requirements.

In a statement to Air & Space Forces Magazine, Lockheed said that to stay ahead of peer threats—read China—"the F-35 will need even greater capability, readiness, range and thrust, which will require an upgraded engine." Neither Ulmer nor a company spokesman stated a Lockheed preference between the two AETP options.

Responding, Jeff Shockey, senior vice president for global government relations at RTX, Pratt's parent company, said Ulmer's comments are "undermine" the Pentagon's decision process regarding the ECU. He charged Lockheed with trying to market the F-35 "as a sixth-generation fighter" in order to "negate the need for a sixth-generation fighter competition," in an effort to "extend the life and longevity" of the F-35 contract. Shockey said Ulmer was trying to "pull a fast one on Congress."

The ECU option, of course, preserves Pratt's own monopoly on F-35 power and likely locks out GE from getting any F-35 work for the balance of the program.

Asked if the public dispute imperils the F-35 program, JPO Program Executive Officer Lt. Gen. Michael J. Scmidt said through a spokesperson that "we expect all our industry partners to work together to achieve the requirements that are set by [the Defense Department] to ensure our warfighters have what they need to accomplish their missions."

The spokesperson declined to say if Schmidt has tried to smooth things over between his two biggest contractors, saying only that the JPO "communicates with our industry partners routinely." The JPO contracts separately for the F-35 airframe and the Pratt F135 engine, which is supplied as government-furnished equipment to Lockheed.

Sneden wouldn't address whether the AETP could be put on the shelf for a future F-35 upgrade. He would only say the Air Force "has made its decision" and the focus now is "just to get the technology to a logical transition point" for NGAP.

The Air Force will choose one NGAP engine that will fit in any of the airframes competing for the NGAD, Sneden said, ruling out a replay of the "Great Engine War" between the two companies in the 1980s, when the Pratt's F100 competed with GE's F110 to power F-15s and F-16s. An attempt to re-run that competition in the 2000s between Pratt and GE was stillborn when the Pentagon terminated the competitive engine program: GE's F136 powerplant, which offered somewhat different technology from the F135.

While some optimization" of NGAP may be needed to match the winning NGAD bidder, Sneden said all the contenders are abiding by "the propulsion constraints that we've studied, and evaluated, and provided to each."

A FRAGILE INDUSTRIAL BASE

The NGAP is a "critical" program for the Air Force, Sneden said, as competition will not only spur contractors to offer better and more affordable options, but also because the engine industrial base is fragile.

"Not many companies in the world can do this," Sneden said.

Adaptive technology is the next step in fighter propulsion, he asserted. Adaptive technology is "our assurance of long-term air dominance and propulsion superiority."

The fragility of the engine industrial base, Sneden noted,

stems from the few-and-far-between new fighter engine programs, and acquisition policies that favored low cost over capacity. Pursuing one new engine every 20 years or so isn't a recipe for maintaining the industrial base's capabilities, he continued.

The propulsion directorate is focused on maintaining the edge "we currently have" and that means "continuing to fund both vendors for as long as we possibly can."

While the U.S. fighter engine industrial base is "very capable," it doesn't move "in a threat-relevant cadence," Sneden observed. "It takes us about 10 to 15 years to put a new propulsion system out to the field."

But, "in fairness to my industry partners, they haven't really been challenged or incentivized" to accelerate that tempo, given the nature of the contracts they're asked to fulfill, Sneden stated.

"The sole-source nature of our enterprise ... exacerbates that same problem by removing some of those competitive forces that drive innovation, speed, and cost control," he said.

Sneden also said the propulsion directorate is working with engine companies to accelerate their processes, which have followed the just-in-time model over the past three decades.

"That's not ... satisfactory, it needs great improvement," he said.

Inflation is eating away at buying power for government and industry alike, he commented, "so it's now harder to maintain the same readiness with comparable amounts of budget you've had the previous years." This is driving a focus "on cost-effective readiness and securing the budgets that we need to ensure that ... the warfighter can fly, fight and win," he said.

He also said the industry and government have digital transformation efforts underway, but they are "not as pervasive as they need to be, which results in longer lead times and more costly efforts."

CHINA, CHINA, CHINA

Sneden said the Air Force's propulsion enterprise needs to be seen in the context of a rising China. Beijing is rapidly gaining prowess with fighter engines, after decades of slow advance and having to import technology from Russia.

"We are losing our propulsion lead to China," Sneden said flaty, because Beijing is "investing heavily in developing and producing effective propulsion technologies."

China has overcome its fighter engine struggles by gaining new facility with single-crystal structure in their materials, Sneden said. Beijing's "intellectual property theft, working with Russia, and frankly, just their own development, activity, and ... budget" have made China a formidable competitor.

Beijing's investments "are significantly greater than ours from a propulsion perspective, so it's allowed them to close the gap," he elaborated. China has made "significant leaps and bounds over this last roughly eight-plus years," Sneden observed, adding that "our focus is not letting them" close the gap.

BACK TO CONGRESS

Congress has not yet decided whether to skip the AETP and move on to the NGAP. Rep. Rob Wittman (R-Va.) inserted language on the House version of the 2024 defense bill requiring that AETP work continue, to the tune of $588 million. The Senate seems inclined to add up to $280 million for advanced engine technology development, as a way to generate work for the engine industrial base. In the Senate Appropriations version of the bill, that committee expressed its concern that "a skilled workforce across the domestic military aircraft engine industrial base will degrade if sufficient work and the requisite funding are not available."

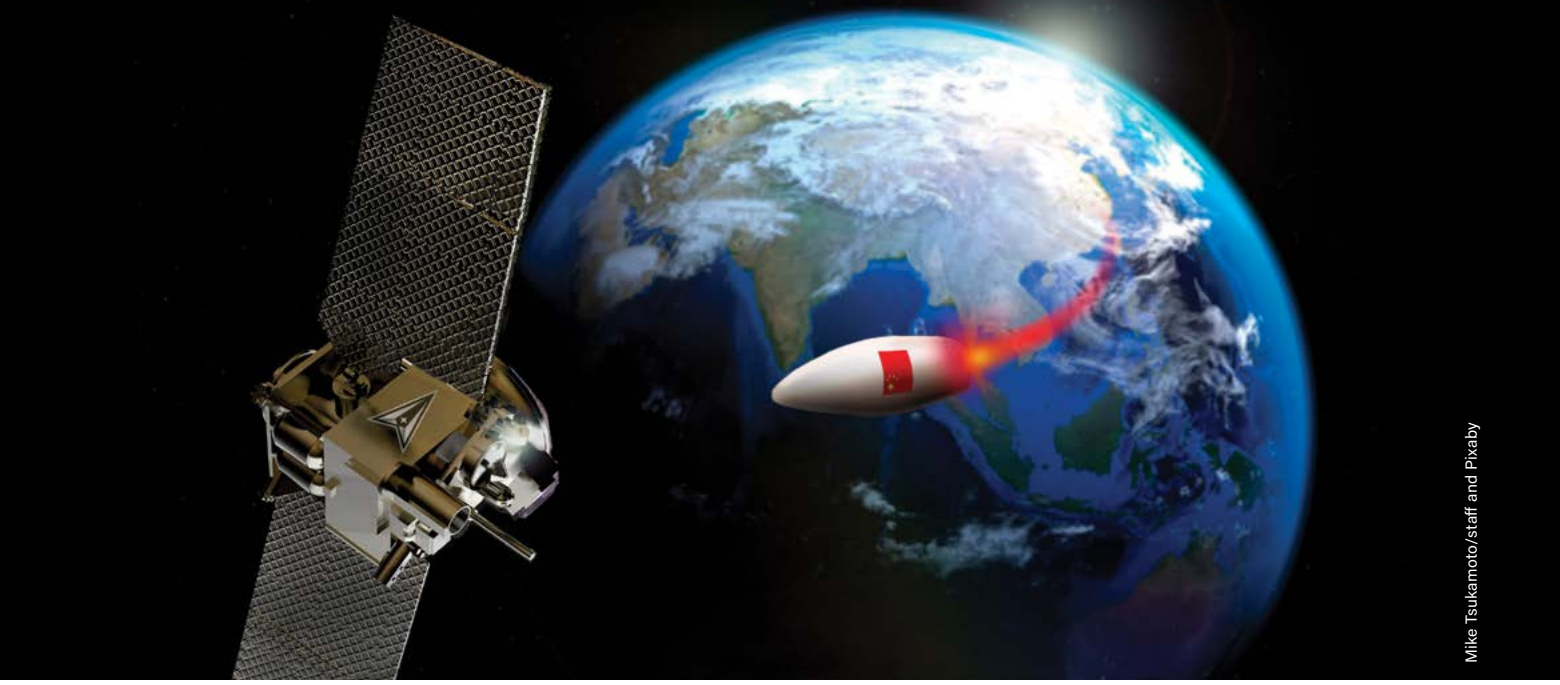
"Everything we're seeing" indicates that NGAP will be funded, Sneden said. Focusing solely on the AETP for the F-35 without advancing the technology for NGAD would be "a waste."

R. Nial Bradshaw

Maintainers with the 421st Fighter Generation Squadron care for F-35A Lightning IIs at Hill Air Force Base, Utah. The jets' engines must generate electric power to run advanced sensors and computer systems and provide cooling to keep those systems from overheating. Coming upgrades will demand even more power and cooling.

Building US Space Force's Counterspace Capabilities

The U.S. Space Force must have a robust suite of defensive and offensive capabilities to credibly deter adversaries.



Mike Tsukamoto/staff and Pixaby

China is rapidly expanding its counterspace capabilities, including ground-launched anti-satellite missiles, as shown in this illustration.

By Charles S. Galbreath

Americans have possessed unrivaled advantage in the space domain for a generation, but now, that advantage is at risk. Not only are potential adversaries developing their own space-based communications and intelligence, surveillance, and reconnaissance capabilities, they are also actively working on ways to defeat U.S. space assets. China's counterspace capabilities are the most advanced and present the largest threat, but Russia also has demonstrated intent to deny its adversaries access to commercial and international space systems. Both share the same aim: to nullify U.S. military advantages in space.

Operation Desert Storm, now more than 30 years in the past, made clear to China and other potential adversaries how critical the space domain is to the U.S. military. China sees attacking space systems as essential to prevail in a conflict with the United States and is actively fielding the most extensive collection of counterspace threats of any nation. To counter Chinese aggression in space, the U.S. must build a credible, effective Space Force with the right capabilities and force capacity.

The enormous responsibility to protect expanding U.S. interests in space, deter aggression in space, and create effects from space that are crucial to the success of all U.S. military operations now falls on the youngest, smallest, and least-funded military service. The Space Force must be prepared and armed with sufficient resources and clear governing policies to conduct credible and decisive defensive and offensive counterspace operations.

Charles Galbreath is a Senior Resident Fellow for Space Studies at the Mitchell Institute for Aerospace Studies. Download the entire report at *http://MitchellAerospacePower.org.*

Changes to perceived threats and vital interests have historically shaped U.S. policies on space weapons. For example, the United States pursued the development of weapons in space to defend against Soviet nuclear ballistic missile attacks as part of the Strategic Defense Initiative, also known as the "Star Wars" program. Then, from the end of the Cold War until recently, the U.S. government believed there were few serious threats requiring it to pursue space defenses. As a result, the Department of Defense (DOD) canceled its Cold War-era space weapons programs.

The "Space Commission" voiced significant concern on this issue in early 2001. Their report cited threats posed by China to U.S. space systems and called for new policies and space capabilities to defend U.S. assets in orbit. But in the wake of the 9/11 terrorist attacks and DOD's subsequent focus on counterterrorism operations, U.S. freedom of action in space did not get the attention it needed. Discussions on whether the

U.S. should develop space weapons were all but taboo, as many U.S. national security professionals continued to believe they were too futuristic, too costly, or too bellicose for a still relatively permissive domain.

While some continue to shun the topic of space weapons, the fact is there are remarkably few explicit limitations on their development. The "Outer Space Treaty of 1967" prohibits placing nuclear or other weapons of mass destruction in orbit or on celestial bodies. While there are conventions related to liability of actions, there are no formal internationally recognized agreements prohibiting the development and fielding of space weapons. Furthermore, since international law originates from a combination of international conventions, general principles of law, and international custom or practice, Russia's and China's placement of weapons in orbit and their fielding of direct-ascent kinetic interceptors are, in fact, laying the legal framework to normalize space weapons.

Our decades-long view of space as a sanctuary profoundly impacted the development of U.S. systems and associated operations, leaving them ill-suited to today's reality, where space is a warfighting domain. The U.S. military's space architectures developed around small numbers of highly capable, very expensive satellites without on-board defenses and ground systems, because man-made threats were believed to be negligible. Now those satellites are "big, fat, juicy targets," lacking even the maneuverability to avoid threats.

Adversaries can also exploit lengthy delays between observations and existing regional gaps in U.S. space sensor coverage to conduct counterspace operations. Growing congestion in space, as more countries became spacefaring, and as irresponsible anti-satellite (ASAT) tests by Russia and China created long-lived debris, has stretched the limited capacity of the space surveillance network (SSN). That means fewer and less frequent observations per object and increasing opportunities for adversaries to exploit the limitations of the legacy SSN.

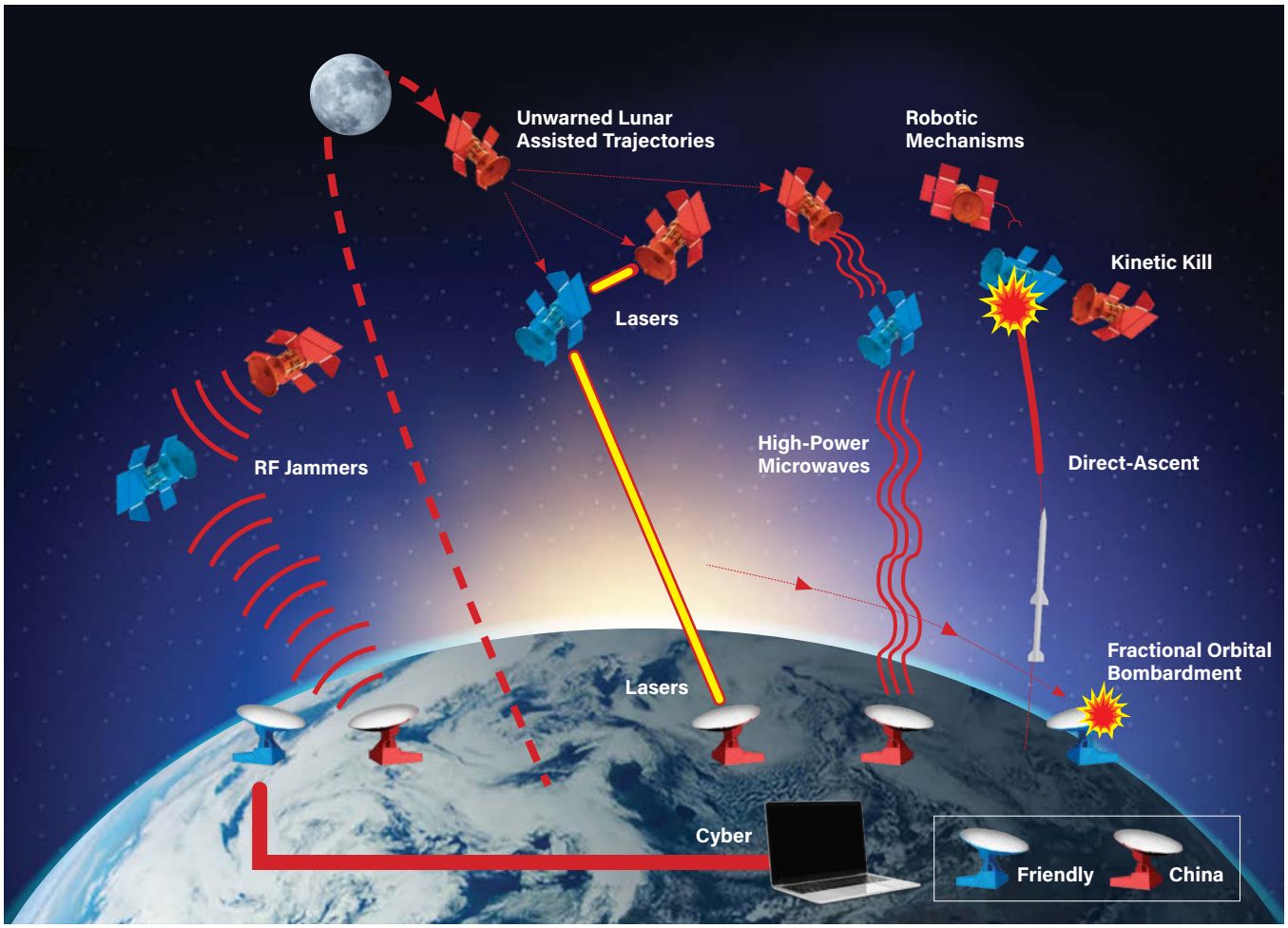
Similarly, it became standard practice for satellites in predictable orbits to go long periods between contacts as long as they were conducting routine operations. Longer "no contact" periods, however, increased the windows of opportunity for adversaries to attack and degrade satellite capabilities.

CHINA'S GROWING THREAT

According to the Director of National Intelligence's most recent intelligence estimate, "China is steadily progressing toward becoming a world-class space leader, with the intent to match or surpass the United States by 2045." While that may seem like the distant future, it is only 22 years away—the same amount of time that has elapsed since the 9/11 attacks on the Pentagon and World Trade Center. China accelerated its efforts to compete with the United States during that span, developing its own capabilities and fielding multiple offensive weapons to target U.S. and allied satellites. Notably, China does not distinguish between its

China's Mounting Space Warfighting Capabilities

Cyber, signal-jamming, and directed energy weapons give China a range of counterspace capability to threaten U.S. space systems.

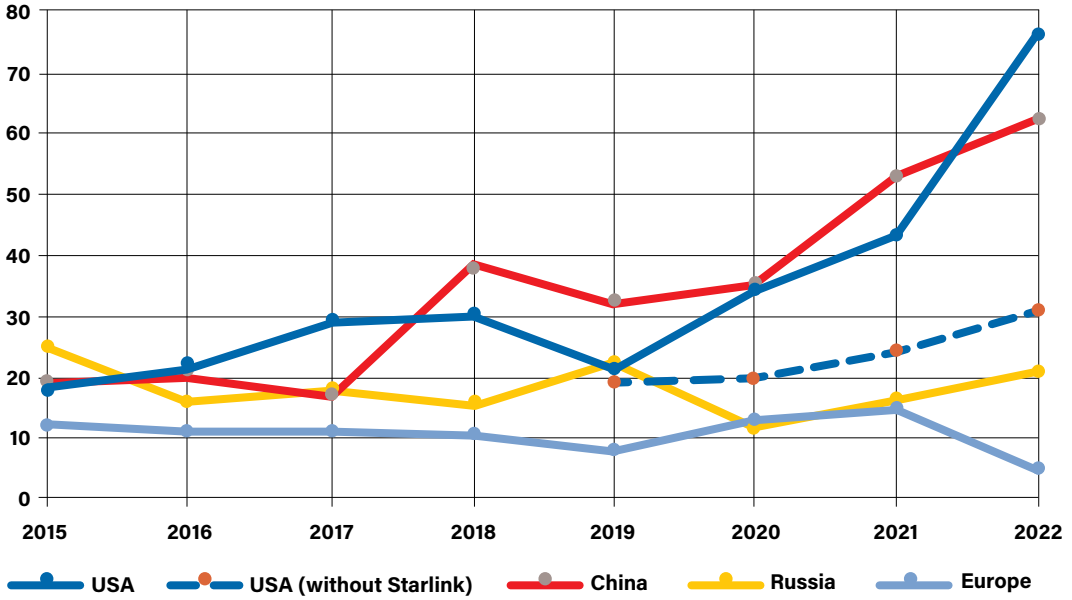


Dash Parham and Mike Tsukamoto/staff

Source: Mitchell Institute

Launches Reaching Orbit

The comparative numbers of successful launches by nation. The dashed line represents U.S. launches minus the launches by SpaceX dedicated to deployment of the Starlink mega-constellation. Since 2018, China consistently outpaces Russia, all of Europe, and the adjusted U.S. launch rate—a clear indication of China's rapidly expanding use of space.



Source: Mitchell Institute

military and civil space programs. The People's Liberation Army (PLA) has purview over planning and direction for all Chinese space activities, even the scientific missions, meaning that any growth in China's space programs is effectively an expansion of its military space capability.

According to the Air Force's China Aerospace Studies Institute (CASI), China believes space deterrence is achieved through forceful persuasion."Space deterrence signifies having powerful space forces as backing and threatening to use or actually using limited space forces to awe and contain the opponent's military activities," notes Air University's CASI in its "Lectures on the Science of Space Operations." China would employ four escalatory stages to achieve its "space deterrence" objectives:

- The first stage is a "show of space strength," which is seen as a means of deterring would-be adversaries from taking aggressive actions, in space or on Earth.
- Next, as a potential crisis escalates, China would demonstrate its prowess through "space military exercises." This is consistent with Chinese activities in other domains, such as a 2023 PLA naval exercise encircling Taiwan.
- China's third stage is to change the disposition of its space forces by launching additional space assets or repositioning its existing space capabilities. China considers this a medium-high deterrence action, with the added benefit of creating a favorable space posture if the situation escalates to combat.
- Last, China would launch an "over-awing space strike" that could potentially simultaneously attack multiple U.S. space systems using a variety of weapons—what the Space Commission warned as a "Space Pearl Harbor."

China has the most rapidly developing ASAT and counterspace capabilities of any nation, according to a 2020 report, "China's Space and Counterspace Capabilities and Activities," prepared for the U.S.-China Economic and Security Review Commission. China has already fielded an array of counterspace weaponry, including cyber, ground-based electronic warfare capabilities, lasers, and ground-launched missiles carrying ASAT kinetic kill vehicles (KE-ASATs). The PLA has demonstrated that its KE-ASAT weapons can threaten U.S. space systems located in low Earth, medium Earth, and geosynchronous orbits. It also has operational units using radio-frequency jamming to disrupt satellite communications, navigation, missile warning, and other vital space capabilities. Additionally, the PLA fielded ground-based lasers in at least two sites capable of temporarily blinding or permanently disabling satellites. In 2006, the PLA deliberately lazed a U.S. satellite, which U.S. officials characterized as a "test." These types of tests are not limited to lasers. In 2021 Gen. David "D.T." Thompson, the Vice Chief of Space Operations, said Russia and China now conduct laser, RF jamming, and cyberattacks against U.S. satellites "every single day."

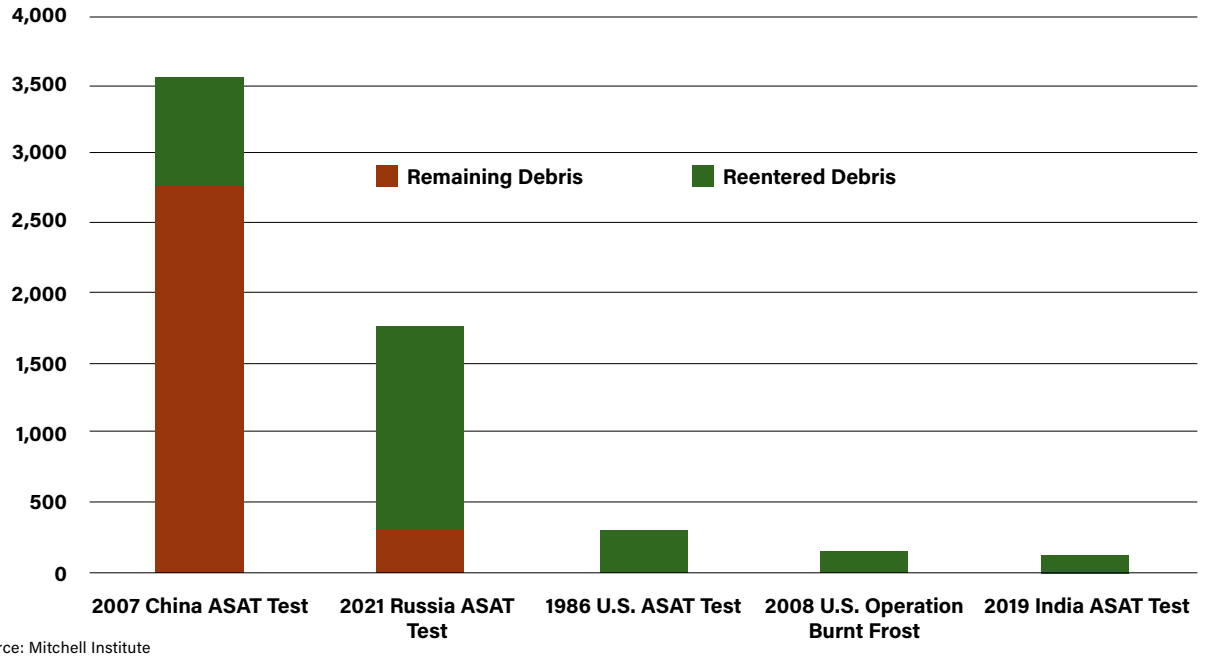
The PLA is also developing and testing additional space weapons. They have demonstrated satellites that can rendezvous with orbiting U.S. satellites and attack them using robotic arms or electronic warfare. Reports indicate China has a megawatt-class solid-state laser and high-powered microwave systems mountable on satellites. It also developed a miniaturized power source for 10-gigawatt microwave weapons enabling attacks on satellites from mobile ground systems. Finally, in 2021, China demonstrated a fractional orbital bombardment system (FOBS), which can launch weapons such as hypersonic glide vehicles into orbit and then de-orbit them to destroy ground targets, according to Pentagon reports.

It's not just China's counterspace systems causing concern. China is now the second most active country in space behind the United States. From 2015 to 2022, China consistently conducted more launches per year than the United States. In 2022, China placed 45 military payloads in orbit compared to 32 payloads by the United States. These Chinese payloads include intelligence, navigation, communication, and potentially counterspace systems, all of which are now integrated into PLA military operation plans. Between 2019 and 2021 alone, China expanded its space architecture by more than 50 percent, giving it 541 operational satellites, according to the Defense Intelligence Agency.

The multitude of Chinese counterspace threats is directly

Intentional Debris-Generating Events

Comparison of debris generated from kinetic intercepts. As tracked by the SSN, the amount of debris initially generated and still persisting varies significantly between Chinese and Russian ASAT weapons tests and activities by the United States and India.



Source: Mitchell Institute

in line with its escalation-based view of deterrence. China has demonstrated its willingness to resort to shows of force, and it has exercised its capabilities and ability to maneuver its space assets. The United States must now be ready for a Chinese over-awing space strike, which could launch a major conflict.

THE U.S. RESPONSE

The United States is making concerted efforts to normalize global space operations to promote stability. The recent growth of the commercial and international space industries, and corresponding congestion in space, underscore the importance of adopting common standards for all spacefaring nations. As in any domain, the development of standards of responsible behavior and norms—like air traffic control procedures or international rules for navigating ships at sea—promotes safe utilization of that domain for all.

One of the most pressing norms sought by the United States is an international agreement to forgo destructive, direct-ascent anti-satellite missile tests. In early 2022, Vice President Kamala Harris announced the U.S. commitment to prohibit such tests and called on other nations to voluntarily make similar commitments. Such tests leave behind long-lived debris affecting all spacefaring nations. Unlike other domains where debris from explosions or impacts eventually settle in a relatively confined area, debris in space persists as a hazard, threatening satellites and increasing the probability of collision, while forcing launch vehicles to travel through congested regions in space.

The past four decades have provided multiple examples of accidental and intentional debris-generating events highlighting the criticality of this issue. Intentional acts rightfully garner the most attention. In 2008, the United States used an SM-3 missile to destroy a non-functioning satellite carrying a fuel tank of hazardous propellant, to eliminate the risk of the tank impacting populated areas. By carefully selecting the geometry of the engagement, the United States destroyed the fuel tank and ensured the resulting debris did not persist or pose a threat to other satellites, according to an unclassified DOD summary. This event only generated 175 pieces of debris, all of which reentered the atmosphere by late 2009. In stark contrast, China tested its KE-ASAT weapon in 2007, generating 3,536 pieces of debris, most of which remain on orbit more than 16 years later. Only 750 of these objects had reentered the atmosphere as of February 2023. The international condemnation of China's test was nearly universal, and while China has conducted seven more direct-ascent anti-satellite tests since then, none created debris or resulted in impacts on other satellites.

The U.S. declaration that it would not conduct additional debris-generating, direct-ascent anti-satellite tests led 12 other nations to make similar pledges. The United Nations General Assembly also passed a resolution for countries to forgo debris causing direct-ascent KE-ASAT tests, with 155 nations voting in favor, nine against, and nine abstaining. Notably, China and Russia voted against the measure, and India abstained.

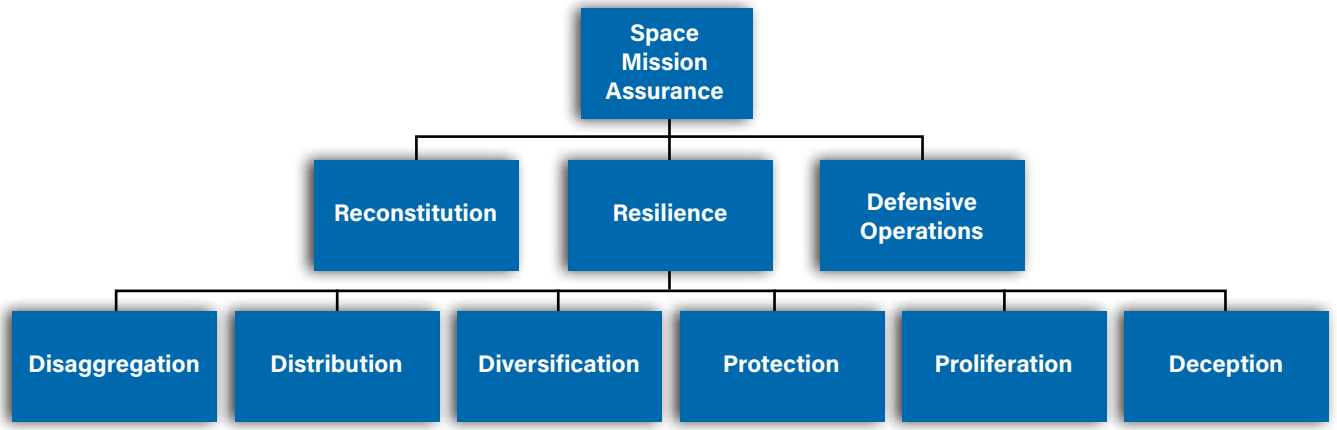
COMPETITIVE ENDURANCE

Chief of Space Operations Gen. B. Chance Saltzman unveiled his Theory of Competitive Endurance at the AFA Warfare Symposium in March 2023; the theory offers a framework to guide Space Force plans to deter, and if necessary, defeat, aggression in space. Competitive Endurance is focused on ensuring U.S. access to space and preventing competition from escalating into conflict. The theory follows three core tenets: avoiding operational surprise, denying first-mover advantage, and responsible counterspace campaigning. The first two tenets continue efforts predating the Space Force to improve space domain awareness and resilience. However, the third tenet, responsible counterspace campaigning, is a new area requiring further development.

The need to understand a warfighting domain and threats in it is common practice for air, land, sea, space, and cyberspace forces. However, the space domain is unique because of the sheer vastness military forces must consider and the lack of first-person awareness. Guardians derive everything they know about the space domain from data received via sensors and satellites. In a way, Guardians are always "flying on instruments" with data

Space Mission Assurance Taxonomy

The United States can achieve space resilience for any element of the space architecture by following these actions, according to a 2015 DOD white paper "Space Domain Mission Assurance: A Resilience Taxonomy."



Source: Mitchell Institute

that is not real-time and may even be days old due to the limited capacity of the legacy SSN and SCN. This is why improving space domain awareness is critical.

In recent years, the Space Force has increased the number and types of systems supporting the space domain awareness mission. Additional sensors around high-value space assets and key regions in space, like GEO and cislunar, will be required to address the expanding number of adversary threats. Furthermore, the Space Force must make significant improvements in how it processes data from sensors. Until a more responsive and capable processing system is online, the Space Force will have difficulty achieving the necessary level of space domain awareness to counter an adversary in space.

Second, the Space Force recognizes its architecture needs to be more resilient. The legacy space architecture is vulnerable to mounting threats, incentivizing adversaries to attack quickly in conflict in order to degrade the U.S. ability to respond. This "offense dominant" condition equates to a first-mover advantage and effectively invites, rather than deters, aggression. To deny this first-mover advantage, the Space Force must increase the resilience of its architecture, reduce the time needed to reconstitute it, and defend its critical space assets to such a degree that adversaries lack confidence in their ability to attack effectively.

A 2015 DOD white paper, "Space Domain Mission Assurance: A Resilience Taxonomy," suggested that resilience along with defensive operations and reconstitution comprise a larger mission assurance umbrella necessary to guarantee critical space systems will be available in a crisis or conflict to deliver essential warfighting effects.

One of the earliest and most visible realizations of this shift is in the Space Development Agency's efforts to field a proliferated low-Earth orbit (pLEO) constellation for missile warning. By increasing the number of satellites in a constellation, this approach would make the loss of some assets tolerable, because the constellation's overall performance could remain above an acceptable threshold. The use of small inexpensive satellites also improves deterrence by imposing greater costs on countering those satellites. When the cost of a direct-ascent KE-ASAT is greater than the target satellite, and the sheer number of satellites increases the complexity and cost of an attack, proliferation reduces the effectiveness and impact of these weapons and other co-orbital threats. The Space Development Agency's pLEO system, coupled with existing U.S. GEO capabilities, like SBIRS, further diversifies the missile warning architecture and improves its overall level of resilience.

Additionally, diversification, distribution, and disaggregation of satellite constellations is also necessary. So is the enduring military practice of deception, which can be applied to confuse adversary understanding and complicate their ability to target U.S. satellites. Finally, the Space Force can expand its use of protection measures beyond nuclear hardening and anti-jam protection for a few satellites. By including protection measures, the Space Force can create options for decision-makers to employ defensive operations.

The booming space commercial sector and growing allied capabilities can provide critical support to both resilience and reconstitution. "Space is a team sport," notes the Space Operations Command 2023 Strategic Plan. "We will leverage our Allies' and Partners' capabilities to improve the resiliency of our architecture."

Leveraging commercial SATCOM and imagery is already common military practice. Further integration and the potential use of hosted payloads is much more extensive in the Space Force's new approach, and while it does increase the resilience of the architecture, it also enables rapid restoration. The repositioning or use of allied or partner capability can effectively restore a lost or degraded Space Force system.

A more ambitious way to reconstitute capability is to rapidly launch new satellites. The Space Force is planning to demonstrate rapid launch for an urgent need in the VICTUS NOX mission, which aims to deliver a space domain awareness satellite into orbit within 24 hours of notification, according to Space Systems Command. While VICTUS NOX is characterized as an augmentation mission, the same approach can provide needed restoration of lost or degraded capabilities.

The final and least developed area of the Space Force's Competitive Endurance initiative is to directly defend space systems and protect friendly forces from space-enabled attacks. Recognizing space as a warfighting domain means any serious effort to achieve space security must include space weapons. It's oxymoronic to charge a new military service with protecting U.S. national interests in space without arming it with the weapons needed to accomplish its mission. Because it is also a key U.S. space interest to preserve the domain itself, U.S. defensive and offensive actions in space must minimize long-lived debris or other effects which might degrade friendly space architectures. This is why the Space Force calls this final element of its plan *responsible* counterspace campaigning.

CONCLUSION AND RECOMMENDATIONS

The objective of any military force is to gain and maintain an advantage over its adversary. To achieve this, given today's real threats in space, counterspace capabilities must be developed. The United States must have the potential to deny China access to the space capabilities that threaten U.S. space and terrestrial forces and national interests.

The Space Force should develop defensive and offensive counterspace capabilities and support elements to protect U.S. national interests in space and hold adversary space assets at risk. Concerted efforts to develop, field, and operate a range of counterspace capabilities will increase deterrence and provide the means for U.S. combatant commanders to defeat aggression should deterrence fail.

The U.S. administration, Congress, industry, and the Space Force should consider these eight steps to develop counterspace capabilities and their supporting infrastructure:

■ Senior U.S. civilian and military leadership should explicitly and publicly state the need to field counterspace systems. Clear guidance is essential to deter potential adversaries and align the resources necessary to field the required counterspace capabilities. Continued silence on the issue will risk further emboldening adversaries.

■ The Space Warfighting and Analysis Center should develop a jointly informed and accessible counterspace force design. This will require a detailed analysis of threats, current and emerging technologies, and the effectiveness and limitations of potential capabilities. Existing systems developed by the other services should also inform this force design to help prevent unnecessary duplication of effort. The force design must guide activities across the entire DOD in support of the counterspace mission.

■ Space Systems Command and the Space Rapid Capabilities Office should partner with industry to develop the necessary defensive and offensive capabilities. These capabilities should include both on-board and off-board defensive measures for high-value satellites. Offensive counterspace systems must be consistent with the principles of the Law of Armed Conflict and will clearly be required to defend joint and combined operations from adversary space-enabled attacks in future crises and conflicts.

■ The defense industry must respond quickly to USSF requirements and requests for information. Given the decades of relative neglect in the area of space weapons, the Space Force will need to be able to leverage technologies and lessons learned from industry and other domain acquisition programs in order to accelerate counterspace weapons development.

■ The Space Force must improve its space domain awareness capabilities to enable effective defensive and offensive counterspace operations. This includes growth in sensors and processing capabilities to enable tracking and warning of threats and a more enhanced SDA architecture capable of faster processing of collections and observations around high-value assets—and in key regions like GEO and cislunar.

■ The Space Force must improve its satellite Telemetry, Tracking and Command (TT&C) capabilities. This is essential to rapidly respond to threats and maintain positive control over its space weapon systems. The Space Force will need a higher-capacity TT&C architecture capable of maintaining contact with its current and future systems, including space weapons.

■ The Space Force must improve its testing and training architecture. Additional live, virtual, and digital elements in the National Space Test and Training Complex are required for Guardians to evaluate new counterspace systems and train all operators for the reality of space being a warfighting domain.

■ Congress must authorize and fund additional Space Force growth. Increases to the Space Force's civilian and military personnel and the construction of additional facilities are needed for counterspace systems. Establishing the counterspace mission as a central task for the Space Force will create a requirement for growth beyond USSF's originally anticipated force size of 18,000 personnel.

A war extending to or starting in space is in no one's interest. The United States is actively pursuing means of preventing such a conflict. A strong Space Force both aids the U.S. deterrent stance and provides integral war-winning capability should deterrence fail. Norms of responsible behavior, improved resilience, and expanded space domain awareness are all vital elements of a comprehensive strategy, but by themselves will not achieve all U.S. national security objectives. The Space Force must have a robust suite of counterspace capabilities to protect national interests in space and defend fielded forces from an adversary's space-enabled attacks.

1st Lt. Charles Rivezzo

Space Force and Air Force members demonstrate space test and training range equipment during a counterspace combined arms training event at Peterson Space Force Base in 2022.

Tyndall Rises Again

How the Air Force is rebuilding the base to withstand future hurricanes.

Airman 1st Class Zachary Nordheim

The Air Force is investing $5 billion into Tyndall Air Force Base, Fla., not just restoring what was all but destroyed by a hurricane in 2018, but ensuring it can withstand future superstorms, as well. Among the new features: a 360-room lodge designed to stand up to 165-mile-per-hour winds.

By David Roza

Tyndall Air Force Base, Fla.—Hurricane Michael tore through this base nearly five years ago, devastating hangars and aircraft and raising some to ask if Tyndall Air Force Base should be given up for good. Instead, Air Force and Florida leaders rallied to the idea that they could build a model "Installation of the Future" here and protect it with a combination of new technology, new understanding, and back-to-the-future ecology.

Today, sand dunes, box culverts, oyster reefs, and new wind-resistant buildings rated to withstand winds up to 165 miles per hour are enabling Tyndall to rise again. The Air Force is pouring some $5 billion into this strategically located base, which affords direct access to one of the nation's largest and most versatile air training ranges. New F-35A Lightning II fighters have begun arriving, ready to make use of those training ranges and will eventually dominate this fighter base.

With weather getting more unpredictable and threatening coastal areas all around the globe, Tyndall is applying both time-proven and novel means to protect the base, its residents, and its mission. Restored sand dunes here will absorb the brunt of ocean waves during a hurricane. Piled atop 18 miles of barrier islands surrounding Tyndall, they make up the base's "first line of defense for storms," said Melanie Kaeser, a biologist with the U.S. Fish & Wildlife Service.

"It's not 'wind blows and things just fall over.' ... Those high-velocity winds cause rapid pressure changes inside the facility, and it will start to come apart."
—Col. Robert Bartlow Jr., chief of the Air Force Civil Engineer Center Natural Disaster Recovery Division

Hurricane Michael swept over dunes and wiped out much of the vegetation on the barrier islands, disrupting the habitat and opening the way for further damage in the future. Kaeser's team is restoring those barrier islands, planting grasses and shrubs with an eye on learning which prove best at trapping sand. Kaeser said the dunes are already recovering without intervention, but her team's work is to "speed that process up."

"If you don't build it back up, you're going to keep pushing back that first line of defense," she explained. "That's what took the brunt of the storm surge, so without these barrier islands, that storm surge would have gone right on to the installation."

Kaeser's team is also restoring thousands of acres of pine forests around the base to help block severe winds. Planting longleaf pines, which can resist wind, insects, and disease better than the slash pines that were here before should prove effective over time. The team has planted 6.5 million of the fast-growing seedlings in the past three years and aims to plant another million within the next year.

Elsewhere on Tyndall, scientists are deploying biodegradable concrete and cement to provide a founda-

tion for seagrass and oysters, a technology called Reefense. Once at home here, the oysters can build and repair wave-blocking reefs on their own, according to Rutgers University, which received $12.6 million from the Defense Advanced Research Projects Agency to pursue the technology.

Living shorelines, a combination of plants, rock, and sand designed to attract marine life; oyster reef breakwaters; and expanded salt marshes are other ways Tyndall officials hope to dissipate waves and reduce flooding, according to installation documents and The Nature Conservancy, which is contributing to developing Tyndall's natural defenses.

"The focus of everything is slowing down that wave attenuation as it comes on shore, whether it's natural waves, tidal surges, or hurricane-related events," said Garey Payne, acquisition program manager with the Air Force's Natural Disaster Recovery Division. "You have this overlapping field of effect that eventually makes the installation more robust to the effects of climate change, sea-level rise, and natural erosive processes."

MacDill Air Force Base, Fla., has been working on oyster reef shoreline stabilization since at least 2004. But what's new at Tyndall is a funding mechanism to facilitate such projects. In the wake of the hurricane damage, Congress expanded the Readiness and Environmental Protection Integration (REPI) program in 2019, allowing the military to use federal funding for installation resilience projects, even if those projects are outside of a base's land or water boundaries.

That means Tyndall can use federal funding to experiment with oyster breakwaters in Florida state waters beyond the base's shoreline. That funding can help attract state and local government or conservation agencies to work with the Air Force on such projects.

"Prior to REPI funds being available for this kind of work, it took community partnerships, it took convincing the county or state or whoever to spend their money to do a living shoreline," Payne said. "Now we're bringing the money to them: we need you to do the legwork because it's in state waters, but we are going to give you the money to do it."

WIND RESISTANCE

Tyndall is also investing heavily in base infrastructure. After Hurricane Michael, Air Force engineers raised the bar for building standards here, matching what they saw in Florida's Miami-Dade County. Each new building at Tyndall is built to survive 165-mile-per-hour winds. And they're adapting those standards to match the Air Force's special needs.

"A lot of what's down in Miami is commercial properties," said William Heiney, senior resident engineer for the Tyndall office of the U.S. Army Corps of Engineers, which oversees the day-to-day awarding of contracts and site management on the base. "We're going to have some unique building elements. ... "If they don't have an existing system that we can use, then [the building element] is designed, engineered, and stamped by a structural engineer to meet those requirements," he said.

To meet the 165-mile-per-hour standard, some foundations must be sunk 30 to 40 feet deep. Precast structures are common. And the volume of rebar in concrete walls, screws and other fasteners used to secure roofing materials, is increased. The key is to keep wind from penetrating, either by peeling doors open or shattering windows to cause explosive imbalances in air pressure.

"It's not 'wind blows and things just fall over,'" said Col. Robert L. Bartlow Jr., chief of the Natural Disaster Recovery Division. "If your building envelope is compromised, those high-velocity winds cause rapid pressure changes inside that facility, and it will start to come apart."

ALL DRY ON THE FLIGHT LINE

To keep the flight line flood-free, Tyndall is building a massive underground concrete tunnel, 7 feet high and 12 feet wide in some sections, stretching across the area known as Zone 1, where the F-35 hangars will be located. Called a box culvert, the tunnel will funnel stormwater away from the flight line and back toward the ocean.

Buildings on the base will be constructed on a gradual incline, raising them above flood levels and sea-level rise.

Even now, five years after the hurricane, the project is still years from completion. Rebuilding Tyndall is not expected to finish until 2027, and some of the natural storm resilience projects may take even longer.

But once complete, the aim is to ensure Mother Nature will not be able to take U.S. airpower offline for long.

"We're not going to treat a Category 5 storm as an exceptional event," Bartlow said. "That's the new standard."

David Roza/staff

The Air Force is restoring barrier islands that were overwhelmed by Hurricane Michael, so they can help protect the base by bearing the brunt of storm surges in future storms.

Senior Airman Jacob Dastas

1st Lt. Nicholas Cap, chief of the Natural Disaster Recovery Innovation Element at Tyndall, demonstrates the promise of the base's new digital twin. The digital model can be used to better understand risks and manage problems all across the base.

NEW TECHNOLOGY

Base planners here are evaluating a suite of new technologies that could change the way military installations operate well into the future.

Among them is a concept already familiar to Air Force weapons programs—a Digital Twin model of the base in which each building is represented by 3D virtual replica. Planners believe the model can save time and money by helping them to predict wear and tear on facilities and to manage a basewide, comprehensive plan for maintenance.

"If we're going to build the "Installation of the Future," we need to figure out what's new out there that we can use to make us more effective at operating," said Col. Robert Bartlow Jr., chief of the Air Force Civil Engineer Center Natural Disaster Recovery Division.

Lance Marrano, science and technology adviser for reconstruction at Tyndall, said models like these can help managers anticipate problems, rather than be surprised by them.

"Instead of waiting for the occupants to say, 'Hey, I've got water on my floor,' now the engineer can look across the base, get a better sense of which roofs are approaching end of life, and then you start developing those engineering projects rather than waiting for a work ticket and more damage," he said.

Marrano comes to Tyndall from the U.S. Army Corps of Engineers, which hopes to learn from Tyndall's example and possibly apply the same technology to Army bases. He explained that the digital twin enables a kind of X-ray vision for engineers or facility managers, who can, for example, hold an iPad up toward a ceiling and use the virtual model to detect exactly which ceiling tile they need to move to access a water pipe.

The models are helpful even before the buildings are completed. The director of Tyndall's soon-to-be-completed child development center did a virtual walk-through of her building and identified areas where toddlers might hide, Marrano said; nurses also got a preview of their spaces.

Installation of the Future

These new technologies form just one pillar of the ongoing $5 billion reconstruction project at Tyndall, which was destroyed by Hurricane Michael in 2018. New facilities and a new F-35A Lightning II fighter wing will also shape Tyndall's effort to become an 'Installation of the Future,' a model for how the Air Force writ large might become safer, stronger, and more efficient in the years ahead.

There are still more emerging technologies that could further enhance security at Tyndall:

- **ZeroEyes:** An artificial intelligence program that scans more than 60 live security camera feeds and alerts Security Forces if a firearm is detected. Rapid detection should help defenders prepare and respond faster in case of an active-shooter situation, Tyndall's Security Force Program Manager Mark Shackley said. Tyndall is the first Department of Defense installation to get ZeroEyes.
- **Digital Force Technologies' Force Protection Kit:** A system of infrared cameras, ground-based radar, and laser-range finders that artificial intelligence can scan for threats such as unmanned aerial systems. The automated system is supposed to reduce the cognitive load for security forces Airmen, according to the Air Force.
- **Robot Dogs:** Designed by Ghost Robotics, the semi-autonomous quadrupeds sport nine sensors and act as extra eyes and ears both day-to-day and in extreme temperatures, according to the Air Force.

Sarah McNair/USAF

Tyndall Air Force Base's Program Management Office showcased the innovative capabilities the Installation Resilience Operations Center (IROC) will bring. The IROC prototype is a game-changing solution for enhancing base security, emergency response, and facility operations.

"Anybody from the base can come in and interact with their facility," he said. "Being able to help users look at their facilities before they receive them and give feedback is really important."

The models are helpful in storm planning. The base model lets managers anticipate how storm surges could affect the base, model traffic congestion due to construction, and simulate the effects of a major exercise, like Checkered Flag. Security Forces Airmen can use it to model how they might respond to an active-shooter scenario, knowing that important details, such as which way a door swings open, are faithfully rendered.

The digital twin project is in a pilot stage as the base awaits cyber accreditation, Marrano said, but the program should be ready for wider use in about six to nine months. At that point, the concept could be applied to other bases—provided facility data is available at those facilities. Over the next year, Marranos' team will explore how to align data standards so that installation managers across the military can quickly create digital twins of their own bases.

IROC N' ROLL

Another new concept getting a test-run at Tyndall is its Installation Resilience Operations Center (IROC). Here, base leadership, first responders, facility managers, and others gain a common operating picture of the facility in real time.

The IROC aims to answer the question: "How do we take all these different hardware and sensors and connect them up to the decision-makers?" Marrano said. "If every piece of information is in a silo and a human is all that's gluing it together, then that slows down our decision-making process and introduces errors."

Conventional processes require time for information to be relayed from one strata to the next. For example, if a fire starts on the flight line, a fire marshal establishes a safety cordon and radios security forces, who map out the incident on a whiteboard with a marker, then relay that information to the unit command center, Marrano explained. But each stage of voice-to-voice communication adds time and increases the risk that information will be relayed incorrectly.

"Grid coordinates or other numbers get switched around all the time," said Mark Shackley, innovation team lead and security force program manager for the Natural Disaster Recovery Division. "Your entry control point might end up somewhere else. Being able to take that data, make it digital, and show the same across everyone's devices means nobody's getting lost."

Day-to-day, IROC can pull in data from building sensors to alert facility managers if air conditioners are not working properly, if a leak is detected, if humidity is reaching unusual levels, or if doors are not closing properly. Consolidating all that data into a single system simplifies everything, especially as systems and sensors are increasingly networked into a base's "Internet of Things."

"If you went to the fire station or the base defense operations center, you'll see an Airman watching five or six monitors with three or four keyboards in front of them," said Marrano. "You can't respond effectively with that much information overload."

The same concept scales across the entire Department of the Air Force. In the future, base IROCs could feed data to an enterprise-level operations center. If a vulnerability or inefficiency is detected in one IROC, enterprise analysts could help resolve similar issues at other bases.

To keep IROC cybersecure, each facility at Tyndall will have its own network switch and gateway, so that a vulnerability can be contained, and not allowed to spread to the rest of the base, Marrano explained.

The IROC already links more than 60 buildings at Tyndall, and USAF leaders are looking at which installation might be next.

"Within a [fiscal] quarter or so, we're going to have more examples of how that data gets connected together, more information fused and layered together to provide more insights," Marrano noted.

Staff Sgt. Stefan Alvarez

U.S. Air Force Col. George Watkins, 325th Fighter Wing commander, prepares to exit an F-35A Lightning II at Tyndall Air Force Base, Fla, in August leading up to the 325th Fighter Wing's mission change, bringing the 95th Fighter Squadron and aircraft iron back to the flight line of Tyndall.

Tyndall Air Force Base Will Be an F-35 Maintainer's Dream ... Eventually

Three new hangars under construction at Tyndall Air Force Base, Fla., could make maintaining the F-35 Lightning II, the world's most advanced fighter jet, more efficient than ever, with built-in maintenance facilities, a walkable campus, enhanced wireless connectivity, and other amenities.

"This is a dream for any maintainer," said Col. Robert Kongaika, commander of the 325th Maintenance Group, which will oversee the upkeep of the 78 F-35s to be assigned to Tyndall's 325th Fighter Wing.

The base is undergoing a $5 billion reconstruction effort after Hurricane Michael destroyed it in 2018. As the installation transitions from training F-22 students to flying operational F-35s, it is also building new facilities and new technological capabilities as it strives to become the Air Force's 'Installation of the Future,' the model of what the service could look like in years to come.

The three F-35 hangars, one for each squadron, are a part of Tyndall's Zone One, an area devoted to flight line activities. The zone includes a maintenance complex, group headquarters, aircraft parking aprons, aircraft support equipment storage, a corrosion control facility, and an F-35A flight simulator building. It is the single largest military construction contract on record in the Air Force database, which dates back to 2008, according to an Air Force release. The construction contract is $532 million, but contingencies and contract oversight brings the total investment to $604 million.

The top-dollar price should deliver top-of-the-line quality: each hangar will serve as home for both maintainers and pilots for each of the three F-35 squadrons, which should allow for easy cross-pollination, Kongaika explained. Hangar doors at either end of the facilities will let jets flow in and out more easily, he said.

Maintenance demands ample electricity to power the aircraft; air for inflating tires or environmental control systems; and water for spraying down the jets. In older hangars, maintainers would bring in noisy aerospace ground equipment that guzzled fuel and generated exhaust, but at Tyndall those utilities will come straight out of the building itself. The colonel worked with a similar set-up at Luke Air Force Base, Ariz., another F-35 location, where utilities rose up from the hangar floor on hydraulics.

"That's state-of-the-art in my opinion, because you're reducing your thrash: the wasted time it takes to bring in other equipment and take it out," he said.

Air conditioning and high-speed wireless internet will be built-in rather than ad hoc, as is the case in some other facilities. Reliable Wi-Fi is increasingly important to connect tablets and other devices maintainers rely on to fix F-35s. Kongaika envisioned future wrench-turners using augmented reality-equipped headsets or glasses to further streamline the maintenance process.

The challenge is that the hangars will not be built until 2026,

but F-35s with the 95th Fighter Squadron have already begun arriving at Tyndall. The first four arrived earlier in August, with 12 more scheduled by the end of summer 2024. For now, maintainers with the 95th Fighter Generation Squadron (FGS) work out of a refurbished office space, but the jets remain outside without the benefit of sunshades.

"We've got ice machines, we've got Gatorade to try and make that as tolerable as possible, but they will be straight up on the open ramp in the Florida sun," said Maj. Benjamin Flores, commander of the 95th FGS. "That will be something we'll have to keep a focus on and try to make it as easy as possible for them."

Another challenge is the scale of the rebuilding effort, where up to 4,000 construction workers a day rub elbows with operational Airmen. The tight quarters require careful coordination between the 325th Fighter Wing, the Air Force's Natural Disaster Recovery Division, the U.S. Army Corps of Engineers, and the contractors the corps manages.

"We spend a lot of time trying to look forward to identify where those conflicts could occur and mitigate them before they become an issue," said Col. Robert Bartlow Jr., chief of the Natural Disaster Recovery Division, "but things happen all the time where we realize we've got a problem and we need to address it."

For example, one of the tenant units at Tyndall is the 601st Air and Space Operations Center, which plans, directs, and assesses air and space operations over North America, a vital mission that cannot be interrupted. But over the next few months, Tyndall is renovating all the utilities across the base, which will require shutting down the roads leading to the 601st building, known as the Air Operations Center (AOC).

"Right now we're figuring out alternate means of access to the AOC and we'll come up with one, get it approved, and we'll press forward," Bartlow said. "That's one thing that fortunately we identified well enough in advance."

Kongaika expressed concern for his Airmen's safety amid the congestion and construction.

"We have to have a really heightened sense of situational awareness around us, so I'm always preaching safety," he said. "I want to empower our Airmen to knock it off or slow it down whenever they see things that are the three Ds: dumb, dangerous, or different."

Maintainers with the 95th FGS are adapting to the fluid circumstances. Their main depot for tools and spare parts is about a mile away and across a security checkpoint from their temporary facility, which can disrupt workflow. To get around the problem, the 95th set up a smaller warehouse in a side room of their current building, reducing the number of back-and-forth trips.

Sustaining a fighter squadron requires thousands of spare parts and equipment such as rolling tool boxes, torque wrenches, screw drivers, pliers, engine covers, safety gear, latex gloves, and more. Col. George Watkins, the commander of the 325th Fighter Wing, likened it to "standing up a super-sized AutoZone."

But a successful fighter generation squadron also requires the right culture to sustain mission-ready aircraft every day, even in difficult weather. While finding experienced F-35 maintainers is not as difficult today as it was a few years ago when the jet was brand-new, it will take time for the 95th FGS to learn how to work as a team.

"We have not worked as a team to generate aircraft—we've all done it individually at different places," Flores said. "We have to make sure we have the communication in place and the expectations set so we make the right call and follow the right processes. We'll learn, but I think that's just part of the growing process for a new team."

Kongaika expressed a similar view.

"There's nothing that replaces hands-on training, so we need some aircraft in order to train," he said.

The arrival of the first four F-35s should keep maintainers busy for now, as will the dozen coming over the next year. Barring further production delays, the 95th Fighter Squadron should reach full operational capability with 24 primary assigned aircraft and two more in reserve by the middle of 2025. The number of 95th FGS maintainers will also grow from about 50 people on the ground today to an end-strength of 200. Becoming operational will take sweat and coordination, but the new aircraft, the new hangars, and the chance to build a new unit from the ground up has its rewards too.

"Seeing our own aircraft in front of the squadron with the Tyndall tail flash on it … it's just a good feeling, and I think that's what everyone is excited about," said Flores.

David Roza/staff

Col. Robert Kongaika, head of the 325th Maintenance Group at Tyndall Air Force Base, Fla., displays a mock-up of Zone 1, where the 325th Fighter Wing's hangers, headquarters, flight simulators, and other facilities will be built. The three identical buildings near the top represent a hangar for each of the wings F-35 squadrons.

OUTSTANDING AIRMEN OF THE YEAR

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

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

SMSGT JUSTIN S. CRUZ

Superintendent, Operations Flight
21st Civil Engineer Squadron, Space Base Delta 1, Peterson SFB, Colo., SpOC (Airmen supporting Space Force)
Home of Record: Vilonia, Ark.

Cruz showcased leadership skills by overseeing his base's largest flight. He executed a $7.6 million budget and 18 service contracts to sustain over 1,000 acres and 205 facilities valued at $2 billion. While deployed in support of Operations Inherent Resolve and Spartan Shield, Cruz led a 25 joint-member team to reconstitute bare-base assets and provide reliable power for 340 new living quarters. Additionally, he and his team created an innovative corrosion-control solution for the command's sole Battle Airborne Communications Node aircraft. His leadership drove a $3 million project to construct the site for the first Air Force owned "Coyote" weapon system, which helped protect six weapon system platforms valued at over $200 million against unmanned aerial attacks.

Senior Airman Brooke Wise/USSF

SMSGT SEDRICK F. EVANS

PACAF Enlisted International Affairs Manager
Headquarters Pacific Air Forces, A5/8 Directorate of Strategy, Plans, Programs and Requirements (PACAF)
Home of Record: Dallas

Evans led Pacific Air Forces enlisted Air and Space Security Cooperation strategy for 36 nations. As an enlisted international strategist, he secured allocations and $20,000 in funding for two language-enabled Airmen to attend Taiwan's Senior NCO Academy, cemented as the first time in U.S. and Taiwan relations history. He also devised an enlisted charter which inked 13 nations to increase regional institutional collaboration. Furthermore, Evans served as a panelist at Sri Lanka's National Defense Conference, where he teamed with eight DOD entities to discuss "Impact of the NCO" to 147 enlisted service members. He forged the first-ever Professional Military Education (PME) exchange in Philippines Air Force history, programming a leadership development week for 40 sergeant majors taught by two Senior NCO academy instructors to culminate a two-year planning effort.

Master Sgt. Gena Armstrong

MSGT MICHAEL A. GALINDO

Chief, Weapons and Tactics
502nd Security Forces Group, Joint Base San Antonio-Randolph, Texas (AETC)
Home of Record: San Antonio

Galindo's leadership as the Senior Enlisted Leader for the 324th Training Squadron resulted in the successful graduation of 328 Air Force and Guardian flights. His interim role as a Security Forces Squadron Senior Enlisted Leader was equally commendable, overseeing the safety and security of 660,000 visitors during five base events, including the largest air show in Texas history. His leadership skills were critical in leading two flights of 161 Airmen and Soldiers through 338 criminal responses, the largest law enforcement mission in the Air Force. He integrated the local school district into active-shooter training and operationalized AETC's first installation self-entry gate at Army North Command. Galindo established the first law enforcement-focused Weapons and Tactics Section with advanced technologies.

Kerry Archam/courtesy photo

TSGT JENNEL L. EDWARDS

Security Forces Evaluator
91st Security Forces Group, Minot AFB, N.D. (AFGSC)
Home of Record: Ohio

Edwards is responsible for conducting evaluations for security forces members across four squadrons. During the award period, she filled the flight chief vacancy for seven months while leading 100 missile maintenance taskings and three camper alert teams, enabling Minuteman III fleet code changes. As one of the Air Force Global Strike Command's top tactical radio experts, she built a contingency plan outlining a framework of beyond-line-of-site capabilities for 20th Air Force that evolved into a $1.9 million upgrade to mitigate a 60-year gap in missile field communications. Edwards also completed 65 credit hours toward a master's degree in social work, while simultaneously mentoring and inspiring fellow Airmen.

Airman 1st Class Kyle Wilson

TSGT MICHELLE A. FERNANDEZ

NCOIC, Marine Patrol Unit
6th Security Forces Squadron, MacDill AFB, Fla. (AMC)
Home of Record: MacDill AFB, Fla.

After four years as a Master Military Training Instructor, Fernandez arrived at MacDill Air Force Base and immediately embedded herself into security operations by stepping into the role of Security Forces Flight Sergeant. She directed 27 Airmen during a USSTRATCOM Nuclear Operational Readiness Exercise, earning 12 accolades for the 6th Air Refueling Wing. She was selected to lead the Air Force's sole 24/7 Marine Patrol Section responsible for securing MacDill's 7.2-mile-long coastal restricted area. Under her guidance, her team orchestrated MacDill's first-ever Operation Neptune Storm, a multijurisdictional show of force comprised of 17 vessels from federal, state, and local maritime law enforcement agencies displaying rapid response and attack capabilities utilized to secure Florida's western peninsula. Fernandez led her team through five drug and immigration-related vessel seizures, capturing 27 criminals and saving two lives on a distressed vessel response.

Senior Airman Joshua Hastings

USAF

TSGT MICAELA R. MAHAN

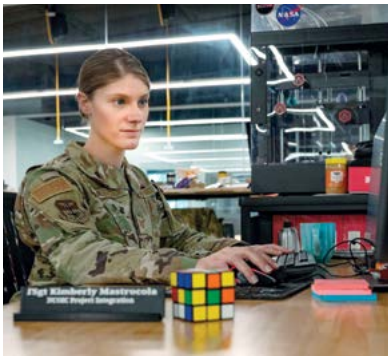
NCOIC, Military Justice
7th Air Force, Office of the Staff Judge Advocate, Osan Air Base, Republic of Korea (AFMC)
Home of Record: Fort Walton Beach, Fla.

Mahan led a nine-member team that oversaw 65 criminal cases, 15 courts-martial, 266 adverse and administrative actions, and 18 discharges for the fourth largest legal office in the Air Force, serving three wings and a major command. As the acting superintendent, she improved the office budget by 77 percent, enabling the purchase of $64,000 in IT equipment. She was also the Wing Staff Agencies' additional duty First Sergeant where she provided support for 190 personnel across 17 units. Mahan earned the Paralegal Craftsman Course Top Graduate Award, and NCO Academy's Distinguished Graduate and Commandant's Award, all while completing her bachelor's degree in Investigative Forensics with honors.

TSGT KIMBERLY R. MASTROCOLA

Noncommissioned Officer in Charge of Wing Project Integration
1st Special Operations Wing, Hurlburt Field, Fla. (AFSOC)
Home of Record: Camillus, N.Y.

Mastrocola directed project integration where she pioneered the first-ever U-28 water egress simulator, engineered a C-130J inspection tool, and chaired a safety working group for 1,400 aircraft maintainers. While commanding several innovation efforts, she impacted 3,000 Airmen by completing 11 major projects and serving as a community leader for Women in STEM, ultimately earning the Wing's Lance P. Sijan Award for leadership. Mastrocola also served as the lead project officer for three data science events under the Chief of Staff of the Air Force's Strategic Studies Group, directly resulting in 39 immediately deployable solutions for DOD. She also excelled academically by completing a Master of Science in Aeronautics before going on to pursue a Ph.D. in Systems Engineering and directly honing learned skills in operational environments.



USAF

TSGT THEODORE M. SEBSIBE

Noncommissioned Officer in Charge of the Electrical Systems Section
316th Civil Engineer Squadron, Joint Base Andrews, Md. (AFDW)
Home of Record: Clinton, Md.

Sebsibe leads two sections and 35 engineers, and is responsible for directing continuous maintenance and upgrades for the electrical distribution system supporting 512 facilities worth $5.6 billion and 26,000 personnel, which earned him a coin from the Senior Enlisted Advisor to the Chairman. He also serves as the Commander's Inspection Program administrator—where he leads 12 Air Force Specialty Codes, 456 engineers, and 955 items which was key to achieving a 97 percent compliance rate and receiving the Inspector General Recognition as Superior Performer during the 2022 Unit Effectiveness Inspection. He was the command team's first choice to fill in for 60 days as the Civil Engineer Squadron first sergeant, supporting a 504-person squadron, executing 5 PME seminars, advising the squadron commander through 24 administrative actions, and resolving 26 family advocacy cases.


Tech. Sgt. Devin Boyer

1st Lt. Jason Carr/ANG

SSGT DHRUVA S. POLURU

Mission Planner and Strategist
222nd Command and Control Squadron, Rome, N.Y. (ANG)
Home of Record: Herndon, Va.

Poluru is the first Air National Guard member to achieve certification and serve as a Joint Task Force, Space Defense Commercial Operations Mission Director, collaborating crowd-sourced satellite telemetry-tracking data and providing Indications and Warning tippers to domestic and allied mission partners. These allies were also mentored in the U.S. Space Command GLOBAL SENTINEL exercise by integrating the New York State Partnership Program with Space Operations through hands-on satellite cataloging and tracking instruction. He was also entrusted to complete the test and checkout of a $55 million suite of electronic warfare equipment that produced the operational verification of a counter communication system upgrade, impacting five Air National Guard Squadrons as well as a number of deployed Space Force units in EUCOM and AFRICOM.

SRA RYAN G. HOSPELHORN

Flight Security Controller
841st Missile Security Forces Squadron, Malmstrom AFB, Mont. (USAFE-AFA)
Home of Record: Norman, Ill.

Hospelhorn launched the small unmanned aircraft system (sUAS) program at Spangdahlem Air Base, Germany. He authored three instructions, secured multiple host nation and wing approvals, and developed shared airspace between manned and unmanned aircraft to enable 12,000 sorties. Over seven months, he led a six-person team to test a hunter-seeker drone in conjunction with the U.S. Air Forces in Europe Command and the Air Force Research Laboratory. Hospelhorn authored and taught a two-month certification process to integrate 10 sUAS pilots into operations to provide a first-time capability to the wing. He managed a $350,000 technology acquisition and upgrade to enable real-time command and control of 47 patrols and nonkinetic emergency response capability for a 40-kilometer AOR. He was selected for a fellowship with AFWERX, where he laid the groundwork for the Air Force's efforts in drone swarming defense.

USAF

SRA KOSTIANTYN KHYMCHENKO

HVAC Journeyman
633rd Civil Engineer Squadron (ACC)
Home of Record: Langley AFB, Va.

Khymchenko was selected for deployment to Germany in support of Operation ATLAS GUARDIAN and awarded an Air Force Commendation Medal. He led eight translators in 50 multinational teleconferences and advised four general officers on partner-nation air defense. He translated over 30 tactical maps and transmissions from Russia, intel which provided Ukraine with the location of over 400 sites and 1,500 real-time missile launch alerts. His actions increased the survivability of 40 aircraft, $2 billion in assets, and 8 million lives. For his efforts, Khymchenko was presented the Ukraine Support Medal by the Ukrainian Minister of Defense and coined by Chief Master Sergeant of the Air Force and Secretary of the Air Force. He was also named wing Airman of the Quarter for the second quarter of 2022 for his role in leading 12 engineers to complete 742 jobs and 36 emergencies, including the protection of a $10 million ISR server farm at Langley Air Force Base, Va., earning himself a COMACC (Commander of Air Combat Command) coin.

USAF

SRA JACOB TAWASHA

Fire Team Leader
349th Security Forces Squadron, Travis AFB, Calif. (AFRC)
Home of Record: Travis AFB, Calif.

Tawasha deployed in support of Operation Inherent Resolve, during which he worked as part of a team securing over 50 combat aircraft valued at over $6 billion. During his deployment, he used his language skills to remove border crossing issues for 11 convoys to seamlessly cross international borders. He was selected for Exercise Agile Lion to provide security, enabling the safeguarding of over 100 personnel and protection of over $2 billion in Air Force assets. Tawasha also volunteered 28 hours to teach Arabic and English to 41 Jordanian, German, and U.S. personnel at an undisclosed location, which directly improved wing interoperability and the partnership between coalition forces. Across 25 assignments and patrols, Tawasha was recognized by the Company Grade Officer Council's "Above the Bar Award," the First Sergeant Council's "Diamond Sharp Award," and was a two-time "Defender of the Month."

USAF

How At-Scale Agility Could Address Structural Challenges in the Department of the Air Force

Many government organizations have pursued "agility" with mixed success, confusing whether it's "nimbleness" or "a culture element." According to McKinsey & Company, agility is objective, and attained by balancing stability and dynamism. Striking that balance can help unlock major opportunities for the Department of the Air Force.

"If you have only stability, then you might be a low-functioning bureaucracy. If you have only dynamism, then you invite chaos," says Kirk Rieckhoff, a senior partner and leader of McKinsey's Defense practice. "Organizational agility refers to the ability to achieve the optimal balance between stability and flexibility. This involves having certain aspects of the operating model, such as personnel, processes and budgets, remain stable. It also entails embracing dynamism and adaptability when it comes to task assignment, resource allocation, and responses to a changing environment. This equilibrium empowers leaders to adapt and remain nimble over time."

Senior Airman Dawn Weber

The Air Force was born out of innovation," says Kirk Rieckhoff, a senior partner and leader of McKinsey's Defense practice. "There's a ton of opportunity for government to bring some of those great lessons from the way it works in an agile manner in times of crisis."

McKinsey & Co. has been around for nearly a century and serves between 80 and 90 of the Fortune 100 companies at any given time. While best known for its work in the private sector, McKinsey has supported public sector organizations since WWII. Its work ranges from developing the first Presidential transition team to reorganizing federal science offices into NASA. McKinsey has served every executive Cabinet agency in the U.S. and two-thirds of U.S. States.

"[The Air Force] is such a large and distributed organization that getting things done quickly and at scale is a significant lift," says Rachel Riley, a partner in McKinsey's Public Sector and People/Organizational Performance practice. But she emphasizes there's nothing about public sector organizations that make them intrinsically slow—in fact, she cites the U.S. Department of Homeland Security's rapid response to 9/11, FEMA's reaction to Hurricane Katrina, and the Air Force's rapid response to the COVID-19 pandemic as prime case studies of public sector agencies that have executed missions with tremendous agility during times of crisis. Achieving at-scale agility within the Air Force is no different.

"The Air Force was born out of innovation," Rieckhoff says. "There's a ton of opportunity for government to bring some of those great lessons from the way it works in an agile manner in times of crisis. It just requires a holistic, aspirational approach to do that in the day-to-day business of running the organization."

According to Rieckhoff and Riley, McKinsey has helped private and public sector companies implement agility into their organizations to improve performance, productivity, organizational health, speed, and work design. Even large, highly regulated, technically complex companies have infused these agile concepts into the fabric of their organization and found success in improving speed, employee satisfaction, and performance.

The Air Force has a structure and set of processes that are well suited and optimized for a relatively slowly changing environment. The current competitive pressures on the Air Force, however, require a faster ability to adapt as highlighted by the CSAF's Action Orders. To make agility happen today, it requires almost single-minded focus of the most senior leadership.

"SECAF's clear priority and laser focus on the operational imperatives are the best example of the level of effort required to make change happen in the Air Force today," says Riley, though she adds that that's an incredibly high bar to allow major change to happen. "Many of the Air Force's pilots, pathfinders, and lighthouses get stuck in purgatory. Our research has found the way out is to reverse the approach. Rather than focusing on a great idea and scaling it across the Air Force, focus instead on a specific unit and apply all the ideas at once. Depots are a great example, or a flight line."

She also emphasizes the importance of personnel and upgrading existing talent within an organization to meet mission. She cites LEGO as a success story in this area. As covered in McKinsey's new book "Rewired," LEGO provides at-scale opportunities within its workforce to upskill their employee's digital talents to empower a company-wide digital transformation.

McKinsey has found that mission-driven organizations have a special competitive advantage that plays a key role in finding that balance between structure and dynamism: the mission itself.

"The most critical enabler for agility is a clear, inspiring mission that every member of the team identifies with and is working towards. Unfortunately, that inspiration can often get buried under the weight of unnecessarily complex processes and structures," Rieckhoff says. "But that's also what gives me the most hope for the future of the Air Force … [as] an agile innovation engine for the next century of American security."

By Patrick Reardon

AFA Delivers Competitive Advantage to Airmen at Joint Base Pearl Harbor-Hickam

Courtesy

Airmen of the 15th Wing at Joint Base Pearl Harbor-Hickam, Hawaii, pose with leadership coach Terry Cook (right) creator of the Lead, Develop, Care course.

AFA's General Jimmy Doolittle Leadership Center (DLC) held a seven-day leadership training program at Joint Base Pearl Harbor-Hickam, Hawaii, in July. Entitled "Lead, Develop, Care: Proactive Leadership for Competitive Advantage," the program was developed to equip leaders at every level with the people-centric leadership skills needed to address the challenges of near-peer competition.

"Leadership is a force multiplier," said DLC Director Patrick Donley, a retired Air Force colonel and former National War College professor. "Concepts like Agile Combat Employment (ACE), Mission Command, and multi-capable Airmen haven't been executed since we were island-hopping in the Pacific during World War II. The decentralized nature of ACE will require our Airmen to practice leadership skills that most haven't even seen modeled before, much less taught. Either we train them to lead differently or else we force them to 'figure it out' on their own. As capable as today's young leaders are, we owe it to them to provide new tools that facilitate success in the emerging security environment. The leadership model we teach, called Lead, Develop, Care (LDC), is one way to provide Airmen and Guardians with a competitive advantage against our adversaries."

The Lead, Develop, Care model was designed by Terry Cook, a leadership coach with decades of experience who now works closely with Donley and AFA's Doolittle Leadership Center. The two have adapted the model for military and defense personnel, particularly leaders in the Air and Space Forces.

"In contrast to a workshop that provides a 'grab bag of tools' or focuses on the theory or ethics of leadership," Donley said, "the LDC model offers a pragmatic leadership framework for how to 'do' leadership on a daily basis. We want leaders to be proactive and comprehensive in their leadership approach and to possess a leadership algorithm that enables them to capitalize on opportunities in a systematic way."

Pacific Air Forces Commander Gen. Kenneth S. Wilsbach invited the DLC to offer an abbreviated workshop to 17 current and future squadron commanders during HQ PACAF's squadron commander course. Donley and Cook also delivered three eight-hour workshops to nearly 60 Airmen from the 15th Wing: one class was designed for company grade officers and senior noncommissioned officers, another worked exclusively with NCOs, and one was a combined workshop with Airmen ranging from E-2 to O-1, plus a Guardian, a Sailor, an Army officer, and a DOD civilian.

In a survey following the courses, 80 percent of the attendees reported that the training was "extremely helpful" to their leadership development. According to Donley, a common and unexpected piece of feedback he received at the end of each course was that attendees wished the seminar was longer.

"I was put in a leadership position and was not given tools," one Airman responded in the survey. "I go to these types of seminars all the time, but this was the first one that made me think how I can change instead of how I can change the organization."

"This course needs to be heard by the entire force," said another. "It is the best eight hours I have spent in years. I truly believe if we had base facilitators to teach this exact material, our force would be so much better."

Indeed, Hickam is just the first stop on the DLC's tour of USAF installations around the world. Donley and the DLC are scheduled to bring the program to seven more Air Force and Space Force bases between July and the end of September: one in Nevada, two in Alaska, two in Colorado, and two in South Korea.

"The namesake of AFA's leadership center is Jimmy Doolittle for a reason. The 'spirit of Jimmy' is leadership," Donley said. "Getting after concepts like ACE and multi-capable Airmen starts by getting after leadership. Leadership is in demand everywhere you look. What a privilege it is for AFA and the DLC to help equip men and women to meet that demand more effectively than ever."

By Patrick Reardon

Assembling Futures in Aviation, AFA's National Teacher of the Year: Bill McInnish

After nearly 22 years of aviation experience serving in the U.S. Navy and Coast Guard, Bill McInnish retired in 1994 as an Aviation Technology Educator for the Coast Guard—opening the door to three decades of sharing his passion for instruction, aircraft assembly, and flying planes with high schoolers in economically disadvantaged communities.

McInnish, a 9th-12th grade Career Technical Education (CTE) instructor of Aviation Fabrication and Assembly and Private Pilot Ground School classes at Eau Gallie High School in Melbourne, Fla., was named the Air & Space Forces Association's 2023 National Teacher of the Year (TOY). The award is sponsored by Rolls-Royce North America. He was nominated by AFA's Florida Space Coast Chapter #309.

Courtesy

AFA National 2023 Teacher of the Year Bill McInnish.

"Congratulations to Bill McInnish for this well-deserved recognition as AFA's National Teacher of the Year," said John Shade, Executive Vice President for Business Development and Future Programs at Rolls-Royce Defense. "Thanks to his efforts, the future is even brighter for the next generation of aerospace leaders. At Rolls-Royce, we are proud to sponsor AFA's Aerospace Education program and support all the stellar educators recognized coast to coast in the Teacher of the Year Program."

"Bill's initiatives have garnered the attention of Florida's elected leaders, NASA, the local aerospace industry, and his fellow educators across the nation," said AFA's Florida State President Todd Freece.

McInnish has taught at Eau Gallie High School since 2015 where he established the Aviation Fabrication and Assembly program, the first program of its kind in the nation. By providing hands-on engineering experience with real planes, the program awards high school students with National Aerospace/Aircraft Assembly certifications, enabling them to find work as entry-level aircraft technicians right out of high school.

"We provide students with a roadmap and a destination, requiring they need only apply themselves and stay the course," McInnish said. "For students accepted into this program, there is a well-paying job with future opportunities available. My seniors are hired well before they graduate, and their employers have programs set-up to immediately commence further training and advancement."

When the program started it was little more than an old plane in the school parking lot, where McInnish and his class spent the year assembling, disassembling, and reassembling the aircraft. Today, the program runs out of a state-of-the-art workshop.

"Fast forward eight years [and we have] a hangar full of aircraft and helicopters," McInnish said.

His mission as a teacher is not just to "provide" students with lessons, but to "empower" them to unlock real-world skills and build a meaningful, lucrative career—an especially important consideration at Eau Gallie where more than half of the student body comes from economically disadvantaged families.

"As a CTE instructor, my job is easy: get students off their parents' payroll and onto a manufacturer's payroll," said McInnish. "Their families are relying—sometimes solely—upon them to provide for [them]."

And McInnish's students are indeed seeing real-world results. In May 2019, eight of his students became the first high school students in the nation to earn the National Aerospace/Aircraft Assembly certifications from ASTM International (formerly known as American Society for Testing and Materials). The program's graduates have gone on to work in more than 20 aerospace companies, including SpaceX, Blue Origin, United Launch Alliance, L3Harris, Collins Aerospace, Lockheed Martin, Boeing, and more. And for the last four years, McInnish said, 100 percent of the program's graduates have moved directly into an aviation job, an engineering college program, or the military.

McInnish is also the Private Pilot Ground School instructor at Eau Gallie. He provides ground school training and simulator instruction, and then releases the students for flight training. With their pilot licenses secured, he arranges further flight experience with aviation companies to help them obtain their Airline Transport Pilot (ATP) rating and jobs in the airline industry. In 2019 alone, 16 of McInnish's students were awarded private pilot ground school certifications.

"Over the last eight years, I've taken this program from an idea to reality," McInnish said. "My students and businesses are seeing results while the program continues to expand. I've eagerly shared our successes so others may follow and, as AFA National Teacher of the Year, I look forward to helping others enjoy the successes we have experienced."

Second Place: David White

Courtesy

David Tyrel "Ty" White teaches high school chemistry and science at Wilcox High School in Wilcox, Ariz. Nominated for Teacher of the Year by AFA's Arizona Cochise Chapter #107, White's passion lies in bringing STEM experiences to rural schools. He is the co-founder of Industry Simulation Education (InSimEd), a nonprofit that connects aerospace engineers with students. He has sponsored students performing authentic research, the space settlement design challenge, the Racing the Sun Solar Go-Kart challenge, the Rocketry camp, the Biosphere experience, and other initiatives above and beyond his chemistry classroom.

Third Place: Colleen Cain

Courtesy

Colleen Cain is a 7th grade science teacher at Larson Middle School in Troy, Mich. She was nominated for Teacher of the Year by AFA's Michigan Mt. Clemens "Selfridge" Chapter #179 and has been inspiring students with STEM for 18 years as a National Geographic Certified Teacher. She has helped her students grow tomatoes from the ISS through the Tomatosphere program to investigate the impact of microgravity on plant growth and arranged for her students to meet a number of aerospace professionals, including NASA flight specialists and Space Force representatives.

By Col. Phillip S. Meilinger, USAF (Ret.)

Billy Mitchell

Father of the U.S. Air Force.

William L. "Billy" Mitchell was born in Nice, France, in 1879, the son of a U.S. senator and Civil War veteran. Billy had the martial urge as well, so he enlisted in the Army when the Spanish-American War broke out. He saw no action in that war, but was then stationed in the Philippines during the insurrection there. Promoted to lieutenant, he was assigned to the Signal Corps.

As a signals officer, Mitchell served in Alaska, stringing telegraph lines through the wilderness. Operating with a small group in extremely harsh geographic and climatic conditions was to his liking. He learned independence, initiative, creativity, and leadership. These traits would make him a remarkable officer. It was those same traits that would get him in trouble.

Mitchell was present at the creation of airpower. When the Army bought its first airplane from the Wright Brothers in 1908, it was placed in the Signal Corps—at the time, Soldiers viewed the new invention strictly as a means of communication. Mitchell thought it had more to offer.

When the U.S. declared war against Germany in April 1917, Mitchell was already in Europe watching and learning how the French and British were conducting their air operations. When elements of the newly named Air Service began arriving in Europe, Mitchell was put in charge. Soon after, aviation pioneer Benjamin Foulois arrived in France. Sparks flew. The two generals instantly disliked and resented each other, an animosity that lasted for the rest of their lives.

The U.S. Commander, Gen. John J. Pershing, saw the trouble in his Air Service and called in an old friend and classmate, Maj. Gen. Mason Patrick, to straighten things out. Patrick put Mitchell in charge of air operations, and Foulois in control of logistics. In this role, Mitchell planned and commanded the largest air operation of the war at St. Mihiel in September 1918—nearly 1,500 Allied aircraft were under his control.

After the Armistice, Billy returned to the States, but unlike most officers, he was put in a position that allowed him to retain his one-star rank—Foulois, for example, had reverted to his permanent rank of major. From his position as Assistant Chief of Air Service, Mitchell shaped the future of American airpower. He was intimately involved in all aspects of Army aviation: procurement, training, doctrine, operations, and the grooming of future leaders.

He saw the U.S. Navy as the biggest threat. It was apparent to Soldiers and Sailors that airpower would play a major role in future wars. The value of airpower was never questioned; rather, the arguments were over who would control that airpower and how it would be used. Mitchell's famous and dramatic bombing tests of 1921 and 1923 when his aircraft sank several battleships were instrumental in prodding the Navy into strengthening its own air arm—if only to ensure its aircraft were not absorbed into the Army. In a sense, one could say that Billy Mitchell was the father of naval aviation.

His ideas on how airpower would be used in war evolved over time. At first, he imagined another major land war with aircraft serving in a supporting role to the dominant land forces. This changed. Instead, he envisioned aircraft playing an independent and strategic role. To him, the enemy army had become a false target—the advent of aircraft could allow the true "vital centers" of a nation to be struck at the outset of a war by bombardment aircraft. He preached this idea tirelessly and became increasingly restive when Army superiors ignored his advice.

Air & Space Forces Association Library

Brig. Gen. Billy Mitchell, in a stunning 1921 airpower demonstration, sank the captured World War I German battleship Ostfriesland.

In March 1925, Mitchell's tenure as Air Service deputy was not renewed. He thus lost his star, reverted to the rank of colonel, and was banished to San Antonio. He was hardly quieted. When the Navy lost the airship Shenandoah in a crash, Mitchell issued a press release accusing the leaders of the Army and Navy of nearly "treasonable administration" of the nation's defense. As he no doubt expected, he was court-martialed for insubordination. The resulting trial was sensational, but the results were foregone. Mitchell was suspended for five years without pay; he elected to resign.

Years later the new Air Force would look at the court-marital to determine if its hero could be exonerated. But the facts were clear: Mitchell was guilty, even if for a worthy cause. He continued to agitate for airpower from retirement, and his ideas and example became a guiding light for countless Airmen who followed him. He died in February 1936 at the age of 56.

*Mitchell wrote three important books, "**Our Air Force**" (Dutton, 1921), "**Winged Defense**" (Putnam, 1925) and "**Skyways**" (Lippincott, 1930), in which he expounded on his theories of airpower. The best biographies are by Alfred Hurley, **"Billy Mitchell: Crusader for Air Power"** (Franklin Watts, 1964) and Douglas Waller, "**A Question of Loyalty" (Harper Collins, 2004).***

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