

Bursting Balloons: The New Cold War With China Heats Up 22

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KC-46A TANKER

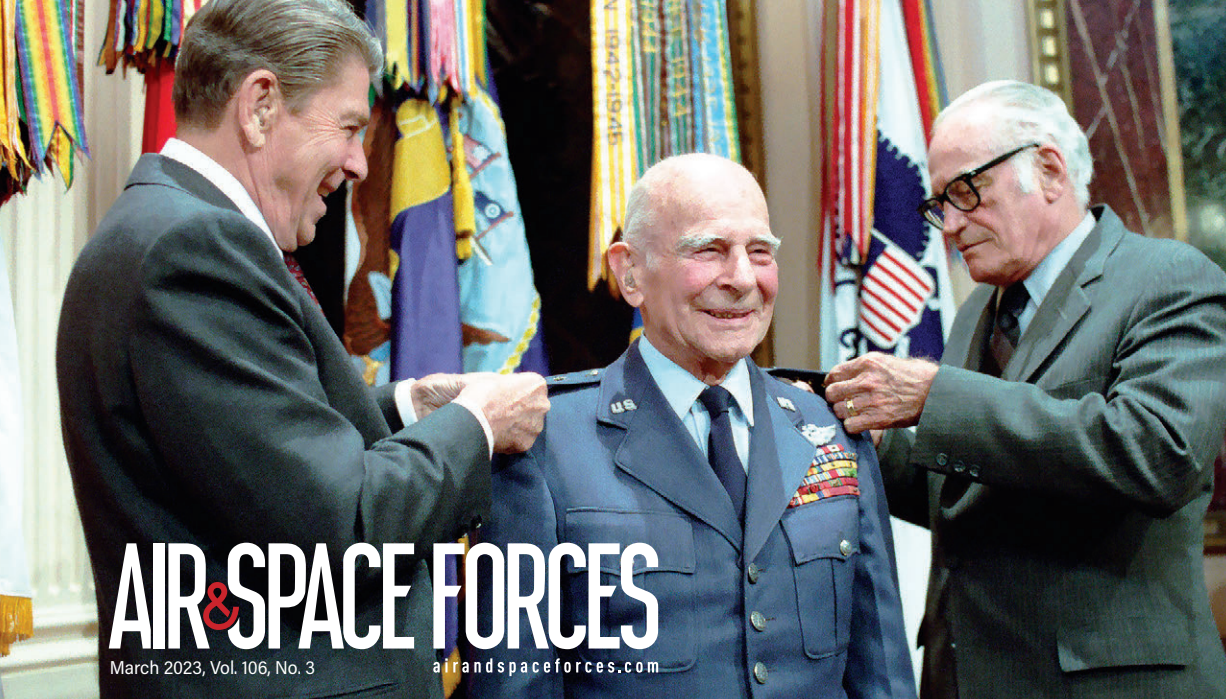
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President Ronald Reagan, left, and Sen. Barry Goldwater (R-Ariz.), right, present the honorary four-star rank to Gen. James Doolittle during a ceremony at the White House, Washington, D.C., June 13, 1985.

ON THE COVER



Mike Tsukamoto/staff

An artist illustration depicts a U.S. Air Force F-15EX firing a Raytheon Peregrine missile. The Peregrine is a small, fast, lightweight air-to-air weapon for use against drones, manned aircraft and cruise missiles. Built with additive manufacturing and readily available materials, the missiles are low cost.

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By Tobias Naegel

Myth Busting

The Chinese balloon that transited the skies over the central United States in late January and early February was nothing if not a wake-up call to the nation. We discovered:

■ All the best satellite intelligence and ground-based radars in the world can still miss threats if they don't know what they're looking for. "It's my responsibility to detect threats to North America," said NORAD Commander Gen. Glen D. VanHerck. "I will tell you that we did not detect those threats. And that's a domain awareness gap that we have to figure out."

■ China has been flying balloons over the United States and other countries for years. It's still unclear if the U.S. Intelligence Community was aware of that and simply failed to share that intelligence with the Department of Defense or whether they, like NORAD, simply didn't know what they were looking for. What is clear is that once we did know, intel agencies were able to rewind the clock and find past incursions over the United States and also some 40 other countries around the world.

■ The Department of Defense had no preexisting operational plan for how to deal with a crisis involving a balloon gathering intelligence over the United States. The indecision and lack of clarity emanating from the Pentagon and the White House as the issue played out in real time make that clear. Whatever one thinks about when the aircraft should have been shot down—over the Pacific, over Alaska, over Canada, over the north central American plains or after crossing the continent in the Atlantic—it's clear that national leadership was also divided and unsure what to do, and that the playbook did not have an answer for this kind of problem.

There's still much we don't know. We don't know how long it took NORAD to inform the Secretary of Defense about the Chinese airship's penetration of the U.S. Air Defense Identification Zone or even to identify what it was that crossed into the ADIZ. We don't know if intelligence agencies that saw the balloon lift off from Hainan Island in China tracked the balloon as it transited the Pacific. We don't know when the Secretary of Defense and the President learned about the balloon: Before it crossed into U.S. airspace, as it happened, or after? And we don't know what military engagement options were recommended.

Defense officials claim the United States gained more intelligence in this incident than the Chinese did. That may be an educated guess, but it's not a fact. We can be sure the Chinese learned a lot from our response, including U-2 flights to monitor the balloon, jamming to limit its collection activities, and ultimately the approach to the balloon by F-22 Raptors and its shoot down with a sidewinder missile.

Clearly, China is now on notice should it risk future incursions. Just as clearly, the U.S. now understands its awareness gaps, making it substantially harder for China to float sensors over the United States unnoticed in the future. Yet we must also recognize that China tested the United States to understand how our defense establishment would respond to a novel incursion, and therefore to gauge how we might respond to future incursions of other sorts.

That test will impose costs. U.S. intelligence will henceforth be looking for balloons and airships in addition to aircraft, ships, and submarines, and that burns attention, time, effort, and resources. We will invest millions in new software, sensor technology, and other means to identify and neutralize airship incursions, even if we never see another one. For China, that's quite a return on its investment.

Yet this newest wrinkle in the emerging Sino-American Cold War has its benefits. China has to wonder: Will the U.S. response be the same the next time? The shoot-downs of smaller "objects" floating over Alaska, the Yukon, and Lake Huron over the next weekend suggest a more aggressive

posture in the future.

Those Americans denying the U.S. has anything much to fear from China have at least been jostled from their gauzy dreams. One would have to be willingly naïve to accept China's explanation that this was a weather balloon that somehow veered off course.

Credit the Chinese for exploiting the seam between air and space, a region generally uninhabited by air or spacecraft where intelligence assets can operate largely unhindered. Why they chose to risk that operational advantage—whether purposely or as the result of some kind of error, or out of arrogance, because they'd never been noticed before and thought they could make such flights with impunity—is a question worth pondering.

Regardless, Americans now may be less quick to criticize those like Gen. Mike A. Minihan who call it like they see it regarding China's speech, actions, methods, and ambitions. Minihan spent two years as the deputy commander at U.S. Indo-Pacific Command before taking charge of Air Mobility Command a year ago. So, when he says he's studied China and he sees trouble getting close, we should pay attention.

"I hope I am wrong," Minihan began in a Feb. 1 message to his Airmen. "My gut tells me we will fight in 2025." He then laid out his reasons for feeling that way and his commander's intent about readiness in anticipation of that chance. He did so in his own direct, plain-spoken style, advising his Airmen to get their affairs in order and to practice their target shooting.

When the internal memo was leaked to a TV news reporter, the story exploded. Minihan was criticized for saber-rattling and warmongering, and some even suggested he should resign or be fired. What Minihan was doing was telling the truth, setting an example for others to follow.

The fact is, we live in a dangerous world. The threats are real, and the stakes are high.

Minihan's message channeled Air Force Chief of Staff Gen. Charles Q. Brown Jr., who came to office warning the Air Force to "Accelerate Change ... or Lose." Like Minihan, his experience commanding U.S. Pacific Air Forces and, before that, U.S. Air Forces Central, informed his conclusion that U.S. forces need to ramp up their game in order to defeat China's ambitions and defeat the People's Republic Army Air Forces if a fight proves unavoidable. Likewise, his sense of urgency echoes that of Air Force Secretary Frank Kendall, who sought out his post because of the threat he sees rising in China.

In the Pacific, Brown championed Agile Combat Employment because the U.S. Air Force could not hope to fight China as we fought Vietnam 50 years ago, flying long-range missions from fixed bases in Guam and the first island chain. Instead, the U.S. and its allies must present an unpredictable and complex set of distributed threats, the ability to operate, attack, and counterattack from anyplace, and with next-generation weapons that give the United States distinct advantages in speed, range, and stealth.

Argue all we want about the details—which aircraft the Air Force needs most, and how many, and whether divesting current capacity to invest in future capability is a viable strategy—but make no mistake Brown remains right on target. So does Minihan. China poses a real and present threat to its neighbors, and a growing threat to American interests. To think otherwise is to buy into a myth.

The time has come to rapidly modernize U.S. Air and Space Forces and develop and field new technologies that restore our ability to dominate, as needed, in the air and space domains. America squandered its edge over three decades because we undervalued air and space power.

It is time to reverse that trend.



Americans now may be less quick to criticize those like General Minihan who call it like they see it regarding China's speech, actions, methods, and ambitions.



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False Alarms

When I read this article ["The Near Nuclear War of 1983," December 2022, p. 47] it brought back memories of the NORAD False Missile Warning event on Nov. 9, 1979. On that morning a technician used a disk pack to check out a device called the Message Generator Recorder. This equipment was routinely used to transmit TEST events to the external users like SAC and NMCC [National Military Command Center].

The disk pack contained an accurate portrayal of a mass missile raid from the USSR. Without the TEST tag enabled the external users of this data had to assume it was REAL. The safety valve was called Confidence Reporting. On that morning, Maj. Paul White and his crew in the inside Warning Center implemented voice tell confidence reporting procedures with all the Missile Warning sensor sites who reported "No Confidence" which meant they had not detected or sent any launch messages. I was part of a small group who investigated this event and prepared recommendations up to the CJCS.

In Sept. 27, 1983, False Warning indications appeared in the equivalent Russian Missile Warning Center. On that day, Lt. Col. Stanislav Petrov used his knowledge of the Soviet missile warning sensors to determine that reports of U.S. launches from Grand Forks Air Force Base, N.D., were internal false alarms hence preventing a possible retaliatory launch.

In 1983, I had moved on to the Surveillance Officer position in the NMCC. I was on duty when the Russians shot down KAL 007 over Sakhalin Island. At the time this looked like a single tragic event but viewed in the context of this article it is clear it was part of the paranoia of the time in the USSR.

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.

Col. Victor P. Budura Jr.
New Market, Ala.

Boom Not Ready

With regards to the continuing saga of the problem-plagued KC-46 remote vision system ["Eye on the Boom: Re-visioning the KC-46," January/February, p. 48], I would be curious to know how the RVS in the competing Airbus A330 MRTT works. Does it have similar problems? I have heard nothing at all about this. Since there seems to have been no complaints about that system, has anyone thought of simply transplanting it into the KC-46?

Who is the contractor for the A330 RVS? I know the KDC-10 that the Dutch used had a RVS, and those two tankers I believe are now operated by Omega as contract tankers. How has that system operated over the last 20 or so years? I think it would be very interesting to hear answers to these questions.

MSgt. Chris Dierkes,
106th RQW
Westhampton Beach, NYANG

The 2.0 vision article still doesn't answer the fundamental question? Who is responsible for the camera approach?

Was it the Air Force or Boeing that thought it was a good idea? Was it a contract requirement to delete the reliable window seat, literally, and replace with a series of unreliable video stations.

After all this time and it isn't fully operational including the boom itself—no excuses accepted!

KC-46B with a rear window. No more video games.

Charlie McCormack,
Danville, Calif.

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All In

Sen. Joni Ernst, speaking at the Reagan Defense Forum, Dec 3, 2022, noted the “push and pull between the administration and Congress” regarding support to Ukrainians. She went on to say, “If we’re not helping the Ukrainians win ... what happens next with Taiwan or another hotspot?” [“Verbatim,” January/February 2023.]

While I agree with her overall intent, I believe she missed the point of how and why we are in this predicament. If the U.S. had established a strong deterrent policy against a Russian invasion of Ukraine, a war could have been prevented. The policy could have stated that the U.S. would stand behind the commitment we had made to defend Ukraine if they would get rid of the nuclear weapons that they maintained under the USSR.

To execute that commitment, the U.S. should have deployed U.S. and EU forces to Ukraine while Russia built up their forces before their attack of Ukraine. The policy should have stated that any attack on Americans, American business and U.S. forces would be an attack on America. In turn, such an attack would invoke the NATO Article 5 defense response, which states that an “attack on one (NATO country) is an attack on all.”

Instead of such a deterrent policy, the administration executed a series of sanctions against Russia that evidently did not prevent a war.

In regards to Taiwan, the U.S. needs to deploy forces there to defend Americans, U.S. businesses and U.S. government entities. Any attack on these entities should be considered an attack on America. Also the policy should state that any attack on Taipei would be countered by an attack on Beijing. Finally, the U.S. State Department needs to update any plan to evacuate noncombatant Americans from Taiwan.

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

Make Ready

I am a retired Vietnam-era Thud Wild Weasel and former commander of the Air-to-Air Weapons System Evaluation Program. I have been following the dialogues in these pages and at the September AFA Air, Space, and Cyber Conference. While decades ago I debriefed any access to classified information, I note from open sources the Chinese retention and converting of hundreds of retired Gen-3 fighters to unmanned drones, and their basing and sheltering on the five mainland air bases closest to Taiwan.

This is an ominous development, for it telegraphs a Chinese intent to overwhelm and exhaust Taiwan's air defenses in advance of any assault on the island, similarly to our use of drones against the Iraqi air defenses in the opening hours of Desert Storm. Loading those five closest bases with sacrificial drones in lieu of their front-line fighters is a pre-attack posture, not a defensive basing configuration.

The latest U.S. National Defense and National Security strategies characterize China as the pacing threat, yet seem sanguine about its immediacy. AMC Commander Gen. Mike A. Minihan and House Foreign Affairs Committee Chair Michael McCaul have publicly questioned those premises that the burgeoning Chinese threat and preliminary air and naval exercising around Taiwan portend only a remote likelihood that China will act on Xi Jinping's rhetoric and, if it does, it will be years away.

I submit that it may even be more immediate than those gents—better informed than I—warn. Why? The coming mass Russian offensive in Ukraine, and western rushing of equipment to the Ukrainians, along with Russian nuclear sabre-rattling, has seized the attention of the western world, and depleted its weapons stocks. Our business-as-usual drawdown of 18th Wing legacy F-15s at Kadena Air Base, Japan, without permanent replacement, and “divest to invest” approach, gapping current “fight tonight” capabilities by the early retirement of F-22 squadrons, the B-1s, and B-2s, and halving the F-15EX buy of potentially Raptor linked AIM-260 missile trucks, before the fielding of Next Generation Air Defense systems and the B-21 bombers, all send precisely the wrong message to the Chinese. And, I think they combine to present a summer of 2023 Chinese perceived window of opportunity for an attack on Taiwan.

Our current actions, like allowing uncontested the air sovereignty violation by the Chinese surveillance balloon across or within sensor range of all three legs of our nuclear Triad, and recapitalization vectors, are failing to deter, and may actually be inviting through waning Northeast Asia capacities, a cataclysmic air battle over Taiwan we must win to forestall an air-and-seaborne invasion. We are setting the stage for a “fair fight,” that would cost our youth dearly, as the Center for Strategic and International Studies wargames predict. We had one of those in Vietnam, and it is a mistake America must avoid repeating. And, as General Kelley said in remarks at the AFA Conference, a second-best Air Force, like WWII Germany's, with exquisite capabilities but insufficient capacity (to

win) is ultimately much more costly than a world-beating, fully funded, Air Force like ours that dominated Desert Storm.

Numbers matter. We should be maximizing, not reducing, ours and our allies' in Northeast Asia. “Divesting to Invest” will entice the Chinese with nearer-term perceived windows of opportunity to achieve sooner, rather than later, at lowest cost its “one China” ambition and hegemony in Asia. The first such window seems just months away, unless we now drastically alter course and messaging.

Col. Lucky Ekman,
USAF (Ret.)
Alamogordo, N.M.

Respect the Position

I really enjoyed the compilation of articles on the seven Air Force Chiefs of Staff in the August and September 2022 issues by Tobias Naegele. They were both enlightening and informative. Each of those individuals who served in that position brought their own gifts to the table as well as their personality and style. They were groomed by the society they lived in, their career experiences, and the world events they were involved in.

Whether you liked or disliked what they did they were each trying to make the Air Force better. Having served under some, but not all, allowed me to see firsthand how their actions directly impacted the Air Force and its Airmen. In most cases they improved things but there were some things that would have been better left alone.

The articles also provided a lot of background that the Chiefs had to deal with while holding their positions. From meddling by individuals who didn't have the background to be involved or those that didn't do what they were supposed to do and that's listen to the warriors who have actually experienced combat and know what their Airmen and the Air Force need to maintain the finest combat Air Force in the world.

I read many of the letters from members commenting on the articles and many of the comments I would have made, have already been presented by other Airmen. The future individuals who fill this position need to look back on their predecessors and make sure they learn the lessons they did and become the advocates the Air Force and this country needs to be able to protect the liberties we have today while protecting and defending our country in the future and the Airmen who make it all happen.

We are not an employment agency, social experiment, or pawn in a political chess game. We need to return to the values that

made the Air Force the best in the world. That starts with the people who fill the Chief of Staff position. The person who will make the fight to get the Air Force what it needs to modernize, train, staff, and equip their Airman with what they need to fight and win our countries wars and defeat our enemies.

I firmly believe that you must respect the uniform the man is wearing and the position he holds, but if you respect the man in the uniform, knowing he will do what's right even when its not politically correct or popular, you will give more than 100 percent. This is the kind of leadership we need going forward.

CMSgt. John P. Fedarko,
USAF (Ret.)
Xenia, Ohio

Level Up

The December issue's interview with the new head of Space Operations [Gen. B. Chance Saltzman] was disappointing in what was said and not said. The new commander speaks correctly about the need to think differently about the command structure in the mid-grade spectrum. The difficulty in finding people at that level up to O-6 will probably mean "pull someone from commercial industry."

But in another part of the interview he looks to the senior management of the other services and finds himself light on generals. Where is he going to find qualified people to fill those slots? The result could definitely be just another top-heavy bureaucracy.

The people at the top being more concerned with form over function trying to maintain the respect of the operational force who recognize that those giving the orders or "guidance" really have little concept of what is essential to perform the mission. General, you have a pretty clean slate. Build it from the factory floor up, not the general offices down. Many were leery of the creation of a separate Space Force. Let's make it more than "just another branch of the service."

Col. Edward G Moran,
USAF (Ret.)
Charleston, S.C.

Vietnam Veteran's Legacy

A great Vietnam Vet legacy is bringing respect back to our military.

Fifty years ago today, the Vietnam peace treaty was signed at the Paris Peace Accords in January 1973. Most would say respect for the U.S. military was rock bottom then.

Twenty-seven years later in 2000, the U.S. military took first place in many polls

(Gallup) as the most respected institution.

It typically takes 24 to 26 years to make brigadier general. Twenty-seven years after the Peace Accords, virtually all generals and senior NCO's were Vietnam vets.

Military leadership the 10 years leading up to 2000, building respect for the military were Vietnam vets, 17 years after 1973. They were the core of senior NCO's and field grade officers who were building respect for the military. In 1991, 18 years after the 1973 Paris Peace Accords, Vietnam Veterans led and fought Desert Storm, which many think is the best U.S. combat campaign of its time. And it began to reestablish respect for the U.S. military.

In 2000, Time Magazine identified their 100 Most Influential "People" of the Century. The American GI was on that list.

In 2003, the American GI won Time Person of the Year.

In 27 years, Vietnam vets transformed the military from rock bottom to number one in respect. They changed our society from being spit on and called "baby killer" to being told, 'Thank you for your service.' I am personally grateful for this.

When I see a Vietnam vet, I also say, 'Thank YOU for bringing respect back to our military.'

That is one hell of a legacy of Vietnam veterans. Vietnam veterans, you should know this and hold your heads high. Thank you. Vietnam vets brought respect back to the military!

Mike Sumida,
AFA Mel Harmon Chapter #128
President
Pueblo, Colo.

In Plain Sight

Retired Lt. Col. Allan G. Johnson's letter to the editor ("Hidden Truths," January/February 2023) writes in response to my article "The Near Nuclear War of 1983" (December 2022). Colonel Johnson rightly states that the effort to declassify U.S. records of the 1983 nuclear war crisis required researchers to "doggedly pursue release of key documents." The work of George Washington University's National Security Archive to get many documents declassified has enriched our understanding of the entire Cold War period, not only the 1983 crisis. That work was not the focus of my article and to dwell on it would have diverted attention from the main points. That said, the work of the National Security Archive is valuable enough to deserve an article of its own.

Colonel Johnson refers to my comments about the Biden Administration's apparent ignorance of the 1983 crisis. It's true that, as Colonel Johnson writes, "it is impossible to

forget what one never knew." Nonetheless, there is no reason for senior governmental officials in the Biden White House or in any administration since Ronald Reagan's to have been the dark about the 1983 crisis. Indeed, President Reagan himself was aware of the severity of the 1983 episode as early as May of 1984.

The classified record of the 1983 crisis, particularly as it is memorialized in the 1990 report of the President's Foreign Intelligence Advisory Board, has been available to every president since George H.W. Bush. It may be the case that current officials have not been briefed on the 1983 crisis. If so, it isn't because the record is unavailable to them.

Maj. Brian J. Morra,
USAF (Ret.)
Sarasota, Fla

Human Factor

The possibility of a single USAF fighter controlling several attritable collaborative combat aircraft (CCA) is a real force multiplier. I certainly think Heather Penney's recommendation [see "Crewed-Uncrewed Teaming," December 2002, p. 32] on including consideration of human factors in the development of the control software is vital. I have a couple of thoughts with regard to CCAs.

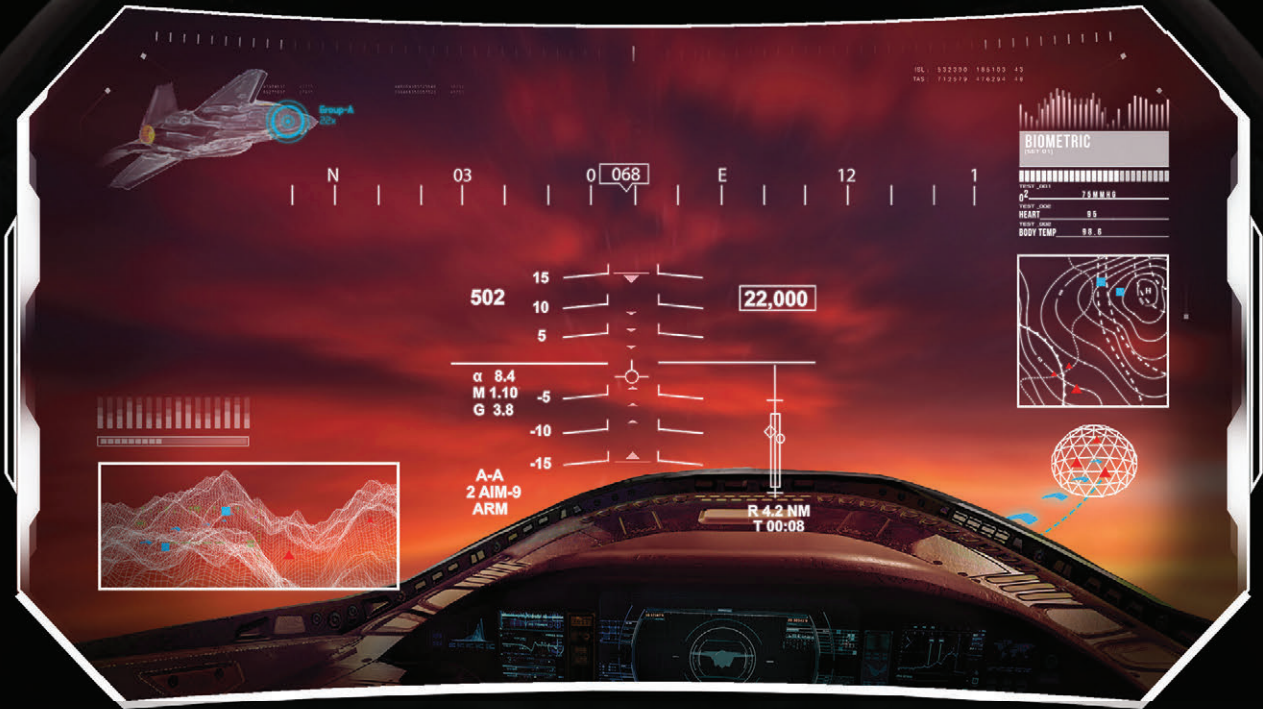
First, these CCAs could have an advantage in the Pacific Theater if they used RATO (rocket-assisted take-off). They would not require an airfield. They could be launched from land including Taiwan and the Ryukyu Island Chain. Thus they might be closer to the Taiwan Strait than a collaborative aircraft which could come from a distant air base. They could also be launched from a ship. If their landing was by parachute, they would not require an airfield to land at but they would require some land.

Second, the CCAs could be sensor gathering or weapons equipped aircraft. In the case of sensors the logical step would be to send the data collected up to a satellite system and back to a HQ which collected data from multiple sources. This HQ could also be a means of controlling the CCAs in addition to a fighter. The HQ might have a better idea of which area needed to have sensor data collected.

The good news today is that we are getting four Philippine bases. It would be easy to use these to launch CCA with RATO and return the CCA for landing by parachute to these bases. If our fighters were based further back they could just approach the Taiwan Strait from the south and pick their team of CCA launched from the Philippines.

William Thayer
San Diego

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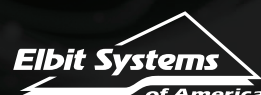
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INDUSTRY LEADER IN HMDS



By John A. Tirpak

Accelerate Weapons Testing Or ... Fail?



Airman Christian Corley

A U.S. Air Force F-35A Lightning II from the 58th Fighter Squadron, 33rd Fighter Wing, Eglin Air Force Base, Fla., takes off for a training mission during Northern Lightning at Volk Field Air National Guard Base, Wisc., in August.

The Pentagon's Director of Operational Test and Evaluation said weapons testing must speed up or the U.S. won't be able to stay ahead of China and other potential adversaries. Writing in his annual report to Congress, released in January, DOT&E Director Nickolas H. Guertin said the test enterprise must be reimagined, so weapons are no longer tested in isolation, but rather alongside the dissimilar systems they'll have to work with.

The Intelligence Community should also play a bigger role in ensuring weapons are measured against current threats. The Pentagon faces a bow-wave of testing programs for which ranges, resources, and time are all short; testing against simulated threats that don't accurately represent the threat and rapid development programs that outran themselves by failing to develop strategies to deal with setbacks and delays.

The 412-page report is also more candid than last year's edition, when two versions were released, one to the public, and one containing "controlled unclassified" data.

The DOT&E enterprise must do its part to accelerate "delivery of weapons that work," Guertin said. Automation and "more widespread use of digital technologies," such as simulation and predictive modelling, to speed up development, he said. Keeping the test strategy, equipment, and workforce "static" will slow things down, he noted.

Accurately simulating threats today "often takes three to five years," Guertin said. "We will need to continue to innovate on the use of simulation and/or emulation of threats in representative environments to ensure that weapon systems will be effective when called upon."

BROADENING THE TEST ENTERPRISE

Guertin sees a "threat realism gap," he said, and in 2022 developed an updated strategy so that programs relying on similar technologies can share knowledge and test results. This could have "dramatic effects" on research, development, testing, and acquisition. So far, "we do not have a clear view of the test-related data that exists across the entire DOD," he said. The new strategy recognizes "the need to improve access to that data in order to extract new insights."

Aggregating data and sharing it with all affected parties "will accelerate the fielding of robust, combat-credible capabilities," Guertin said.

The Pentagon must "test the way we fight," Guertin stated, to determine whether a system "will be effective, suitable, survivable, and lethal in the hands of a warfighter facing a thinking enemy." Weapons don't succeed on their own, but as part of a "kill web," so should not be tested in isolation. Rather, test plans should incorporate realistic scenarios, including the joint and allied capabilities that will also be part of the fight. Testing should include live, virtual, and constructive elements.

Cyber, electromagnetic spectrum, and space threats are particularly challenging, Guertin said. The T&E ecosystem must develop more robust testing and figure out ways to replicate "the space environment and space threats, both kinetic and nonkinetic." These efforts will require funding.

New "T&E infrastructure, tools, and processes" are needed to keep up, Guertin asserted. They must be "able to scale and adapt quickly to reflect changes when they arise, and efficiently

evaluate kill web and system-of-systems performance."

The T&E enterprise also has to be more cognizant that upgrades and system changes throughout a program's life will necessarily have a domino effect on the other systems they touch.

"We must therefore 'look right' into the life cycle of a system," he said, revisiting systems after they have "evolved substantially after fielding" to look for those unintended consequences.

This will be especially important in assessing systems using artificial intelligence, autonomy, and machine learning, according to Guertin. This approach will require developing "a framework to evaluate iterative software improvements and their impact to a system's role in, and interoperability with, the kill web."

GOING DIGITAL

The T&E community will also have to broaden its use of digital twins as a testing method, he said. These approaches will allow the T&E community to "keep pace with rapid and frequent changes ... with minimal disruption" to operational units.

Digital twins will "aid, but not obviate, the need for live operational and live-fire" test events, Guertin said. Modeling and simulation systems must be consistently "validated, verified and accredited," and if simulation is seen to "diverge substantially" from the real world, the T&E community must be willing to throw out the models and conduct live tests "to reconnect us to an accurate reflection of the operating environment."

The key to all this adaptation is workforce, but Guertin sees a

shortage of experts "in the use of automation, cyber survivability, data management, artificial intelligence, and digital engineering." A combination of training, cooperation with industry, and both internships and externships can help.

"We need ... heavy investment in individual brainstorming; collaborative brainstorming among government entities, the private sector, and academia; and smartly timed planning and programming in the amounts required," Guertin asserted.

MORE CANDOR

Past complaints about issuing public and controlled versions of last year's DOT&E report were amplified when negative testing results from the F-35 were withheld from the public version.

"Issuing two documents allowed DOT&E to be more transparent with congressional and DOD personnel, while maintaining the integrity of information related to programs under oversight," Guertin said in his foreword to the new edition. The new, single version "reflects careful consultation with the program offices that determine the classification of information about systems under DOT&E oversight, and contains the maximum detail permitted." Guertin offered to provide additional information to lawmakers "on request."

Pentagon spokesman Air Force Brig. Gen. Patrick Ryder said last year's "controlled, unclassified" version was required by law, and not intended to shield embarrassing information from public view.

Some Notable Air Force Test Programs

The DOT&E report examined 17 Air Force programs. Several of them, listed here, exemplified the problems Guertin called out with Defense programs overall. To read what DOT&E said about the KC-46, see "World" p. 32.



Giancarlo Casem/USAF

Lockheed Martin AGM-183 Air-Launched Rapid Response Weapon (ARRW). The hypersonic ARRW missile was launched as a mid-tier, rapid acquisition program. But the ARRW, to be launched from a bomber, does not yet have an integrated test plan blessed by DOT&E. A shortage of range space and long waits between test shots, coupled with snafus unrelated to its design, have slowed progress. ARRW lacks approved modeling and simulation tools to augment physical testing and DOT&E has yet to see a plan for testing its warhead. It's unclear whether ARRW might be vulnerable to cyber disruption, DOT&E said. So far, it "has not yet demonstrated the required warfighting capability."



Ethan Wagner/USAF

BAE Systems/Boeing AN/ALQ-250(V)1 Eagle Passive Active Warning and Survivability System (EPAWSS). EPAWSS was criticized for frequent hardware failures that threaten required rates for mean time between failures. The result means pilots might not trust EPAWSS or may not know when it has failed. EPAWSS completed cybersecurity tests, however, and the Air Force is eliminating the vulnerabilities identified. DOT&E assessed that EPAWSS will probably otherwise be operationally effective.



Samuel King Jr./USAF

Boeing MH-139 Grey Wolf Helicopter. Several deficiencies are keeping the MH-139 from proceeding to production this year, largely the result of assumptions that the commercial version of the helicopter would easily translate to military capability. But issues with the automatic flight control, the intercom, and the layout of the crew cabin and deficiencies in the flight manual for crosswind operations have arisen, as have concerns about whether the powertrain might need extra maintenance under military use. Ballistic protection and electromagnetic hardening are "areas to watch," the DOT&E said, suggesting more testing before the Air Force commits to a production decision.



1st Lt Savannah Bray

Boeing F-15EX Eagle II. The DOT&E commended the Air Force for putting its first two F-15EXs into high-level wargames early, and said the aircraft performed as well as, or better than, the F-15C and E that it will replace. It found the EX operationally effective and probably suitable. Only about half the planned test flights planned in 2022 were flown, though, mostly due to an FAA restriction on the aircraft using Link 16. The EX will be assessed for its survivability mid-2023. It needs to be integrated with the Open-Air Battle Shaping system (OABS), which is a wargame model. DOT&E wants the EX to be tested against threat-representative radars, and for the test aircraft to be updated with any changes made to production versions.



Staff Sgt. Sarah McClanahan/ANG

Northrop Grumman F-16 Radar Modernization Program. There's "compelling evidence" the F-16's new APG-83 active, electronically scanned array (AESA) radar "is a significant improvement over the legacy" APG-68 radar. Testing is "on track, with some schedule risk," although its resilience against cyberattack cannot yet be assessed, the DOT&E said. It wants an updated test and evaluation master plan to answer those questions, and others.



Master Sgt. Jeremy Lock

Lockheed Martin F-22 Raptor. DOT&E was generally pleased with the Raptor's capability upgrades. A single suitability concern and cyber resilience issue persist but are being fixed. Testing is being hampered by the FAA's slowness in allowing the aircraft to use Link 16 data transmission, though. It also urged the Air Force to develop a plan so that the test and evaluation community can "keep pace" with a series of rapid planned improvements in the F-22's capabilities.



Staff Sgt. Enrique Barcelo

Lockheed Sikorsky HH-60W Jolly Green II. While DOT&E found the HH-60W likely to be both operationally effective and suitable, "the Air Force is tracking several deficiencies that result in degraded crew situational awareness from threat warnings and indications on navigation displays during engagements." Software updates over the next few years are expected to resolve these problems. The fuel system and aerial refueling apparatus also have some issues that will need further testing. Testing is on track and will support a full-rate production decision in mid-2023.



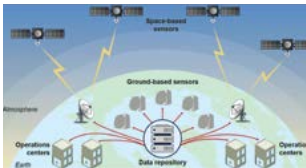
Boeing

Boeing T-7A Redhawk Trainer. DOT&E said the T-7's crew escape system and the canopy's bird-strike resistance "failed to meet minimum safety requirements" during subsystem qualification tests and need "design changes" before the T-7A can enter low-rate initial production. The DOT&E also wants more testing of the T-7's oxygen generation system and believes the aircraft should have an Automatic Ground Collision Avoidance System and wants more cyber resiliency testing.



1st Lt. Lindsey Hefflin

Raytheon Technologies AIM-120 Advanced Medium Range Air-to-Air Missile (AMRAAM). The DOT&E found that AIM-120D3 version of the AMRAAM is effective and suitable, but the program's testing realism would benefit from realistic, stealthy targets.



GAO graphic

Space Command and Control System. The Space C2 program fell way behind on test in 2022 "primarily due to delayed product delivery, understaffed development teams, unclear test team constructs and responsibilities, and development focus on non-critical capabilities." To address those concerns, "the program changed key leadership personnel, restructured development teams, more clearly defined their integrated testing construct, and refocused capability development to only the most crucial capabilities," Guertin said. Yet, despite the lack of operational testing, one Data-as-a-Service capability, Warp Core, "was conditionally accepted for operations by the U.S. Space Force (USSF) in FY22, pending completion of cyber survivability testing.



Chase Kohler/USAF

Lockheed Martin F-35 Joint Strike Fighter. The F-35 has been on the verge of initial operational capability for years, but its integration into the Joint Simulation Environment—a wargaming system—remains a hurdle. Guertin said initial operational test and evaluation will be cleared late this summer, although there could be more slips due to "further discoveries of deficiencies and potential delays" in the verification, validation, and accreditation process. The DOT&E enterprise was dissatisfied with "immature, deficient" software updates, which are costing the program "time and resources." Guertin said the Joint Program Office hasn't "adequately planned" for testing of the Tech Refresh 3 (TR-3), necessary to support most of the Block 4 upgrades. The JPO hasn't yet put flight-test gear for Tech Refresh 2 on contract, and this is delaying TR-3 testing as well. There might not be enough test aircraft available, Guertin noted. And ODIN—the Operational Data Integrated Network, which is to replace the much-maligned ALIS Autonomic Logistics Information System—is now a year behind schedule due to safety deficiencies.



Win, Place, Show



Defense of Ukraine/Twitter

"We thought this was the second-best military in the world, and it turns out they're not even the second-best military in the former Soviet Union."

—**Kori Schake**, American Enterprise Institute, on Russia's performance in Ukraine, speaking on a Council on Foreign relations webcast with Air Force Secretary Frank Kendall [Jan. 11].



Defense of Ukraine/Twitter

So, You're Saying There's a Chance?

"They didn't want to give us heavy artillery, then they did. They didn't want to give us HIMARS systems, then they did. They didn't want to give us tanks, now they're giving us tanks. Apart from nuclear weapons, there is nothing left that we will not get."

—**Yuriy Sak**, adviser to Ukrainian Defense Minister Oleksii Reznikov [Reuters, Jan. 25].

Bursting Balloon!

"I am not aware of any 'fleet of balloons.' ... That narrative is probably part of the information and public opinion warfare the U.S. has waged on China."

—Chinese Foreign Ministry Spokeswoman **Mao Ning**.



Chad Fish/ABC World News Tonight

"At what point do we say a ... spy balloon coming from China is a threat to our sovereignty? It should be the moment it crosses the line, and that line is Alaska."

—**Sen. Lisa Murkowski** (R-Alaska).

Materiel Chain

"We say 'supply chain,' we say 'kill chain'; I like networks and fabrics, [because] chains are only as good as the weakest link. ... Many of these systems are going to need a long-term investment."

—**Gen. James C. McConville**, U.S. Army Chief of Staff stating that the U.S. must invest in long-term defense because Russia 'is not done' [Breaking Defense, Jan. 19].

I, Robot

"While it's obviously not a military system, per se, I think that growing exposure of these kinds of incidental, often corporate-driven enterprises is really raising the awareness of what can go right and what can go wrong with these tools."

—Pentagon Chief Technology Officer **Stephen Wallace** on the new ChatGPT [Chat Generative Pre-Trained Transformer] technology, which produces human-like conversations and content [Defense News, Jan. 26].



Mike Tsukamoto/staff; GuHyeok Jeong/Pixabay

Mature for Our Age



Mike Tsukamoto/staff

"We're not standing up the Space Force anymore, although there's probably still some work. ... We're here. Now it's time to deliver, to build capabilities, start producing on some of the promises that we've laid out. ... We are going to have resilient, ready combat credible forces ... amplify the Guardian spirit ... and [strengthen] rich partnerships based on mutual trust, mutual benefit."

—Chief of Space Operations, **Gen. B. Chance Saltzman** on the Space Force's priorities described in three lines of effort [Inside Defense, Jan. 24].



Mike Tsukamoto/staff; Pixabay

NIGHTMARES

"It keeps you up at night. It keeps you up in the day. It keeps you up most of the time."

—Philippine President **Ferdinand Marcos Jr.**, comment on increasing Chinese aggression against his nation in the South China Sea [Washington Post, Jan. 31].



If the United States ever had a chance of winning the war in Southeast Asia—and that is a big if—it was Operation Rolling Thunder, the air campaign against North Vietnam. Running from March 2, 1965, to Oct. 31, 1968, Rolling Thunder was premised on the idea that airpower could not achieve decisive results on its own, but instead had to be in support of ground forces. Yet Rolling Thunder never had a clearly defined military objective. Air Force and Navy fighter-bombers, including the RB-66 Destroyer leading four F-105 Thunderchiefs here, flew more than 300,000 combat sorties over North Vietnam from bases in Thailand and South Vietnam and carriers in the Tonkin Gulf. The “Thud” flew more strike missions and took more losses than any other type. Nearly half—382 of 833 aircraft built—were either shot down or lost in training. After three years and eight months, Rolling Thunder was over. Deemed a failure, it was never intended to win. Handcuffed from the start, it was an opportunity lost.

Operation Linebacker ran from March to October 1972, and was followed by Linebacker II in December of that year. With the objective of cutting off supply lines to North Vietnamese forces in the south, Linebacker was the first sustained bombing campaign since Rolling Thunder ended. Some 209 B-52 bombers took part in Linebacker I. Linebacker II ran from Dec. 18 - Dec. 29, 1972. More than 20,000 tons of ordnance was dropped on military and industrial areas in Hanoi and Haiphong and at least 1,624 civilians were killed. The operation was the final major U.S. military operation before the end of the war and represented the largest heavy bomber campaign since World War II. Not until 1990's Operation Desert Storm would the U.S. drop more ordnance in a single operation.





Necessity is the mother of invention in every war, and Vietnam was no exception. Airmen employed the low-altitude parachute extraction (LAPE) to supply remote units in rural Vietnam, using parachutes to drag pallets out of cargo bays without ever having to land. Pilots approached the extraction zone with landing gear down and cargo doors open; drogue chutes attached to the cargo were released when the aircraft was 1 to 2 meters off the ground, putting drag on the cargo, rather than the aircraft itself. Once the pallet was ejected, the aircraft climbed away from the drop zone. This photo dates from the 1960s.

Operation Homecoming began Feb. 12, 1973, and continued over eight weeks, as 597 American service members held captive as prisoners of war returned home from North Vietnam. The Paris Peace Accords, signed two weeks prior, ended U.S. involvement in the Vietnam War enabling the POWs to be released. When the first C-141 lifted off from Hanoi en route to Clark Air Base in the Philippines and then on to the continental United States, the former POWs erupted in shouts and cheers.



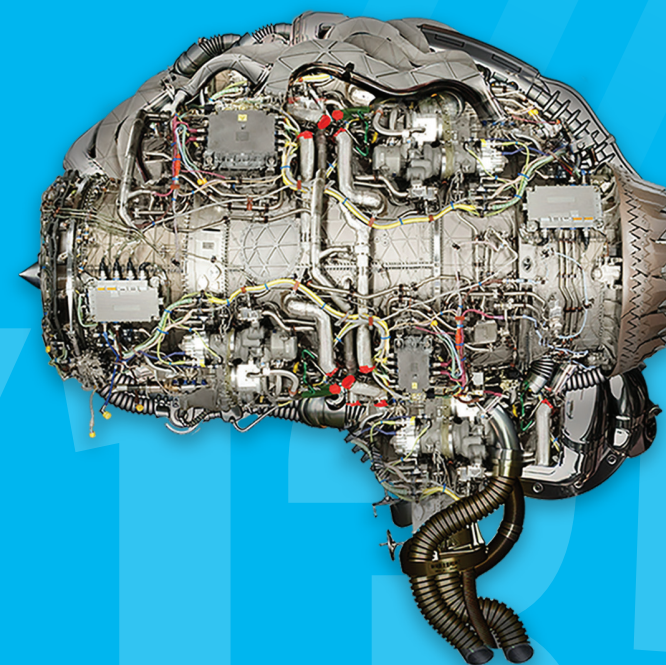
GO BEYOND

The Smart Decision for the F-35

The F135 Engine Core Upgrade (ECU) upgrade delivers adaptive technologies wrapped in a variant-common, combat-tested, coalition-assured and cost-effective combination. For full Block 4 capability and \$40B savings over the lifecycle of the program to keep our military on the leading edge.

Get Smart at PrattWhitney.com/F135ECU

Variant-Common



Combat-Tested



Coalition-Assured



A RAYTHEON TECHNOLOGIES BUSINESS

CHINA: SPECIAL REPORT

ABC News/Good Morning America; Jonathan Snyder/LSM; Mike Tsukamoto/staff

A series of frame grabs from ABC News/Good Morning America video taken by Jonathan Snyder/LSM shows a suspected Chinese spy balloon being shot down by a missile from a U.S. Air Force F-22 fighter off the South Carolina coast on Feb. 4.

Concerns Over China Reach New Heights

USAF Bursts Chinese Surveillance Balloon, as Nation Comes to Grips With an Ever-More Assertive People's Republic.

By Chris Gordon, Greg Hadley and Tobias Naegele

Military leaders and some politicians have been talking up the threat posed by China with increasing alarm in recent months, but for many Americans that concern didn't fully hit home until a Chinese surveillance balloon drifted into the public consciousness Feb. 2. The balloon caused aviation officials in Billings, Mont., to shut down air operations at the airport there for hours and prompted consternation among citizens and public officials alike over such an overt violation of public airspace.

Air Force jets scrambled to respond, but U.S. officials did not shoot the balloon down until it moved over water. At 2:39 p.m. on Feb. 4, a pair of F-22s from the 1st Fighter Wing at Joint Base Langley-Eustis, Va., approached the balloon off the coast of South Caroli-

"We successfully took it down, and I want to compliment our aviators who did it."

—President Joe Biden

na, and fired a single AIM-9X Sidewinder missile into the approximately 90-foot-wide balloon, sending it plunging into the Atlantic Ocean below.

"We successfully took it down, and I want to compliment our aviators who did it," said President Joe Biden.

The incident played out in the midst of a national debate over U.S. relations with China and the relative risk of war, sparked first by a memo from Air Mobility Command boss Gen. Mike A. Minihan to his Airmen in which he warned of his "gut" feeling that conflict could break out with China within the next two years.

"I hope I am wrong," Minihan wrote, but "my gut tells me we will fight in 2025. [Chinese President Xi Jinping] secured his third term and set his war council in October 2022. Taiwan's presidential elections are in 2024 and will offer Xi a reason. United States' presidential elections are in 2024 and will offer Xi a distracted America. Xi's team, reason, and opportunity are all aligned for 2025."

Minihan and China: In His Own Words

This message from Air Mobility Command boss Gen. Mike Minihan to his Airmen generated international headlines and sparked debate among lawmakers, experts, and observers. Here is the memo in full, with additional context in brackets.

**DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR MOBILITY COMMAND
MEMORANDUM FOR 18 AF/CC, EC/CC, 22 AF/CC, 4 AF/CC,
618 AOC/CC, ALL AMC WING COMMANDERS
FROM: AMC/CC
1 February 2023**

SUBJECT: February 2023 Orders in Preparation for—The Next Fight

SITUATION. I hope I am wrong. My gut tells me we will fight in 2025. [Chinese President Xi Jinping] secured his third term and set his war council in October 2022. Taiwan's presidential elections are in 2024 and will offer Xi a reason. United States' presidential elections are in 2024 and will offer Xi a distracted America. Xi's team, reason, and opportunity are all aligned for 2025. We spent 2022 setting the foundation for victory. We will spend 2023 in crisp operational motion building on that foundation. If you want to know what the operational motion I demand looks like, look at what Total Force Team Charleston did in January.

COMMANDER'S INTENT. Go faster. Drive readiness, integration, and agility for ourselves and the Joint Force to deter, and if required, defeat China. This is the first of 8 monthly directives from me. You need to know I alone own the pen on these orders. My expectations are high, and these orders are not up for negotiation. Follow them. I will be tough, fair, and loving in my approach to secure victory.

END STATE. A fortified, ready, integrated, and agile Joint Force Maneuver Team ready to fight and win inside the first island chain. Maximize the use of the force and the tools we currently have and extract full value from things that currently exist. Close the gaps: C2, navigation, maneuver under attack, and tempo.

RISK. Run deliberately, not recklessly. You will be governed by the principle of calculated training risk, which you shall interpret to mean the avoidance of death, serious injury, and Class A damage to attain higher readiness, integration, and agility. If the Tactic, Technique, and Procedure you are developing increases AMC's ability to fight and win inside the first island

chain ... move out. If you are comfortable in your approach to training, then you are not taking enough risk.

OT&E. Attached are our OT&E efforts from 2022 Fall PHOENIX Rally, which will guide our preparation but are not intended to limit creativity of approach. This is not an all-encompassing list. I expect you to move out briskly on the monthly tasks, anticipate the projected tasks and weave them eloquently into your units' training and operational battle rhythms.

FEBRUARY.

(a) All AMC aligned personnel with weapons qualifications will fire a clip into a 7-meter target with the full understanding that unrepentant lethality matters most. Aim for the head.

(b) All AMC personnel will update vRED [virtual Record of Emergency Data].

(c) All commanders will acknowledge this order directly to me immediately. Then, report all 2022 accomplishments preparing for the China fight, and forecast major efforts in 2023 through command chains by COB 28 February 2023.

MARCH (Projected).

(a) All units will report progress toward established OT&E requirements for INDOPACOM Operations discussed and reviewed at Fall PHOENIX Rally.

(b) All AMC personnel will consider their personal affairs and whether a visit should be scheduled with their servicing base legal office to ensure they are legally ready and prepared.

(c) KC-135 units will coordinate to provide a conceptual means of air delivering 100 off-the-shelf size and type UAVs from a single aircraft.

APRIL (Projected).

(a) All units will report their integration and operation plans for MOBILITY GUARDIAN 2023 to include all events (lead-in and concurrent) they wish to include for credit.

ADMIN. AMC/A3 [Operations] will formalize these orders in FRAGO [Fragmentary Order] format. Completion, progress, reporting, reporting format, and advancement be measured, driven, and collected by our AMC/A3 Team through ARC [Air Reserve Command], NAF [Numbered Air Force] and EC [Expeditionary Center] leadership.

LET'S GO!

MICHAEL A. MINIHAN
General, USAF
Commander



Gen. Mike Minihan, AMC Commander

Mike Tsukamoto/staff

The memo, sent to AMC wing commanders and other leaders in the command, was soon leaked to the media, where its candor sparked debate among those who thought it saber-rattling and others who saw it as straight talk from a plain-speaking commander.

Former National Security Adviser Robert C. O'Brien was among those praising Minihan, writing on Twitter that Minihan's memo "demonstrates solidarity with the men & women he leads by telling them the truth that all of us at the senior level know, but few are willing to utter. He should be commended."

Retired Lt. Gen. David A. Deptula, dean of AFA's Mitchell Institute for Aerospace Studies, praised Minihan in a LinkedIn

post, saying he "should be commended for the clarity in which he delivers his messages, sense of urgency, and speaking as a warfighter—not a bureaucrat, politico, or academic."

In an interview with Air & Space Forces Magazine, Deptula called Minihan's memo "wholly appropriate," and a necessary reminder for AMC Airmen, who are responsible for all the Air Force's cargo and refueling missions.

"Air Mobility Command is a combat-oriented command," Deptula said. "Its day-to-day airlift missions often appear more like a commercial airline mission than an organization in the thick of flying and fighting. But the point that Minihan was making is the violence of combat comes quickly. And he wants his crews to be thinking about that and ready to support



Peng Zhifu/China Ministry of Defense

Amphibious armored infantry fighting vehicles (IFV) of an Army brigade under the PLA Eastern Theater Command form battle formations in waves during a maritime combat training exercise on June 30, 2022.

delivering devastating consequences to the enemy in a very hostile environment.”

Minihan was rightly “trying to instill this perspective on his Airmen, that they need to be thinking about what’s necessary to succeed in combat against our pacing threat and raise that awareness that it’s not business as usual in that this possibility could come sooner rather than later.”

CHINA WORRIES

Air Force Secretary Frank Kendall has repeatedly cited his concerns about China as his motivation for returning to public service when others might be retired in order to apply decades of Cold War experience to the rising challenge in the east. Ensuring technological superiority over China is the primary driver, in fact, for Kendall’s seven operational imperatives, which have framed his priorities as the Air Force’s top civilian since he defined them at the AFA Warfare Symposium a year ago.

Warnings about Chinese behavior and aggression have likewise been sounded by seeking out his job following President Biden’s election to the presidency in 2020. The Navy’s Chief of Naval Operations Adm. Michael M. Gilday, who said in October the U.S. should prepare to fight in 2022 or 2023; by Adm. Phil Davidson, who as head of U.S. Indo-Pacific Command predicted China might take military action against Taiwan by 2027—a timeline some have since dubbed “the Davidson window”—as well as others.

“That’s doing what we pay general officers to do,” Deptula said—that is, “to motivate and prepare their forces and to get them thinking about the potential threats that we face.”

Sen. Tom Cotton (R-Ark.), a member of the Senate Armed Services Committee; Rep. Mike Gallagher (R-Wisc.), a member of the House Armed Services Committee and the chair of a new House Select Committee focused on competition with China; and Rep. Michael McCaul (R-Texas), chair of the House Foreign Affairs Committee, all supported the general.

But Rep. Adam Smith (D-Wash.), the ranking member of the HASC, said it’s worrisome “when anyone starts talking about war with China being inevitable.” Generals, he said, “need to be very cautious about saying we’re going to war.”

Michael O’Hanlon, a senior fellow and director of research in Foreign Policy at the Brookings Institution, echoed that concern. “We’re awfully cavalier about this idea that we might fight China, right?” said O’Hanlon, a member of the Pentagon’s Defense Policy Board, in an interview with *Air & Space Forces Magazine*. “We’re talking about World War III. ... That’s a not a way we can afford to think, because if this war happens, we’ve already lost.”

Minihan’s brute-force language—he wrote, for example, he wanted his people to train with live ammo on “a 7-meter target with the full understanding that unrepentant lethality matters most” and to “Aim for the head”—was reminiscent of Gen. Jim Mattis, who as a Marine General was once vilified for saying “it’s fun to shoot some people,” talking about the abusive ways the Taliban treated women, for example. “You know, guys like that ain’t got no manhood left anyway. So it’s a hell of a lot of fun to shoot them.”

By contrast, Minihan was merely laying out the rationale for why members of his Air Mobility Command should prepare themselves for a potential peer fight. But O’Hanlon sees the two differently.

“It was one thing when Jim Mattis said it about the Taliban,” O’Hanlon said. They “did not have nuclear weapons and did not pose existential threats to the United States. ... It’s entirely something else to say this about the world’s No. 1 rising power with several hundred nuclear weapons and a central place in the entire world economy.”

He cited risk that China will use the comments “as a window into our thinking,” O’Hanlon said. “And to the extent they believe that the United States has settled on a paradigm of the inevitability of a U.S.-China war, that could affect their crisis decision-making and make them more inclined to escalate if they think the war is going to sort of happen anyway.”

Airmen responded to Minihan’s memo with a mixture of debate and memes, with some arguing that the focus on a near-term war with China takes attention away from core problems like retention and maintenance.

Gallagher, who served as a Marine Corps intelligence officer before being elected to Congress, said being clear about U.S. understanding and response is essential in this kind of high-stakes peer competition.

“If we’ve learned anything from Ukraine, it’s that we need to take our adversaries at their word when they threaten their neighbors and put hard power in their way before it’s too late,” Gallagher said in a statement. “General Minihan should be commended for directing his Airmen to take the threat seriously and preparing with the urgency that the situation demands.”

POPPING THE BALLOON

Shooting down the Chinese intelligence balloon as one of those military events that looks easy on cell-phone video but is actually intensely complex. In addition to the F-22s that executed the takedown order, F-15s from Barnes Air National Guard Base, Mass., aerial tankers, and intelligence aircraft took part in the operation. Capturing the balloon was not feasible at 60,000 to 65,000 feet; at that altitude, only F-15s or F-22s were able to fly high enough to attack. The F-22 that fired the Sidewinder did so from about 58,000 feet, officials said, marking what appears to be the first known air-to-air takedown for an F-22. Such a strike does not count as an aerial “kill,” however.

The entire area had to be closed to air traffic during the operation.

Defense Secretary Lloyd J. Austin III said plainly in a statement following the shoot-down: “The balloon, which was

being used by the PRC in an attempt to surveil strategic sites in the continental United States, was brought down above U.S. territorial waters.”

The balloon first entered the U.S.’ air defense identification zone (ADIZ) near Alaska on Jan. 28, north of the Aleutian Islands and moved largely across land, a senior defense official said. North American Aerospace Command (NORAD) jets typically escort unwelcome or unidentified foreign aircraft out of the U.S.’s ADIZ, which defines the protective buffer beyond U.S. territory. But for reasons still not known publicly, the balloon proceeded unhindered into Canadian airspace on Jan. 30 and then later reentering U.S. airspace in northern Idaho Jan. 31.

F-22s from Nellis Air Force Base, Nev., were scrambled on Feb. 1—the first time the U.S. considered shooting down the balloon—where it was then flying over Montana in the vicinity of Malmstrom Air Force Base, host to American nuclear international continental ballistic missile (ICBM) silos.

But commanders decided shooting down the balloon and its substantial payload “posed an undue risk to people across a wide area, due to the size and altitude of the balloon and its surveillance payload,” Austin said.

Not until Feb. 2 did the Pentagon acknowledge the incident, forced to do so after the balloon was spotted by civilians. That delay prompted consternation across both sides of the aisle in Congress.

China, atypically, acknowledged the incident and apologized for what it claimed was an accident.

“China regrets that the airship strayed into the United States due to force majeure,” China’s foreign ministry said in a statement Feb. 3., using a legal term indicating a situation beyond its control.

Secretary of State Antony J. Blinken had been scheduled visit China Feb. 5, but canceled his trip at the last moment in

the midst of the crisis.


INTELLIGENCE GAPS

As the story unfolded, it also became clear that this was not the first time Chinese intelligence balloons had transited into U.S. airspace. Pentagon officials cited at least three prior incidents, including during the Trump administration, none of which had been publicly acknowledged previously.

“Over the past several years, Chinese balloons have previously been spotted over countries across five continents, including in East Asia, South Asia, and Europe,” a senior defense official said. The Pentagon said another Chinese balloon is currently flying over Latin America.

The earlier balloons were spotted and tracked by intelligence agencies, not DOD, other officials said Feb. 5. It was unclear if that information was shared with DOD and, if not, why not. Congressional leaders from both parties called for further explanation. But while Democrats praised the administration’s handling of the incident, Republicans blasted the administration for delay in notification and decisive action.

“President Biden made the right decision to shoot down this alleged Chinese spy balloon out of range of American civilians and infrastructure,” Sen. Jack Reed (D-R.I.), chairman of the Senate Armed Services Committee said in a statement Feb. 4. “I look forward to a full briefing on the situation and U.S. plans moving ahead.”

As the balloon finally drifted over the Atlantic, two Langley F-22s, using the call signs FRANK01 and FRANK02, brought the balloon down. A NORTHCOM spokesperson said the call signs paid homage to World War I ace Lt. Frank Luke Jr., nicknamed the “Arizona Balloon Buster” after he destroyed 14 German balloons in 17 days. A Medal of Honor recipient, he is the namesake of today’s Luke Air Force Base, Ariz. 

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Republic of Korea Ministry of Defense courtesy photo

B-1s Join F-22s and S. Korean F-35s in Latest BTF Mission

By Greg Hadley

A pair of U.S. Air Force B-1B Lancers and F-22 Raptors flew alongside F-35s from the Republic of Korea (ROK) on Feb. 1—the third bomber flight near the Korean Peninsula in recent months. The jets then trained Feb. 3 with USAF F-22s, Marine Corps F-35Bs, and ROK F-35s.

The B-1s subsequently flew to Andersen Air Force Base, Guam, to kick off another Bomber Task Force (BTF) deployment.

The Republic of Korea Defense Ministry announced the first round of joint air training Feb. 2, saying the aircraft linked up over the Yellow Sea, just west of the peninsula. The ROK Air Force announced the second round Feb. 3, according to multiple media reports, noting that it also took place over the Yellow Sea.

A Pacific Air Forces spokesman confirmed to Air & Space Forces Magazine that the B-1s came from Ellsworth Air Force Base, S.D., and the F-22s came from Joint Base Elmendorf-Richardson, Alaska. A release from PACAF announced the BTF mission.

The combined flight marks the first combined air training between the ROK, or South Korean, Air Force and the U.S. Air Force in 2023, though U.S. bombers have become a frequent sight in the skies near South Korea recently.

In late December, B-52 Stratofortresses from Barksdale Air Force Base, La., flew alongside American F-22s and ROK F-35s and F-15s around Jeju Island south of the peninsula. And in November, B-1s from Ellsworth flew over the peninsula for the first time in five years.

In both cases, the bombers' flights represented shows of force shortly after North Korea conducted missile tests.

These most recent flights came just a day after Defense Secretary Lloyd J. Austin III visited Seoul and pledged alongside South Korean Defense Minister Lee Jong-sup to increase the size and scope of joint U.S.-ROK military exercises. That includes increased participation from fifth-gen fighters and strategic bombers.

Ellsworth B-1s last participated in an Indo-Pacific BTF in the fall, from October to November.

"It's a privilege to be back in the Pacific area of responsibility and to be on the forward-edge of deterring our adversaries and supporting our allies," Maj. Abraham Moreland, assistant director of operations for the 34th Expeditionary Bomb Squadron, said in a statement. "The relationships we have with our allies in the region are crucial to the security of the Indo-Pacific, and the partnerships we build while out here give our aircrews the critical training and experience necessary to be successful in this environment."

The U.S. missions both reassure South Korea and respond to mounting pressure from North Korea, where Kim Jong Un has stepped up missile tests and recently launched drones over South Korean airspace.

With tensions increasing, South Korean President Yoon Suk-Yeol made waves by saying his country may be forced to either ask the U.S. to redeploy nuclear arms on the peninsula or to develop nuclear weapons of its own. And a recent independent, bipartisan commission recommended the two countries begin "pre-decisional" discussions about what it would take to redeploy tactical nuclear weapons to the region.

US Gains Access to More Bases in the Philippines

By Greg Hadley

The U.S. will be able to rotate troops and build facilities at four military bases in the Philippines, officials from the two countries announced Feb. 1, deepening their military cooperation to counter China.

Defense Secretary Lloyd J. Austin III and Philippine Secretary of National Defense Carlito Galvez made the joint announcement during Austin's visit to the Philippines.

The deal expands the 2014 Enhanced Defense Cooperation Agreement (EDCA), which did not allow U.S. troops to be based in the Philippines but did authorize access to "agreed locations ... on a rotational basis, for security cooperation exercises, joint and combined military training activities, and humanitarian assistance and disaster relief activities," according to the State Department.

The two countries had previously agreed to five locations, including four air bases. The U.S. has already allocated \$82 million in infrastructure for those bases, the Pentagon noted in a release.

Officials declined to name the locations of the four new bases, with Galvez saying in a joint press conference that they will do so after consultations with local authorities. Possibilities include Clark Air Base, where the U.S. Air Force operated until 1991. In 2012, the Philippines agreed to give U.S. forces limited access to the base.

The U.S. and the Philippines have a long military relationship, dating back to the Spanish-American War, after which the U.S. acquired the territory from Spain. Even after its independence following World War II, tens of thousands of Filipinos joined and served in the American military, and the U.S.

maintained a robust presence in the Philippines for decades. In 1991, the Philippine Senate voted not to reauthorize the basing agreement, and the U.S. left its bases there the following year.

Even after that, the two countries maintained close ties and conducted frequent military exercises together. During President Rodrigo Duterte's time in office, he threatened to scale back joint exercises with the U.S. and pursued closer ties with Russia and China. That delayed implementation of the EDCA.

After Duterte left office in 2022, he was succeeded by Ferdinand Marcos Jr., the son of controversial former President Ferdinand Marcos Sr., who ruled for more than 20 years, imposing martial law for part of that time.

Under the younger Marcos, relations between the U.S. and the Philippines have strengthened, and EDCA projects are again ramping up. Said Austin: "This relationship is strong, and we will continue to work hard to strengthen it further."

In January, U.S. Pacific Air Forces Airmen visited Clark Air Base and Basa Air Base in the Philippines for a subject-matter expert exchange with the Philippine Air Force. They discussed "munitions, maintenance, logistics, and hot-pit refueling ... [in] a precursor to cooperation in future large exercises in the Indo-Pacific region," according to a Feb. 2 news release.

Galvez expressed interest in expanding the Philippine Air Force's capabilities with U.S. platforms and further engagements in the future.

"We really need C-130s, and also those Black Hawks that we bought that we configured to search-and-rescue capability," Galvez said. The Philippines signed a deal for 32 Black Hawk helicopters in February 2022 and has made moves to acquire C-130Js as well.



Chad McNeeley/DOD

Secretary of Defense Lloyd Austin III, right, greets Philippine President Ferdinand "Bongbong" Marcos in Manila, Feb. 2, 2023. Austin is traveling to Asia to meet with senior government and military leaders in Korea and the Philippines to advance regional stability, further strengthen the defense partnerships and reaffirm the deep commitment of the United States to work in concert with allies and partners in support of the shared vision of preserving a free and open Indo-Pacific.

"Technology makes space operations possible," said Chief of Space Operations Gen. B. Chance Saltzman during a talk at the Air & Space Forces Association. But high-tech weapons, he said, are ineffective without highly trained operators.



Mike Tsukamoto/staff

SPACE FORCE

C-Notes from Saltzman: Sets Course for Guardians

By Greg Hadley and Tobias Naegele

Chief of Space Operations Gen. B. Chance Saltzman tore a page from another young service chief's playbook to speak directly to his Guardians, issuing the first three of a planned series of "C-Notes"—short for "Commander's Notes"—to the force.

Saltzman's inspiration: Navy Adm. Elmo R. Zumwalt Jr., who became the youngest-ever Chief of Naval Operations on July 1, 1970, almost a year to the day after Saltzman was born. Over the next four years Zumwalt sent 121 All-Navy messages, or "Z-grams," as they came to be known, covering topics as diverse as deployments and time off to beards and race relations, all sensitive issues as the Navy transitioned from conscription to an All-Volunteer force.

Saltzman's initial C-Notes aren't detailed policy statements, but rather a window into the CSO's thinking on what he sees as three critical lines of effort:

- Fielding Combat-Ready Forces
- Amplifying the Guardian Spirit
- Partnering to Win

The three letters represent Saltzman's first direct, broadly published guidance to Guardians about where the Space Force is headed under his leadership. Fielding Combat-Ready Forces

"First and foremost, we must field resilient, ready, combat-credible forces," he said in a Jan. 28 talk with Air & Space Force Association volunteer field leaders gathered at AFA's Arlington, Va., offices. "Each of these descriptors is important and must be clearly understood. A resilient force is one that can withstand, fight through, and recover from attacks. A ready force has the

trained personnel, equipment, and sustainment capacity to accomplish missions and tasks in a high-intensity operational environment. And a combat-credible force has demonstrated the ability to conduct offensive and defensive operations against an adversary. All three are important."

Saltzman said it will take both technology and trained, ready personnel to achieve military objectives, not just technology alone.

COMBAT-READY FORCES

"Technology makes space operations possible. But the Space Force does not present technology systems or capabilities to the joint force, we present Space Forces. ... As the Russian military in Ukraine is showing us right now, a high-tech weapon system will be operationally ineffective" without the trained personnel and sustainment systems needed to execute the mission.

"Let me offer a few observations about this war, looking at it through a spacepower lens," Saltzman added. "First, it's clear that space is viewed as a critical enabler to both militaries [in the conflict in Ukraine]. Both sides have attacked SATCOM capabilities to degrade command and control, and there's been a concerted effort to interfere with GPS to reduce its effectiveness in the region.

"Second, the clear connection between space and cyber became apparent with a Russian cyber attack against a commercial satellite communications network used by Ukraine's military.

"Third, the value of proliferated constellations and commercial augmentation was clearly demonstrated with Ukrainian integration of SpaceX's Starlink SATCOM system. Acquiring access to this system enhanced the Ukrainian [command and control]

structure and it's proven much harder to target and degrade than previous systems.

"And finally, we've observed that even the best military equipment does not ensure success on the battlefield. A modern military must have well-trained operators, well-rehearsed multi-domain operations, effective tactics, and robust logistics and sustainment."

Saltzman is concerned about the weapons China could bring to a fight in an effort to deny space to U.S. forces. "The Chinese have multiple ground-based lasers, numerous jammers targeting wide swaths of SATCOM frequencies and GPS," he said. "Both Russia and China have invested in cyber capabilities which threaten our ground networks. ... Anywhere the Space Force operates, there are threats. And these threats can attack across multiple domains and multiple attack vectors."

China too has integrated space into its overall military operations, with 290 ISR satellites, 49 precision-navigation-and-timing satellites, and "a growing number of rapid-response launch capabilities," Saltzman noted. The U.S. Space Force must develop its own counters to those new Chinese systems.

Commanders must ensure that operators are ready to employ the technology the Space Force acquires, and that they understand tactics—not only U.S. tactics, but the nature of the threat they face from adversaries. U.S. forces need training, and support, and training plans, he said. They can't just be told "Do the best you can." So the gist of his first line of effort is a question: What do Guardians need in the way of doctrine, infrastructure, and organizations to become combat-credible in the future?

Combat capability cannot merely be a centralized concept presented to the nation through U.S. Space Command. "We tend to think about the global nature of space operations," he said, noting that the responsibility for the entire space domain belongs with the unified U.S. Space Command. But Space requirements

can also be regional and local.

"Let's talk about missile warning," he said. "I think most people would say missile warning is a global enterprise, right? You have satellites spread around the ring. They're monitoring the whole earth, from Colorado, and when they get a missile event, they process it and they disseminate it back out to the warfighters." But U.S. Space Command does not deliver warnings to local commands; instead, they go to a regional Air Operations Center (AOC) and may not reach forward operating bases (FOB) and refueling points. "How do [those Airmen] get missile warning?"

To Saltzman, the answer is the new Space Component Commands that the Space Force has been standing up. The first was in U.S. Indo-Pacific Command in November, and it has since added them in Korea and at U.S. Central Command. These organizations help grease the wheels of communication between the services and their component commands.

"The space component has a responsibility to make sure that the missile warning track that gets to the AOC now gets to every single person that needs it," Saltzman said. "That's a very dynamic environment. FOBs and FARPs [Forward Arming and Refueling Points] are changing constantly."

The Air Force's focus on Agile Combat Employment, in which forces move dynamically to different operating locations to be less predictable and more complicated for adversaries to target makes that an even more fluid, complex task. "We are bouncing forces around continuously to keep our enemies guessing where our forces can be and that doesn't stop a missile warning architecture from having to get them missile warning data wherever they are," Saltzman said. "Space Command can't do that, ... there's too many of them. So you need space experts who understand procedurally and architecturally how to provide this warning in local areas.

"A capable and resilient weapon system will be operationally

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ineffective if its personnel, expertise, tactical employment, and sustainment are insufficient for the mission,” Saltzman wrote in his C-Note on readiness. Resiliency concepts apply not only to satellite constellations, but to “ground stations, networks, data, and mission-critical support facilities” that are under constant cyberattack.

AMPLIFYING THE GUARDIAN SPIRIT

Expanding on the Space Force’s Core Values of Character, Connection, Commitment, and Courage, Saltzman defined three core traits of the Guardian Spirit:

Principled Public Servant: Guardians are expected to demonstrate the Space Force’s core values as members of the profession of arms, a critical part of the U.S. public’s trust in the military.

Space-minded Warfighter: Guardians should have a “deep understanding” of space operations and be “experts” in deploying space capabilities against an adversary.

Bold and Collaborative Problem Solver: Guardians should “engage with, analyze, and debate new ideas and perpetually challenge the status quo,” without fear of failing or adapting. They should also seize the initiative and be “comfortable empowering subordinates to act.”

Together, these traits are the keys to “taking care of Guardians,” Saltzman said, promising more details in a forthcoming “Guardian Handbook,” which will expand on the “Guardian Ideal” released in September 2021, the service’s foundational approach to talent management.

Saltzman acknowledged that in the Space Force’s quest to take care of Guardians, “we have not reliably hit this mark in the past,” an apparent reference to complaints about the “Semper Soon” catchphrase used by Guardians frustrated by the service’s slow

progress on structures and policies. The CSO said he is committed to personnel processes that are “transparent, predictable, and professional.”

PARTNERING TO WIN

Emphasizing the need for cooperation with a broad range of different organizations, Saltzman wrote in the third letter that “even with superlative talent and exceptional capabilities, the Space Force will not succeed without robust joint, coalition, international, interagency, academic, and commercial partnerships.”

As examples of those partnerships, Saltzman noted the Space Force’s close ties with both the Air Force, which provides much of the service’s support functions, and the National Reconnaissance Office. But Saltzman also wants the Space Force to engage with international allies, academia, industry, and others. “Foreign exchanges, deployments to industry, university partnerships, reverse industry days, security cooperation initiatives, and shared PME opportunities” are all avenues for partnering to make the Space Force stronger, he said.

The Space Force’s University Partnership Program has more than a dozen members, and it has already held a number of so-called “Reverse Industry Days,” where industry shares what it has to offer, as opposed to listening to service officials describe their needs. The Service’s partnership with Johns Hopkins University is another key partnership, one that will largely replace the need for its own War College.

Describing the three letters together, Saltzman said he hoped the newly defined lines of effort (LOEs) will generate “serious discussion at all levels,” and that “command teams are empowered to accelerate activities that align with these LOEs and discard activities that don’t.”



‘Backdoor’ to Attack Satellites: Ground Systems Vulnerable to Cyber

By Greg Hadley

The Space Force and the Pentagon have put considerable effort into making proliferating satellite constellations to make them more resilient against attack, but the ground stations and networks that communicate with those satellites pose a “backdoor” risk through which adversaries could potentially attack space capability, said Chief of Space Operations Gen. B. Chance Saltzman.

Speaking with reporters Jan. 31 at the Pentagon, Saltzman said vulnerabilities in ground systems highlight the extent to which space and cyber warfare are interconnected—a key lesson he’s drawn from the Russian-Ukraine war.

“Satellites in space are not useful if the linkages to them and the ground network that moves the information around and communicates with the satellites is not assured, is not capable, is not accessible,” Saltzman said. “We’ve witnessed some cyber activity that has hurt satellite operations. ... When we think about satellite operations, if we’re not thinking about cyber protection of our ground networks, then we may have a backdoor, if you will, to negate satellite operations without counter-satellite operations.”

China and Russia’s counter-satellite capabilities have received scrutiny in recent years, from Russia’s direct-ascent anti-satellite missile test to China’s satellites with robotic arms that can



Senior Airman Thomas Sjöberg/USSF

A SpaceX Falcon 9 rocket carrying the GPS III SV06 payload launches from Cape Canaveral Space Force Station, Fla. The overall objective of GPS III is to deliver sustained, reliable GPS capabilities to America’s warfighters, our allies, and civil users.

“grapple” with other satellites. U.S. officials have begun warning those two countries could turn space into the next battlefield.

But the importance of ground networks hasn’t been lost on military space leaders. In May 2022, the Space Development Agency awarded a \$324 million contract to General Dynamics Mission Systems to establish the ground operations and integration segment of Tranche 1 of what was then called the National Defense Space Architecture but is now dubbed the Proliferated Warfighter Space Architecture.

At the time, an SDA official said the award “really is the most critical element of Tranche 1,” noting that “without a ground segment, our space vehicles orbiting around the Earth can’t really do what we need them to do. They can do things autonomously, but really in order to make things work as a complete network, as a complete enterprise, you really do need the ground segments to manage the enterprise and the mesh and the control of the space layer.”

Around the same time, Lt. Gen. Stephen N. Whiting, head of Space Operations Command, warned that “cyberspace is the soft underbelly of our global space networks.”

Also in May, Saltzman told reporters that those worrying solely about the Russians shooting down satellites are “missing the bigger picture,” and that the Space Force would need to establish its own component within U.S. Cyber Command, as it has recently with other combatant commands.

Saltzman cited several other lessons he is drawing from Russia’s invasion of Ukraine: the criticality of space to functions like command and control, and the importance of commercial space assets for things like connectivity or satellite imaging.

And he tied one more lesson back to the three lines of effort he recently released to Guardians and his overall focus on “combat-credible forces.”

“High-quality equipment alone doesn’t make you successful,” Saltzman noted. “If you don’t have the training, the logistics, sustainability, the operational concepts to operate multi-domain

axes—I think the Russians on paper had very good equipment, but they didn’t necessarily have the sustainment behind it, they certainly didn’t have logistics. And so this is ... a comprehensive look at what it means to put a force on the field that is going to be effective.”

Saltzman has emphasized the importance of the Space Force maturing its own training and operational concepts and said his other lines of effort are focused on “Amplifying the Guardian Spirit” and “Partnering to Win.” But he said Jan. 31 that he would not dictate how Guardians should go about pursuing those LOEs.

“We’re trying to ... strike a different tone with those Guardians that are out there, the commanders that are out there in the field, that have to actually execute the operations. ... I’m not going to be prescriptive,” Saltzman said. “I’m saying this is generally what I think is important. You tell me what activities you’re currently doing that supports these efforts, and let’s make sure we’re on the right track and they’re properly resourced and your timelines are consistent with how fast we need them.”

Saltzman said he wants Guardians to speak up and share their thinking about “opportunities you’re not taking advantage of, or things that you need to be doing differently or that you don’t want to do so that you can realign your activities.”

The idea of his C-notes and other means of reaching out to share his thinking with the field is not to dictate how things should be accomplished, but rather set the mark of what needs to be accomplished. “I really want this to be feedback from the field rather than a top-down prescriptive needs. The Service’s partnership with Johns Hopkins University is another key partnership, one that will largely replace the need for its own War College.

Describing the three letters together, Saltzman said he hoped the newly defined lines of effort will generate “serious discussion at all levels,” and that “command teams are empowered to accelerate activities that align with these LOEs and discard activities that don’t.”



‘Keep It Simple, Stupid’—Senior Military Space Leaders Focus on Streamlining Acquisition

By Chris Gordon

Senior U.S. military space and intelligence leaders drove home a clear and consistent message at a gathering of space industry and government officials Jan. 24: The Department of the Air Force and the Intelligence Community must move from a bloated, complicated acquisition process to one in which space systems can be fielded faster and better meet requirements.

In remarks at a conference held by the National Security Space Association, leaders from the Department of Air Force, Space Force, and Intelligence Community framed the issue in blunt terms.

“We have a culture we have to break,” undersecretary of the Air Force for space acquisitions and integration Frank Calvelli said.

While Calvelli had some critiques of industry, he put much of the blame for issues he sees on the Department of Air Force’s own lack of clarity on what it wants from specific space programs. Calvelli noted that the Pentagon often rethinks and modifies pro-



U.S. SPACE COMMAND

Honorable Frank Calvelli,
assistant secretary of the
Air Force.

grams to fit the current budget, shifting scheduling, and adding and removing capabilities.

Calvelli has outlined clear goals for the way he wants the Department of Air Force to conduct business: shorter, three-year start-to-launch times, smaller systems, more use of commercial assets, and the use of fixed-price contracts to prod industry to deliver programs focused and on time.

“We like to build new,” Calvelli said. “New is cool. But we have to stop building new and take advantage of existing designs if we really want to drive schedules to be faster.”

Calvelli noted that he does not want to hamstring future technologies, but he does want to increase speed in the acquisition process and proliferate the sources of America’s space assets to complicate targeting for America’s adversaries.

He pointed to his time as a senior official at the National Reconnaissance Office, which he said takes a more hard-line approach to contracting than the Department of Defense’s process, which defense leaders, experts, and elected officials

have long said needs reform.

One common DOD practice Calvelli cautioned against is awarding contracts to the lowest bidder. He said the Department of the Air Force must take a hard look at whether contractors for its space projects can actually deliver before spending millions of dollars on a project that is ultimately canceled.

"You get to the mode where you're just reviewing the proposal, and you don't take into account knowledge about the company, or you don't know about the company," Calvelli said. "You can end up awarding a significant space program to a part of a company or to a company that has absolutely no experience and no chance of actually executing the program."

Another of Calvelli's points of emphasis was moving toward as many commercial assets as feasible, both to take advantage of existing technology and proliferate the sources of America's space assets to complicate targeting for America's adversaries.

Calvelli's views are shared across the military space enterprise, according to the deputy commander of U.S. Space Command.

SPACECOM is focused on "staying in our lane," Lt. Gen. John E. Shaw told reporters, instead of "unnecessarily or prematurely" focusing on broad solutions that don't align with specific operational requirements, which may be more limited.

Similarly, as the Space Force enters its fourth year, it cannot

lose sight of its core missions of maintaining and building systems that allow the entire U.S. military to fight, the service's deputy chief of space operations for intelligence said.

"Keep it simple, stupid," Space Force Maj. Gen. Gregory J. Gagnon said. "Let's just do small things, do them really fast, and continue to move forward. I think that's absolutely the right way ahead."

U.S. officials have noted that because space is a largely classified realm, frank discussion about issues with an asset can be limited.

But while Calvelli said he is sometimes frustrated with DOD's space acquisition process, one of the nation's most senior intelligence officials said some of the same issues extend to the rest of the federal government's national security enterprise.

"We recognize that we have to figure out how to move faster in our acquisition realm," said Stacey Dixon, the principal deputy director of national intelligence.

Dixon noted the Intelligence Community is naturally risk-averse, methodical, and still working out how to fix its processes.

"We will continue to try to decrease the amount of time that it takes to do work with us and the amount of time that it takes for decisions to be made of which they're waiting on our input," Dixon said.

Airmen from the 60th Aeromedical Evacuation Squadron and 60th Aerial Port Squadron load equipment onto a KC-46A Pegasus at Travis Air Force Base, Calif., in August. In addition to aerial refueling, the KC-46A can accommodate a mixed load of passengers, aeromedical evacuation, and cargo transport.



Nicholas Pritch/USAF

MODERNIZATION

New KC-46 Tankers Coming—but New Deficiency Revealed

By Greg Hadley

The Air Force awarded Boeing a \$2.2 billion contract for 15 KC-46 tankers, the ninth lot of the aerial refuelers, just days after the Air Force Life Cycle Management Center acknowledged a previously undisclosed deficiency with the aircraft.

The latest purchase order is roughly the same as the Lot 8 order from Aug. 31, 2022. The number of aircraft is the same, but

the cost slightly increased. Work on the 15 aircraft is expected to be completed in 2026.

The KC-46 Pegasus has suffered a stream of deficiencies since its introduction, including ongoing issues with its over-stiff boom and the remote vision system for boom operators. But the latest deficiency has nothing to do with aerial refueling; instead, the ding is for insufficient documentation for loading cargo on the jets.

The Defense Department's Office of the Director, Opera-

tional Test and Evaluation, disclosed the latest problem in its annual report, which noted that the Air Force Operational Test and Evaluation Center (AFOTEC) had determined that several “individual cargo-related deficiencies merited generation of a Category I emergency deficiency report against overall KC-46A cargo operations capability.”

An Air Force Life Cycle Management Center spokesperson, responding to questions from Air & Space Forces Magazine, acknowledged the deficiency, but said it had been downgraded to a Category II deficiency in November 2022. The command did not indicate if that was based on progress toward its resolution or simply a judgment call.

The problems are related to five issues:

- Complex, unorganized cargo loading guidance;
- Nonstandard cargo limitations, causing aircrew confusion and requirement of onboard cargo inspections;
- Restrictions regarding the cargo barrier net can prohibit loading sufficient, or any, cargo if the forward-most cargo does not meet requirements;
- Problems with the Automated Performance Tool software used to calculate aircraft weight and balance can increase loadmaster workload and require complex manual calculations, introducing potential human error; and
- Aerial port operational restrictions caused by inadequate technical guidance increase workload for loading personnel and loading times, driving KC-46A incompatibilities within the Defense Transportation System.

The Air Force defines Category I deficiencies as those which prevent “the accomplishment of an essential capability or critically restricts [operational safety, suitability, and effectiveness],” with no known workaround. By contrast, a Category II deficiency is one “which adversely affects an essential capability or negatively impacts operational safety, suitability, or effectiveness,” but can be overcome by “significant compensation or acceptable workaround.”

According to Air Force policy, a program manager can downgrade a submitted deficiency report (DR) provided there is agreement with the test director of the operational test agency, in this case AFOTEC. Asked if AFLCMC followed this procedure and coordinated with AFOTEC, neither agency responded.

The AFLCMC spokesman did say that “the estimated comple-

tion date for the solutions to close the DR is [the third quarter of fiscal year 2023],” putting it between April and June. No further details were offered. Boeing also did not immediately reply to a request for comment.

The Air Force has officially recorded nine Category I deficiencies with the KC-46, most of which officially remain open. Boeing executives told reporters in December that some of those open deficiencies are formalities at this stage, the result of infrequent meetings of the KC-46 deficiency board.

The issues that led to this latest deficiency report are unrelated to the cargo lock problem that barred the KC-46 from carrying cargo or passengers for three months in 2019. That problem, which was solved and closed out in December 2019, required changes to the cargo pallet locks, which until then, had sometimes come unlocked in flight.

Boeing and the Air Force have touted the KC-46’s cargo capabilities in comparison to the legacy KC-135 tanker; they have said the aircraft can carry up to 18 pallets, 114 passengers in contingency situations, or more than 50 patients for an aeromedical evacuation.

The most prominent Category I deficiencies, however, remain months, if not years, away from being resolved, most prominently the troubled Remote Vision System, an array of cameras and screens the boom operator uses to connect and refuel other aircraft. The current setup can result in “whiteouts” or “blackouts” for the boom operator in certain lighting conditions, heightening the risk of the boom accidentally scraping a receiver aircraft. That is particularly troublesome for aircraft with stealth coatings like the F-35 fighter or B-2 bomber.

Another key deficiency that remains unresolved is a “stiff” boom—some receiver aircraft, particularly the A-10, cannot maintain the thrust against the boom necessary to keep it engaged. As a result, the KC-46 is still not cleared to refuel A-10s.

The rest of the Category I deficiencies are classified as “product quality,” and primarily related to cracks or leaks. Boeing is working on the issues.

Boeing has delivered more than 60 KC-46s to date, with a planned buy of 179 over the life of the program. The Air Force has also considered increasing that number rather than acquiring a so-called KC-Y in the future.



What Concerns These Air Force Generals Most about Nuclear Modernization Right Now

By Christopher Prawdzik

Manpower, material, and funding remain the foundation—and a key concern—for the Air Force’s top-to-bottom nuclear modernization effort, a pair of top generals said Jan. 24.

That modernization effort covers everything from personnel to weapons systems to entire facilities, and the service must execute this massive undertaking without losing the slightest bit of operational superiority in a world where nuclear threats have considerably increased, Lt. Gen. James C. Dawkins Jr. and Maj. Gen. Michael J. Lutton said during an Aerospace Nation event hosted by the Mitchell Institute for Aerospace Studies.

A reminder of those increased threats came shortly before the event began, when the Bulletin of Atomic Scientists moved its infamous “Doomsday Clock” to just 90 seconds before midnight, the closest it has ever been, driven primarily by Russia’s invasion

of Ukraine and subsequent nuclear saber-rattling.

At the same time, the Air Force is in the thick of its nuclear modernization program—according to Dawkins, deputy chief of staff for strategic deterrence and nuclear integration, the “bow wave” of new requirements and fielding of new systems discussed a decade or more ago is now here. With the enormous number of systems and improvements on the horizon, immense challenges follow.

“Believe it or not, what I worry about most, more than anything right now—more than technology—is concrete and rebar, reinforcement steel that goes in the concrete to build the 650 construction projects that we have, not just in the missile fields but across the nuclear enterprise,” Dawkins said. “It has to be built in the next 12 years in 13 states.”

He noted a number of systems and equipment that will be fielded in the coming years, including the recently rolled-out

B-21, the air-launched B61-12 tactical bomb, the MH-139 Grey Wolf helicopter for missile site security, and a modernized nuclear command, control, and communications network. But that's only part of the picture.

"Anytime you transition and do everything at the same time, you've got to really be careful about how you orchestrate that," Dawkins said. "That is going to require a lot of work by our Global Strike Command to ensure that they, again, do that just right."

The personnel component to these efforts is also crucial, and Dawkins particularly emphasized the need for experts in critical areas—such as electricians, pipe fitters, and welders—to keep the multitude of projects on schedule.

Lutton, commander of the 20th Air Force, discussed the human capital component of the process and how talent management shapes and is shaped by emerging systems and technology. He focused on the integration of Grey Wolf, along with the ground-based Sentinel ICBM system that's replacing the Minuteman III.

"Some of the similar questions about talent management, talent retention, talent placement, when you're building a new weapon system, are agnostic of the weapon system, whether it's an aircraft or a missile system," Lutton said. "So Grey Wolf right now is teaching us some lessons that will definitely export to Sentinel."

Lutton said Sentinel has prompted some organizational changes, with the flight-test squadron evolving into a test and evaluation group. This will include a flight-test squadron, test support squadron, and a maintenance test squadron. Overall, these developments have expanded opportunities for Airmen across the board, particularly when it comes to the country's ICBM defense.

"Historically, and by historically I can only talk about the time that I've served, we've never really been 'Total Force' in the ICBM business," Lutton added, noting that the first Reservist weapons officer graduated from the U.S. Air Force Weapons School in December. "We are looking to build so much more Total Force opportunity in the ICBM business, and that does two new things for us: One, it gives us incredible depth of expertise, and two, it allows our Airmen to have options."


In addition, Lutton noted the service has increased communication about "why" Airmen are doing what they're doing, looking closely at world events and diplomacy to form a better understanding of their role.



The U.S. nuclear enterprise is undergoing a mammoth modernization, said Lt. Gen. James Dawkins Jr., deputy chief of staff for strategic deterrence and nuclear integration. "Anytime you transition and do everything at the same time you've got to really be careful."

"There's a component to it where we have to ensure that we're still very active with counterproliferation," he said. "We still have to ensure that we're very active with nuclear nonproliferation, and then we have obviously a very healthy treaty system that is transparent and compliant."

Dawkins said stable funding remains essential, and he's pleased with the bipartisan support the mission has had for many years—even with the scrutiny the nuclear enterprise often receives. Still, raw materials, personnel, and tight timelines remain at the forefront.

"We deferred programs back to the early 2000s, and then we had sequestration, and so we don't have a lot of margin to produce these," he said, adding that while producing new systems, the current ones must endure. "The ICBMs that General Lutton commands and is in charge of out there in missile fields have to be as good on their last day as they were on their first day, and that continues to get more challenging." 

Hinote Urges DIB to Find Incentives for Faster Technology Development

By John A. Tirpak

As the Defense Department engages commercial entities to speed innovation, cultural and structural differences between government and the private sector continue to be the biggest hurdle to rapidly deploying new technology, the head of Air Force Futures told the influential Defense Innovation Board (DIB) at a recent meeting.

"It's not an access to innovation problem that we're dealing with, it's an innovation adoption problem," said Air Force Lt. Gen. S. Clinton Hinote, deputy chief of staff for strategy, integration, and requirements, noting a number of barriers he's experienced in recent years. "I've witnessed each of these [barriers] stifle innovation on behalf of the bureaucracy and at the expense of

tomorrow's warfighter."

Hinote made his remarks at the end of a two-day meeting of the new Defense Innovation Board. Chaired by Michael Bloomberg, the nine-member board includes academics, technology professionals, and other experts who advise DOD on emerging technology and innovation and how to promote military technological dominance. Among its members are former Assistant Secretary of the Air Force Will Roper and retired Adm. Michael Mullen, former Chairman of the Joint Chiefs of Staff.

Passionate but positive, Hinote urged the board to identify incentives throughout the acquisition world that can speed technology development in a culture rife with bureaucratic roadblocks.

He said he's witnessed leaders from three different adminis-

trations come in with a sense of urgency, only for that dynamic to not permeate through the bureaucracy. “Having the lack of sense of urgency in the middle is deadly, and that’s what it has been for us,” Hinote said.

One particular area Hinote focused on was risk timelines, noting that DOD’s actions are based on near-term risks, in contrast to its stated focus. Hinote also said there is a strong tendency to focus on “old ways” instead of new ones.

“There are a lot of soft vetoes in our department ... and at any one point, there are so many different people, offices, interests that can block an action,” Hinote said. “They can’t start an action; they can’t initiate or get an action through, but they can block, and that’s a fact of life in this department that makes it very difficult to keep going.”

He added that there’s also a strong “not-invented-here culture,” where there can be competition between internal and external science and technology sectors. And while some competition between sectors can be good, Hinote added, it can be challenging when the timelines of a company differ from the government’s budget timelines.

It’s a particular issue with small startups whose fast-paced innovation might be perfect for DOD, but the startup must fund itself for multiple years until the budget process catches up with them. On top of that budget process, he added, is a lack of trust between the executive and legislative branches, particularly when looking at finding flexibility on how money is spent.

“At some point, we’re going to have to explore what types of transparency we need to get our congressional stakeholders semi-comfortable with the type of flexibility that we know we have to get to,” Hinote said. “And I think that involves a flexibility in intellectual property that we have not seen yet.”

In challenging the board to map out incentives, he emphasized the need to tap more into intellectual property and use it to scale.

For example, Hinote suggested that in critical times of need, if U.S. forces have good technology and an ally has good manufacturing capability, “it is in the national interest to release the intellectual property, give it to the partner and let them build the weapons, because at the moment, we are not able to build enough weapons fast enough,” he said.

Ultimately, Hinote said, the conversation must change, because oftentimes there’s little incentive to push technology

boundaries, increase the speed of a bureaucratic process, or take risks.

“I don’t believe this is impossible; I don’t believe that people want to watch innovation flounder in our department,” he said. “But the incentives are structured in a way that makes it darn impossible, and until we call it out, I just don’t see how it gets better.”

In another brief to the board, Jason Rathje, director of the Office of Strategic Capital (OSC) and co-founder and former director of AFWERX’s AFVentures division, insisted the government must do more to increase capital access for innovators.

With so many American companies investing and developing capabilities in science and technology, boosted by cooperation with academia, there has been world-class advancement in critical areas, Rathje said. But there needs to be a next step—to provide opportunities for entrepreneurs to have their technologies support national security goals.

Rathje added that OSC is looking at two new strategies to promote private investment as a national security tool: syndication and leverage.

“Syndication is a strategy that simply partners with private capital providers to co-invest in new technology efforts to help scale the business as we help scale the technology,” he said. “What leverage does is it lowers the cost of capital; private investors can make patient capital investments that are required, at the sizes that they’re required to invest, in deep technology companies.”

Rathje also celebrated the OSC’s partnership with the Small Business Administration and working with the Small Business Investment Company program. SBIC provides investment opportunities to technology companies in their early stages by leveraging the Federal Credit Program.

“The way these investment funds work is that we can license new limited partnerships that are vertically focused on deep technology areas,” he said. “We can provide two dollars of leverage, two dollars of debt, for every dollar of private capital that is raised.”

The SBIC initiative began in December, and Rathje said they hope to begin receiving applications for the initiative by mid-year. In addition, OCS will soon publish its inaugural investment strategy, which will review critical technology sectors and provide assessments regarding capital availability.



The Defense Innovation Board, headed by former New York City Mayor Michael Bloomberg, will try to advise the Pentagon on how to accelerate innovation. Lt. Gen. S. Clinton Hinote, deputy chief of staff for strategy, integration, and requirements, urged the board to address the “soft vetoes” that can stifle innovation before it ever happens.

Petty Officer 2nd Class Alexander Kubitza/DOD

US, Israel Kick off Massive Exercise with 142 Aircraft

By Chris Gordon

The U.S. and Israel kicked off a massive combined week-long military exercise Jan. 23, the largest since Israel was moved to U.S. Central Command's area of responsibility in 2021.

U.S. officials told Air & Space Forces Magazine the exercise, dubbed Juniper Oak, was notable in both size and scope. CENTCOM said everything from space assets, a carrier strike group, strategic bombers, stealth fighters, electronic warfare aircraft, Special Operations forces, and crews operating HIMARS precision artillery launchers would drill in a "combined joint all-domain exercise."

The exercise ran from Jan. 23 to 27 and involved 180,000 pounds of live munitions and 6,400 U.S. personnel, 450 of which were on the ground in Israel. Operations will take place in Israel and the Eastern Mediterranean Sea.

The exercise "underscores our commitment to the Middle East," CENTCOM Commander Gen. Michael "Erik" Kurilla said in a statement.

"No country in the world can bring this level of combat power, with such agility into a region" that is not its primary focus, said Bradley Bowman, a former Army aviator and military expert at the Foundation for Defense of Democracies. "At the same time, it's important for our adversaries and our allies, frankly, to know that and our partners and everyone in the region to know that."

The drills mark a significant step toward integrating Israel with U.S. forces in the region. Until late 2021, Israel was considered part of U.S. European Command's area of responsibility, a somewhat incongruous placement that limited the ability of the two nations to exercise together despite facing some common adversaries, such as Iran. The arrangement reflected older sensitivities among Arab states about cooperating militarily with Israel, but relations have warmed between Israel and some Arab states after the signing of the Abraham Accords.

Just a year and a half later, U.S. and Israeli forces are conducting a significant exercise of capabilities that will be used in the Department of Defense's ambitious joint all-domain command and control (JADC2) concept by practicing operations "on land, in the air, at sea, in space, and in cyberspace," according to Kurilla.

"We are not leaving the region," Bowman said. "Exercises like this demonstrate the truth of a sustained, persistent, and serious U.S. military presence in the region."

Of the 142 aircraft participating, 100 were American, including everything from four Air Force B-52 Stratofortress strategic bombers to four Army AH-64 Apache attack helicopters. The U.S.' robust air presence also included specialized airborne early warning planes, surveillance assets, and electronic warfare aircraft, such as an Air Force RC-135 reconnaissance plane, Navy E-2D Hawkeyes, and EA-18 Growlers. The George H.W. Bush carrier strike group supported six EA-18s, five E-2Ds, and 45 F/A-18s. The U.S. Air Force sent four fifth-generation F-35s, which are not normally based in the region, joining six F-35s from the Israel

Juniper Oak 2023 included 142 total aircraft, both fixed-wing and helicopters. The **100 American aircraft** included:

- Four B-52s
- Four F-35s
- Two MQ-9s
- One HC-130
- Two HH-68s
- Four AH-64s
- One AC-130
- Four F-15Es
- Four F-16s
- 45 F/A 18s
- One RC-135
- Six EA-18s
- Two KC-46s
- Five E-2Ds
- 15 MH-60s



Israeli forces flew **42 aircraft**:

- Six F-35s
- 18 F-16s
- Eight F-15s
- One CH-53
- One UH-60
- One Gulfstream G550
- Two 707s
- Two unmanned aerial vehicles
- Two AH-64s

Defense Forces.

In addition to its stealth fighters, the U.S. Air Force sent four F-15E Strike Eagles and four F-16 Fighting Falcons, as well as Air Force Special Operations components such as an AC-130 gunship. Israel had 32 fixed-wing fighters who participated.

The Space Force was represented in Juniper Oak, with low-Earth and medium-Earth orbit satellites under the control of the command's new space component, SPACECENT.

CENTCOM said the focuses of Juniper Oak include combined command and control, maritime air operations, combat search and rescue, electronic warfare, suppression of enemy air defenses, air interdiction, and strike coordination.

The exercise took place amid continued tensions in the region. Iranian-backed militias have launched drone and missile attacks against U.S. forces and allies—a drone attack took place Jan. 20 against the Al Tanf Garrison in southeast Syria, though the U.S. has not formally ascribed responsibility.

Iran has also alarmed the U.S. by providing drones to Russia for Moscow's attacks in Ukraine and has exceeded the limits of the 2015 accord limiting its nuclear program. National Security Adviser Jake Sullivan traveled to Israel from Jan. 18 to Jan. 20 to discuss a range of issues, including Iran's continued threats in the region, according to the White House.

In a statement, Kurilla said the exercise "enhances our ability to respond to contingencies."

Juniper Oak included 142 total aircraft, both fixed-wing and helicopters. The exercise included six U.S. ships, including the USS George H.W. Bush, its air wing, and cruisers and destroyers. Six Israeli ships also participated.

Four HIMARS launchers provided long-range precision fire from the ground.

All told, 7,580 personnel participated, including 6,400 Americans, 450 of which are in Israel. Israeli forces involved in the drills number 1,180.

An image from video shows a Russian Tu-142 as it prepares to launch from an undisclosed airfield on an anti-submarine mission over the Barents Sea.



Russian Ministry of Defense/YouTube

Report: Despite Losses in Ukraine, Russia Remains a Threat in the Arctic

By Chris Gordon

American and Western officials have grown increasingly concerned about Arctic security and Russia's threat to the region, and even as the Russian military has been degraded by its losses in Ukraine, its Arctic forces remain strong, according to a new report from the Center for Strategic and International Studies (CSIS).

Russia has faced heavy attrition of its ground forces in Ukraine, forcing Moscow to order the conscription of hundreds of thousands of new soldiers, but "the toll from the Ukraine war is not necessarily reflected in the other service branches in the Russian Arctic," according to the CSIS report.

"The naval components of Russia's Northern Fleet, particularly its strategic submarine fleet, continue to give Moscow a credible second-strike capability," report authors Colin Wall and Njord Wegge write, referring to Russia's ability to launch military attacks from the region.

Russian strategic bombers have been able to operate over Russian airspace unfettered and attack Ukraine with standoff weapons. U.S. military officials have watched the situation with concern, including the commander of North American Aerospace Defense Command (NORAD) and U.S. Northern Command (NORTHCOM) Air Force Gen. Glen D. VanHerck.

"They can take off over Russian air bases today and launch their cruise missiles from over Russia and attack almost all of North America, including the United States of America," VanHerck said in October.

The U.S. relies on its deterrence capabilities including its nuclear arsenal to prevent attacks on the homeland. Experts have argued America needs a more comprehensive approach to combat missile attacks on the U.S. homeland. The U.S. Missile Defense Review, released in late October, acknowledged that America must better protect itself against various missile threats.

The Biden administration's Arctic Strategy, which was also released in October, is clear that the region is growing in its strategic importance to U.S. security.

"We will deter threats to the U.S. homeland and our allies by

enhancing the capabilities required to defend our interests in the Arctic," the Arctic Strategy states.

In response to Russia's war in Ukraine, Sweden and Finland have applied to join NATO and would join Norway as countries in the alliance with a significant presence in the Arctic. But Russia also has major interests and a large footprint in the Arctic, which is home to rich natural resources and the Northern Sea Route shipping channel in Russia's exclusive economic zone.

"There's no sign that Russia intends to slow down or stop these projects," Wall said during a CSIS launch event for the report.

The CSIS report offers recommendations for the Biden administration to help better protect the U.S. and its allies without further militarizing the Arctic.

"There are indirect, light-touch ways to enhance Arctic security: effective imposition of the sanctions regime concerning dual-use computer chips seems to be one way to diminish the conventional Russian threat in the Arctic that does not involve deploying U.S. military assets or personnel to the region," the report says.

The U.S. has extensive export controls to prevent U.S. technology from fueling Russia's military arsenal. However, the Royal United Services Institute (RUSI) has examined Russian weapons used in Ukraine and found they make use of U.S. and Western technology and noted that Russia has a variety of ways to acquire such technology, such as front companies.

"These are fielded on Arctic assets," Wall said.

Despite current U.S. sanctions, Russia's previous technological development poses an issue, which VanHerck has often highlighted.

While the CSIS experts cautioned against escalating tensions in the Arctic, they also acknowledged a need for NATO and the U.S. to bolster their presence in the region. The U.S. recently activated the 11th Airborne Division in Alaska and the Marines routinely conduct Arctic training. NORTHCOM also hosts a biennial defense exercise known as Arctic Edge, which includes the use of Air Force aircraft.

"I think there is a need on the U.S. side to rebuild some of this institutional knowledge that you had during the Cold War that you are capable of actually deploying there," Wagge said. ★

Fifth-Generation Weapons

The future of munitions is coming into focus, promising increased speed and range, shared components, stealth—and even collaborative capabilities.



Raytheon's Peregrine is a compact, high-speed air-to-air missile for countering drones, cruise missiles, and manned aircraft. Designed for affordability, the weapon's light weight effectively doubles the number of missiles fighters can carry.

Raytheon illustration

By John A. Tirpak

When the Air Force flies into combat, it does so with the same portfolio of tactical weapons it's used since the 1990s and early 2000s. Many date to before the 1991 Gulf War.

Adversary air defenses have gotten a lot tougher since Operation Desert Storm, however, and what was unthinkable 30 years ago—an enemy that could shoot down, blind or jam individual high-speed munitions—is now very likely. High-fidelity and long-range air defense radars and sensors in the hands of potential adversaries—in rapidly proliferating numbers—paired with new interceptor weapons are making it harder to hit the most well-defended targets.

A new generation of precision weapons is needed to enhance modern strike capability and deter potential aggressors.

"We need fifth-generation weapons to go with our fifth-generation Air Force," said Gen. Mark D. Kelly, head of Air Combat Command, in October 2021, counting such munitions among his top five priorities.

What exactly "fifth generation" weapons are isn't well defined, though. Kelly framed his comments in relation

"We need fifth-generation weapons to go with our fifth-generation Air Force."
—ACC Commander, Gen. Mark Kelly

to fifth-generation combat aircraft—the F-22, F-35, and B-2—which combine stealth and fused sensor data for superior situational awareness. But those platforms are still employing weapons designed for fourth-generation fighters. Kelly needs new munitions that can extract maximum effect from all the capabilities of modern stealth aircraft.

Brig. Gen. Jason Bartolomei, program executive officer for weapons and head of the Air Force's armament directorate, declined to offer a "black-and-white" definition for fifth-gen weapons, but said in a January interview that "what we're talking about there is making sure that we have effective weapons to support the missions" required.

"It's hard for me to focus on any specific attribute," he said, noting that "since antiquity" weapons have been pursued for "the same basic attributes"—presumably speed, lethality, and surprise—"and how we achieve those different attributes have changed with technology."

"We just have to keep pace with the adversaries and... the changes in the technological environment," he said.

Retired Air Force Col. Mark Gunzinger, director of future concepts and capability assessments at AFA's Mitchell Institute for Aerospace Studies and a former

deputy undersecretary of defense, said the Air Force "has a real problem."

The Air Force fleet is "too small, not survivable enough, doesn't have enough range, and doesn't have enough lethality for the kinds of conflicts it's now being asked to prepare for," Gunzinger said. USAF is struggling to find "the right mix between shorter range fighters, longer-range bombers, [and autonomous] collaborative combat aircraft... what their payload should be, what the ranges should be, what their degree of survivability should be, and how much should be standoff versus penetrating."

The same problem afflicts the weapons portfolio, he said. Today's stockpile of precision-guided munitions "is too small for peer conflict... lacks survivability [and]... is skewed... toward the shorter range," according to Gunzinger. The Air Force has to find "the sweet spot—or balance—between range, warhead size, degree of survivability, speed, and the cost of its [precision guided munitions]."

In a November 2021 paper titled "Affordable Mass," Gunzinger pressed the Air Force to develop "a family of affordable, next-generation, mid-range (50 to 250 nautical miles) air-to-ground PGMs that can be carried in large numbers by its fifth-generation fighters and stealth bombers."

The Air Force is clearly headed in that direction. Based on comments from senior service leaders, think-tankers and industry experts, fifth-generation weapons likely share certain

key characteristics:

■ **Stealthy.** To get past modern defenses, weapons must be either low-observable by nature or employ electronic means to hide until they reach the engagement endgame. They must be resilient against electronic attack and spoofing by cyber techniques.

■ **Faster.** Some fifth-gen weapons will be extremely fast, so that even when detected, they are too hard to intercept before they hit their targets. This is the idea behind hypersonic weapons now in development.

■ **Longer-Ranged.** Striking from much greater distances than current weapons is a crucial capability in order to launch before coming within range of an enemy's weapons.

■ **More Compact.** To remain stealthy, advanced aircraft must carry weapons internally. Miniaturized electronics and novel propulsion methods can make new weapons smaller, increasing the number of weapons each aircraft can carry. Smaller weapons will also be essential as USAF develops collaborative combat aircraft—uncrewed, autonomous "wingmen" likely to be more compact than crewed aircraft and carry a smaller payload.

■ **Modular.** USAF has solicited industry for weapon concepts with "mix-and-match" seekers, warheads, and propulsion units. Modular designs could potentially increase production rates and reduce costs, while increasing manufacturing flexibility. Open architectures should make it easier to create a variety of strike options.



Air Combat Command's Gen. Mark Kelly posted this conceptual image of an F-22 firing the AIM-260 Joint Advanced Tactical Missile on Instagram in 2022, offering the first official glimpse of the new weapon.

■ **Collaborative.** Some fifth-gen weapons will be able to coordinate with each other to strike targets in the most effective sequence; to overwhelm a defender, to mask their objectives, or increase their survivability. The Air Force is experimenting with a number of such “swarm attack” concepts. New weapons will also collect information on the way to the target to feed the whole force’s understanding of the unfolding fight.

■ **Digitally Designed.** Modern, computer-based design and modeling will enable the Air Force to run through thousands of design variations and options to achieve the optimal mix of capabilities and producibility.

BUILDING A MUNITIONS ROADMAP

Air Force Secretary Frank Kendall’s seven Operational Imperatives (OIs) define the capabilities the Air Force needs to present a credible deterrent to adversaries while laying the groundwork for victory if war becomes necessary. The OIs range from sensor/shooter networks to a resilient space architecture, the new B-21 bomber, and a future family of tactical combat aircraft, among others.

But Kendall also identified three capabilities that underlie the seven OIs. Those are airlift, electronic warfare, and munitions, which he calls “crosscutting enablers” because they touch nearly all the Air Force’s missions and can’t be considered in isolation. A team of operators and acquirers have been assigned to each of the three to organize and integrate them with the seven OIs and USAF’s broader plans.

Bartolomei co-leads the Weapons Functional Integration team, the task force organizing the crosscutting munitions effort. It aims to identify operational gaps in munitions and fill them in order of urgency. The resulting plan will inform budgets, starting with the President’s fiscal 2024 request.

While Bartolomei is the team’s co-chair for acquisition, Col.

Christopher Buckley, chief of weapons development and requirements in the Air Force Futures shop, is the co-chair for operations.

The munitions roadmap is intended as a “living document” that will continue to evolve with progress in various programs, available funding, and the evolution of the threat, Bartolomei said.

Bartolomei said breakthroughs in sensors, propulsion, and effects technologies are coming rapidly, and the plan may therefore remain closely held.

“We live in a dynamic environment and things are changing ... more frequently than I think anyone ... is comfortable with,” he said.

The plan’s horizon is focused on the next five years, taking into account capabilities adversaries such as China are known to be developing.

Besides “really integrating and knitting together, very deliberately,” the operations and acquisition efforts, the munitions effort draws heavily on contractors and the science and technology community to inform the Air Force of the art of the possible, Bartolomei said, adding that the objective will be to define “the right capabilities for the mission sets we see emerging ... but also ... in the right quantities.”

In an email response to questions, Timothy P. Grayson, Kendall’s special assistant overseeing the Operational Imperatives and crosscutting teams, said expanding the military’s munitions inventory is crucial.

“Extensive wargaming and analysis demonstrates that limited capability, capacity, and upgradeability of the U.S. munitions inventory presents risks to our forces,” he wrote.

The U.S. needs “an affordable mix” of air-to-air and air-to-ground weapons “that can deliver the capability and capacity needed to maintain a competitive advantage over China—the pacing challenge,” he said.

On The Way: 10 Fifth-Generation Weapons Now in Development

The Air Force is exploring a host of new air-to-air and air-to-ground weapons to fill roles from direct-strike bombs and standoff ground attack missiles to long-range dogfight missiles.

Not all will ultimately enter service, but with modularity a consistent theme, some elements could still join the inventory.

This list was compiled from answers to inquiries, industry day briefings, and budget documents. Other weapons, still classified, are also likely in development.

AIR-TO-AIR MISSILES

■ **AIM-260 Joint Advanced Tactical Missile (JATM).** This radar-guided dogfight missile will be about the same size as the 30-year-old AIM-120 AMRAAM, but with considerably longer range. Built by Lockheed Martin it was first revealed in 2019. Little has been revealed since, but USAF has acknowledged that live tests were conducted in 2020 and 2021. The JATM's enhanced range is greater than China's PL-15—in many ways, an AMRAAM clone, restoring the "first shot, first kill" advantage to U.S. aircraft. The Navy and Army are said to be collaborating with USAF on JATM.

■ **Long-Range Engagement Weapon (LREW).** Another potential AMRAAM successor or JATM complement. Built by Raytheon, the LREW is reportedly a larger missile that can only be carried externally on fighters, and may be intended to shoot down adversary airborne warning systems, tankers, or bombers at great distances.

■ **Modular Advanced Missile (MAM).** Possibly a successor to the AIM-9X short-range dogfight missile, the MAM will have stackable propulsion units and interchangeable seekers. Built by Boeing, the MAM contracts also support other company projects, such as the Compact Air-to-Air Missile (CAAM), Extended-Range Air-to-Air Missile (ERAAM), and Long-Range Air-to-Air Missile (LRAAM). The ERAAM/LRAAM may be a competitor to Raytheon's LREW.

■ **Peregrine.** This Raytheon concept would combine the capability of the AMRAAM with longer range in a package only half the size. Raytheon received Air Force Research Laboratory funding to explore Peregrine in December 2022; previously, it was a self-funded program.

■ **CUDA.** A Lockheed proposal that AFRL began evaluating in 2019 under the Small Advanced Capabilities Missile project, the CUDA would also be half the size of AMRAAM, steered with a unique system of propulsive bursts from around the rocket body.

HYPERSONIC MISSILES

■ **AGM-183A Air-Launched Rapid Response Weapon (ARRW).** The ARRW is USAF's large, quick-and-dirty entrée into hypersonic missiles—those that travel at more than five times the speed of sound. Intended for use against high-value

or mobile targets where speed of attack from standoff range is crucial, ARRW accelerates to hypersonic speed with a rocket, detaches, and then maneuvers as it glides to its target. The Lockheed Martin weapon has accumulated several successful flight tests after a string of failures, but USAF officials are mum on how many it plans to build. Part of Lockheed's contract is to demonstrate it can be produced affordably. A B-52 can carry four ARRWs on its wing pylons. The B-1B and F-15EX may also be equipped with it.

■ **Hypersonic Attack Cruise Missile (HACM).** Raytheon won the HACM competition in September 2022, with an initial operating capability eyed for around 2027. The missile is a ground-attack weapon using an air-breathing, scramjet engine, and will be small enough to be carried on fighter-sized aircraft; the F-15EX has been mentioned as a likely platform. It builds on the Air Force-DARPA Hypersonic Air-breathing Weapon Concept (HAWC).

GROUND-ATTACK WEAPONS

■ **Stand-in Attack Weapon (SiAW).** The Air Force awarded competitive SiAW contracts to L3Harris Technologies, Lockheed Martin, and Northrop Grumman in May 2022. The weapon is intended to be a Suppression/Destruction of Enemy Air Defenses successor to the High-speed Anti-Radiation Missile (HARM) in use since the 1980s. Intended as a pathfinder weapon to clear out defensive radars and surface-to-air weapons, SiAW will add ballistic missile launchers and other time-sensitive targets to its target list. The weapon must fit inside the F-35 weapons bay. Once a contractor is selected, a 2026 operational capability is contemplated.

■ **Stand-off Attack Weapon (SoAW).** The Air Force formally announced its SoAW competition in September 2022 and specified that it's looking for multiple vendors to produce the chosen design, which USAF intends to own. The Air Force didn't disclose its range requirements for SoAW; it may be intended as a lower-cost standoff weapon to fill the niche of the AGM-158 Joint Advanced Surface Standoff Missile—Extended Range (JASSM-ER) and its close kin, the AGM-158C Long Range Anti-Ship Missile (LRASM).

■ **Global Precision Attack Weapon (GPAW).** Likely to be the successor to JDAM—USAF's family of direct-attack, GPS-guided bombs—the GPAW was announced in the fall of 2020. The service wants small, lightweight weapons to strike surface targets as well as hardened or deeply buried targets, yet affordable in large numbers. The weapon is supposed to have advanced sensors and a degree of autonomy. The GPAW is to have an open architecture and be compatible with advanced as well as legacy aircraft, with a "cockpit-selectable warhead effect."

MIX-AND-MATCH

Bartolomei sees "a lot of value" in approaching new weapons development as a menu of modular components—seeker heads, propulsion, and warheads/effects—that can be put together in various combinations to address various kinds of targets. He envisions future weapons "being more open and modular."

Discussions with industry focus on "how we're partitioning the technical subsystem ... how we're thinking about the interfaces" to make modularity a reality, Bartolomei explained. This could also pay off in "our ability to produce" munitions at scale.

Modularity may also allow more "niche" weapons that could address small but crucial target sets, he said. "You could see ... both those properties in our future weapons," he observed.

A modular approach presents an opportunity to increase competition for more weapon elements, which could attract new competitors to the market, expanding the industrial base and potentially increasing capacity to surge production in a crisis.

The war in Ukraine has highlighted such risks, as most of the weapons the U.S. has provided are coming from U.S. war stocks. Replacing them will be a lengthy process, and in some



Giancarlo Casem/USAF

The AGM-183A hypersonic Air-launched Rapid Response Weapon (ARRW), shown here before a flight-test on a B-52 at Edwards Air Force Base, Calif., is a hypersonic missile designed to take on high-value targets from standoff range.

cases could prove nearly impossible if components are long out of production.

More suppliers also guards against “vendor lock,” wherein the service becomes dependent on a single contractor for a given system’s upgrades and consumables.

The Air Force will “transition from proprietary, vendor-locked solutions” to one that applies “digital engineering, open-systems architecture, and agile software development,” Grayson said.

“The U.S. intends to increase its industrial base capacity to fulfill inventory requirements and sustain a conflict with a peer adversary, including sufficient volume of fire over an entire campaign,” he added.

CAPACITY CHALLENGES

In a Pacific war, Gunzinger said, the Air Force could be tasked with striking “tens of thousands of aimpoints.” That means “you have to have weapons at scale that you can afford.”

With unit costs of \$2 million a shot for some standoff weapons, and as much as \$14 million per round for air-launched hypersonic weapons—to say nothing of projected \$40 million to \$50 million per shot for surface-launched hypersonic missiles—relying on such weapons isn’t economically feasible, he said. High-cost missiles might be appropriate for “incredibly high-value, time-sensitive targets” but can’t be a staple of a campaign.

“More speed can be part of the answer,” he said, “but there are other ways of achieving the survivability we need for striking into ... highly contested threat environments.”

Gunzinger estimates the Air Force has enough weapons for only 10 to 14 days of moderate- to high-intensity strikes.

“And of course ... we have to keep some in reserve,” in case another conflict erupts, he noted, adding: “We have to get the inventories up.”

According to his analysis, “the sweet spot is in mid-range weapons,” Gunzinger said. “That’s where you get the most effects” for the lowest cost, he added, “but it also allows you to have an attack density that can maintain pressure on the enemy.” If strikes only come every 48 hours, adversaries can recover because “there’s no stress on their system.” Only continuous strikes keep the pressure on. The munitions inventory must be sized “to impose a cost that will force” a quick conclusion to the conflict.

Grayson said the weapons inventory requires “the right mix” of “affordable standoff and stand-in munitions with sufficient capacity and capability needed to win in a peer conflict.” That mix has to be sustained over time, “so that we do not leave gaps in capability or capacity as we develop new weapons.”

Requests for information, industry days, and other industry involvement in the munitions dialog are “critical to the ... process and [to] ... help validate assumptions, identify the realism of development and fielding timelines, production capacities, and sustainment needs” to help USAF make its weapons decisions, Grayson said.

PRODUCTION AT SCALE

William LaPlante, the Pentagon’s acquisition and sustainment czar, said munitions production needs to be rethought in order to meet projected wartimes needs. Speaking at the Potomac Officers Club in October, he said the Pentagon has accepted “just in time” supply of weapons in the recent past because that was

all that could be justified in an ersatz “peacetime” environment. Weapons have also been a convenient bill-payer when budgets get tight, he said.

Now, however, as potential risks of conflict with China grow, munitions production takes on a new significance, LaPlante said. “Production is deterrence,” he asserted.

The U.S. and its military partners and allies should have multiple factories able to mass-produce arms, LaPlante said. Weapons not only “interoperable, but interchangeable.” The U.S. and its allies can’t afford to depend on factories or vendors that represent potential single points of failure in the supply chain, he added. Weapons having a more modular design could help reduce such risks, he said.

Gunzinger agreed, saying “we need all hands on deck,” with NATO and other partners producing weapons “that can move between battlefields and employed by any member of the alliance or coalition.”

LaPlante also warned against “too much prototyping” and not enough production. Weapons in the lab aren’t a deterrent, he said.

The Pentagon and Congress agree that capacity must expand, but “we’re going to have to pay for it.” That will mean buying weapons the military may not ultimately need. “You have to hedge your bets,” he said.

A SENSE OF URGENCY

Gunzinger worries that a national “sense of urgency” is missing, and that today’s lack of surge production capacity is “scary.”

Past assumptions that “we would have some time to surge production before we engage in combat; [or that] we can take six months to deploy to a fight, and have healthy stocks before we pull the trigger” are no longer valid, he argued.

“The assumptions we used to size our force and inventories ... are gone,” he said. “We’re not going to have time to build up. Wars will start with little notice. They’re not going to be small. We’re going to have attrition like we’ve not seen since World War II.”

Gunzinger said China can see the problem the U.S. faces, and has an incentive to win “through exhaustion.” It’s “almost existential in terms of U.S. military posture across the planet, that there will have to be a significant investment [in munitions], but it can be done smartly.”

His prescription for the Air Force is to “maximize what you can buy today,” in stealthy standoff weapons and mid-range weapons, but get on with the next generation “as fast as possible.”

“The time has come to buy now, he said. “We just have to. Our inventories are too low, we don’t have the right mix, but we have some programs that can help with that in the near term. Don’t put it off to the future.”



Northrop Grumman illustration

L3Harris, Lockheed Martin, and Northrop Grumman are all competing to develop the Stand-in Attack Weapon (SiAW), envisioned by the Air Force for suppressing and destroying enemy air defenses. It would supplant the High-speed Anti-Radiation Missile (HARM) for use against increasingly sophisticated integrated air defenses and must be sized to fit within the bomb bay of an F-35.



Staff Sgt. Noah Cogger

An F-16 Fighting Falcon assigned to the 309th Fighter Squadron, flies over Luke Air Force Base, Ariz., in January. Ukrainian officials continue to press for combat airpower to strengthen their capacity to fight Russian invaders.

Will Ukraine Get F-16s?

Despite pleas for U.S. aircraft, NATO isn't ready to deliver F-16s or equivalent jets—at least not yet.

By Chris Gordon

The extent and types of arms sent to Ukraine from NATO and other nations continues to grow in scale and sophistication, with the latest escalation coming in the form of tanks, Challengers from the UK, M1s from the United States, and Leopards from Germany. Continued aggressive attacks by Russia have kept the flow of military aid from the west rising and the sophistication of the weapons on offer growing.

Yet the one line the United States and its allies have thus far not crossed is delivery of modern combat aircraft, such as U.S. F-16s. U.S. officials worry that fighter jets would be a logistical and training challenge and that providing combat airpower could escalate tensions, complicating attempts to keep the war contained to Ukraine. But Ukrainian officials continue to press for combat air power to strengthen their capacity to fight Russian invaders.

“Until today, the major focus in the discussions have been the tanks,” Yuriy Sak, an adviser to

“The Ukrainians have proven that they can learn complicated, complex, and challenging systems.”

—Pentagon Deputy Press Secretary, Sabrina Singh

Ukraine’s defense minister Oleksii Reznikov, told Air & Space Forces Magazine after Ukraine had finally secured Western tanks. “Now we’ll start talking about jets.”

American-made F-16s top Ukraine’s wish list, though Swedish-made Gripens, designed to operate from spartan airfields with a limited support crew also would be welcomed by Kyiv. Sak said Ukraine’s hope is that Washington will eventually support the transfer of F-16s.

“F-16[s] are best suited for our situations,” Sak said.

Ukraine has asked for Western jets since the start of the war, along with longer-range ground weapons, such as ATACMS surface-to-surface missiles. The Biden administration has tried to thread the needle between strongly supporting Ukrainian independence, on the one hand, and avoiding anything that could be seen as escalatory in order to keep the war from leading to a direct clash between U.S. and Russian forces or spreading to NATO allies. If Russia were to attack a NATO ally, that would bring the entire alliance into the fight.

Deputy Pentagon Press Secretary Sabrina Singh said in a Jan. 26 briefing that F-16s were “another challenging system that would require training,” noting that even if the aircraft were provided, it would take time for Ukraine’s pilots to become proficient enough for combat.

The West has relented on providing some weapons that were initially denied, including the PATRIOT air defense system and M1 tanks. Today, Ukrainian troops are training to operate PATRIOT at Fort Sill, Okla., and the Netherlands and Germany have also pledged to provide PATRIOT systems. Biden’s change of heart over the M1 Abrams tanks was particularly swift, and once it became clear that the only way to get the Germans onboard was to provide M1s, the President recanted and pledged the weapons, effectively shaming the Germans into doing the same.

It’s not yet clear whether Ukraine will get tanks from or new tanks from General Dynamics, but either way, it will take up to a year before the M1s arrive—far too late for the coming spring offensive. “The Ukrainians have proven that they can learn complicated, complex, challenging systems,” Singh said.

AIRPOWER

Plans to bolster Ukraine’s air forces, however, are still unclear, but time could be running out on Ukraine’s ability to fight in the skies.

“Unless Ukraine acquires a replacement fighter force of Western origin in the coming months, it will lose the ability to defend its airspace and support its ground forces, and without control of their airspace they will lose,” warned retired Lt. Gen. David A. Deptula, dean of AFA’s Mitchell Institute for Aerospace Studies. “Some have raised the practical challenges of pilot training, supply, maintenance, etc. The Ukrainian Air Force can overcome these challenges.”

Other airpower analysts said providing Western aircraft and more advanced air-to-air missiles is essential to enabling Ukraine to defend its cities and infrastructure against punish-

ing missile and Shahed drone attacks.

“The Ukrainian Air Force fighter force needs modern Western fighters and missiles to sustainably counter the VKS,” wrote the Royal United Services Institute (RUSI) in a November report, referring to the Russian Aerospace Forces. “Russian pilots have been cautious throughout the war, so even a small number of Western fighters could have a major deterrent effect.”

Justin Bronk, a co-author of that report, said in an interview that the addition of Western fighters would provide Ukraine with a “much better ability” to defend against Russian air threats and cruise missile and drone attacks.

Due to Russia’s air defenses, he said, providing the aircraft to Ukraine “would not be a decisive battlefield swing in terms of their ability to conduct air support.”

The most significant threat to Ukrainian aircraft right now, according to RUSI, are Russian S-400 surface-to-air missile sites deployed in Russian-occupied Crimea and Belarus. These systems have forced Ukrainian pilots to fly low to avoid detection, a strategy that would likely still be necessary if they were flying F-16s. The S-400 poses a threat even to stealthy fifth-generation aircraft.

“I think it’s really crucial to understand the constraints that will be placed by dense and in some cases very long-range Russian ground-based threats,” Bronk said. “They would all have great difficulty operating above very low level within tens of kilometers from the front line. So they would have to stay low. That would greatly constrain their weapons employment and their sensor picture options.”

Still, F-16s would represent a significant upgrade in capability over Ukraine’s existing air forces. The U.S. has already provided Ukraine’s Air Force with AGM-88 HARM air-to-surface anti-radiation missiles that can be used against surface-to-air missile sites, and those would be crucial F-16 weapons as well. Recently, the U.S. has increased Ukraine’s strike capability by providing 4,000 Zuni rocket aircraft rockets, a legacy U.S.



F-16 Fighting Falcons assigned to the 120th Fighter Squadron, Colorado Air National Guard fly together with JAS 39 Gripens from Sweden above the Baltic Sea during Saber Strike 18. American-made F-16s top Ukraine’s wish list, though Swedish-made Gripens, designed to operate from spartan airfields with a limited support crew also would be welcomed by Kyiv.

Staff Sgt. Jordan Kaminski/ANG

weapon that carries a small warhead as well as providing an unspecified number of JDAM precision-guided bombs. But defense officials have repeatedly said that providing aircraft is not a priority for the Biden administration.

NATO members' decisions to provide infantry fighting vehicles, armed personnel carriers, and main battle tanks aims to help Ukraine make a push to regain more ground. The U.S. is also conducting combined arms training in Europe to help Ukraine employ those capabilities by training Ukraine troops in tactics used by Western militaries.

Biden's top U.S. military advisors, including Defense Secretary Lloyd Austin and Chairman of the Joint Chiefs of Staff Gen. Mark A. Milley are experienced ground officers (Austin is a retired Army General and Milley is the Army's former Chief of Staff) and their collective experience is skewed toward land warfare.

"The Defense Department leadership giving advice to President Biden are products of the Army, and it was Army decision-making and leadership that made Operation Enduring Freedom the longest war in U.S. history—and a strategic loss," Deptula said. "They have no comprehension of the effective use of airpower in a concerted conventional campaign."

Regardless, U.S. joint warfighting doctrine depends on airpower as a critical component in war, and Ukraine's plea for Western airpower aid is consistent with that vision, Bronk said. But it's not just a question of the aircraft, he emphasized: Western aircraft must be paired with modern air-to-air missiles, such as the AIM-120 AMRAAM, to be effective.

Sensitivity about technology leaking into Russian hands remains a major concern, however. "There's a big question mark on sensitivity about whether we would even be willing to provide those things," Bronk said.

CHINESE SUPPLY CHAIN

While the U.S. struggles to decide what weapons and systems to provide Ukraine, Russia continues to shop for new

suppliers. With European parts suppliers no longer manufacturing parts and supplies to Russia, China and Iran have both stepped in.

C4ADS, a data-focused nonprofit in Washington, D.C., released findings in early February in which it highlighted three examples of previously undetected trade in defense products between a major Chinese state-owned conglomerate and Russia's state defense sector. The report found:

■ **PRC state-owned conglomerates proliferate to companies supporting Russia's invasion of Ukraine.** C4ADS identified 281 previously unreported shipments of sensitive goods by China Poly Group Corporation (hereafter Poly Group) subsidiaries to Russian defense organizations from 2014 to 2022. For example, a subsidiary called Poly Technologies Inc. exported one shipment containing anti-aircraft missile radar parts to the sanctioned Russian state-owned defense company Almaz Antey.

■ **Lack of transparency.** Chinese trade data is expensive, unreliable, and incomplete, lacking details about both the products in any given shipment and the importing company overseas. C4ADS used third-party nations' reported imports from China to gain greater insight into illicit PRC defense networks.

■ **Complex relationships.** Corporate records indicate that Poly Group consists of more than 2,900 companies operating in more than 100 sectors C4ADS identified unsanctioned companies that trade in the same defense products with the same overseas partners as sanctioned entities inside; C4ADS focused their attention on individual corporate leaders to identify patterns common between known and unknown defense "proliferators."

"If China can send the Russians aircraft parts, why shouldn't the U.S. send Ukraine F-16s?" asked retired Lt. Gen. Bruce Wright, AFA's President. "Keeping Russian jets combat-capable is sustaining Russia in its unjust war. Giving Ukraine F-16s merely gives them the ability to fend off Russian aggression." ★



Airmen assigned to the 77th Expeditionary Fighter Squadron, prepare to load an AIM-120 advanced medium-range air-to-air missile (AMRAAM) on an F-16 in November at Prince Sultan Air Base, Saudi Arabia. For Western airpower aid to Ukraine, it's not just a question of the aircraft. They must be paired with modern air-to-air missiles, such as the AIM-120 AMRAAM, to be effective.

Staff Sgt. Shannon Bowman

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Autonomy, Collaboration, and Experimentation

The Air Force can leverage inexpensive, attritable drones to expand combat capacity in the Pacific and, perhaps, deter China from risking a war.

The jet-powered Gambit, an autonomous collaborative platform developed by General Atomics, is being built for air dominance. Working alongside human-piloted aircraft, Gambit is envisioned as enabling pilots to see deeper into hostile airspace, detect threats first, and provide time and space for critical decisions and actions.

Artist's concept courtesy of General Atomics

By Caitlin Lee

For the commander of U.S. Indo-Pacific Command, Adm. John C. Aquilino, China's military buildup—and its growing coercive military behavior—is a daily worry. The timeline for competition between the U.S. and China to boil over into conflict could be “much closer to us than most think,” he told the Senate Armed Services Committee in March 2021. “We’ve seen aggressive actions earlier than anticipated, whether it be on the Indian border, or whether it be Hong Kong, or whether it be against the Uyghurs ... that’s why I continue to talk about a sense of urgency,” Aquilino said. “We ought to be prepared today.” Gen. Mike A. Minihan, commander of Air Mobility Command, echoed those sentiments in a recent internal memo ordering his mobility forces to prepare for war as soon as 2025.

Airpower plays a central role in Aquilino's plans. He has called for forward-based advanced aircraft that can operate in “contested space” west of the international dateline, closer to China, and “the ability to be expeditionary and move around the theater to places that matter when needed.” Such capabilities can demonstrate resolve, assure allies, and support the kind of posture needed to operate in a major war.

The introduction of Autonomous Collaborative Platforms “actually changes the way we fight.”—

Maj. Gen. R. Scott Jobe, Air Combat Command director of plans, programs, and requirements

But the U.S. Air Force doesn't have enough fighters and bombers to go around, and its bases in the Indo-Pacific are increasingly vulnerable to Chinese air and missile attacks.

The Defense Department's plan to deploy newer and more advanced aircraft to Kadena Air Force Base in Japan is one piece to solve the INDOPACOM posture puzzle. But recent technological advances in autonomy and uninhabited aircraft design offer still other solutions. Assessments conducted by the Air Force, Mitchell Institute, and others suggest a new generation of autonomous drones—called autonomous collaborative platforms or “ACPs”—offer a potentially lower-cost option to provide sufficient airpower to the region, fight through attacks, and distribute U.S. force posture to confound any enemy. As Maj. Gen. R. Scott Jobe, the director of plans, programs, and requirements at Air Combat Command said in December, the introduction of low-cost ACPs into the force structure “actually changes the way we fight.”

ACPs AND FORCE STRUCTURE

Over the past year, the Mitchell Institute worked with Air Force, industry, and DoD experts to examine the cost, capability, and capacity requirements for these drones and the impact they might have on the

ability of forces to continue generating combat power while under attack. The centerpiece of the effort was a three-day workshop in which some 40 Air Force, industry, and Defense Department experts explored how China's force posture, the geography of the Indo-Pacific, the state of advanced technology, and the U.S. budgetary environment—among other factors—might influence the design, manufacturing, posturing, employment, and sustainment of autonomous drones in a U.S. effort to assist Taiwan to repel an invasion from mainland China.

We found that ACPs could play a central role in denial, cost imposition, and resilience—the three cornerstones of the current U.S. deterrence approach, as outlined in the 2022 National Defense Strategy. In other words, ACPs can provide a way for Admiral Aquilino to get that survivable airpower into theater to bolster INDOPACOM's deterrence posture.

During the workshop, we asked experts to identify how ACPs might mitigate current gaps in the U.S. Air Force's ability to conduct three types of penetrating strike missions, which are critical for denying China and Russia the ability to rapidly seize territory. During these missions, advanced bombers launched major strikes against three types of Chinese military targets: a surface action group acting as a blocking force northwest of Taiwan; two mobile ballistic missile launch sites on mainland China; and an H-6 bomber base also on mainland China.

Experts assessed that the ACPs would increase the survivability of advanced bombers, increasing the likelihood that a denial

campaign to blunt and halt Chinese invasion forces could succeed. Experts also concluded that ACPs could enhance U.S. force resiliency—the ability to fight through an attack, survive, and continue generating combat power—and potentially impose costs on the adversary by making it more expensive to shoot down the ACPs than to manufacture replacements.

SUPPORTING DETERRENCE BY DENIAL

Three critical aspects of a denial campaign are finding the enemy, generating combat power, and rapidly reducing the adversary's warfighting capability. These would prove difficult in a race against time to prevent China's air and maritime forces from establishing lodgments on Taiwan. Advanced inhabited fighters and bombers with low-observability and other stealth characteristics would be essential to such a campaign, because they can rapidly bring firepower to bear at scale, and they have a better chance of surviving adversary attacks to complete their mission. But with too few of them, those that are available may be stretched so thin that commanders have no choice but to employ them for “dull, dirty, and dangerous” missions, some of which may sub-optimize the use of sophisticated inhabited aircraft capabilities and aircrews and expose those aircrews to additional risk.

In the workshop, experts could draw on an extensive array of current Air Force weapon systems for their penetrating strike packages, but they often turned to advanced bombers,

Three Autonomous Platform Missions

Experts conceived of three notional ACP types for each penetrating strike mission, focusing each on addressing gaps in penetrating ISR and counterair capabilities and increasing combat mass.

	Maritime Strike			Hunt for Mobile Missile Launchers			Air Base Attack		
	ACP 1	ACP 2	ACP 3	ACP 1	ACP 2	ACP 3	ACP 1	ACP 2	ACP 3
Mission	Defensive Counterair	ISR, Comm Relay	Strike	Escort, SEAD	ISR, SEAD, Offensive Counterair attack	ISR, SEAD, Offensive Counterair attack	Escort	SEAD	Jamming
Quantity in Force Package	40	10	20	10	144 (24 per bomber)	120 (20 UAVs per rocket clamshell)			
Survivability Not low observable (LO); LO; or VLO	VLO (fighter decoy)	LO	Not LO	VLO	VLO	Not LO, small size and flying low altitudes reduce some risk	VLO	VLO	VLO
Sensor (cost: high, moderate, low)	AESA (high)	SAR (moderate)	n/a	AESA (high)	Low-cost SAR	Low-cost long wave infrared	AESA (high)	SAR (high)	n/a
Air-ground	2 x Stand In Attack Weapon (SiAW)	n/a	2 x Long Range Anti-Ship Missile (LRASM)	n/a	Loitering munition	Loitering munition	n/a	6 x SiAW	n/a
Air-to-air	4 x Advanced Medium Range Air to Air Missile (AMRAAM)	n/a	n/a	Joint Advanced Tactical Missile	n/a	n/a	6x AMRAAM	n/a	n/a

Mitchell Institute

drawn by their survivability, range, and payload capacity. A key assumption of the scenario was that space assets had been degraded or denied; experts did have options to employ non-survivable aircraft, but assessed that China’s integrated air defense system would force those aircraft to operate only at standoff ranges, beyond the threat range.

Lacking alternatives, experts tasked bomber crews with long, dangerous intelligence, surveillance, and reconnaissance (ISR) missions, such as hunting for mobile ballistic missile launchers. They worried about exposing their strike packages to air defenses, a problem made more acute by the lack of advanced fighters with the range to provide offensive counterair functions, including escort and suppression of enemy air defenses (SEAD), over the vast distances of the Indo-Pacific. These shortfalls led participants to rate the risk of mission failure as significant to high.

However, when experts introduced their own notional ACP designs to mitigate these shortfalls, they assessed that the risk of mission failure was much lower. As depicted in the table above, experts preferred ACP designs and force packages that distributed mission capabilities across large numbers of ACPs, as opposed to concentrating them on a smaller number of very capable inhabited aircraft. Such an approach increased mission package resiliency to losses, presented the adversary with a more complex air defense challenge, and helped reduce individual ACP costs. Larger numbers of ACPs also meant that mission commanders had more options and could therefore present more dilemmas to adversaries.

From a mission perspective, the experts prioritized the employment of ACPs to fill mission gaps. As a natural result,

counterair was a top priority: six out of the nine ACP types were assigned a counterair role. Experts also focused on incorporating ISR capabilities into their ACPs, particularly for suppressing air defenses and attacking mobile missile launchers—missions that could require extensive loiter time and increased exposure to adversary threats.

Yet in assessing ACP performance, the experts were not just interested in their design attributes; the cost of the ACP was also viewed as a key performance parameter, which had to be addressed upfront, during the aircraft design phase. This thinking upends decades of acquisition culture and processes that prioritize optimizing aircraft capabilities over controlling cost. The radical mindset change was made possible because experts saw the characteristics of low-cost solutions—shorter service life and fewer capabilities, for example—as features, rather than drawbacks of an uninhabited system. In their view, lower costs reduced the barriers to taking operational risks, which in turn created new ways of fighting envisioned by Maj. Gen. Jobe in his remarks.

IMPOSING COSTS

Experts saw the introduction of low-cost ACPs as a means to raise the price of aggression for China, while at the same time holding down the cost to the U.S. Large numbers of ACPs could confuse the adversary, acting as “missile sinks” that might force China to expend precious munitions. The net effect would be increase in bomber survivability because so many low-cost ACPs, rather than bombers, would absorb adversary fires.

Indeed, cost-imposing advantages would accrue, experts argued, even if the cost of the ACP was not less than that of a

Chinese missile or weapon system. Take, for example, China's HQ-9 air defense system, which fires eight missiles. Experts conceived of a notional loitering munition (the mobile missile hunt team's "ACP 2" in the table below), which could be launched in a package of 24 from a bomber to target air defenses or ballistic missile launchers. They estimated each of their ACP 2 loitering munitions would cost about \$1.7 million, well greater than an HQ-9 missile, estimated at about \$1 million. Assuming a 0.9 kill ratio, an HQ-9 battery's eight missiles could destroy almost a third (7.2) of the U.S. bombers' 24 loitering munitions, at a cost of just \$8 million to China and \$12.2 million to the U.S. military.

Yet even though the cost exchange favored China, workshop participants viewed it as a bargain. That's because about 16 loitering munitions would have survived the air defense attack and gone on to destroy the \$120 million HQ-9 launchers. And even if they didn't, the ACPs would have protected the advanced bomber, a far more precious asset. Of course, as the cost of ACPs rise, the Air Force's ability to buy very large numbers of them could decline unless additional funds could be found. But such extra costs might be well worth it. Providing protection to highly capable resources could be even more valuable in a protracted conflict, providing an asymmetric advantage against an increasingly exhausted adversary.

This point becomes particularly important as one looks at the range of estimated flyaway costs for ACP concepts produced in the workshop. Many were not as cheap as the loitering munitions. The counterair ACPs (ACP #1 across all three teams) stand out as costing much more because of their larger size, a requirement to accommodate sensors, and air-to-air payloads. Yet workshop participants still favored these concepts because they saw them as contributing to the survivability of advanced bombers.

Managing Costs and Missions

Workshop experts were asked to imagine Autonomous Collaborative Platforms for three distinct missions. Costs were estimated based on weight, at \$1,000 per pound, plus sensors, payloads, and low-observability features. The results were concepts costing from \$1.7 million for a simple loitering munition to \$60.7 million for large, counterair systems.

Of course, both the U.S. and China would likely continue to adjust tactics and technology to gain an edge in this exchange. But if the U.S. were able to produce ACPs in large numbers (by either capitalizing on their relatively low cost, receiving a significant budget increase, or some combination of the two) quantity might take on a quality all its own. Gen. Charles Q. Brown, the Air Force Chief of Staff, has said that a war between the U.S. and China could see levels of combat attrition more akin to World War II than recent conflicts. Given two adversaries with rough technological parity, minimizing attrition of aircrews and aircraft could become a critical offsetting advantage—particularly in a protracted conflict. This is when operational resiliency—the ability to sustain and generate combat power while under persistent and dynamic attack—becomes key. Mass, of course, is a key aspect of resiliency. But so is the ability to disperse—a fundamental tenet of the Air Force's Agile Combat Employment concept, which seeks to rapidly disperse forces from main operating bases to confuse adversary targeting.

IMPROVING OPERATIONAL RESILIENCY

From a posture perspective, workshop participants recognized the vulnerability of air bases in the Indo-Pacific to potential air and missile attacks from China. Yet they also were reluctant to base ACPs outside the theater—in fact, none of them did—because doing so increased the cost of the ACPs by requiring greater range and fuel requirements, which in turn would increase the size and weight of the ACP. Because aircraft costs are calculated by the pound, more weight means more cost. Further, basing ACPs far from the area of operations would also significantly increase aircraft turn time, reducing the mass available in theater at any given time.

	Maritime Strike			Hunt for Mobile Missile Launchers			Air Base Attack		
	ACP 1	ACP 2	ACP 3	ACP 1	ACP 2	ACP 3	ACP 1	ACP 2	ACP 3
ACP Role	Counterair	ISR	Strike	Counterair	Counterair, ISR	Counterair, ISR	Counterair	Counterair	Electronic Attack
ACP Missions	DCA	ISR, Comms	Strike	Bomber Escort, SEAD	ISR, SEAD, Offensive Counterair Attack	ISR, SEAD, Offensive Counterair Attack	Escort	SEAD	Jammer
ACP Empty Weight (lb.)	35,000	1,500	16,200	35,000	1,000	Small UAV: 50 lb. each	10,000	15,000	3,000
Fuel Load (lb.)	30,769	1,500	12,088	9,231	1,269	Battery powered)	3,500	7,000	3,500
Total Payload Weight (lb.)	7,000	400	5,400	7,000	500	<ul style="list-style-type: none"> Rocket-launched clam shell: 1,200 lbs. Each clamshell dispenses 20 UAVs Each UAV: 50 lb. plus 5 lb. warhead 	3,000	5,000	500
Gross Weight (lb.)	72,769	3,400	33,688	51,231	2,769	UAVs: 50 lb. each	16,500	27,000	7,000
Flyaway Cost (Millions)	\$60.7	\$4.2	\$16.4	\$60.7	\$1.7	\$11.0	\$28.2	\$29	\$8.9
Quantity in Team Force Packages	40	10	20	10	144 (24 per bomber)	120 (20 UAV per rocket clamshell)	16	8	8

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Making Choices, Reducing Risk

In contested environments, experts preferred to operate ACPs from short non-military runways and roads, or air launch them if possible. The intent was to reduce the risk of enemy large-scale air and missile attacks that would suppress ACP sortie generation operations.

	Maritime Strike			Transporter-Erector-Launcher Hunt			Air Base Attack		
	ACP 1	ACP 2	ACP 3	ACP 1	ACP 2	ACP 3	ACP 1	ACP 2	ACP 3
ACP Role	Counterair	ISR	Strike	Counterair	Counterair, ISR	Counterair, ISR	Counterair	Counterair	Electronic Warfare
ACP Missions	Defensive Counterair	ISR, Communications Relay	Strike	Escort, SEAD	ISR, SEAD, Offensive Counterair attack (MALD-class weapons)	ISR, SEAD, Offensive Counterair attack (swarm attack concept)	Escort	SEAD	Jamming
Quantity of ACPs for Mission Packages	40	10	20	10	144 (24 per bomber)	120 (20 per bomber)	8	16 initially, increased to 32	8
Range	2,000 nm	1,000 nm	1,000 nm	3,000 nm	600 nm	Small UAS: 1 hour search across 20 nm radius Rocket: 1,000 nm	3,000 nm	3,000 nm	3,000 nm
Take-off and Landing	Runway < 5,000 ft	Road, runway < 5,000 ft	Runway < 5,000 ft	Road, runway < 5,000 ft	Air launched from stealth bomber	Air launched by rocket from stand-off B-52	Runway < 5,000 ft	Runway < 5,000 ft	Runway < 5,000 ft

Mitchell Institute

Thus, rather than opting for long-range ACPs, the experts based short-range ACPs closer to China, but with a twist: as depicted in the table above, they favored air launches, shorter civilian runways, and even dirt roads over conventional runways. These choices lend themselves to a more survivable, distributed force posture, consistent with the Air Force's vision for ACE.

Experts acknowledged that moving off runways would, of course, present many challenges to operations, logistics, and sustainment. Launching large numbers of uninhabited systems from nontraditional areas would impose its own workforce requirements for security, maintenance, and operations. Experts worried that insufficient attention was being paid to these areas, and emphasized the need to rapidly field ACP prototypes to combat units so that some of these issues could be worked out. As such, the central recommendation emerging from our Mitchell Institute study is that the Air Force should develop a full-scale campaign of "operational experimentation" for its ACP efforts. The goal of this campaign would be 1) bolster deterrence and assure allies by deploying ACPs to combat units in the Indo-Pacific and Europe as fast as possible, and 2) asking combat units to continue experimenting with the ACP technology to better define use cases, tactics, and technology improvements required to meet operational demands.

A CAMPAIGN OF OPERATIONAL EXPERIMENTATION

Our work at Mitchell Institute suggests that ACPs could offer an innovative, affordable means for the Air Force to contribute to support key tenets of U.S. deterrence: denial, resilience, and cost imposition. Large numbers of low-cost ACPs could not mitigate, but also could confound China's A2/AD strategy—provided they can be fielded quickly.

To deliver this kind of leverage, however, the Air Force must move fast. It must build on the momentum generated by Air Force Secretary Frank Kendall when he announced that building next-generation drones would be one of his top priorities. In the Mitchell workshop, experts repeatedly warned that many

of the technologies they most prized in their ACPs—such as "swarm-like" collaborative autonomy—were not yet ready for "prime time." At the same time, they worried that without new drone technologies, their strike packages would come up short against China.

One way to thread this needle is to pursue a broader campaign of "operational experimentation," as Brig. Gen. Dale R. White, the Air Force leader responsible for development, procurement, and fielding of next-generation drones, explained at a December Mitchell Institute event. Operational experimentation involves integrating new technologies into combat units with the expectation that the technology can and will be updated to meet operator needs, changes in the threat environment, and new technology breakthroughs.

An Air Force campaign of operational experimentation could involve three crucial steps.

■ **Proliferate Operational Experimentation Units.** The Air Force's new Task Force 99, based at Al Udeid Air Base, Qatar, is currently experimenting with UAVs, autonomy, and other technologies in the Middle East. Replicating Task Force 99 in both the Indo-Pacific and in Europe, the other centers of gravity for U.S. military planning, could provide opportunities to rapidly demonstrate new U.S. capabilities to allies and adversaries, alike. If fully staffed with pilots, data scientists, coders, intel operators, and acquisition specialists, these task forces could fuel rapid ACP software and hardware changes, testing and reviewing the results, and iterating improvements. The payoff would be the proliferation of state-of-the-art ACPs into other combat squadrons. By using these task forces as testbeds for thinking about how to organize, train, and equip combat units, they can lead the way in developing new tactics, techniques, and procedures that can be rolled out to the wider force.

■ **Prioritize Modularity.** ACPs will need to accommodate constant software upgrades, evolving AI technology, and other mission system changes. Workshop participants saw ACPs enhancing combat effectiveness only when the ACP

could operate with a high degree of independence from human control. Without sufficient autonomy, experts worried it would be difficult for the Air Force to scale its ACP fleet without over-tasking aircrews and slowing down the decision cycle. Even though such sophisticated autonomy may not be available today, the modularity it requires must be built in from the beginning to accommodate it when it does arrive. From a cost perspective, workshop participants noted that modularity and “open architecture” designs would allow the Air Force to maintain the same air vehicles while changing out the software to accommodate different mission sets. This would be important, since the Air Force sees ACPs contributing to a variety of mission areas, including air dominance, reconnaissance, strike, mobility, and training.

■ **Build Coalitions.** The third aspect of an operational experimentation campaign involves building an effective coalition. Experts at the Mitchell workshop widely agreed that the Air Force has come far in the past year in articulating the use cases for ACPs and communicating with industry and Congress. But as Air Force leadership seeks significant resources for ACPs in the President’s 2024 budget request, it must articulate the case to all the relevant stakeholders in order to gain buy-in. The Air Force should develop an ACP flight plan that links the technology to the deterrence approaches outlined in the National Defense Strategy and lays out both aggressive timelines and the need for agility, so that programs can shift as changes in technology and the threat environment evolve. The Air Force could also consider hosting unclassified wargames with lawmakers, staffs, and industry, to allow stakeholders to see what ACPs can bring to the fight.

The Air Force must also regularly engage with industry, especially at the unclassified level, to align incentive structures for ACP production. The U.S. military’s traditional acquisi-

tion model—in which companies make the majority of their profits on aircraft sustainment—will not work for low-cost ACPs designed to be attritable or even expendable. The Air Force must work closely and openly with industry to figure out how to align these incentives and maximize low-cost ACP production.

OPENING THE OVERTON WINDOW

In the 1990s, political scientist John Overton described how the range of acceptable policy preferences shifts over time through a concept called the Overton Window. Policies that were once unimaginable—in this case, the idea that combat units might operate AI-enabled drones alongside inhabited aircraft—can eventually become more mainstream as the window expands. During the Mitchell Institute workshop, we saw how advances in technology, combined with concerns about the changing threat environment, are helping to create the case for expanding the window to include the deployment of ACPs. At the same time, a new wave of Air Force autonomy experts are writing books, leading experimentation, and pushing for competitive, open and flexible acquisition strategies—all steps that advance the case for the role of uninhabited aircraft and autonomy in deterrence and warfighting.

Solving Admiral Aquilino’s problem—a lack of aerospace capability and capacity in the Indo-Pacific theater—will require quickly turning ACP concepts into combat-capable reality. INDOPACOM, Congress, and DOD should all be paying close attention to the Air Force’s ACP plans in the President 2024 budget request. While there is no “silver bullet” solution to deter China from aggression, rapid fielding and continuous experimentation with ACPs offers an important contribution. The Air Force is ready to throw open the Overton Window; now everyone else needs to get onboard. ★



Courtesy photo

A U.S. Air Force F-22 Raptor and F-35A Lightning II fly in formation with the Kratos XQ-58A Valkyrie low-cost unmanned aerial vehicle over the U.S. Army Yuma Proving Ground’s Arizona testing range. This integrated test follows a series of gatewayONE ground tests that began during the inaugural Department of the Air Force on-ramp last year in December.



Then-Brig. Gen. William Mitchell in the cockpit of an aircraft at Selfridge Field, Mich., in 1922.

Honorary Promotions

Four Air Corps and Air Force Leaders and the Shadows that Remain.

By Dwight S. Mears

Honorary promotions have existed in different forms throughout U.S. military history. In the 20th and early 21st centuries, honorary promotions for officers were normally authorized via legislation. However, not all such honorary promotions were accomplished this way—and perhaps not all were lawful as a result. The cases of William “Billy” Mitchell, Claire Chennault, James Doolittle, and Ira Eaker illustrate the process by which these promotions became standardized, the questionable motives and methods behind some of them, and the widespread failure of the Air Force bureaucracy to verify associated historical claims. Incorrect historical claims about honorary promotions raise questions about the official record and cast shadows over these air power heroes. These claims should be corrected to enhance public trust and counter misinformation.

“Tombstone promotions” first appeared at the turn of the 20th century and were not strictly honorary at their inception. Rather, these end-of-career promotions allowed officers to retire with the rank and pay of the next higher grade than the highest one they held on Active duty. Since beneficiaries either never held the rank

The original motive was to “provide an incentive for voluntary retirement”... to reduce a backlog of officers in a given grade.

—Illinois Rep. George Foss, member of U.S. House of Representatives (1915-1919)

in Active service, or held it only briefly, the higher rank often only appeared on their tombstone or retirement records—hence the term “tombstone promotion.” According to Rep. George Foss, the original motive was to “provide an incentive for voluntary retirement,” in order to reduce a backlog of officers in a given grade.

The Navy was authorized tombstone promotions by law in 1889. In contrast, the Army had no such authority, and simply retired many officers as generals with only nominal service in a given grade. In 1900, Rep. Thomas Jett observed that several recently retired brigadier generals had served in that grade for only one day. While the number of generals in Active service was capped, there was no such restriction in retirement, and at the time, no time-in-service requirement to retire at a grade. In 1904, Congress passed legislation permitting tombstone promotions for certain Army veterans of the Civil War.

In the 1930s, several statutes authorizing tombstone promotions for veterans of World War I made the advancements strictly honorary, prohibiting higher pay or benefits. Blanket tombstone promotion authorizations continued through the 1950s, but in later years evolved to apply only to select retirement specialties, such as service academy department heads, senior

military acquisition advisers, and assistant judge advocates general of the Navy.

For other deserving retirees, Congress started authorizing personal honorary promotions via joint resolution. Since these honorary promotions normally targeted individuals rather than entire ranks, this also meant that the motive had shifted to recognize individual service or achievement. In 2000, Congress established a process through which a member of Congress could request review of a proposed honorary promotion by a military secretary. If favorable, Congress would then authorize the promotion with a provision in that year's National Defense Authorization Act. When the Office of the Secretary of Defense objected to the reporting requirement as "overly burdensome," lawmakers in 2021 delegated authority to the department for honorary promotions up to major general. Honorary promotions to three- or four-star rank still require Congress' consent.

WILLIAM L. MITCHELL

Col. William "Billy" Mitchell is an outsized figure among air power theorists, simultaneously "the most prominent American to advocate a vision of strategic air power" and "the single most ... controversial figure in the history of American air power," according to Air Force historian Roger Miller. In 1925, Mitchell was



Brig. Gen. Billy Mitchell, facing front in uniform, with another man, at bomb under wing of an airplane at Langley Field in Virginia, March 7, 1925.

convicted by court-martial for charging that aviation accidents were "the result of the incompetency, the criminal negligence, and the most treasonable negligence of our national defense by the Navy and War Departments." He was sentenced to five years suspension and half pay, but resigned rather than accept the punishment.

Mitchell had already held the temporary rank of brigadier general as Assistant Chief of the Air Service, but reverted to his permanent rank of colonel in 1925 after that appointment concluded. To the public, it appeared he had been demoted. In 1930, Congress authorized some former WWI officers to be

advanced to the highest temporary rank they held during the war—a blanket tombstone promotion. This act did not promote Mitchell, as it required he be "retired according to law," and Mitchell resigned, rather than retire. Instead, it permitted him to use the title of his highest wartime rank, enabling Mitchell to call himself a brigadier general even though he was a former colonel on official records.

Efforts to restore Mitchell's rank or retirement began after his death in 1936, when Congress considered restoring him to the Army's retired list. The proposal failed, however, when lawmakers could not square Mitchell's strategic vision with his insubordination. This same problem repeatedly scuttled proposed legislation in the years that followed.

Perhaps the strongest push to restore Mitchell's rank came in the 1940s. Two bills sought to make Mitchell whole; they specified that "his rank in War Department records should appear as that of brigadier general," or that "William Mitchell was a brigadier general ... at the time of his death." Another bill added that "no pay, allowances, or other financial benefit" would flow from the promotion. None of the measures became law.

Efforts to promote Mitchell continued in vain into the late 1950s, when the director of the Air Force Records Center added a document to Mitchell's personnel file claiming that "on 18 July 1947, a special bill was passed by Congress promoting General Mitchell to the rank of major general." In fact, however, the bill only passed in the Senate on July 16, 1947; it never gained the consent of the House.

Mitchell's promotion to major general was finally authorized in 2004, when Rep. Perkins Bass (R-N.H.), a relative of Mitchell's, successfully inserted a provision into the FY05 defense bill. However, the promotion reportedly did not occur; congressional authorization merely permitted the action and could not require it be carried out. Air Force Lt. Col. William Ott reflected in the *Air & Space Power Journal* that the promotion would be "a pyrrhic victory," since it would not "erase the questionable actions that proceeded from [Mitchell's] passionate advocacy of air power's independence."

There is no dispute that Mitchell was never posthumously promoted. However, at this writing, the mistaken promotion claim still appears on the official Air Force website for Medal of Honor recipients. The website incorrectly claims that in 1947, "a special bill of Congress promoted him to major general." Indeed, the claim that Mitchell is a Medal of Honor recipient is also untrue. Congress recognized Mitchell with a Congressional Gold Medal in 1946, not a Medal of Honor. The bill's sponsor did not understand the difference, leading to the measure's original language that would have authorized a Medal of Honor. The House Committee on Military Affairs discovered the error and amended the bill to remove all substantive references to the Medal of Honor, and clarified that "the legislation under consideration does not authorize an award of the Congressional Medal of Honor." Nevertheless, the title of the bill—Authorizing the President of the United States to award posthumously in the name of Congress a Medal of Honor to William Mitchell—was never corrected, which understandably misled many readers.

The Air Force presumably advanced mistaken claims about Mitchell in good faith, but with many historical and legislative resources at their disposal, it is difficult to explain why these errors remain uncorrected.

CLAIRE L. CHENNAULT

The first Air Force general to be advanced in retirement was Maj. Gen. Claire Lee Chennault, who famously trained the Chinese Air Force during the Sino-Japanese War, and then

USAF via Library of Congress





Maj. Gen. Claire Chennault, Commander, 1st American Volunteer Group (AVG), the Flying Tigers, is shown posing at the Air Base in Kunming, China.

commanded the Flying Tigers in China during World War II. Chennault retired in 1945, but received a retirement promotion to lieutenant general authorized by legislation in 1958. The fact that Chennault received this tribute despite a rocky relationship with his Air Corps colleagues can perhaps be attributed to his association with the influential anti-communist “China Lobby” of that period. Chennault was also immortalized in popular media—Air Force historian Col. Phillip Meilinger called him “one of America’s more famous Airmen.”

Chennault’s promotion was discernible from Mitchell’s in that it was not posthumous. After Chennault was hospitalized with terminal lung cancer, Congress passed the promotion bill “without objection or debate,” and officials “sped it to the White House” for immediate signature only hours later. Chennault’s promotion was far-less controversial than Mitchell’s, which undoubtedly helped to forge a legislative consensus. According to *The New York Times*, the promotion represented “a heartfelt vote of respect to the man.”

Chennault’s legislation specified, “no increase in retired pay or benefits shall accrue as a result of the enactment of the Act.” The House Committee on Armed Services specified that there should be “no cost to the government involved in the proposed legislation.” According to the committee, “the fact that no funds are involved” obviated the need for reports on the bill, and thus expedited its passage.

Finally, unlike Mitchell’s promotion, Chennault’s was actually carried out. This made it perhaps the first individual promotion of a retired officer that was strictly honorary, long before the process of honorary promotion was codified in law.

JAMES H. DOOLITTLE AND IRA C. EAKER

Starting in the early 1980s, various individuals began to petition President Ronald Reagan to advance retired Lt. Gen. James H. “Jimmy” Doolittle to the grade of four-star general. The effort was a successful and eventually was packaged with another retirement promotion for Lt. Gen. Ira C. Eaker. By this time, the pathway for authorizing honorary promotions had atrophied, which perhaps influenced the administration’s choices.

In April 1981, actor and retired Air Force Reserve Brig. Gen. “Jimmy” Stewart wrote to his friend President Reagan as part of a lobbying campaign to promote Doolittle to four-star general. Doolittle had many impressive qualifications, which led one Air Force historian to call him “the United State Air Force’s true Renaissance man.” His leadership of the so-called “Doolittle Raiders,” who bombed Tokyo in the spring of 1942, earned him the Medal of Honor. He later commanded the 4th Bombardment Wing, the Northwest African Strategic Air Forces, the 15th Air Force, and the 8th Air Force. Doolittle attempted to retire in 1946, but was convinced to revert to inactive Reserve status. Not until 1959 was his retirement finally accepted.

The promotion request was referred to the Air Force, but the service’s reaction was tepid. Air Force Secretary Verne Orr reflected that Doolittle had already received the Medal of Honor and that he did not necessarily deserve promotion compared to contemporaries like Lt. Gen. Eaker, whom Orr noted “had greater responsibilities.”

Special Assistant to the Secretary of Defense John Rixse researched the proposed promotion and discovered the prior honorary promotion of General Chennault in 1958, which he considered “one precedent for this type of initiative.” But the department ultimately opposed the move. President Reagan informed Stewart that promoting Doolittle “might create disappointment and resentment that would outweigh the pleasure and favorable publicity of selecting one national hero for unusual promotion.”

Around the same time, however, Sen. Barry M. Goldwater also lobbied the President for Doolittle’s promotion, writing that “no one man living in America has done more for the science of flying.” Obviously aware of the administration’s position, he argued that “Jimmy Doolittle should take precedence” over other retired generals. Goldwater’s involvement was significant, because as a prominent senator he had an outsized influence on any legislative authorization. Goldwater was also a retired Air Force Reserve major general himself.

The repeated interest in Doolittle’s promotion drew another



U.S. Army Air Corps Lt. Col. James Doolittle poses with his Tokyo Raiders for a group photo on the U.S. Navy aircraft carrier USS Hornet at an undisclosed location in the Pacific.

rebuttal from Orr, who wrote to the White House expressing that “in the past, all of the military services have guarded against using flag or general officer promotions as a reward for performance.” Evidently, Orr was unaware of Chennault’s promotion, because he added, “we have not made any posthumous or honorary general officer promotions in any of the services.”

A frustrated Goldwater wrote to Air Force Chief of Staff Gen. Charles A. Gabriel in 1984, asking about potential blowback from the Doolittle promotion. Specifically, Goldwater wanted to know if the service could “come up with some way of regulation that can be made solid and permanent, placing an absolute limit on two-stars as the ultimate rank of a Reservist or a National Guardsman?” Goldwater was worried that the four-star promotion—unprecedented for a reservist like Doolittle—would potentially “open the lid” for other reservists to also seek promotion.

Lt. Gen. Duane H. Cassidy, the Air Force deputy chief of staff for manpower and personnel, reviewing the legality of the proposed promotion, wrote that the law “places a de facto cap on non-Active duty officers at two-stars.” Further, Cassidy noted that legislation made retired officers ineligible for promotion to general officer ranks, since it required that “officers be serving on Active duty.” Thus, promoting retirees would require either “a change in the law” or a congressional waiver, based on the precedent of promoting Chennault in 1958.

By this time the proposal to promote Doolittle also had grown to include Eaker who had many accomplishments during World War II, including commanding the 8th Bomber Command, the 8th Air Force, the Mediterranean Allied Air Forces, and serving as the deputy commander, Army Air Forces and Chief of the Air Staff. He had likely been denied a fourth star because of his transfer out of the European Theater during World War II, which was perceived as a rebuke from the U.S. Army Air Forces Commanding Gen. Henry H. “Hap” Arnold. Ironically, Doolittle was Eaker’s replacement—Doolittle recorded that he was “pleased” that he had proven himself to the leadership, but also “sensitive about Ira’s feelings.”

Gabriel wrote to Goldwater expressing that he had convinced the Secretary of the Air Force to endorse the promotions, and that he agreed with Cassidy’s conclusion that “special legislation will be required to get Ira and Jimmy their fourth stars,” since the law “states specifically that officers must be on Active duty to be eligible for three- and four-star promotions.” He referenced the Chennault promotion, remarking, “I’m convinced that’s the right way to go.” Gabriel even had his chief of legislative liaison draw up a draft bill.

In October 1984, Goldwater informed Gabriel that the proposed legislation was doomed in that session, speculating that “at this late date, someone would for whatever reasons, object to it.” The resolution was thus delayed until January 1985, and reintroduced stating that “advancement . . . shall not increase or change the compensation or benefits from the United States.” Goldwater sent the draft to the Secretary of Defense for comment, even though it was authored by the Air Force.

The resolution passed the Senate on Feb. 21. However, Air Force officials recorded that it “[met] resistance in the House,” which led them to search for other options. Lt. Col. Andrew Pelak in the office of the deputy chief of staff for manpower and personnel claimed that both the Defense and Air Force General



Chief of staff of the Air Force Gen. Charles Gabriel, left, pins a fourth star on retired Gen. Ira Eaker, an aviation pioneer, during a ceremony at the Pentagon.

G. Dennis Plummer/DOD, via National Archives

Counsel’s Offices believed Doolittle and Eaker could be promoted under “the appointment power of the President contained in Article II, Section 2, Clause 2 of the U.S. Constitution” (known as the Appointments Clause), although there were no legal opinions attached to evidence this claim. An added bonus, he believed, was that this would authorize “increases in retired pay.”

Pelak’s suggestion quickly ascended into orbit, presumably because it was back-channelled to Goldwater without significant staffing. Goldwater told friends he brought the proposal directly to President Reagan, telling him that “even though the Reserve rules prevent the additional third or fourth star,” he could ignore the statute and “promote anybody he wanted.” According to Goldwater, the nominations dropped and were confirmed by the Senate the very next day.

The strategy of seeking Senate confirmation was clearly uncoordinated, for it was not communicated to the Senate Committee on Armed Services. Weeks later, the committee incorporated Goldwater’s promotion resolution into a draft of the fiscal 1986 authorization bill, expressing that “there have been a number of cases in the past 20 years in which similar authority has been enacted into law.” However, the provision had already been preempted by its own sponsor and was removed from later drafts.

On April 26, Eaker was promoted at the Pentagon by Chief of Staff Gen. Charles Gabriel. In prepared remarks, Eaker thanked “the members of Congress” among other Air Force officials, suggesting that he misunderstood who was responsible. His biography, written by a former member of his staff in cooperation with the Air Force Historical Foundation, also incorrectly recorded that Congress “passed special legislation” authorizing the promotion.

Doolittle was promoted by Reagan and Goldwater at the White House on June 13. Reagan thanked Goldwater “for his part in making this ceremony possible today.” An earlier draft of the speech also thanked Rep. Ike Skelton (D-Mo.), who along with Goldwater was credited in the speech’s border as being an “[initiator] of legislation.” Skelton’s name was removed after speechwriters ordered a legislative trace, which uncovered that the House had no involvement. The Los Angeles Times credited Goldwater at the time as the “sponsor of the legislation promoting the 89-year-old Doolittle,” suggesting that the administration left this authority opaque.

The authority behind the promotions was also distorted in

President Ronald Reagan, left, and Sen. Barry Goldwater (R-Ariz.), right, present the honorary four-star rank to Gen. James Doolittle during a ceremony at the White House, Washington, D.C., June 13, 1985.



White House via National Archives

multiple releases. An Air Force public affairs spokesman, quoted in the Washington Post, reportedly said this was “the first time [such promotions have] ever happened.” The Air Force biography of Eaker claims that “Congress passed special legislation awarding four-star status to General Eaker, prompted by Sen. Barry Goldwater.” Doolittle’s Air Force biography claims that “the U.S. Congress advanced him to full general on the Air Force retired list.” As the record clearly shows, Congress did not pass any legislation, and the full Congress was intentionally bypassed.

As Chairman of the Senate Committee on Armed Services, Goldwater certainly knew the promotions raised separation of powers issues, but it appears that any such concerns were subordinate to his own interest in Doolittle’s recognition. Goldwater originally informed Doolittle that “all we need to do is get the [promotion] bill through the House,” but then told him, “I went to the President . . . because of some complication that arose with my bill in the House.” He later explained that Senate confirmation was “a way around these scoundrels [in the House]” who wanted to “trade these promotions” for his vote on their “boondoggling projects.”

By way of authorization, Doolittle and Eaker’s promotion orders listed only the Constitution and Senate confirmation. While the attorney general had previously ruled that the President could appoint officers in violation of statutory provisions “in exceptional cases,” he also ruled that “Congress may point out the general class of individuals from which an appointment may be made, and may impose other reasonable restrictions.” In this case, the primary statutory restriction was to be presently serving in the military, and thus capable of actually occupying the office in question. This seems like a reasonable restriction that would not encroach on the President’s constitutional appointment authority. The Air Force leadership apparently reached the same conclusion, since they believed statutory provisions barred promotions of this type.

The promotions’ authority became even murkier in November 1986, when the Comptroller General reviewed them. He ruled that “when retired service members are advanced in grade on the retirement lists, their retired pay may not be recalculated . . . in the absence of statutory authority.” He noted that “there does not appear to be an Act of Congress authorizing a recalculation of the officers’ retired pay,” and “we are unaware of any provision of statute which would provide for a recomputation of their retired

pay predicted on the action that was taken to advance them on the retired list.” While this ruling concerned only pay implications, it plainly contradicted the claims of Pelak, who argued Doolittle and Eaker would receive higher pay in retirement.

While the process for honorary promotions of retired members was not yet codified in 1985, a precedent already existed for legislative authorization, and there were many such promotions authorized later which passed both chambers of Congress. No case law exists on this precise issue, for a claimant must be denied promotion to have the standing and motive to litigate.

CONCLUSION

These case studies offer a window through the evolution of honorary promotions into present-day statutory provisions, as well as the questionable methods behind some promotion efforts. Some were driven by personal motives, which at times were likely conflicts of interest. Congress recently delegated the authority for honorary promotions up through major general, meaning that many defective honorary promotions of the past could be easily remedied without legislation. Unfortunately, this remedy would not apply to Doolittle and Eaker because of their ranks. As a result, reauthorizing those promotions would require Congress to waive public law, much like the aim of Goldwater’s unsuccessful resolution in 1985. Mitchell is another matter, as his advancement remains bound-up in his own impropriety. While that promotion has already been authorized by Congress, the effort appears to have been abandoned.

Air Force officials have not helped matters by building on false claims, such as Mitchell’s non-existent promotion to major general and false award of the Medal of Honor. Official biographies incorrectly state that Gens. Doolittle and Eaker were promoted under legislative authorization, when that is clearly not the case. With public trust in the federal government at record lows, the Air Force should correct the record, rather than contribute to misinformation. ★

Dwight S. Mears, JD, is a reference librarian with a background in history and law. A former Army officer and history professor, he focuses on strategy, policy, aviation, and military intelligence. This article was adapted from a version appearing in Air & Space Operations Review: Vol. 1, No. 4, Winter 2022.

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AFA Texoma's Tribute to Staff Sgt. John Rucker, the Last Enlisted Airman Killed in Vietnam



An American flag next to the grave marker of Staff Sgt. John Rucker, of Linden, Texas, who was among the last Americans killed Jan. 27, 1973, in a rocket attack at Da Nang Air Base, Vietnam, about 11 hours before the cease-fire agreement was to take effect.

The AFA Texoma Region organized a gathering in Linden, Tex., on Feb. 4 to commemorate the 50th anniversary of the Vietnam War's end. Hundreds, mostly Vietnam-era veterans and their families, traveled to Linden for the ceremony which honored their service during the war while specially memorializing one local Airman who made the ultimate sacrifice 50 years ago.



Colin Kimball

A painting of Staff Sgt. John Rucker.

Linden is the hometown of the last enlisted American service member killed in action during the war, Staff Sgt. John O'Neal Rucker. Rucker was an aircraft crew chief assigned to the 18th Special Operations Squadron at Nakhon Phanom Royal Thai Air Force Base and Da Nang Air Base, Vietnam. On Jan. 27, 1973—just 11 hours before the cease-fire went into effect—Rucker was off-duty and asleep on his cot when his barrack was struck by a rocket. He was 21 years old.

Fifty years later, his family and fellow service members still mourn his loss. The gathering in his hometown began with a wreath-laying ceremony at Rucker's grave in Linden before moving to the Cass County courthouse in downtown Linden, where the AFA Texoma Region unveiled a painting of Rucker that now hangs in the courthouse's hall. The assembly then listened to speakers and presentations in



Family and relatives of Staff Sgt. John Rucker pose with his portrait at the unveiling ceremony taking place at the Linden courthouse. (L to r) Roger Manning, brother-in-law; Margie Manning, sister; Marsha Bradford, sister; Travis Bradford, brother-in-law; Rose Dulaney, cousin; Mae Rucker, mother; Vicki O'Neal, niece; Patti Rucker, niece; Tia McConnell, daughter; Dr. Vance Cortez Rucker, cousin; and Sandy Cortez Rucker, cousin-in-law.



Family members of Staff Sgt. John Rucker hug during the wreath ceremony at a cemetery in Linden, Texas.

Photos by Senior Master Sgt. Patrick Nugent (Ret.)



A member from the AC-119 Gunship Association places an organization challenge coin at Staff Sergeant Rucker's grave.



CMSgt. Paul Weseloh (Ret.), AFA Texoma Region, salutes after presenting a wreath at the grave of Staff Sgt. John Rucker.

memory of Rucker, his family, and all who served in Vietnam. In addition to several members of the Rucker family, several key delegates from AFA National attended the event, including Chairman of the Board Bernie Skoch, retired CMSAF #14 and former AFA Chairman Gerald Murray, National Chaplain Maj. Gen. Steven Schaik (Ret.), and more. AFA Texoma Region also welcomed elected county officials, members of the AC-119 Gunship Association, and Civil Air Patrol Cadets from local area units.

"Our nation owes a debt to Staff Sgt. Rucker and to his family, as well as to every Vietnam veteran. It is gratifying to see a community come together in such a dignified ceremony to honor them all," Skoch said. "AFA is proud to have partnered with the AC-119 Gunship Association, Cass County, and the City of Linden, Tex., to honor an American who risked, and lost, his life in service to his country."

The event also marked 50 years since the surviving veterans of the war returned home to face national disrespect, resentment, and hostility rather than a hero's welcome. By sharing stories like Rucker's and by commemorating Vietnam-era service members at events like the one in Linden, AFA's Texoma Region and its partners have moved the needle in showing all veterans the gratitude they deserve.

"Today, and in following events and activities throughout this year, AFA wants to ensure all Americans are aware and pay proper respect for those who served in Vietnam," Murray said in his speech at the ceremony. "We honor all veterans of the Vietnam War era, especially those who were held as prisoners of war, listed as missing in action, and gave their lives in service and sacrifice on behalf of the United States."





Artist Colin Kimball, left, applauds as his portrait of Staff Sgt. John Rucker is revealed by Air & Space Forces Association Board of Director (At Large) Lt. Col. Paul Hendricks (Ret.) at a ceremony at the courthouse in Linden, Texas, Feb. 4, 2023.



Tia McConnell, Staff Sgt. Rucker's daughter, tells her story to the audience at the courthouse in Linden, Texas, on Feb 4, 2023.



Tia McConnell, left, former AFA Chairman of the Board Gerald Murray, and current AFA Chairman of the Board Bernie Skoch, place a wreath at the Memorial.



Veterans render a salute after a wreath was laid at the Linden, Texas, Veterans Memorial commemorating Staff Sgt. John Rucker on the 50th anniversary of the end of the Vietnam War.

Finding 'Gold' and Funding STEM

Since 2020, The Air & Space Forces Association has presented three young women with the Dr. Sydel Perlmutter Gold Memorial Scholarship, an award of \$5,000 per year for young women pursuing degrees in STEM. But the award represents far more than financial aid. Its recipients—all dependents of a present or former Airman—are blazing a wider path for women to excel in STEM careers, carrying on the pioneer work of the scholarship's namesake.

Dr. Sydel Perlmutter Gold was unafraid to pursue a career in math and science, a predominantly male field. She earned her master's degree in mathematics from the University of New Mexico in 1962 and her Ph.D. in theoretical mathematics from the University of California, Berkeley, in 1973—at this point, she was already the mother of three children. She spent the better part of the next two decades years working in applied mathematics and national security, including serving on the National Security Council staff under Presidents Carter and Reagan and a six-year stint as deputy for strategic requirements in the Office of the Assistant Secretary of the Air Force for Research, Development, and Logistics.

In the 1990s, Gold began her career at SAIC as the Senior Vice President and Deputy Manager in the Advanced Technology & Analysis Sector, where she established a Women's Business Forum to help female voices be heard at the company. In 1992, she was appointed to be one of the five original members on the Joint Advisory Committee on Nuclear Weapon Surety. She was also a member of the U.S. Strategic Command Strategic Advisory Group and served on Defense Science Board and National Academy of Sciences task forces.

She passed away in 2008, but her tremendous legacy is living on through the recipients of the memorial scholarship set up by her husband, Ted S. Gold, in 2020.

"It has been my privilege to help young women pursue their STEM-related education and career aspirations through scholarships honoring my late wife Sydel Perlmutter Gold," Ted Gold said. "It is especially meaningful for me and my family that the Air & Space Forces Association provided the opportunity to extend these scholarships to daughters of Active and retired Air Force personnel."

The first recipient, Shanti Mickens, is now in her junior year at MIT. A computer science student, Mickens has studied autonomous machines, 3D design, machine learning, and wireless technologies through her classes and on-campus research opportunities. She has worked as a software engineer intern at Apple for two consecutive summers.

"I hope to emulate what Dr. Sydel Gold did in the aerospace field in the computer science field," Mickens said. "She was and still is today a role model for women."

The 2021 winner was Abigale Lamontagne, who is in her second year at Northeastern University. Lamontagne is pursuing a degree in biomedical engineering and has made the Dean's List each semester. She spent last summer studying abroad in London, an opportunity she says was only possible through the Gold Memorial Scholarship.

The latest recipient, Stella Stozak, is the daughter of a retired Air Force pilot. She inherited her passion for aviation from her father and is now in her freshman year of mechanical engineering classes at Princeton University. Stozak says that her dream job is to fly for the Coast Guard, but USCG height requirements are blocking her



Courtesy

Shanti Mickens, currently pursuing her STEM degree at The Massachusetts Institute of Technology, was the first recipient of the Dr. Sydel Perlmutter Gold Memorial Scholarship.

way. She hopes her studies will lead her to opening the door of the cockpit for more women.

"Just as Dr. Gold pioneered her career in the male-dominated government and STEM fields, I will advocate for (and maybe even engineer) advancements in aircraft development and policy that eliminate gender bias and open opportunities for more women in the future," she says.

"The first three scholarship recipients strengthen my optimism about our nation's future," Ted Gold said.

To be considered for the Dr. Sydel Perlmutter Gold Memorial Scholarship, applicants must be the daughter of an Active-duty, Guard, Reserve, or retired Airman; a graduating high school senior with demonstrated academic excellence in mathematics; and committed to pursuing a B.S. in science, technology, engineering, or math at an accredited four-year college or university. Preference is given to first-generation college students with demonstrated financial need.

Applications for the 2023 Dr. Sydel Perlmutter Gold Memorial Scholarship are open now through April 30.

Candidates can apply at afa.org/scholarships.



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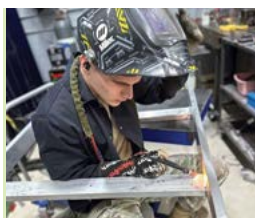
Staff Sgt. Austen Adriaens

Minnesota Air National Guard **Maj. Katie Lunning**, a member of the 133rd Airlift Wing, became the first Air Guard flight nurse to receive the Distinguished Flying Cross Medal on Jan. 7. She received it for her actions as a Critical Care Air Transport Team nurse with the 379th Aeromedical Evacuation Squadron supporting Operation Allies Refuge in August 2021. For two weeks, Lunning flew up to six missions a day to evacuate casualties from Hamid Karzai International Airport, Kabul. Up to 36 times per day, she would trek three blocks pushing a stretcher through Taliban-controlled streets.



Airman 1st Class London Guntsals

Lt. Col. Raymundo Vann Jr., and his daughter **Capt. Gabriella Graham**, stepped into the launch control capsule at Echo-01 missile alert facility at F.E. Warren Air Force Base, Wyo., on Jan. 6 and assumed a 24-hour alert together, before Graham attends the Squadron Officer School at Maxwell Air Force Base, Ala. Following SOS, she will begin maternity leave. "There has never been any parent-child alert ever ... so I'm glad we got to be the first to do it and spread the word that ICBMs is family business," Vann said. "It is amazing to know that two generations—three when we count her baby—were proudly providing nuclear deterrence."



Master Sgt. Leon Jackson

Staff Sgt. Keith Lee, an aircraft metals technology craftsman with the New Jersey Air National Guard's 108th Wing, used his skills to install a Global Aircrew Strategic Network Terminal in its command post in January, saving the wing thousands of dollars. Lee developed his construction talents during high school designing his own three-axis computerized numerical control milling machine, which ultimately led him to join the Air National Guard. He quickly learned the art of tungsten inert gas welding, gained certification in four different alloys, and established himself as a master craftsman.



Tech. Sgt. Katie Maricle

Air Force Reserve **Staff Sgt. Jayaira Ghrim-Harvey**, a member of Ohio's Youngstown Air Reserve Station's 910th Force Support Squadron and deployed to Air Force Mortuary Affairs Operations at Dover Air Force Base, Del., will have her poetry published in the spring of 2023. She was inspired by her peers and leadership at AFMAO to submit her work to a project called "The Women We Watched," written by Air Force women about their mentors and inspirations. "I chose to write about my mom," Ghrim-Harvey said, "because she's been one of my biggest inspirations."



Airman Kylee Tyushttps

Senior Airman Austin Andrews, a loadmaster with the 4th Airlift Squadron at McChord Air Force Base, Wash., received the Staff Sgt. Henry E. "Red" Erwin Outstanding Enlisted Aircrew Member of the Year Award for 2022. The award is given for outstanding leadership and sustained self-improvements in support of enlisted aircrew operations. "I returned from a deployment, and the day my rest and recuperation leave was up, I got back out [to Afghanistan]," Andrews said. "We were the last jet on the ramp to leave ... and it was a ghost town on the flight line. Everyone ... left to help during Operation Allies Refuge."



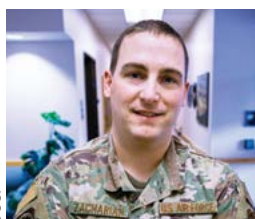
Master Sgt. Luke Kitterman/USAF

When Ohio Air National Guard **Tech Sgt. Wendy Kuhn**, a public affairs specialist with the 121st Air Refueling Wing, first walked into a Brazilian jiu-jitsu class seven years ago, she didn't know what to expect. But in 2022, she became the Master Four Purple Belt World Champion for the second year in a row at the World Master International Brazilian Jiu-Jitsu Federation Jiu-Jitsu Championship. Kuhn's first tournament was just three months after she started practicing. "I love them, because every time I prepare for one, I increase my skills," she said.



Tech. Sgt. Luke Kitterman/USAF

Space Force **Master Sgt. Josef Margetiak**, a Space Delta 5 ISR Division operations superintendent at Vandenberg Space Force Base, Calif., began the new year as recipient of the William O. Studeman Award. A 16-year Air Force member before transitioning to the Space Force two years ago, Margetiak received the award for his contributions overseeing ISRD's Electronic Warfare team and the Analysis, Correlation, and Fusion team. "We uncovered new adversary electronic warfare sites, identified a new enemy offensive capability, and helped affect change in Remote Piloted Aircraft [TPPs]," he said.



Michael Crane/ANG

Missouri Air National Guard **Senior Master Sgt. Joshua Zachariah** received the Outstanding Guardsman (Enlisted) in Contracting Award in the 2022 Air Force Contracting Awards recognition program. As a contracting superintendent assigned to the 139th Mission Support Group, Zachariah led a contracting team that managed 65 contract actions valued at more than \$164 million while deployed in support of Operation Inherent Resolve. This included contracts that contributed to the disruption of human-trafficking efforts in U.S. Central Command's AOR.



Senior Airman Camille Lienau/ANG

Master Sgt. Seth Maheux, 104th Armament Flight NCOIC at Barnes Air National Guard Base, Mass., will receive the 2022 Air National Guard Lt. Gen. Leo Marquez Award for maintenance excellence. It is presented to maintainers who have demonstrated superior service, performance, job knowledge, and results in aircraft, munitions, missile, and communications-electronics maintenance. "Honestly, I have never thought of myself in that manner so it's also a bit of a surprise to receive an award of this magnitude," Maheux said. The award is one of the most prestigious awards in all of the Air Force.



Courtesy photo

Former longtime AFRL Senior Scientist **Nicholas "Nick" J. Pagano** was inducted into the Engineering and Science Hall of Fame at the Dayton Engineers Club in Ohio in November. Honored for achievements significantly enhancing quality of life for humanity, Pagano pioneered numerous contributions for more than 40 years. His discovery of the "stacking sequence phenomenon" led to new practices to reduce the potential for delamination, or failure between composite layers, ultimately leading to the creation of material that is stronger and lighter than the aluminum traditionally used for aircraft production.

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

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