

Operation Desert Storm's punishing 43-day air campaign crushed Iraq's forces in advance of the ground war that followed. The war marked the first extensive use of precision weapons, many of them launched from U.S. Air Force F-16A, F-15C, and F-15E fighters.

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Chief of Space  
Operations  
Gen. John "Jay" Raymond  
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# AIR FORCE

MAGAZINE

## DESERT STORM

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Staff Sgt. Cassandra Johnson

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## ON THE COVER



USAF via Department of Defense

Air dominance in all its terrifying fury took center stage when Operation Desert Shield gave way to Operation Desert Storm on Jan. 17, 1991. Air Force Magazine commemorates the air war that destroyed Iraq's army with a rare wraparound cover depicting F-15As, F-15Cs, and F-15E's cruising over oil fields set alight by Saddam Hussein's forces.

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# Domain Dominance

**T**hirty years pass in a flash. More than 80 percent of today's Air Force was not born when Maj. Gregory "Beast" Feest, flying an F-117 Nighthawk, dropped the first bomb of Operation Desert Storm at 2:51 a.m. Baghdad time on Jan. 17, 1991.

U.S. and allied forces had spent five months building up to that moment, gathering a force of more than 500,000 in Saudi Arabia, and all the gear needed to house, feed, and support them. Another 200,000 supported the operation, whether in the U.S., Europe, or elsewhere in the Middle East. CNN was a new media sensation, sharing live daily briefings from the combined forces commander, Gen. Norman Schwarzkopf, on-the-scene reporting—and airing grainy, black-and-white videos showing bombs guided to their targets with stunning precision and devastating results.

Desert Storm was an air power triumph. In the face of one of the most sophisticated air defenses on the planet, the Air Force systematically degraded and destroyed Iraq's ability and will to fight. Stealth, precision, and an effects-based air campaign designed by then-Lt. Col. Dave Deptula demonstrated a radical departure in the conduct of war. It enabled Feest and his fellow Nighthawk drivers to attack key targets throughout Iraq, while USAF's then-modern fleet of F-16s, F-15Cs, F-15Es, and F-111s took out most everything else. Naval aviation contributed, but its air wings had been built for a different kind of combat and lacked the range and capability to be primary contributors; instead, Navy destroyers and submarines contributed Tomahawk cruise missiles to the precision attacks in the opening salvo.

This war justified the investments the Air Force made in the wake of painful losses in Vietnam:

- Precision-guided weapons to destroy targets with fewer aircraft
- Stealth to evade enemy defenses and proceed unhindered to well-defended targets
- Satellites for eyes-in-the-sky intelligence, targeting, and instant communications.

The Air Force paralyzed Saddam's command and control and then destroyed the Iraqis' intelligence capability, blinding them to the maneuvers of two U.S. Army corps that shifted to attack from the west, rather than the anticipated frontal assault in Kuwait. The much-anticipated tank battle was over in hours, and totally one-sided. So demoralized was the Iraqi army after six weeks of air assault that many couldn't wait to surrender. After air power destroyed 50 percent of Iraq's fielded forces, U.S. tanks engaged targets beyond their line of sight, while air attacks continued with greater ferocity. The highway to Baghdad became a shooting gallery from the air until President George H.W. Bush called off the rout.

Troops came home to a victory parade in Washington, where America shed its collective embarrassment and guilt over the failures of the Vietnam war and the maltreatment of its unappreciated veterans. We lavished praise on the victors.

While Desert Storm was a turning point in the conduct of warfare, it was also the closing phase for forces built to fight the Cold War. Even before Desert Shield began, the Pentagon was planning a massive drawdown to shrink the military by some 25 percent. Desert Storm did nothing to slow that plan. Afterward, each of the

services took deep force structure cuts and aging weapon systems were retired. As a reward for bankrupting the Soviet Union and its communist satellites in Eastern Europe, Americans sought a peace dividend in the form of a smaller defense budget.

Meanwhile, the first Gulf War's unfinished business fell to the Air Force. Having left Saddam Hussein in power, U.S. forces imposed no-fly zones in both Northern and Southern Iraq, both to keep Saddam from attacking his own people and to ensure he didn't seek revenge on his neighbors. Operations Northern Watch and Southern Watch dragged on for years, even as the Air Force led NATO air campaigns in the Balkans, including the decisive air war that ended Slobodan Milosevic's Kosovo war. When al Qaeda struck the World Trade Center and the Pentagon on 9/11/2001, the Air Force was still flying Northern and Southern Watch. Now, nearly two decades hence, USAF's deployments to the region continue unabated, yet its force today is smaller and older—and poorly sized

for a peer fight with the likes of China or Russia.


For all who care about national defense, this is a pending emergency. Air Force Chief of Staff Gen. Charles Q. Brown Jr.'s call to "Accelerate Change—Or Lose" is a rallying cry to get on with the transformation of the force that has been too long delayed. Modernization is not gilding the lily,

but an imperative. America's defense strategy has long assumed we could afford to have smaller forces than some rivals, so long as we ensured we are technologically superior. Force multipliers like precision, space, and stealth pay for themselves by enabling America to wage war with fewer, but more capable forces.

Here's the rub: Our adversaries are not only larger today, they are growing more capable, developing means to counter our advantages in space and stealth. Where Americans, tired of a 19-year war that's produced little for its trillion-dollar investment, crave another peace dividend, our adversaries perceive weakness. China sees America in decline, and its own ascendance as inevitable; Russia seeks to exploit a growing American preoccupation with the Pacific by growing more assertive in the Arctic and Europe.

Aerospace power is the root of our national defense and the key to our strategy to deter the aggression of others and to fight and win when needed. The speed, range, flexibility, precision, and lethality of our Air and Space Forces are unparalleled today, but their superiority is not guaranteed in the future and their margin of advantage is narrowing. The air, space, and cyber domains will take precedence over land and sea in future conflicts, and without air, space, and cyber, our land and sea forces can only be minimally effective, anyway.

Only months before Iraq launched its ill-fated invasion, the Air Force rolled out "Global Reach—Global Power," a strategy paper that defined aerospace power and the advantages it brings in terms anyone could understand. It proved prescient for the combat that soon followed; it remains an effective argument today.

Our aerospace forces must accelerate change for a reason: to become faster, more agile, more flexible, and more precise—of course—but more importantly to retain global reach and global power. America will not prevail in any domain if it cedes its dominance of air, space, and cyberspace. 

**The air, space, and cyber domains will take precedence over land and sea in future conflicts.**



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**Air Basing Basics**

It was a pleasure to again run into my old friend, Lt. Col. Price Bingham, not in person unfortunately, but in his well-written and researched article: "The Air Base: The Air Force's Achilles' Heel?" [October, p. 48]. Price, a proud Air Force Academy grad—not a ring knocker—and I met on the Air Staff in the Pentagon in 1980. I was assigned to Doctrine and Concepts and my boss was a former Misty pilot, shot down once in his fast-mover F-100 over South Vietnam. When I showed up, he briefed me on our mission, then said, 'Find a problem area, study it, and write me a paper.' That was it, and how I got into Soviet armor attack and what I called a concept with a fatal flaw. Price was researching similarly contentious issues, not always well received, but we moved amongst people with vision who had the future of the Air Force in mind, not their personal careers. One of them was John Boyd, whose thinking shaped us both. Boyd is best-known for the OODA Loop—Observe-Orient-Decide-Act—a fighter pilot's survival guide. Boyd pushed his concept vigorously, to the chagrin of many of the senior staff, and when we met him he was working as a retired colonel for a dollar a year in OSD. Before that, Boyd developed a series of energy maneuverability curves for the F-105s assigned to the 36th Tactical Fighter Wing in Bitburg [Air Base, Germany,] and helped bring out the airplane's true capabilities. All that before handheld computers or GPS. So I am not surprised that Price came up with this article, which has to be among the top 10 issues the Air Force is—or should be—working.

Air base vulnerability was recognized before World War II. In 1933, within days of Hitler becoming Germany's new chancellor, he ordered the construction of a number of new air bases. One of those bases was Fassberg, in the Lüneburg Heath, near Hannover. Fassberg, the air base, and the adjacent town that was to house the people who ran and maintained the base, was built

into the pine forest. Little could be seen from the air. The hangars all had flat roofs covered with soil, allowing grass, heather, and trees to grow. In addition, a fake airfield was constructed, anticipating Allied bombings. During the war years, that fake airfield was attacked several times, as well as a nearby hillside after which Fassberg was named—but not the air base. Although this base anticipated the future, the Luftwaffe continued to cling to large air bases, dooming many of its Me 262 jets and pilots.

The ultimate deception the Germans constructed probably was their aviation research center at Voelkenrode near Braunschweig, which accommodated 76 buildings and an 8-meter wind tunnel. From the air it appeared as little more than an ordinary farmstead.

When Price and I were assigned to USAFE, the issue of air base vulnerability was of course addressed, at least minimally, by creating landing strips on Germany's autobahns. If war would come, in those days, we all viewed it as a doomsday exercise.

In today's threat environment such minor changes as autobahn landing strips won't do. We have to move first of all from a wing-centered combat unit, of three to five squadrons, down to the squadron as the 'mother hen' and the squadron down to its flights. The base structure to accommodate such dispersal has to be accordingly decentralized and diverse. Camouflage, along with small size, has to be high on the agenda, as well as fake structures good enough to serve

**WRITE TO US**

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that purpose. The logistics will have to accommodate to the revised deployment structure. A wing can still operate as a command, control, and coordinating element from a larger air base, but the cutting-edge elements cannot, as in the past, be assembled on large bases.

Yes, when at our forward locations, we may have to live in tents, or whatever serves our purpose. We've done it before, we can do it again. Flier and maintainer as one integrated element. Colonel Bingham, you did a great job raising this issue!

Col. Wolfgang W.E. Samuel,  
USAF (Ret.)  
Fairfax Station, Va.

I was gratified to read Price Bingham's characteristically insightful discussion of air bases as the "Achilles' heel" of our air warfare capabilities. As he points out, Airmen have dealt with the dilemma of basing for logistical convenience or for survival since the earliest days of air combat. What I would add is that the choices they made usually reflected their perceptions of the vulnerabilities of bases to truly devastating attacks; perceptions that differed over time. When Airmen believed that enemies

could devastate bases in short order, they tended to default to dispersing assets or sheltering them. When they perceived that enemies could attack, but not with instantaneous destruction of bases and the assets on them, they tended toward reliance on general air superiority, perhaps with some aircraft sheltering, to protect infrastructure-rich, fixed bases. USAF has addressed these issues in various ways, but has never been comfortable with acquiring the types of aircraft or accepting dispersal concepts that might reduce the generation of combat power.

The TAB VEE (Tactical Air Base Hardened Aircraft Shelter) hanger program is a case in point. When other NATO air forces began looking to [vertical take-off and landing] fighters, light attack aircraft, and highway strips in response to growing Warsaw Pact air capabilities in the mid-1960s, USAF began to build hundreds of hardened fighter shelters that could withstand the overpressures of nearby nuclear blasts and anything but direct, high-angle hits from large bombs. These hardened shelters made some sense through the 1980s, when a nuclear war would obviate the need for sustained air

operations, and the unguided conventional air weapons of the time minimized the likelihood that fast jets forced low by air defenses would find—let alone hit—shelters obscured by trees, terrain, smoke, and other obscurants. But, when the advent of precision weapons reduced such shelters to the role of target markers, the Air Force kept them but largely returned to hopeful dependence on general air superiority to protect the fixed bases upon which it continued to rely.

However, in this age of threats ranging from local fifth-columnists to long-range precision missiles, the Air Force knows it cannot expect to hold continuous air superiority in some possible conflict situations. Indeed, some regional enemies have the capacity now to place the Air Force's entire combat, logistical, and communications infrastructures under threat from their homeland bases to their forward-most operating locations. So, as [Bingham] has so ably argued, the time has come to reduce the Air Force's dependence on fixed basing while, at the same time, preserving its ability to generate combat effects at decisive levels. I have addressed this challenge for

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air mobility operations in a number of studies and articles over the last decade or so and, from that experience, I would close here by saying that the Air Force must approach the challenge of achieving dispersed effectiveness as a systemic one. It will be useless, for example, to dream in peacetime of fighter mobility dependent on utilizing transport aircraft as rolling magazines, if the airlift and tanker fleets remain dependent on fixed-basing themselves. The Air Force must convert all of its parts—kinetic, electronic, command, logistics—all of them—to a unified concept of agile dispersion that makes them elusive targets while they also do their jobs.

Robert C. Owen  
Daytona Beach, Fla.

Lt. Col. Bingham has written a very good article on the dependency of USAF on air bases. The F-35B is about the only answer I see thus far. In the Pacific, it's pretty clear that a lack of nearby air bases is acute. It is a much worse situation than in Europe. One possible solution is to amplify the power of the F-35B with Skyborgs. The Kratos Syborg lands with a parachute and inflatable air cushions. Elon Musk lands his launch vehicles on their tail. Obviously he has the advantage of a thrust to weight ratio of better than one. But it would seem that it might be worth investigating if a Skyborg and combination of a parachute, landing struts, and a fairly powerful engine might be able to do the same.

Obviously, you could do this with a thrust to weight ratio of one. But the desire would be to keep the Skyborg cheap with a less-powerful engine (maybe T/W = 0.2). However, there might be some trade-off if you could get more sorties from a Skyborg with a more powerful engine (probably

you could get away with something less than a thrust to weight ratio of one if you used a parachute).

Here's what I have in mind: Fly the Skyborg into a hammerhead stall and release the parachute. The Skyborg descends tail first. The attitude is kept vertical using Elon Musk techniques. The engine is firing straight down. Maybe there could even be an afterburner just for landing. The landing struts ought to be good for a landing a 20 feet/second. There should be some trade-off between a parachute size and engine thrust to achieve the terminal 20 feet/sec.

Of course, it all depends on the numbers. Might not be practical at all, might be worth exploring. No one thought of landing launch vehicles on their tail until Elon Musk tried it.

William Thayer  
San Diego

**Discussing Missileers**

I wish to both thank and respond to Lt. Col. Bill Norwood for his corrections of my errors ["Letters: Different Times in Service?" October p. 6].

Unfortunately, while there is some history about the hardware of our missile heritage, there is little information available about the crew force itself. I agree with Colonel Norwood that General [Curtis E.] LeMay was gone by the time of the first crew selection—my bad. What is important is a majority of the early crew force was handpicked from the rated force—pilots and navigators (Jacob Neufeld, "Ballistic Missiles in the United States Air Force, 1945-1960." Over time, these experienced (and senior in comparison to today's missileer) rated officers returned to their cockpits.

The point I wished to make is, in the beginning, missile duty had an initial high level of interest, and it was presumed that crew members needed a depth of experience or "seasoning" to operate to Strategic Air Command's standard—flawlessly.

While operating without a crew may have been a stretch, one thing Minuteman did succeed in was reducing the crew manpower requirements. Early systems (Atlas D) operated with a one Launch Control Center (LCC)

to three Launch Facilities (LFs) ratio. Atlas E and F had a 1:1 ratio. The Titan I ratio was 1:3 and the Titan II ratio was 1:3. Minuteman was a big improvement—one LCC to 10 LFs! Also, unlike Atlas and Titan the missile itself no longer needed daily hands-on treatment—at least by the '80s.

Theoretically, the Minuteman ratio could also be extended by LCCs relinquishing their command to other LCCs within the squadron for maintenance, if required. This was a big manpower savings and step toward automation. During LCC modifications it was common to have two or three LCCs monitoring the 50 LFs of the squadron (though crews were still required at the other LCCs to monitor contractors and safeguard classified materials).

The different eras of our experience in the Minuteman program is highlighted by Colonel Norwood's praise for the Minuteman Education Program (MMEP). As a crewmember at Minot during '84-'88, most of the crews were not involved with the MMEP, but those who worked on their advanced degrees used other schools available in our education center. The University of North Dakota only offered an MBA program. One of my early commanders looked into it, and they required him to take an extensive list of prerequisite courses—he already had a B.S. in management. He chose not to get his degree there. English majors didn't stand a chance.

Those early missileers certainly had their hands full as the system was basically being built around them. Improvements made in the hardware/procedures over the decades of alerts made the job less unpredictable. Unfortunately, I think since the dissolution of SAC and the remarkable reliability of the Minuteman hardware, this vital leg of the triad has been neglected and the crew member most of all.

Lt. Col. David J. Wallace,  
USAF (Ret.)  
Albany, Ohio

I would like to add a little more to the Norwood/Wallace discussion in the June and October issues, from the viewpoint of someone who came into the intercontinental ballistic missile

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(ICBM) force in 1961, spending the last 28 of my 30 years Active duty in Minuteman and ground-launched cruise missiles, with a short, four-year "vacation" as a base commander on two European fighter bases.

For 25 of the 31 years following my retirement, I was the executive director and one of the founders of the Association of Air Force Missileers (AAFAM), and I still edit the quarterly newsletter for AAFAM. Therefore, I have stayed fairly current with the missile/ICBM business over the last 59 years.

First, as Norwood said, General LeMay was no longer CinCSAC during the early ICBM activation process for Atlas, Titan, and Minuteman. When he came into SAC at the end of 1961, Gen. Thomas Power had already been CinCSAC for four years. I volunteered for ICBM duty, and when I began training at Sheppard AFB, Texas, in September 1961, my training class was a mix of officers like me who came from varied backgrounds (I had been in aircraft maintenance), along with a couple of second lieutenants who were some of the first Minuteman officers. There were a number of what we then called "rated officers" because a significant number of air-

craft were being phased out (B-47s, KC-97s, and even early B-52s). Most of our crew commanders at Mountain Home AFB, Idaho, one of the Titan I bases, were pilots, with about a third of the people like me. They were not "handpicked by LeMay" as Wallace stated, some were volunteers and some were just sent to missiles. There were no "spot" promotions in the missile force—that was a benefit only enjoyed by those who flew SAC aircraft.

When I went to Minuteman in 1965 as a crew member at the last wing, Grand Forks, the majority of the crew force were navigators, displaced by the continued phaseout of B-47s, early B-52s, KC-97s, early KC-135s, and the B-58). Some of us had come from the recently closed Atlas and Titan, others straight from aircraft. It was just a matter of manning needs for the developing ICBM force and shrinking number of cockpits.

Many of those SAC bomber and tanker types stayed in the missile business, some rising to high leadership positions. The demands of Vietnam sent many back to the cockpit after missile duty.

The Winter issue of the Friends Journal, the publication of the Nation-

al Museum of the Air Force, included my article, "The Bomber Heritage of the ICBM Force," describing how the decision to bring these experienced officers (and NCOs, for those of us in maintenance) into the ICBM force gave us some great mentors and got us started off on the right foot in the nuclear deterrent role for ICBMs.

Wallace suggested to bring officers into missile duty as "more mature officers." I don't agree with his assertion that the current model is a critical error. When I was a squadron commander 40 years ago, we taught our new lieutenants officership with a great program developed in our missile wing. The 60 crew members in my squadron were typical—motivated, mature, and involved. Many went on to senior leadership in our ICBM force.

Over the 59 years I have been involved, we have mostly done it right, and we when stumbled, we quickly fixed the problems. It was, and is, a great part of our Air Force and a superb career path. We even added incentive pay for missile operators a few years ago.

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

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## Entering Vietnam

I would like to compliment John Correll for his many years of service to AFA and especially to his latest article, "The Air Force Enters the Vietnam War," in your October edition [p. 52]. Let me endorse John's research and add some personal knowledge. I was assigned to the 602nd Fighter Squadron (Commando) flying A-1 Skyraiders. When I arrived at Bien Hoa [Air Base, South Vietnam] in January 1965, the Farm Gate T-28s were already gone. I saw a few of them on the ramp later, in June 1965 when we deployed to Udorn, Thailand, to set up the Sandy operation.

For the first several weeks, we flew A-1s with Vietnamese aircraft markings exactly as depicted in John's article. Right from the beginning we had two missions. The first was training Vietnamese lieutenants who had recently graduated from pilot training, in weapons delivery. The two-seat A-1E was ideal for this mission. We used an air-scored gunnery range near Vung Tao, southeast of Saigon. The training primarily was in dive bombing, the most difficult of the attack missions. We did observe the small-boned Vietnamese had some difficulty in maneuvering the large and fairly heavy A-1, even with only 25-pound practice bombs. After a set number of training sorties, our graduates would go off to Vietnamese fighter squadrons flying the single-seat A-1H.

Our second mission was attack/close air support with a Vietnamese enlisted observer in the right seat. This was not only a cynical observation of "no Americans in combat," but was also viewed by the pilots as a helpful local colleague in case we got forced down or bailed out. Of course, we also viewed it as a convenient ruse. There was one exception to requiring a Vietnamese observer. That was in January/February when American ground troops were being deployed in the field. If there were "Americans in trouble," we were allowed to fly solo combat missions. These were called "Flaming Arrows."

All this changed on 7 February 1965 when the 409th Viet Cong Regiment attacked the Americans at Camp Holloway air base and barracks near Pleiku. This led Pres-

ident [Lyndon B.] Johnson to order "Flaming Dart" retaliatory missions against North Vietnam, and in the South, we took off the Vietnamese markings on our airplanes and began combat in earnest.

Brig. Gen. R.G. Head,  
USAF (Ret.)  
Coronado, Calif.

The title of John Correll's article, "The Air Force Enters the Vietnam War," in your October 2020 issue is certainly misleading. I expected to read about the first Air Force personnel to enter the Vietnam War and about what they did there.

Not so.

I know that Air Force Photomappers had Active-duty Air Force people on the ground in Vietnam operating aerial electronic surveying ground stations in 1957, well before the 1961 date identified in the article. And, in fact, they were operating stations in Vietnam for the six months in 1955 immediately before the official start date of the war on November 1, 1955. These were people on TDY orders conducting then SECRET missions. They operated as Air Force units called ASTs (Aerial Survey Teams). Perhaps Mr. Correll meant the first PCS Unit or perhaps the first combat oriented unit? Anyway, I think it should be clarified as I'm sure there may have been several units operating there prior to the 1961 date cited.

Lt. Col. Gordon Barnes,  
USAF (Ret.)  
Manchester, Mo.

## On Race, Unrest, and USAF

As a Black man from a five-generation military family, I would like to thank and congratulate Air Force Magazine for turning its letters area into a forum for responses to the article on racial problems, in and out of the service. It was a fine editorial response to a problem that spans all of society in uniform—sadly—and out.

One of the most helpful indicators were the respondents. Some denied the existence of systemic racism (but have obviously not asked any of their fellow Black citizens). Others lauded the Tuskegee Airmen who flew, fought, and lived in racially segregated units. One said he had

never encountered nor witnessed a racist action carried out against anyone, surely a unique happenstance for any American. One letter even stated plainly that the writer was disturbed by the "force-feeding" "ALL DAY LONG" of coverage of the racial divide in our country. As the man said, "The more this is shown and pushed, the more anger grows on both sides!" ["Letters: On Race, Unrest, and USAF," p. 8]. I only wish he would have indicated what the other "side" was. But the majority recalled and recognized their knowledge of the problem and were Air Force strong in their condemnation of this systemic problem.

I know that there was a time not very long ago when no matter what the level of upheaval, it never would have reached the pages of Air Force Magazine. And for that, I am thankful. If our country is to be the exemplar of what we say we want it to be, it will take work on every level of society, including our armed forces. For, while President [Harry S.] Truman's factual integration of the U.S. armed forces set the tone and momentum for civil rights in America, the work toward that goal has not been concluded. While some members and ex-members of the force may not believe that racism is a systemic problem, that may just reflect the fact that they have not asked someone Black what they think. Doing so—and listening—might be the best way to close this divide.

Norman E. Gaines  
Hartsdale, N.Y.

## A Little Bit Off

Back in 1964, I transitioned from B-47s to B-52s. I went to K.I. Sawyer [Air Force Base, Mich.,] to fly the "newer" B52H ["BUFF Up," October, p. 36]. The H models had the usual B-52 skin wrinkles and paint scratches in the cockpits and started to look old. In late '94, word was out that the B-52Hs would be going through depot maintenance for upgrades that would extend their life for 10 years. We laughed, and said there was no way these birds will last until 1974.

Guess the laugh is on us.

Lt. Col. Russ Grunewald,  
USAF (Ret.)  
Benbrook, Texas



Spc. Michael Hunnisett/USANG

## Grateful

"My grandfather served in the Philippines during World War II. He got to experience firsthand what it felt like to be on the losing side of peer competition, to know what it's like to be an American not prepared for war. He learned about the Bataan Death March ... as he marched past thousands of dead. And he was among the lucky few who survived the death ships and three and a half years in captivity. So I've spent the last 39 years ... ensuring that no other American ever has to go through what my grandfather did."

—Air Force Vice Chief of Staff **Gen. Stephen W. "Seve" Wilson**, speaking at his retirement ceremony Nov. 13.

## Cops and Robbers

"We might have to use guns when dealing with robbers, as that is the language that robbers understand."

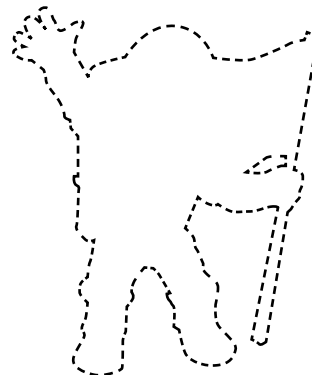
—**Alpha Military Review blog** on China's Sohu.com, explaining a Nov. 4 government proposal to allow the Chinese Coast Guard to use force against foreign ships violating territorial waters.

# Space Reservations



"As if 2020 hasn't brought us enough surprises, U.S. Space Command announced on Nov. 13 that the U.S. military can now count Space Marines among its ranks ... or something along those lines."

— **Aerotech News**, referring to Marine Corps Commandant Gen. David Berger's activation of Marine Corps Forces Space Command at Offutt Air Force Base, Neb.



"If the Marine Corps believes so much in the significance of operations in space as to stand up their own service space component, shouldn't the Air Force do the same? Right now, if USSPACECOM was designated the lead COCOM for a major operation, the Air Force would be the only service without service representation to the operation!"

—Retired **Lt. Gen. David A. Deptula**, dean of AFA's Mitchell Institute for Aerospace Studies.

Mike Tsukamoto/staff

## Homecoming

"We are on the verge of defeating al-Qaeda and its associates, but we must avoid our past strategic error of failing to see the fight through to the finish. ... We are not a people of perpetual war—it is the antithesis of everything for which we stand and for which our ancestors fought. All wars must end."

—**Acting Defense Secretary Christopher C. Miller** in a Nov. 13 letter to the military, his first following his appointment on Nov. 9.

## Arctic Thawing

"It is well-known that we have a unique ice-breaker fleet that holds a leading position in the development and study of Arctic territories. ... We must reaffirm this superiority constantly, every day. We must build up our positions, strengthen and update our fleet, introduce new advanced technologies in the construction of icebreakers and other vessels of that class."

—Russian **President Vladimir Putin** while unveiling a new ice-breaker vessel in Saint Petersburg, Russia, on Nov. 3. The U.S. is in the process of expanding its own fleet as the military and commercial activity in the Arctic is growing. **Business Insider**, Nov. 9.

## Thank You for Your Service

"Mark Esper has been terminated. I would like to thank him for his service."

—**President Donald J. Trump**, via Twitter, announcing the appointment of Christopher C. Miller as Acting Secretary of Defense.



Lisa Ferdinando/DOD

"I serve the country in deference to the Constitution, so I accept your decision to replace me. I step aside knowing there is much we achieved ... over the last 18 months to protect the nation and improve the readiness, capabilities, and professionalism of the joint force."

—Defense Secretary **Mark T. Esper** in a letter to President Trump Nov. 9.



Staff Sgt. Hailey Haux

## Changing Times

"When I came in, cyber wasn't a thing. Now, it is. Space was a benign environment. Now, not as much."

—**Gen. Charles Q. Brown Jr.**, USAF Chief of Staff, interview with **Defense News**, Nov. 17.

# Staffing and Shaping the Space Force

*Gen. John W. “Jay” Raymond is the first Chief of Space Operations of the new U.S. Space Force. He spoke with Air Force Magazine Senior Editor Rachel S. Cohen about the service’s future. This conversation has been edited for length and clarity.*

**Q: The Space Force turns 1 year old this winter. What are some of your goals over the next few months?**

A: I really couldn’t be more excited for where we are and what we’ve already accomplished, and maybe even more excited about the opportunities that are ahead of us. The U.S. is leading in space globally. We’ve seen other countries follow suit as the U.S. has elevated space, ... with France, for example, the United Kingdom, and now Japan standing up a space unit, with more to follow. ... I’ve visited a few universities since we’ve been established and what I’m being told by those universities is their applications for getting into space-related majors are up, and so I think there’s a lot of good news for our nation.

On the people side, ... in December, we’ll probably be around 2,500-ish. This [fiscal] year, we’ll get to roughly 6,700 folks that are on Active duty, and we’ll have civilians with us as well. ... We’ve got people coming in from all accession sources. We graduated the first [U.S. Air Force Academy] class that had direct commissions, with 86 cadets coming in. ... Our first two [Officer Training School] graduates got commissioned directly into the Space Force. ... Our first seven basic military trainees have now arrived at BMT, and will graduate in December. It will be the first direct accessions on the enlisted side into the force.

We’ve got the Space Systems Command that we’ve architected, and we’ll stand that up in the spring ... of this coming year, along with what we’re calling [Space Training and Readiness] Command.

We’re still in the final stages of coordinating [the new acquisition strategy], but I think that’s going to pay significant dividends for us. The acquisition organization that we designed will focus on pushing authority down to a lower level, bringing unity of effort across the department, and being able to get at speed the capabilities that we need. We’re embracing digital engineering as our standard.

We also took the first step toward ... building a missile warning, missile defense partnership, taking an enterprise approach to that and getting those requirements approved by the [Joint Requirements Oversight Council].

When a service stands up—in my opinion—there’s five things a service needs to do to deliver value. First, you need to develop your people. Second, you have to have your doctrine, which we’ve already completed. Third, you have to have your own budget. Again, we’ve already done that. Fourth, ... you have to design your force and your force structure. Then fifth, you have to present that force to combatant commands. In the next few months [as of Oct. 29], we’ll release the [force design] planning guidance. And then in the months after that, we’re going to build the force design, and in doing so,



Eric Dietrich/USAF

Some 300 Airmen at bases worldwide transferred into USSF during a virtual ceremony Sept. 15, 2020, led by Chief of Space Operations Gen. John Raymond. By this month, Raymond expects there to be about 2,500 Active-duty Space Professionals.

bring unity of effort across the department and reduce the bureaucracy that’s involved as well, to get everybody rowing in the same direction, reduce duplication of effort, reduce costs, and get capabilities on orbit fast.

The first year is largely inventing the force. This next year is really integrating that force. This force design will help us integrate with the Department of Defense and the Joint Staff and our other services. ... With a small service, we have an opportunity to [collaborate with foreign countries, commercial companies, and NASA] even more fully.

**Q: Where do you want to be one year from now?**

A: Our staff structure is already built at the Pentagon. We’ll get more people on board. Today we have roughly about 200 on the staff. We’re going to grow to about 600 total. It will take us a couple years to do that. ... I would really like to have a top level of force design done and approved by the department.

Our commissioning sources and enlisted accessions will be further refined. We’ll stand up professional military educational courses designed for space and continue to evolve those. ... On the 20th of December, I’ll be an official member of the Joint Chiefs. Although I’m treated like one today, I go to all the meetings, ... officially one year out is when the law says I become an official member.

**Q: What's the status of agreeing on which Army and Navy components to bring into the Space Force, and what are the opportunities and challenges there?**

A: I am very pleased with the work that has gone on. We are at about ... 98 percent agreement. You won't see a wholesale taking space out of other organizations. We can't break the Navy, we can't break the Army. But you're going to see those things that make sense, from a mission of the Space Force, to take over, and we're in vast agreement. There's a couple of minor issues that we're discussing, and I would expect we'll hammer those out over [November] or so. Then the Secretary of Defense will make a decision, and off we go. But we're really close.

Our S1 [personnel staff] is working with the Army A1 and the Navy N1 to get volunteers. Every person that comes over to the Space Force is a volunteer. We can't order somebody to come over. Luckily, we have way more volunteers to come over than we have positions for. We can be very selective. We put in place a process ... modeled after the nuclear Navy, and we're going to interview everybody that wants to come in.

I don't think there's any more significant challenges than what we've already worked over the last year with putting all the processes in place for Airmen to transfer over. ... We wanted to do it in a way that didn't hurt people's careers and provided them an opportunity to have a career path that would be professionally rewarding to them. ... The same thing will apply for other services.

For example ... we designed a way to assign those [Air Force Research Laboratory] folks in the Space Force, but leave them where they are, with an agreement that they could also benefit from the collaboration of all the other labs. Those are the types of issues that we're working, for example, with the Navy: How would you do that to make sure that you don't break the synergies of an organization?

**Q: How has your thinking evolved about the right way to address incidents like the Russian "inspector" satellite that the U.S. says threaten National Reconnaissance Office satellites. How do you react to and plan for that as a service?**

A: In every talk I give, I say, 'Space is a warfighting domain, just like air, land, and sea.' One of the things that we've found, I've learned, and I know *we've* learned, is the implications of that statement are significant. The other thing that I always say in every speech is that we want to deter conflict from beginning [in] or ascending into space. The thing that I have learned [is] the value of communicating what an adversary is doing in space. You have seen me in my former [U.S. Space Command boss] hat talk more broadly about what we're seeing, ... what Russia has been doing over the last several months. I think it's important to have a conversation on what [are] safe and professional behaviors in space.

The value of partnerships is really important. The work that we're doing with our partners, largely Five Eyes partners, plus France, Germany, and Japan, is something that the Space Force is really focusing on. ... We still have data-sharing arrangements with many different organizations in many countries, to keep the domain safe for all. We're progressing onto not just data-sharing, but training together, operating together, exercising together, war-gaming together, building capabilities together. When we stood up U.S. Space Command ... I designed an organization called the Combined Force Space Component Command. That was purposely done to make that a combined organization ... with our partners. It's the first time we've ever had that.

A big, ripe area for the Space Force that we're working hard on is overclassification. If you want to deter, you have to be able to help shape an adversary's calculus, and that requires being able to communicate. Right now, we're overly classified. I think we're making some really good work on the strategy on what you would reveal and what you would conceal, which then drives the security architecture that will be beneficial for our efforts to deter.

(Raymond declined to answer how the military responded to Russian satellite activity.)

**Q: What are you planning to work on with Capitol Hill in the next year?**

A: We've done a lot of design work [on] ... how do you integrate the Reserve forces into the Space Force? Today we operate very closely with the Air National Guard and the Air Force Reserve. We think there is [a way to include Reservists differently], and we've done the work to be able to do that. ... I would expect that that plan will be approved here, probably before [December]. ... But it's really innovative. That will require some legislative proposals to make that happen.

The alternate acquisition system that we've designed, once we get finally coordinated, will require some legislative changes. We'll work very closely with the Hill to be able to do that as well.

**Q: Where do you stand on adopting naval ranks like the House proposes?**


A: I really appreciate the strong bipartisan support that Congress has given us. We're working very closely to develop the rank structures that we think are important for our force going forward. ... Some of these culture pieces are things that we want to get right. We want to give an opportunity for the folks that are in our service to have a voice. We've just brought in the first 2,100 folks in the service. We've been very deliberate in our efforts to make sure that these things that we do, either the seals or the flags or the naming convention, mean something to the Space Professionals.

We have been in conversations with the staffers, and I've had a couple conversations with members on our ideas on rank.

**Q: How have you seen the understanding of military space capabilities change across DOD in recent months?**

A: Earlier in my career, you really had to fight to get a seat at the table. It was hard to get people to understand the importance of space. We were just beginning, back when I was a young captain, to integrate space into the fight. Desert Storm was what some call the first space war, the first where we integrated capabilities. That has continued to mature over the years.

You don't have to have that conversation anymore. They understand it. ... On the warfighting side, they understand the value of a U.S. Space Command. They already see the benefits of that command standing up, and same thing holds true on the organize, train, and equip side. I have not felt at all like anything other than, 'Hey, we're glad you're here, and keep moving. This is really important to us.'

Both on the U.S. Space Command side and on the Space Force, I have a stronger voice in requirements. When you elevate from a component of a service to an independent service, there's a big difference between being an Air Force major command commander and being a service chief. That elevation of voice in really critical settings, in budget requirements, and in The Tank, is important. 

Two B-1Bs lineup at Andersen Air Force Base, Guam, on Oct. 21, 2020, during a Bomber Task Force deployment to exercise agile combat employment skills. ACE answers the National Defense Strategy's call for "operational unpredictability" in the face of threats to traditional bases by building the resilience to rapidly relocate and operate without all the support at a conventional base.



An unarmed Minuteman III intercontinental ballistic missile launches during an operational test on Oct. 29, 2020, from Vandenberg Air Force Base, Calif. The Air Force has 400 Minuteman IIIs in silos spread throughout Montana, North Dakota, and Wyoming, and periodic test launches ensure the systems are working and safe. Over the next decade, they will be replaced by the Ground-Based Strategic Deterrent, a project that could cost as much as \$85 billion once all costs are tallied.





Senior Airman Theresa Braak guides Sam through the “window,” one of nine obstacles he must master at Delaware’s Dover Air Force Base obedience yard on the way to becoming a military working dog. Other skills in his future: Patrolling and taking down bad guys, and potentially a specialty like explosive or narcotics detection. Military working dogs also aid in disaster response and search and rescue.



By John A. Tirpak

# Parsing the New Electromagnetic Strategy

The electromagnetic spectrum is congested, contested, and constrained. The new Pentagon strategy stops short of designating the spectrum as a warfighting domain, but emphasizes the need to find new ways to share spectrum with civilian users. Here, Airmen set up a satellite dish during Exercise Heavy Rain in France in January 2020.



Staff Sgt. Devin Boyer

The Pentagon's new electromagnetic spectrum (EMS) warfare strategy seeks major changes in how the U.S. military will fight in the EMS realm, calling for military and commercial entities to share the spectrum and for a potential future EMS combatant command.

While the strategy describes EMS as a "critical battlespace," it does not declare it a discrete warfare "domain," as some experts have urged for years. Instead, it continues to view the EMS as enabling combat in air, land, sea, space, and cyberspace. An implementation plan is due in April 2021.

The "Electromagnetic Spectrum Superiority Strategy," unveiled Oct. 29 and 18 months in the making, calls on the military to dynamically shift frequencies and to "hide" in civilian bands to complicate jamming and eavesdropping. It acknowledges that billions of personal devices and thousands of commercial satellites are competing for bandwidth and argues for interleaving the military and commercial uses rather than reserving specific frequency bands for each. Some bands previously off-limits to commerce may be available in the near future; the Pentagon strategy lists bolstering economic growth among its goals.

Based on the 2018 National Defense Strategy and built by the Electromagnetic Spectrum Operations Cross-Functional Team (CFT), the new strategy supersedes the Pentagon's 2013 EMS and 2017 electronic warfare strategies. The CFT was created by the 2019 defense bill to address electronic warfare, but expanded to include the whole EMS.

Artificial intelligence could enable dynamic frequency changing, but moving in and out of today's commercial bands would require the Federal Communication Commission to change its rules. Frequency-changing AI software would be employed by military and commercial entities alike, with AI deciding second by second which users get access to which frequencies. Fixed-frequency systems would eventually be replaced.

The strategy represents "a unique opportunity" to redesign spectrum warfare for "multi-domain fighting," said a Pentagon official at the strategy's roll out. New tactics and technologies will better thwart enemies and defend against attacks in cyberspace, he said, calling for better means to "patrol" EMS.

The strategy sets five goals: develop superior EMS capabilities; evolve to an agile, fully integrated EMS infrastructure; pursue Total Force EMS readiness; secure partnerships in EMS; and establish effective EMS governance.

The strategy does not mention the joint all-domain command and control concept (JADC2), but JADC2 depends on success in EMS warfare, another official said.

Threats to the military's ability to use the spectrum are constrained by which parts of the spectrum are available, the Pentagon said, citing the "three C's": "the spectrum is *contested* by more enemies; *congested* by frequency crowding; and *constrained* by which spectrum is available for use. "EMS vulnerabilities have become increasingly sophisticated and easily attainable," the strategy states. The U.S. must preserve its military's "freedom of action" while also addressing the voracious commercial appetite for bandwidth.

## BIGGEST CHALLENGES

The biggest challenge in the strategy will not necessarily be hardware or even AI, but establishing "common links to coordinate and integrate certain capabilities," said Glenn Carlson, president-elect of the Association of Old Crows, the electronic warfare association. Such links are needed to integrate "not just across our services, but across allied services." The other main hurdle, he said, will be training EMS practitioners across the force.

An Old Crows issue brief released in mid-November said the Defense Department "simply does not have established standards of training, nor the sheer number of personnel currently to achieve" the new Pentagon Joint EMS doctrine. It seeks to ensure "all personnel

are indoctrinated and trained at the appropriate level on EMS core concepts that enable an EMS maneuver mindset."

"It is not simply about adding personnel," the issue brief continued, but about establishing required skill sets, training standards, and measures of progress.

"We don't have enough people out there filling billets," said Ken Miller, director of outreach for the Old Crows. "We don't have the expertise, we don't have a way to train them up through the services and in support of [Combatant Commanders]."

A Pentagon official said DOD recognizes that U.S. Strategic Command lacks the "manpower and structure to accomplish all of the things they need to do within the electromagnetic spectrum." While STRATCOM owns responsibility for EMS today, "the operational level needs to be looked at," the official said.

Undecided at this stage is the "governance" of EMS.

The Old Crows' Carlson said DOD will have to choose. "Should this be under a unified command? Should it be under the Chairman?" he asked. "I could argue either way. But because it goes across all the services, the higher, the better."

The implementation plan should determine "where is the proper home for this."

In fact, the Senate version of the 2021 National Defense Authorization bill would make EMS Operations "Chairman-controlled activity," Miller noted, but it's not clear if that change will survive the House-Senate conference.

"We're open to alternatives," Miller said. The goal should be to have electromagnetic spectrum operations "as close as possible to the warfighter, so ... they can respond to threats immediately, and also have ... reachback."

In September, the Pentagon's chief information officer (CIO) was designated as the lead for executive governance of EMS activities. But the Old Crows' position is that DOD needs a separate organization "to grow, integrate and manage the EMS enterprise across the joint force with the authority to hold COCOMs and the military services accountable, and coordinate with the CIO to ensure a uniform, DOD-wide approach to EMS superiority."

## A DOMAIN ... OR NOT

Air Force Brig. Gen. Darrin P. Leleux, deputy director for the Secretary of Defense's electromagnetic spectrum operations cross-functional team, is leading the implementation effort. He explained the "current thinking" that EMS "is an enabler for all the other five domains" at a C4ISRNET online event Nov. 12. "For example, you can't have air superiority without EMS superiority," he said.

The Pentagon appeared on the verge of declaring EMS a fighting domain as recently as 2015, but instead bestowed that status on cyber and formed a number of joint organizations to prosecute electronic warfare.

"The Pentagon has punted on the issue," said Lt. Gen. (Ret.) David Deptula, dean of the Air Force Association's Mitchell Institute for Aerospace Studies. DOD "does not want to add another domain to its lexicon, whether—by definition—the EMS actually is one or not."

Deptula said the case can be made that cyber is a "subset" of EMS, a "form of electronic warfare," and that designating EMS as a fighting domain—and not merely as a supporting element—"could provide a firm, logic-based foundation upon which the cyber and electronic warfare communities could build a truly electromagnetic-savvy warfighting force."

Recognizing EMS as a domain "would bring focus to the multiple, often incongruent, and disconnected electronic warfare and cyber operations ongoing" among the services, combatant commanders, and defense agencies, he said. Deptula was the first Air Force deputy chief of staff for intelligence, surveillance, and reconnaissance.

The Old Crows' Carlson said that while EMS likely is a fighting domain, designating it as such is probably more than the Pentagon can handle at this point.

"Standing up the Space Force" is a heavy task, he said, and designating EMS as a fighting domain would incur costs and a level of effort that might exceed the Department's ability to manage, he said. Stating the need for EMS superiority "and how it overlays the other domains, that's a big step forward and a real positive step," he said. The domain argument is not over, merely postponed.

Leleux said there's no budget associated yet with EMS implementation, and the plan will not be completed until after the fiscal 2022 budget is submitted to Congress. Yet as the implementation team develops the tasks that must be accomplished to bring the strategy to reality, his team will have to develop "a sense of cost." For each task, he wants to know "the resources necessary to accomplish that task, and the risk associated with not accomplishing that task." This will inform the trade-offs as these bubble up to budgetary discussions.

Rethinking how spectrum is shared is still another issue. Miller said, "There is obviously a lot of discussion about whether our antiquated way of dividing up the spectrum—auctioning it off to commercial—is the way to go ... and whether we need to move toward more dynamic spectrum sharing, or other models that might give DOD a little bit more leverage in how we use spectrum."

The issue has Congress' attention. Right now, "the way we meet commercial demands for 5G and preserve the bands of spectrum we need for military purposes ... isn't the best way," Miller added.

## EMS WING AND HIGHER


The Air Force will create a new Spectrum Warfare Wing in 2021, said Air Combat Command Chief Gen. Mark D. Kelly, in an interview with Air Force Magazine. The new unit will fall under the Air Force Warfare Center and will be the first-ever USAF wing focused on EMS. Kelly said the unit will be built up from the 53rd Electronic Warfare Group at Eglin Air Force Base, Fla. That unit already does "a lot of our work across the spectrum" and provides expertise for programming labs and "the sensing grid," he said.

China's and Russia's EMS capabilities "keep me up at night," Kelly said, more than their advancing kinetic capabilities, stealth aircraft, or precision navigation capabilities.

"Their ability to jam across" EMS, "wherever they choose to, is significant," Kelly said. Adversaries have developed jamming capabilities from "extremely low frequencies" up through high, very high, and ultra-high frequencies, and the Air Force's sensing and command and control bands, he said. They also have good jamming capabilities in typical radar frequencies such as the X, K, Ku, Ka bands, and in the infrared and ultraviolet bands, he added.

These advances are worrying, Kelly said, especially in light of adversary capabilities in 5G and quantum computing, and they squeeze the Air Force's ability to use the spectrum freely.

Deptula said what's really needed is an Information Warfare major command to integrate the effects of ISR, cyber, and EW. The quicker it happens, "the quicker it will be able to adapt to the information age."

Recent high-level discussions "on establishing an undersecretary of defense for Information, that would have oversight of the DOD's information warfare portfolio" he said, is "welcome news ... and long overdue." Such an official would have purview over "strategies, policies, acquisition, budget, and international engagement that would include the Department's cyber, EMS, and influence operations portfolios," according to Deptula. It would be a great step toward "assembling a concerted approach to achieve information superiority." 



R. Nial Bradshaw/USAF

The Air Force has prioritized F-35 purchases and Congress has plussed up its requests in each of the past two years. Whether that could shift under a Biden administration remains unclear and could depend on who gains control of the Senate once runoff elections in two Georgia Senate races are tallied in January. Air Force F-35As lined up for a combat power exercise at Hill Air Force Base in Utah January 2020.

# What a Biden Administration Means for Defense

Experts differ on how drastically Biden will cut defense spending.

By Rachel S. Cohen

**P**resident-elect Joe Biden, is expected to bring a middle-of-the-road defense policy to the White House in January, drawing on priorities from both Presidents Barack Obama and Donald Trump.

Budget austerity was going to be an issue regardless of who won the election; leaders anticipated a period of little to no growth even before the COVID-19 pandemic struck. That could affect the status quo more than Biden expected, noted Michael E. O’Hanlon, foreign policy research director at the Brookings Institution. Defense and related spending is set to be about \$740 billion in 2021.

Conservatives worry a Democratic administration spells trouble for funding that has steadily grown since the 9/11 terror attacks. But budget watchers differ on how aggressively Biden would pursue cuts.

Lawrence Korb, a senior fellow at the Center for American Progress, expects Democrats won’t

**“Defense budgets are probably going to be flatter in the coming years, no matter who wins the election.”**

—Michèle Flournoy, former undersecretary of defense for policy

try to take a large bite out of defense spending. Republicans who fear vast underfunding for the military should remember that Obama requested more for the Defense Department in his first budget as President than Trump did in his own first request, he said.

“Even under Trump, they have projected flat budgets for the next couple years,” said Korb, who served as assistant secretary of defense for manpower, reserve affairs, installations, and logistics in the Ronald Reagan administration. “Biden has never been part of the [Bernie] Sanders [I-Vt.] wing of the party or [Elizabeth] Warren [D-Mass.] wing [with big cuts]. I think it’ll be pretty much the same.”

Proposals for large cuts, like Sanders’ attempt to shrink the Pentagon budget by 10 percent, have failed to garner much support in Congress.

“If the Democrats had won a big victory in the Senate, I think you would have seen the defense budget being cut maybe by 5 percent or something like that,” Korb said.

Republicans will temper any proposals to dras-

tically downsize defense spending and will try for small increases to the defense budget to keep up with inflation, said Thomas Spoehr, director of the Heritage Foundation's Center for National Defense.

The election results are likewise unlikely to spur significant changes to either the 2021 defense spending or policy bills, which Capitol Hill had yet to finalize as of mid-November, or the Pentagon's fiscal 2022 budget request due out early next year, experts said. A Democratic executive branch could still ditch low-yield nuclear warheads and plans for a sea-launched nuclear cruise missile in the 2022 submission, among other programs unpopular on the left.

As chairman of the Democratic-led House Armed Services Committee, Washington state Rep. Adam Smith will be an ally to the White House on defense and a mediator between Biden and congressional progressives. He believes the defense budget could hover around \$720 billion to \$740 billion in the coming years. He argues that a spending overhaul must be justified by a revamped national security policy, and is optimistic that redirecting some money away from the nuclear enterprise could pay for other wish list items.

Analysts anticipate DOD will put the funds it does receive toward a similar slate of priorities.

The Trump years brought a renewed focus on competition with Russia and China as part of the 2018 National Defense Strategy. While Smith recently called the blueprint "a recipe for a very dangerous and unnecessary Cold War," experts believe a Biden plan would look quite familiar.

"The National Defense Strategy is pretty much where we ought to be," Korb said. "The big thing is, and we've gone through this so many times, 'Oh, we're going to stop worrying about these small wars' ... you can't do that."

China and Russia should remain at the center of an updated strategy as the greatest military threats to the United States, analysts said. "It probably won't call it, 'great power competition,' but it will be essentially the same thing by another name," said Todd Harrison, director of the Aerospace Security Project at the Center for Strategic and International Studies.

The main tenets of the National Defense Strategy—increased lethality, better alliances, and reform—will stay the same, Spoehr added.

Biden's Pentagon will continue pursuing cutting-edge technologies such as maneuverable hypersonic weapons and autonomous combat vehicles, experts said. The department is likely to be more vocal on climate change as a national security threat, support increased humanitarian aid, and allow transgender Americans to serve in the armed forces. Democrats would also delay or avoid arms sales to countries with spotty human rights records.

## BIDEN'S SECDEF?

In carrying out those policies, Biden's Pentagon may be led by America's first female Defense Secretary. Former Undersecretary of Defense for Policy Michèle Flournoy has long been seen as a top pick for a Democratic administration. Another name that have been floated is Army combat veteran Sen. Tammy Duckworth (D-Ill.).

If nominated and confirmed, Flournoy, who founded the Center for New American Security, would lead a Pentagon facing possible tightening budgets with a need to modernize and update its policies to address a growing threat from China. In recent writings and speeches, Flournoy has hinted at what her top priorities would be in the department, in-

## Pentagon Transition Team

Once General Services Administration boss Emily W. Murphy formally recognizes former Vice President Joe Biden as the winner of the 2020 presidential election, the transition team, which will be led by Kathleen H. Hicks from the Center for Strategic and International Studies (CSIS), will work directly with federal agency employees to begin pivoting to the policy priorities of the Biden-Harris administration. Other team members and their most recent employers include:

- Susanna V. Blume, Center for a New American Security
- Sharon E. Burke, New America
- Lisa Coe, OtherSide Consulting
- Melissa Dalton, Center for Strategic and International Studies
- John L. Estrada, Department of State (Ret.)
- Victor Garcia, Rebellion Defense
- Lt. Gen. Karen Gibson, USA (Ret.)
- Michelle Howard, George Washington University
- Andrew Hunter, Center for Strategic and International Studies
- Mike McCord, Stennis Center for Public Service
- Farooq A. Mitha, Imbue Group
- Frank O. Mora, Florida International University
- Michael Negron, State of Illinois
- Stacie L. Pettyjohn, RAND Corp.
- Ely Ratner, Center for a New American Security
- Deborah G. Rosenblum, Nuclear Threat Initiative
- Lisa Sawyer, JPMorgan Chase
- Shawn Skelly, CACI International
- Terri Tanielian, RAND Corp.
- Veronica Valdez, Port of Seattle
- Debra Wada, Senshi Ame Advisors
- Christine E. Wormuth, RAND Corp.

cluding investing in emerging technologies, such as the Air Force's Advanced Battle Management System, and focusing on ways to make current systems more survivable and capable versus large new acquisition programs like is typical for new aircraft and carriers.

"Defense budgets are probably going to flatten in the coming years, no matter who wins the election," Flournoy said in August. "That means you have to make trade-offs. That means you have to make many hard decisions. It means you probably need to buy fewer legacy forces in order to invest in the technologies that will actually make the force that you keep more relevant, more survivable, more combat effective, and better able to underwrite deterrence."

Defense policy watchers on the left have urged the next administration to extract the U.S. from myriad conflicts in the Middle East and Africa and bolster diplomacy to resolve them. The presumptive President-elect wants to bring thousands of U.S. combat troops home from Syria, Iraq, and Afghanistan but leave up to 2,000 personnel on the ground there for special operations.

One tough strategic choice Biden could make to create more wiggle room in the defense budget might be to pare back military presence, O'Hanlon said. For instance, DOD could reduce its rotating forces in Europe, as fighting Russia in the Baltics was a bigger concern five years ago than it is now, according to O'Hanlon. Permanently basing troops in places like Poland would require fewer people than a rotating

force of multiple Army brigades, he added.

He also suggested pulling back from Bahrain, Kuwait, and Saudi Arabia—countries where America’s military presence provides a staging ground for operations in the Middle East.

## SENATE CONTROL

Gordon Adams, who served as the senior White House budget official on national security in Bill Clinton’s administration, believes Biden’s priorities will heavily depend on which party controls the Senate.

The two Georgia Senate seats are headed to runoff elections in January that will determine which party controls the upper chamber—Democrats in a 50-50 split with the Vice President as tie-breaker, or Republicans with a 51- or 52-seat majority. As of mid-November, Republicans had a slight lead at 50-48.

If Democrats get the upper hand, either through an outright Senate majority or because Vice President-elect Kamala Harris would cast the tiebreaker vote in a 50-50 split, the White House would focus on health care, climate change, and jobs, Adams said.

Negotiating with a GOP-led Senate would look much like the past several years, he said: “Little likelihood of deep cuts in defense, despite progressive caucus efforts. Not much growth, perhaps less than inflation.” New technologies and naval forces would be the priority then, he argued, pulling funds from areas like nuclear weapons programs and Army manpower.

“For the Air Force, I would expect trims in the F-35 buy in the outyears, slower bomber progress, [intercontinental ballistic missile] cuts,” he said. It’s also possible Democrats could try to scale back ambitious plans for the Space Force, such as growing it into a separate department like the Army, Navy, and Air Force.

Harrison cautioned against pulling back investment in military space as a “knee-jerk reaction” to undo the Trump administration’s work. He expects the Space Force is here to stay, but that other pieces of the military space enterprise could face more scrutiny.

“Things like the Space Development Agency (SDA), that might not have the same support under a Biden administration,” he said. “They may try to fold it into the Space Force sooner, and they may not be enamored with some of the missions that the SDA is attempting to take on, particularly the missile sensing layer. Those programs could be at risk.”

If a Republican Senate has to cut deals with a Democratic House and President, GOP lawmakers could use Democratic priorities as leverage to keep divisive nuclear weapons programs, according to Spoehr. He argues the GOP won’t trade off sea capabilities, and will try to keep F-35 procurement from slowing down.

“They’d be willing to compromise, I think, on some of these areas of force posture, like forces in Germany, Korea,” Spoehr added. “There’s many Republicans who don’t think we ought to vacate some of these places where we’ve been talking about.”

Slim majorities in both chambers of Congress can moderate spending levels and force more bipartisan efforts to compromise on contentious issues, analysts predict. Republicans have retaken some of the advantage Democrats won in the House in 2018, and the blue senators who won in red states won’t be “raving liberals,” Korb said.

“Most defense issues don’t break down neatly along partisan lines,” Harrison added.

Nuclear weapons will remain a major sticking point between the two parties during Biden’s term. At a minimum, the administration is expected to push back on the “low-yield” W76-2 nuclear warhead for submarine-launched missiles, plus a new sea-launched cruise missile. Some believe the land-based intercontinental ballistic missiles and the air-launched cruise missiles could be in jeopardy.

Korb said ICBMs are likely here to stay because of their bipartisan support from members of Congress whose states are home to the missile fields. If the Democratic national security establishment wanted to change course on ICBMs, they would have done it during the Obama years, Harrison noted.

“They studied it and they considered it and they did not [change course]. They had every chance,” Harrison said of the Obama administration.

## STRATEGIC ARMS

A new Nuclear Posture Review could leave open the possibility of deploying fewer than 400 ICBMs—the current number—across the northern U.S. in the 2030s.

“In all likelihood, they wouldn’t want to reduce the number of missiles unless we’ve got an agreement with Russia and/or China, or bilateral or trilateral reduction,” Harrison added.

Analysts anticipate Biden will put his own stamp on arms control by reversing the Trump administration’s decision to leave major international treaties.

Biden is expected to revive the Iran nuclear deal, known as the Joint Comprehensive Plan of Action (JCPOA), under which Iran dismantled much of its nuclear program before the U.S. withdrew in 2018. The administration may rejoin the Open Skies Treaty, which allows a global coalition of nations to inspect each other’s military installations from the air. It can also pursue new terms to govern the use of intermediate-range nuclear weapons, after the U.S. withdrew from that pact in 2019.

Those issues make some feel like they’re replaying Biden’s eight years as Obama’s veep.

“More like an Obama third term, ... that’s probably the best way to think of it,” Harrison said.

Kathleen H. Hicks, director of the international security program at the Center for Strategic and International Studies, will lead the Defense Department agency review team (ART), which will review the agency’s operations and begin the process of handing it off to new leaders in January. Several other members of the transition team also come from CSIS and other prominent research institutions, including the Center for a New American Security, RAND Corp., and New America.

Their work experience spans years in the defense, foreign policy, energy, technology, and other sectors. Some names are well-known to the military, such as former DOD comptroller Mike McCord. Others have a less-traditional resume, like Michael Negron, a Navy veteran who is now assistant director of the Illinois Department of Commerce and Economic Opportunity.

Many people on the list have ties to past Democratic administrations as well, like Susanna V. Blume, a former deputy chief of staff to the deputy secretary of defense under Obama and Trump, and Debra Wada, who served as assistant secretary of the Army for manpower and reserve affairs under Obama.

Notable to Air Force watchers, the DOD review team includes Stacie L. Pettyjohn, director of RAND Project Air Force’s Strategy and Doctrine Program, and Veronica Valdez, former special assistant and deputy chief of staff to Air Force Secretary Deborah Lee James.

They will begin meeting with former agency officials and the experts who track those organizations, as well as with officials from think tanks, labor and trade groups, and other non-governmental organizations, according to the transition team.

The Biden-Harris transition team touted the diversity of its agency review teams, saying the presumed President-elect and Vice President-elect are “committed to building an administration that looks like America.”

“The teams have been crafted to ensure they not only reflect

the values and priorities of the incoming administration, but reflect the diversity of perspectives crucial for addressing America’s most urgent and complex challenges,” as stated in the Biden-Harris transition team release. “Of the hundreds of ART members to be announced, more than half are women, and approximately 40 percent represent communities historically underrepresented in the federal government, including people of color, people who identify as LGBTQ+, and people with disabilities.”

# Air Force Honors Five Airmen for Heroism While Flying

By Amy McCullough and Brian W. Everstine

**W**ithin a week’s time this fall, the Air Force bestowed one Silver Star, three Distinguished Flying Crosses, and a Bronze Star with Valor upon five Airmen for their heroic actions in the air.

Staff Sgt. Nicholas Brunetto, a pararescueman with the 38th Rescue Squadron at Moody Air Force Base, Ga., received the Silver Star—the nation’s third-highest award for valor in combat—in recognition of heroism displayed during a February 2020 ambush in Afghanistan.

Lt. Col. Adam C. Darrow, 58th Operations Group Detachment 1 commander, and Tech. Sgt. Samuel T. Levander, a special missions aviator assigned to the 71st Operations Squadron, received the Distinguished Flying Cross on Nov. 3, while Lt. Col. John R. Leachman was awarded the Bronze Star with Valor for their roles evacuating forces before and after the Jan. 7 Iranian ballistic missile attack on al-Asad Air Base, Iraq.

Two days later, the service awarded Michigan Air National Guard A-10 pilot Maj. Brett DeVries a Distinguished Flying Cross for dramatically guiding his Warthog to a belly landing in 2017 after a catastrophic gun malfunction blew the aircraft’s canopy off and prevented the landing gear from functioning properly.

## HEROISM IN AFGHANISTAN

While deployed to Afghanistan on Feb. 8, 2020, Brunetto and the Army Special Forces team he was attached to were ambushed. Eight U.S. service members and three partner forces soldiers were critically injured. Brunetto realized one of the troops needed a blood transfusion to survive and ran back through the line of fire to get the necessary medical equipment.



Airman 1st Class Ireland Summers

Lt. Col. Adam Darrow



Airman 1st Class Ireland Summers

Lt. Col. John Leachman



Airman 1st Class Taryn Butler

Staff Sgt. Nicholas Brunetto



Airman 1st Class Ireland Summers

Tech. Sgt. Samuel Levander



Terry Atwell/USAF

Capt. Brett DeVries

“I often emphasize that effective warriors must have two things: discipline and purpose,” said Maj. Gen. Chad P. Franks, commander of 15th Air Force, during the Oct. 29 ceremony at Moody Air Force Base, Ga.

Brunetto repeatedly exposed himself to enemy fire without regard to his own life as he carried his wounded comrades to the helicopter extraction point.

“The Silver Star is representative of an Airman’s willingness to place their life in danger against the enemies of America for their comrades,” Franks said. “It reflects the American military fighting spirit and selfless service to our nation. Nobody would deny Nick’s selfless service to America and his team that day.”

## VALOR AT AL-ASAD

On Jan. 7, 2020, Iran enacted its revenge for the U.S. killing of Iranian Quds Force Commander Qassem Soleimani, raining ballistic missiles down on al-Asad Air Base, Iraq, injuring more than 100 personnel and severely damaging the base.

Darrow and Levander were deployed as part of the 7th Expeditionary Special Operations Squadron, Special Operations Command-Central when they received a notice to evacuate because of an “imminent theater ballistic missile threat.” The Airmen were part of a three-ship of aircraft tasked with evacuating 194 special operations forces. They filled their CV-22 Osprey to its maximum gross weight limit, and within about 90 minutes of the initial notification flew 132 of those personnel out of the threat area.

Iraqi forces prevented a runway landing, so the three-ship of Ospreys flew a minimum separation, maximum gross weight formation to rolling landings at a parallel taxiway. When the aircraft returned to the threatened location, they loaded another 62 special operators on board but had to divert to a third location because of a blocked refueling point and a “critical fuel state,” the award citation states. While at the third location, the crews came under missile attack.

“Ensuring his aircraft was safe to continue, despite several

flight control malfunctions and an ill crewmember, he flew with the formation to a desert landing site to link up with other contingency forces and executed a zero illumination, low visibility landing in close proximity to 18 other aircraft, 19 hours into a standard 12-hour crew duty day,” Darrow’s citation reads.

Darrow and Levander also infiltrated special operations forces as part of a 13-aircraft dissimilar formation assault force to reoccupy the attacked base, ending their mission 24 hours after the crew day began.

Leachman distinguished himself by meritorious achievement during an operation “in support of a presidentially directed combat mission,” his award citation states. He led a deployment of Ospreys from RAF Mildenhall, U.K., to al-Asad, departing within 24 hours of notification. He was tasked with integrating with 15 other aircraft, including fixed-wing and rotary-wing close air support aircraft, rotary-wing assault aircraft, special operations mobility aircraft, and both manned and unmanned intelligence, surveillance, and reconnaissance aircraft, the citation states.

After being notified of the missile threat at al-Asad, he was able to quickly locate all 68 on- and off-duty personnel, loading them on an Osprey within 90 minutes of the notification.

Eighteen days after the attack, Leachman’s unit was specifically requested to carry a fallen service member from the Syrian border through poor weather, long distance, and in a high-threat environment, the award citation states.

“Through his leadership, multiple other missions were flawlessly accomplished, including Army Special Operations Aviation support for ammunition and refueling equipment, Army Ranger movements, and airlift from the Baghdad Embassy helipad for key personnel,” the citation states.

## A DRAMATIC BELLY LANDING

DeVries, then a captain with the 107th Fighter Squadron at Selfridge Air National Guard Base, Mich., was flying a training flight on July 20, 2017, when his A-10’s GAU-8 Avenger cannon malfunctioned, sending a “donut of gas” through the aircraft, blowing off the canopy while flying at 325 knots. The malfunction caused other systems to fail, slamming DeVries’ head against his seat. He was able to gather himself and, with mission-planning papers flying out of his cockpit, made contact with his wingman and maintainers back at Selfridge.

The team decided to fly to nearby Alpena airfield, situated about 250 miles south of the base. DeVries ducked behind the canopy to avoid the wind to try to make an approach to the airfield. When he attempted to lower the landing gear, it got stuck. Maj. Shannon Vickers radioed him to try to retreat the gear, thinking a belly landing would be better than one with partially protruding landing gear.

Vickers flew on DeVries’ wing, guiding him in to a belly landing at Alpena. Video shows the A-10 without a canopy gliding down to a smooth belly landing and skidding to a stop on the flight line.

DeVries, a senior pilot, has more than 2,000 flight hours, including 830 in combat. Brig. Gen. Rolf E. Mammen, commander of the 127th Wing, said during the award ceremony that DeVries “demonstrated a level of Airmanship to which we should all aspire.”

“As a commander, I cannot tell you how proud I am of Major DeVries and our entire 127th Wing, who work so hard every day to ensure that we are ready to fly, fight, and win,” he said in a 127th Wing release.

Air Force Secretary Barbara M. Barrett presented the award,

saying it is the oldest military aviation decoration “awarded for heroism or extraordinary achievement that is ‘entirely distinctive, involving operations that are not routine.’ Today, Major DeVries, you will join the ranks of some other American heroes.” ★



Senior Airman Michael Hunsaker

Staff Sgt. Elizabeth Caulfield, standing, guides an Airman on mission operations in 2018 at the National Air and Space Intelligence Center on Wright-Patterson Air Force Base, Ohio.

## Space Force Planning Guidance Calls for Intel Hub, New Training

By Rachel S. Cohen

The Chief of Space Operations’ new Planning Guidance directs the service to create entities like a National Space Intelligence Center, begins to set benchmarks for improving the force, and offers insight into future operations.

Chief of Space Operations Gen. John W. “Jay” Raymond rolled out the planning document Nov. 9 to communicate “my intent and [define] the capabilities and culture the USSF will pursue over my tenure,” he wrote. It also elaborates on priorities that military leaders have touted over the course of the Space Force’s first year, such as speed, flexibility, technological savvy, and international cooperation.

While the guidance reads much like the Space Force’s first doctrine document that was released in August, it includes several notable updates about how the young service will proceed.

For one, Raymond wants to move parts of the National Air and Space Intelligence Center (NSIC) to create a co-located National Space Intelligence Center at Wright-Patterson Air Force Base, Ohio. Military officials and experts have floated that possibility over the past year as the Pentagon grapples with improving intelligence collection in space.

“In concert with the Space Force [intelligence, surveillance, and reconnaissance] enterprise, the NSIC will provide a framework for growth to meet anticipated demand for increased space intelligence at foundational, tactical, operational, and strategic levels,” the guidance said. That ISR enterprise will be spearheaded by the senior intel officer in Space Force headquarters’ operations office.

The service did not immediately answer whether NASIC, which dates back to 1961, would revert to being the National Air Intelligence Center. It's unclear how soon the NSIC will stand up.

A top military space official said last year the Department of the Air Force needed to have a better understanding of what people, processes, and capabilities would provide comprehensive information on what's happening in space. The push for more space intelligence support comes as the Space Force is maturing its ties with other agencies that handle the same mission, like the Defense Intelligence Agency, National Geospatial-Intelligence Agency, National Reconnaissance Office, and National Security Agency.

The Space Force also wants to create a Space Warfighting Analysis Center (SWAC) to "develop future force structures that meet evolving mission requirements, are resilient to the threat, and are cost-informed," the document said. Much like the Air Force Warfighting Integration Capability group, the SWAC will hold wargames that shape those plans to benefit the joint force.

Officials at Space Force Hq. are getting new marching orders as well. The headquarters includes offices to manage human capital, operations, strategy and resources, and technology and innovation, plus a staff director. In the next year, the staff director will set standards for how the Space Force approaches "structured, data-driven decision-making," Raymond said.

The Technology and Innovation Office will also look for ways to automate and digitize daily work so Space Force members can spend 15 percent more time on advanced training.

Raymond's guidance pushes forward some of the same practices the Air Force has adopted in recent years. He expects subordinates to act on their own authority unless a superior officer specifically needs to make the call. In preparation for a world where artificial intelligence and machine learning increasingly power military software, Raymond also wants commanders to create operational plans that either people or machines can carry out.

Those plans will help warfighters and computers decide when a human should be in charge of a decision, and what tasks software can carry out on its own.

"Commanders at all levels must ensure crew commanders and mission directors are proficient at applying warfighting concepts like acceptable level of risk, self-defense, risk to mission, and risk to force, and prepared to make sound tactical decisions in a contingency," the guidance said. "We will recognize and reward expert system management and prudent risk acceptance to meet commander's intent."

The document notes that the Space Force should be less vulnerable to a "first-mover" attack, or a surprise maneuver in orbit that could spur the United States to escalate into a larger conflict.

"Adversaries will target vulnerable segments to degrade the larger architecture," Raymond added of satellites, ground controls, and other parts of the space combat enterprise. "We must ensure joint commanders are prepared to defend critical space assets that enable joint forces."

He also noted that he's willing to pursue more resilient, defensible systems sooner, at the risk of the Space Force's current inventory. That could mean stopping a development or procurement program before new technologies are ready, even if it limits military operations in the short-term.

Raymond told reporters Nov. 9 he expects a follow-on implementation plan with timelines and other specifics to be released in December. 



Gen. David Allvin received his fourth star and began serving as the Air Force Vice Chief of Staff Nov. 12, replacing retiring Gen. Stephen "Seve" Wilson, USAF's longest serving No. 2.

## Allvin Promoted to Vice Chief

By Brian W. Everstine

Gen. David W. Allvin received his fourth star and took over as the service's new Vice Chief of staff on Nov. 12 as Gen. Stephen W. "Seve" Wilson retired, having been the Air Force's longest-serving No. 2.

Allvin previously served as the director for strategy, plans, and policy for the Joint Staff.

He started his career as a C-141 pilot before becoming a test pilot evaluating the C-17 and C-130J. He previously served on the Air Staff as the director of strategy, concepts, and assessment, and has been the director of Air Force strategic planning, the director of strategy and policy for U.S. European Command, and commander of the 618th Air and Space Operations Center.

During the ceremony at Joint Base Anacostia-Bolling, Washington, D.C., Allvin said the "stakes I don't think have been higher. The future security environment is evolving in a way that plays right into the wheelhouse of the Air Force."

"I can't guarantee you what all I'll be able to accomplish on this team," he said. "But I have gas in the tank, I have got the energy to do this, and I've got the will to do it, and I'm excited to do it."

Air Force Chief of Staff Gen. Charles Q. Brown Jr., who hosted the ceremony, said he expects Allvin will serve as the brains behind the Air Staff, with himself doing the operations. "He's going to be behind the scenes making things happen," Brown said.

Wilson retired Nov. 13 after 39 years of service. He served four years and four months as Vice Chief, surpassing the previous record of time in the job set by Gen. Curtis E. LeMay, who served in the role from July 1957 to 1961. Throughout his career, Wilson accumulated more than 4,600 flight hours and 680 combat tours in B-1s and B-52s. He previously served as commander of Air Force Global Strike Command and the deputy commander of U.S. Strategic Command before joining now-retired Gen. David L. Goldfein to lead the service.

As the 39th Vice Chief of Staff, Wilson led initiatives such as Spark Tank, his Vice Chief's Challenge, and partnering with the Massachusetts Institute of Technology to create an "artificial intelligence accelerator." Through his time at Global Strike, STRATCOM, and on the Air Staff, he has also been a key leader pushing the development of the B-21 Raider.



During the ceremony, the Air Force announced it would rename building 905 at Joint Base San Antonio-Randolph, Texas, to “Wilson Hall” in his honor. As a salute to his time flying and commanding the Air Force’s bombers, a B-1 and B-52 flew over Anacostia-Bolling at the end of the retirement ceremony. ✪



Maj Gen. William Cooley, here at SBIR Pitch Day in Dayton, Ohio, in 2019, is charged with “making unwanted sexual advances” in violation of the Uniform Code of Military Justice.

## Former AFRL Boss Heads to Art. 32 on Sexual Assault Charge

By Amy McCullough

A military court will consider a sexual assault charge levied against former Air Force Research Laboratory boss Maj. Gen. William T. Cooley at an Article 32 preliminary hearing on Jan. 27, 2021, the Air Force said.

Cooley is accused of making “unwanted sexual advances by kissing and touching a female victim” on Aug. 12, 2018, in Albuquerque, N.M., according to a USAF release.

Air Force Materiel Command boss Gen. Arnold W. Bunch Jr. relieved Cooley of command on Jan. 15 amid an Air Force Office of Special Investigations inquiry, saying the service had lost confidence in the two-star general’s ability to lead. Cooley was reassigned as Bunch’s special assistant, and Lt. Gen. Gene Kirkland, commander of the Air Force Sustainment Center at Tinker Air Force Base, Okla., was tasked with reviewing the evidence associated with the misconduct allegations.

Cooley is charged with a single count of violating Article 120 of the Uniform Code of Military Justice, with three specifications related to sexual assault of the woman, according to the charge sheet. She is not a member of the military or a Defense Department employee.

Kirkland reviewed the facts of the case, “including evidence noted in the Air Force Office of Special Investigations Report of Investigation and consulting with legal authorities,” the service said, and preferred the charge against Cooley on Oct. 29.

During the preliminary hearing, which is similar to a civilian grand jury, a military judge will review the evidence and may hear from witnesses before determining whether “probable cause exists that the accused committed a UCMJ [Uniform Code of Military Justice] offense,” the Air Force said.

“The officer will also provide a recommendation on disposition of any offenses supported by the evidence,” according to an AFMC release.

Brig. Gen. Heather L. Pringle assumed command of AFRL in June. She replaced Brig. Gen. Evan Dertien, who was serving as acting commander after Cooley was fired. ✪

## Greece Wants F-35s, and Fast: It Could Take Used USAF Jets

By John A. Tirpak

Greece asked to purchase 18 to 24 F-35s and is willing to accept used USAF airplanes. In an official Nov. 6 request, Greece asks for an “immediate” purchase with deliveries in 2021, citing the timeline as “crucial.”

Industry officials said the rush could be related to European Union loan guarantees that expire in the coming months. The letter of request said the speed of delivery, configuration of the aircraft, and “the repayment plan” would influence any final deal.

Speaking on background, a U.S. defense official said the Air Force has “not identified any F-35s that are excess to need,” but the Air Force has in recent years waffled on the cost and work involved to upgrade its oldest F-35s to the current production standard. Selling the older jets could be a way to solve that issue. USAF has previously indicated it intends to use at least some of its older F-35s as aggressor aircraft.

The U.S. has urged Greece to buy the F-16V Block 70, the most advanced F-16 now available for export, but one official said there’s “a prestige factor” involved. A small batch of F-35s could also be a “force multiplier” for Greece’s existing F-16s, he said.

Greece’s neighbor and rival, Turkey, was an original partner on the F-35, but was drummed out of the program after it acquired the Russian S-400 air defense system. Industry officials speculated that F-35s built for Turkey, but never delivered, could answer Greece’s request. The U.S. Air Force is getting some of those aircraft, but not all.

“You could think of them as ‘pre-owned,’ but not necessarily ‘used,’” a defense official said.

To acquire brand-new F-35s, Greece would have to get in line: Lockheed Martin’s production capacity is spoken for through at least 2024. ✪

## COVID-19 Claims First Airman

By Brian W. Everstine

A member of the Texas Air National Guard died of COVID-19-related issues, becoming the first uniformed member of the Department of the Air Force and the ninth service member overall to die of the disease.

The Air National Guardsman has not been identified. The death was reported in a Defense Department tally of COVID-19 cases on Nov. 4. The Air National Guard reports its COVID-19 cases through the National Guard Bureau, instead of in the Air Force’s own reports.

As of Nov. 5, there have been a total of 58,968 cases of COVID-19 reported among service members. The Air Force has reported 15,744 cases, which include Active-duty Air Force, Space Force, and Air Force Reserve Command personnel, along with civilians, dependents, and contractors.

In the Air Force, 14 civilians, two dependents, and seven contractors have died from COVID-19. According to statistics released Nov. 3., there were 32 USAF personnel hospitalized with the coronavirus.

The Air Force has taken new measures to try to limit the spread of the virus, including testing service members who travel on “Patriot Express” flights from two airports. Patriot Express routes are flown by commercial jets that contract with the Defense Department to ferry military members and their families overseas. As of Nov. 2, travel restrictions remain at nine USAF installations across the globe. ✪



Airman 1st Class Jacob Gutierrez

An F-16 Viper from Shaw Air Force Base, S.C., takes off during Red Flag 20-2 at Nellis Air Force Base, Nev., on March 9.

## Pilot Error, Ejection Seat Blamed in Fatal F-16 Crash

By Amy McCullough

Pilot error and a series of ejection seat malfunctions led to a fatal F-16CM crash at Shaw Air Force Base, S.C., in June, accident investigators said in a report released Nov. 9.

First Lt. David Schmitz, 32, was conducting his first nighttime qualification training flight on June 30, including his first-ever attempt to refuel in midair and simulated suppression of enemy air defenses. But after unsuccessfully trying to refuel, Schmitz’s training mission was cut short and he headed back to the base.

When nearing the base, Schmitz, an Airman with the 77th Fighter Squadron at Shaw, misinterpreted the approach lighting system. He failed to identify where the runway began, hitting the localizer antenna array on the ground and “severely damaging the left main landing gear,” according to Air Combat Command.

The aircraft briefly touched the ground, then tried to circle back and land again. Shaw Airmen attempted to land the plane by catching the jet on a cable at the beginning of the runway, but the tailhook missed the cable. Damage to the landing gear caused the plane’s left wing to hit the runway.

Schmitz ejected from the fighter after missing the cable, but his parachute never deployed. He died after hitting the ground while still in the seat, according to the release.

The F-16CM is equipped with the Advanced Concept Ejection Seat (ACES) II, which is supposed to be capable of ejecting in any landing gear failure scenario while traveling at speeds up to 200 knots. Schmitz’s aircraft was going 120 knots, or about 138 mph, when he ejected.

“Based on the airspeed and altitude of the ejection, the mishap seat should have initiated a Mode 1 ejection,” the

report said. “As the seat exits the aircraft, the Digital Recovery Sequencer (DRS) is activated, which is responsible for providing seat stabilization, pilot/seat separation, and parachute deployment. For a Mode 1 ejection, the seat’s drogue chute is not used, expediting the deployment and inflation of the personnel parachute.”

However, there was a “critical failure” when the seat left the aircraft, and six of seven “pyrotechnic devices” that should have activated did not.

“This accident is a tragic reminder of the inherent risks of fighter aviation and our critical oversight responsibilities required for successful execution,” ACC commander Gen. Mark D. Kelly said in the release. “The AIB [Accident Investigation Board] report identified a sequence of key execution anomalies and material failures that resulted in this mishap.”

Accident investigators also found two related maintenance issues with the mishap aircraft. The first was the failure to install a shorting plug on the DRS electronic module, which is designed to prevent noise bias issues in channel three.

“Two of the three channels must be in agreement for the DRS to function properly. DRS failure due to channel three noise bias issues have been observed in approximately 9 percent of all live ejections and sled tests,” according to the report.

A time compliance technical order was issued on Jan. 20, 2016, and work was to be completed on the mishap aircraft seat on Aug. 28, 2017, but it was not completed because not enough parts were available.

Second, the DRS’s 10-year life span expired on Feb. 28, 2019, but the Air Force Life Cycle Management Center issued three temporary extensions because parts, once again, were not available.

Another contributing factor was the flying supervisor’s decision not to consult Lockheed Martin on using the cable to stop the plane, according to investigators.

A visual inspection of the mishap aircraft concluded the landing gear was “broken and (was) hanging,” though the right landing gear and nose landing gear “appeared normal,” according to investigators.

Schmitz began working off of a checklist meant for landings with an unsafe or undeployed landing gear, but Lockheed flight safety engineers told accident investigators that list “only applies if a landing gear fails to extend normally, not when it is damaged or hanging.”

“Analysis concluded that the [mishap pilot] had a total of 3.475 seconds from when the [seat] left the aircraft to pull the [emergency manual parachute deployment handle] and achieve a successful parachute deployment,” according to the report. Had he not attempted the cable landing and ejected earlier, he would have had as much as six times longer to pull the handle.

In addition, Kelly noted that Air Force instructions require pilots to successfully demonstrate proficiency in aerial refueling during the day before attempting it at night.

“That didn’t occur for this officer, and when we have oversight breakdowns or failures of critical egress systems, it is imperative that we fully understand what transpired, meticulously evaluate risk, and ensure timely and effective mitigations are in place to reduce or eliminate future mishaps,” he said.

Schmitz was a prior enlisted Airman who served as a C-17 loadmaster before earning his commission through Officer Training School, 20th Fighter Wing Commander Col. Lawrence T. Sullivan said in a video at the time of the crash. Schmitz earned his pilot’s license at 17 years old before enlisting in the Air Force. ✪

# **FACES OF THE FORCE**



Bill Stafford/ NASA

The Space Force plans to swear in NASA astronaut and Air Force **Col. Michael S. Hopkins** while he's aboard the International Space Station (ISS) as part of the Crew-1 Mission, a service official confirmed to Air Force Magazine. Hopkins was commissioned into USAF in 1992, according to his NASA bio. He went on to work with "advanced space system technologies" at Kirtland Air Force Base, N.M., graduate from the U.S. Air Force Test Pilot School's flight engineering course, and test C-17s and C-130s as a member of the 418th Flight Test Squadron at Edwards Air Force Base, Calif., it notes. His other pre-NASA accomplishments include training at the Defense Language Institute, studying abroad in Italy, supporting the Air Force Rapid Capabilities Office as a project engineer and program manager, and serving as a special assistant to the Vice Chairman of the Joint Chiefs of Staff. Hopkins, a member of NASA's 20th astronaut class, completed his Astronaut Candidate Training in 2011, according to his bio. The Crew-1 Mission marks his second stint on the ISS.



R. Nial Bradshaw/USAF

**Lt. Col. Jared "Vic" Santos**, 388th Fighter Wing special projects manager, recently became the first Airman to accrue 1,000 flying hours in the F-35A Lightning II fighter jet. He hit the milestone during a training sortie Oct. 22, the wing said. Wing Commander Col. Steven Behmer said, "A relatively short time ago, the Air Force was standing this program up. Now we've got our first 1,000-hour pilot. Pilots like Vic are able to pass that experience on to younger pilots in the F-35 community."



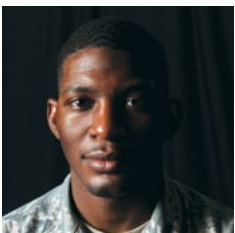
Tech. Sgt. Jerilyn Quintanilla

**Tech. Sgt. Theodore Crowley III** from Eielson Air Force Base's 354th Aircraft Maintenance Squadron was named one of the unit's first-ever dedicated F-35A crew chiefs on Oct. 9. Maintenance "guardian angels" ensure the tails they're assigned are safe and ready. "It's an honor to be one of the first F-35A Dedicated Crew Chiefs on Eielson," he said. "I treat the maintenance of the aircraft with the utmost seriousness, and I do my best to make sure that the aircraft is ready everyday."



ANG

Air National Guard **Brig. Gen. James McEachen** was named an Aerospace Medical Association Fellow in recognition of his professional achievements in and commitment to aerospace medicine. He pulls double duty as the ANG assistant to the Defense Health Agency's director of combat support and as the head of DHA's Reserve Liaison Office, and is leading research into how to optimize human performance in "extreme operational environments" at AFRL.



Staff Sgt. Daryn Murphy



Courtesy

Kadena Airman 1st **Class Leonard Cantrell Jr.** saved a mother and daughter from drowning in a waterfall in Okinawa, Japan. After realizing the mother was in distress, he swam to meet the two and pulled them to safety. "We are all neighbors at the end of the day, so it's important to remember to be a positive ambassador wherever we go and help out if needed," said Cantrell, who works as an executive communications technician with the 18th Communications Squadron.

Seven Airmen from Malmstrom Air Force Base's **41st Civil Engineer Squadron** helped battle a wildfire near Fort Shaw, Mont. Local firefighters contained the blaze, and Malmstrom troops were among forces that were called in after intense winds aggravated the situation. "Our brush engine was embedded with volunteer units to support suppression efforts, while our tender engine was assigned to resupply the main volunteer fire engine," said Squadron Crew Chief Staff Sgt. Aaron Theriault.



Senior Airman Max Goldberg

The 908th Airlift Wing recently memorialized fallen 908th Maintenance Squadron maintainer and Arizona State University graduate **SrA. Jarvise Gibson** with a C-130 Hercules paint job. A few of the wing's C-130s bear the logos of nearby universities, but the ASU logo is also a tribute to their late crewmember. Wing Commander Col. Craig W. Drescher said Gibson's "wingmen have decided to remember him in this special way." They hope in the future to see this plane fly over a special ASU event.



Chustine Minodar/USAF

After the COVID-19 pandemic led Air Mobility Command to halt the distribution of pillows and blankets to passengers on flights out of the Travis Air Force Base, Calif., in an effort to slow the spread of the virus, one of its squadrons decided to put the excess supplies to use in the local community. **Airmen from the 60th Aerial Port Squadron** donated 1,000 of the pillows and blankets to the Yolo County Animal Services Shelter in October, and plan on giving 4,000 more to other area shelters soon.



Steven Dimote/DOD

When she's not working as the 7th Logistics Readiness Squadron's individual protective equipment supervisor at Dyess Air Force Base, Texas, **Staff Sgt. Tanya Siford** serves as a member of the U.S. Air Force Women's Rugby Elite Performance team. She says the sport helped her escape her comfort zone and become more open "to new experiences and people. ... Professionally, it helped me become a better leader and follower, as well as how to quickly adapt to new situations," she said.

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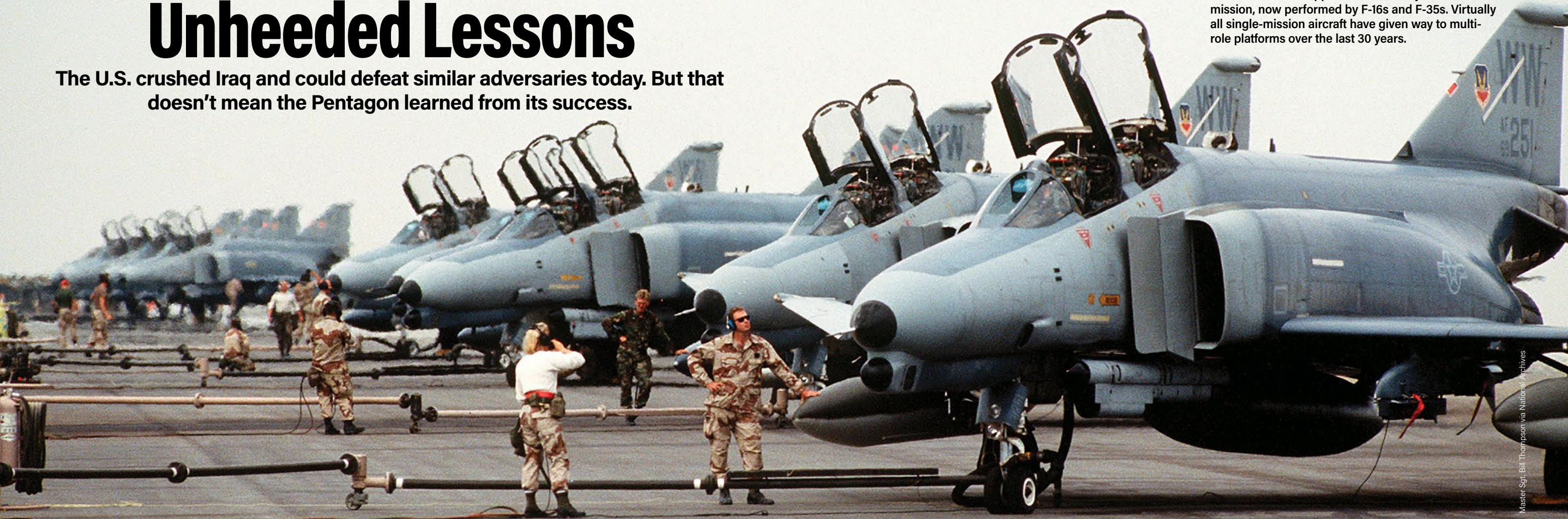
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# Desert Storm's Unheeded Lessons

The U.S. crushed Iraq and could defeat similar adversaries today. But that doesn't mean the Pentagon learned from its success.

Ground crews ready F-4G Wild Weasel aircraft for action at a base in Saudi Arabia on Jan. 18, 1991—the start of Operation Desert Storm. The F-4Gs were dedicated to the suppression of enemy air defense mission, now performed by F-16s and F-35s. Virtually all single-mission aircraft have given way to multi-role platforms over the last 30 years.



Master Sgt. Bill Thompson via National Archives

By John A. Tirpak

January 2021 marks the 30th anniversary of Operation Desert Storm, the six-week war to reverse Iraq's 1990 invasion of Kuwait. The swift and overwhelming victory over the world's fourth-largest military stunned allies and adversaries alike, and imbued the U.S. military—particularly the Air Force—with an aura of invincibility.

Thirty years later, the Air Force that executed the bulk of the five-week air campaign—setting the conditions for the quick ground war that followed—has been cut in half. The wonder weapons it used to so thoroughly dominate Iraq—stealth, precision-guided munitions, satellite intelligence—are no longer unique, having been copied and developed by peer adversaries. Precise theater ballistic missiles are now more accurate and commonplace among potential opponents. Sanctuary and months to build up forces in a region is no longer a given.

If the U.S. had to fight another major theater war today, could it notch a similarly rapid and decisive win?

The U.S. still enjoys an edge in most air combat

**“There is no such thing as a bloodless peer fight.”**

—Gen. Mark Kelly, head of Air Combat Command

technologies, has better-trained troops and an extensive array of partners and allies, said Gen. Mark D. Kelly, head of Air Combat Command, in a November interview with Air Force Magazine. If the U.S. had to fight such a war now “we [would] again prevail,” he said. However, an enemy's modern air defenses, theater ballistic missiles, and skills in spectrum warfare would make the fight tougher, he noted. Victory is unlikely to be as lopsided as it was in Desert Storm.

The American public should brace for heavier casualties in future wars, Kelly added, and “look more through the lens of World War II and less through the lens of Desert Storm” or the Afghanistan or Iraq wars for a sense of what the price of conflict could be.

“There is no such thing as a bloodless peer fight,” he said. Modern combat is “extremely fast ... extremely chaotic, and extremely violent.”

## SIZE MATTERS

The Air Force of 1990-91 was built for the Cold War and combat with the former Soviet Union. It was newly modernized, with fighter aircraft averaging less than 12 years old. Readiness was high and aircrews were well-practiced.

Back then, USAF boasted 134 fighter squadrons, compared to just 55 today. The average fighter is now 27 years old. Many of the aircraft in the overall inventory are now older than 50.

Strategy has also changed. The 9/11 attacks in 2001 remind the Air Force that it must reserve some squadrons for homeland air defense, as well as retain enough forces to deter aggression in some other part of the world.

“We did have absolutely overwhelming numbers of aircraft,” said retired Lt. Gen. David A. Deptula, dean of AFA's Mitchell Institute for Aerospace Studies. Deptula was in charge of selecting targets during the coalition bombing campaign against Iraq, and later became USAF's first deputy chief of staff for intelligence, surveillance, and reconnaissance.

Coalition air forces arrayed against Iraq for Desert Storm numbered some 2,430 aircraft, of which 1,300 were deployed by the U.S., including Navy and Marine Corps airplanes operating from aircraft carriers in the Red Sea and Mediterranean Sea. Iraq fielded about 700 combat-capable fixed-wing aircraft, not including trainers. Air opposition dropped off quickly.

So great were the numbers of available aircraft, Deptula recalled, that “I often planned 72-aircraft strike packages.” It was too many; wing commanders complained, and strike packages were reduced.

“We could have done what we did in Desert Storm with half of what we had there, quite frankly,” Deptula said.

Today's numbers are a different story.

“People say, ‘OK, if you have the capability, you don't need the numbers,’” Deptula said. “Well, not necessarily. The F-22 is the most capable fighter in the world today. But you can really only get 30 to 40 of them in the air at any one time, anywhere in the world.” The rest are either en route to or from the target, used for training, or down for maintenance.

“That's not a lot of frappin' airplanes,” Deptula commented. Such numbers make it “difficult to deal with ... one theater, let alone multiple areas simultaneously.”

In a contested air war, the dynamics can change rapidly. In the Vietnam conflict, the U.S. lost “50 percent of our F-105 force,” Deptula said. “In 11 days of bombing, we lost 15 B-52s.” Deptula predicts that in a future peer conflict, “there will be a much greater level of attrition than we've become accustomed to in the last 30 years.”

Indeed, “the big surprise” in Desert Storm was how few aircraft were lost—just 27 U.S. airplanes. “That doesn't mean it's always going to be that way,” Deptula observed.

The gradual but steady reduction in the size of the Air Force over the past three decades has reached a critical level, he said. “We have less than 50 percent of the number of fighter aircraft”

Then-Lt. Col. David Deptula, right, briefs (l-r) Gen. Chuck Horner, Lt. Gen. Buster Glosson, and Gen. Norman Schwarzkopf during Desert Storm. Gen. Michael Loh called Schwarzkopf an "Airman in disguise" for his support of overwhelming air power to lead off the operation.



David Deptula/courtesy

USAF had in 1991, Deptula continued. "Bombers are worse; we have less than 43 percent of the bombers we had at that time."

Offsetting the smaller number of platforms is their greater capability, particularly in precision attack. "The vast majority of weapons we employ today are precision-guided," Deptula said. In Desert Storm, only 9 percent of all coalition weapons, by tonnage, were precision-guided, and only 4.3 percent were laser guided bombs, yet LGBs accounted for 75 percent of strategic targets destroyed. (The rest of the PGMs were missiles such as Maverick or HARM.)

## PRECISION WEAPONS

The laser guided bombs of Desert Storm impressed CNN viewers who saw black-and-white images of bombs guided onto rooftops and straight down air shafts. But those weapons couldn't function through clouds, smoke, or other obscurants. In many cases, pilots had to return to base without releasing their weapons. By contrast, today's precision munitions use satellite navigation and can operate in any weather, day or night.

What strategists learned in 1991 was that precision is a force-multiplier. USAF moved quickly to develop weapons like the Joint Direct Attack Muniton, which uses GPS guidance, as well as laser seekers in some variants. "Every munition we developed from that point on became a precision munition—no more dumb bombs," said Gen. John Michael Loh, who was Vice Chief of Staff and acting Chief for a month during Operation Desert Shield—the regional buildup for Desert Storm. Loh later headed Tactical Air Command and was the first to lead Air Combat Command.

## STEALTH

Desert Storm also saw the first application of stealth in combat. The Air Force's F-117 proved that low-observable aircraft could get through a good air defense system to strike the enemy's most valued targets.

"We knew we were on the right track," Loh said. The Air Force "went 110 percent" afterward with stealth in developing the F-22, its next fighter, as well as the then-new B-2 bomber.

Today, stealth is an essential aspect of U.S. air power, but not the only trick in the bag.

"Are lower signatures better than big signatures? Absolutely,"

Kelly said. "Is multi-spectral resilience better than putting all your eggs in a single bandwidth to operate in? Absolutely." Air Force stealth is "very, very capable" and a "very, very relevant element to the way we execute."

Low observable doesn't mean invisible, though, Kelly noted. Tactics are as important as the technologies that go into making aircraft hard to detect and track. "If we employ our low-observable assets as if they're ... 'non observable,'" Kelly said, "that's when we end up making mistakes."

## ISR

The Air Force had an unmatched network of ISR platforms in the air and in space during Desert Shield and Desert Storm—E-3 Airborne Warning and Control System jets, spy satellites, tactical reconnaissance systems on fighters, and the E-8 Joint STARS aircraft, still in development but rushed to the field of battle. Even so, planners struggled with "a serious lack of current overhead imagery of the area," Deptula recalled. "I was targeting using imagery that was six months to two years old," he said.

"I would have given a year's pay for Google Earth," Deptula said. While the service may not be totally accurate, "you should have seen what was [Top-Secret/Sensitive Compartmentalized Information] back in the Desert Storm days."

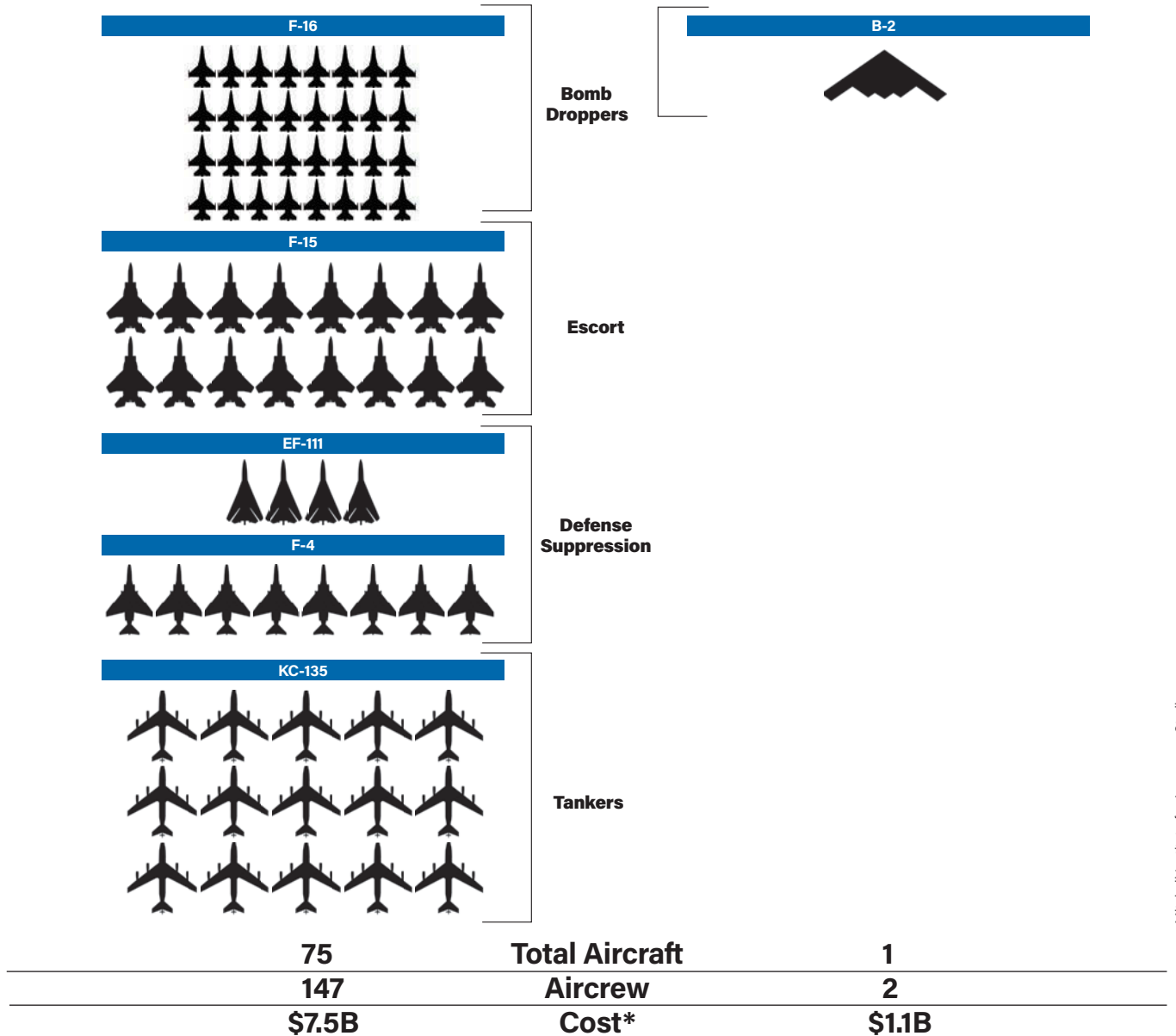
Getting intelligence to the people who needed it was also a problem. There was "no connectivity between attack planners and the people who had control over the overhead intelligence collection platforms," Deptula said. The intelligence process, especially battle damage assessment, "was totally and completely unresponsive," he added.

Likewise, "There was no such thing as 'time-critical' targeting in Desert Storm," Deptula said. He put F-111s with precision-guided munitions on alert, but "from the time we got information to the time they were over a target was on the order of eight hours. That's not very time-sensitive." Today, by contrast, aircraft can be airborne with a variety of weapons, ready to respond when ISR reveals an urgent target, or troops in contact need help from above.

Surveillance drones are now standard gear. In the Gulf War, there were no Predators or Reapers; the only drones were target-spotting Pioneers belonging to the Navy.

# The Power of Stealth, Versatility, and Capacity

During Desert Storm, the preponderance of single-mission aircraft demanded larger attack packages than would be needed today. In this real example, 75 aircraft manned by 147 aircrew were needed to deliver the destructive capacity of a single B-2 bomber with just two aircrew.



\*Flyaway price + 20-year operation and sustainment costs

“There was no 24/7, 365 overwatch that we’ve absolutely become accustomed to,” Deptula said. The need for persistent, or “staring,” ISR would be one of the Air Force’s lessons learned, eventually manifesting into a range of small, medium, and large unmanned systems. The easy access to live ISR feeds is so great today, Deptula said, that when he addresses company-grade and higher officers, he admonishes them not to micromanage junior officers dealing with tactical situations.

## STRATEGY

The Air Force’s approach to targeting in Desert Storm was also a change. Instead of “hammering” all of Iraq’s military, Deptula applied an effects-based operations (EBO) approach, striking a range of related targets at once. This “parallel” warfare created chaos and confusion from which Iraq never recovered during the conflict.

“This was very different from the way militaries have

traditionally planned,” according to Deptula. Without the effects-based logic, “what would have happened would have been random attacks on discrete enemy elements unrelated to the ultimate objectives—not unlike what happened in the Vietnam War and what some might say happened in the first part of the air war over Serbia.”

The lesson hasn’t been taken to heart, though. The EBO approach was not applied “over the last 20 years in Afghanistan and Iraq,” Deptula observed.

Loh praised Army Gen. H. Norman Schwarzkopf, who led the Desert Storm campaign, as “an Airman in disguise.”

Schwarzkopf “was very strongly in favor of leading with ... overwhelming air power,” Loh said.

The relentless pace of attacks on Iraqi targets—starting with air bases, the air defense system, command and control nodes, and later expanding to ground formations—overwhelmed Iraq, Loh said. Saddam Hussein “never really had a chance” to put

his air force to work; after a few days, his most advanced jets fled to Iran, or were hidden in hardened shelters where they were picked off by bunker-busting bombs, Loh recounted.

“We had overwhelming force,” he said. “We attacked when he didn’t think we were going to, we were prepared, and we led with air power, and stealth, and stand-off weapons.” The coalition continued with the attack “every day, continuous pounding—1,000 attack sorties a day. ... He just couldn’t cope with that.”

Echoing Deptula, Loh said, “We could have done what we did in Desert Storm with half the air power we had ... but we didn’t recognize that at the time. You always want to go in with overwhelming force.”

That lesson needs to be re-learned, Loh asserted. In 2003’s Operation Iraqi Freedom, it was forgotten, he said. “The Army wanted to go simultaneous with the Air Force, and it got very confusing.”

## AIR DEFENSES

Russia and China have studied Desert Storm the conflict for 30 years, Loh said, and it has directly influenced how they’ve structured and postured their own militaries since.

Iraq believed it was safe because of the KARI air defense system (KARI is Iraq spelled backward in French; France sold the system to Iraq). KARI netted together more than 150 batteries of Iraqi air defense missiles and anti-aircraft artillery, and more than 700 combat-capable fixed-wing tactical aircraft. Iraq had thousands of surface-to-air missiles, as well as shoulder-fired anti-aircraft weapons.

Allied air commanders anticipated heavy losses. “[We] thought we would lose about 100 to 120 airplanes the first two nights of the air campaign,” Loh said. “Attrition experts said 20 to 25 percent.” Even after air defenses were beaten down, Loh said, it was estimated that air losses “would tail off to about five or 10 per day for the next week or two.”

Instead, only 75 coalition aircraft were lost—and only 27

of those by U.S. forces—across the entirety of a five-week bombing campaign before ground combat began, and four days of close air support and interdiction afterward.

Modern air defense systems, such as Russia’s S-300 through S-500, can detect threats at far greater range than those of the Desert Storm era. An SA-2 from the Gulf War could engage targets 20 to 30 miles away, Deptula noted, but an S-400 can engage targets at ranges approaching 400 miles. “That is a huge leap,” he said. Modern surface-to-air missiles are faster, have their own guidance systems, and are tougher to fool, he added.

Stealth remains essential, Deptula argued. “Low observability is the entry-level requirement for ... operating against a near-peer threat today,” he said. “If you’re not low-observable, you’re not going to survive.”

Stealth is also a force-multiplier. “If it takes 10 to 20 non-stealth aircraft to do the same thing as one stealth aircraft, the stealth aircraft are a bargain at 10 times their cost,” he argued.

## ELECTROMAGNETIC WARFARE

After Desert Storm, the Air Force retired the F-4G Wild Weasel Suppression/Destruction of Enemy Air Defense aircraft, and the EF-111 Spark Vark electronic warfare/jamming aircraft. Block 50/52 F-16s assumed the SEAD/DEAD mission and the Navy took over the escort jamming mission with its EA-6B Prowlers, and later the EA-18G Growlers.

Loh called that decision “a mistake,” saying the Navy hasn’t been able to handle “all the Air Force’s requirements for electronic attack.” USAF officials announced plans this year for an EMS (electromagnetic spectrum) wing to buoy “electronic warfare, electronic attack, information warfare, cyber, and ISR” capabilities, which Loh sees as encouraging.

Kelly noted that while China and Russia are making inroads with stealth and precision navigation, it’s their efforts in spectrum dominance that concern him more.

“Their ability to jam across the electromagnetic spectrum,

**U.S. Army Troops arrive at an air base in Saudi Arabia as a giant C-5A Galaxy transport looms behind them. The U.S. built up at regional bases for five months before launching the air campaign against Iraq.**



Department of Defense via National Archives





Most Iraqi ballistic missiles went off course and landed harmlessly, or were intercepted by the U.S. Army's Patriot air-defense system. Even so, U.S. forces still suffered 27 dead and 90 other casualties due to Scuds. Such missiles are far more accurate today. Here, Staff Sgt. Stephen Olava uses an M-13K rough terrain forklift truck to hoist a Scud carcass outside the Saudi capital of Riyadh.

where they choose to, is significant," he said. They can jam "from extremely low frequencies down to 3 Hz" through the sensing bands and radio bands, radar bands like the X, Ku, and Ka bands, "all the way up through the [infrared] spectrum, even ultraviolet wavelengths," Kelly said. Coupled with advances in 5G, quantum computing, space, and cyber, he said, adversaries are effectively using the EMS to "enhance red kill chains and ... break blue kill chains."

The Air Force intends on not only "surviving but thriving in the electromagnetic spectrum," he said. Besides being stealthy, the Air Force must "hold our cards tight" in terms of capability and tactics, "and we need to make sure we can absorb the signals that they are putting back at us, and use them to reprogram quickly."

It will depend on the particular threat as to how much "we're going to be able to power through it," Kelly added.

### AGILE COMBAT LOGISTICS

The Air Force had months to build up forces and practice the tactics and procedures that proved so effective in Desert Storm. Iraq had tactical ballistic missiles with which to disrupt those preparations, but used them sporadically. Most went off course and landed harmlessly, or were intercepted by Army Patriot missiles. While the Air Force suffered just two tactical ballistic missile hits during Desert Storm, they endured 27 deaths and 90 injuries as a result.

The profusion of such systems since then—and startling gains in their accuracy—means large theater air bases in the future will be "big fat targets that are easily found and easily geo-located," Kelly said.

The lack of enough Army air defense systems to go around in a war and the risks of being a sitting duck are "driving us to Agile Combat Logistics," Kelly said. The strategy will be to deploy small units, such as a "four-ship" of fighters, to austere bases where they can rearm, refuel, and launch again quickly. They'll depend on minimal ground crews "organized, trained, and equipped as a cohesive expeditionary mission team," he explained. They'll have "multiple skill sets" for providing quick, limited missions support.

"We don't have everything we need" for this concept, but it highlights the need to maintain alliances and partnerships worldwide, Kelly noted. Having a host nation that can provide

an airfield and maybe even air defense will be a huge benefit in this approach, he stated, and having those partnerships is a big discriminator with China and Russia, who don't have such networks and must look "internally" for expeditionary support.

Loh and Deptula both said that the Air Force needs to again embrace giving decision authority to combat leaders at the flight level, to adapt to changing conditions and fight through a possible denial of communications.

"We've got to move from a concept of centralized control/decentralized execution to one of centralized command/distributed control/decentralized execution," Deptula said. "You should not have to call back to the air operations center and ask, 'Mother, may I?' before you engage or employ a weapon."

### A MATTER OF RISK

The central question in deciding if the success of Desert Storm could be replicated today lies in how much risk the nation wants to take. Even the Air Force's own "The Air Force We Need" white paper on what it requires to fulfill the national strategy is considered a "moderate risk" force, and that's not what it had in 1991.

"Moderate risk is not a 'Desert Storm'-like operation," Deptula said. "It's not winning 99-1. It's winning, like, 55-45." That risk is driven by resources.

Chief of Staff Gen. Charles Q. Brown Jr.'s "Accelerate Change—or Lose" directive "is also a message for the greater DOD and the American public," Kelly said.

There are "four distinct choices" about the shape of the future military, Kelly said. The U.S. can "invest and build a force to address a growing peer threat across key domain." It can "divest to invest" to remain relevant," by getting rid of older hardware now to pay for new gear later. It can reduce its ambitions by determining the U.S. military no longer needs to "defend the global commons." Or, Kelly said, "If we don't do any of those things, we have to make a decision to raise our risk calculus of a high likelihood of kinetic defeat. Basically, that's the 'lose' aspect of General Brown's 'Accelerate Change or Lose.'"

The Air Force and the Defense Department in total will follow whatever direction they're given, Kelly said. "If you don't like change, you're going to dislike irrelevance even more. And you're going to outright hate a kinetic defeat." ❖

Russia continues to develop new strategic weapons—as many as 31 new missiles, bombers, submarines, and related weapons from 2010 to 2027. Russia's Yars ICBM missile system transporter-erector-launcher (TEL) vehicle, in this 2018 photo, carries a road-mobile ICBM with three MIRV warheads in the 150 to 200 kiloton range.



Ministry of Defense

# New Life for New START?

The Trump administration wanted to widen the treaty's scope. Now what's the plan?

By Amy McCullough

If the New Strategic Arms Reduction Treaty (New START) expires as scheduled on Feb. 5, 2021, it will mark the first time since the end of the Cold War the world's two largest nuclear powers will be free to expand their arsenals without restraint or verification.

New START entered into force nearly 10 years ago and included an option to extend the treaty for up to five more years. But while Russian President Vladimir Putin said in December 2019 his country would extend the treaty "without any preconditions," the Trump administration argued to expand the scope of the treaty to include:

- Russia's buildup of short- and medium-range systems, which fall outside the current scope of New START;
- Stronger verification measures;
- Bringing China into the accord.

It's not that the Trump administration was not interested in an extension, said Robert M. Soofer, deputy assistant secretary of defense for nuclear

**"Russia has expanded the number of circumstances under which they would consider ...**

**nuclear weapons, or at least they're now willing to say it publicly."**

—Adm. Charles "Chas" Richard, USSTRATCOM commander

and missile defense policy during an AFA Mitchell Institute for Aerospace Studies event in September. But the administration wants to ensure the treaty includes a "broader framework."

Joe Biden, the projected President-elect who was vice president when the treaty was negotiated, promised during the campaign to pursue a New START extension, "and use that as a foundation for new arms control arrangements," according to his campaign website.

"President Biden would take other steps to demonstrate our commitment to reducing the role of nuclear weapons. As he said in 2017, Biden believes the sole purpose of the U.S. nuclear arsenal should be deterring—and if necessary, retaliating against—a nuclear attack. As President, he will work to put that belief into practice, in consultation with our allies and military," states his campaign website.

Under New START, the U.S. and Russia are limited to 1,500 deployed nuclear warheads and 700 of any combination of deployed intercontinental ballistic missiles, submarine-launched ballistic missiles, and nuclear-capable bombers. The pact allows for up to

18 on-site inspections a year.

Over the treaty's 10-year life span, the two sides conducted 328 inspections and exchanged more than 20,000 notifications, according to the U.S. Department of State.

New START never addressed tactical weapons, a point that Russia aggressively sought to exploit by building up its arsenal and gaining an advantage over the United States.

When asked in a September press conference if the U.S. can limit a nuclear exchange to tactical weapons, or if there is even such a thing as tactical nuclear weapons, U.S. Strategic Command boss Adm. Charles A. "Chas" Richard replied: "Sir, you're asking one of the greatest unanswered questions in military theory—deterrence theory—of all time, right? The answer is nobody knows if that's the case, but I do think it's an obligation for the United States to do everything in its power should a nuclear weapon be used by somebody else to stop the exchange as soon as possible, to limit damage to the U.S. to the maximum extent possible, and to end it on terms favorable to the United States. ... Fortunately, we don't have any real-world experience in that, and I would just as soon keep it that way."

## RUSSIA MODERNIZING

Russia is also modernizing its strategic weapons. Peter Huessy, director of strategic deterrent studies at AFA's Mitchell Institute of Aerospace Studies, said Russia will have introduced 31 new types of strategic nuclear systems from 2010 to 2027, including new bombers, submarines, cruise missiles, ICBMs, and submarine-launched ballistic missiles (SLBMs). By contrast, U.S. modernization efforts have been slow for all three legs of its nuclear triad. The Ground-Based Strategic Deterrent, which will replace 50-year-old Minuteman III ICBMs, won't enter service until 2029, and the program won't be completed until 2035; the Air Force's B-21 Raider bomber isn't planned to come online until 2026 or 2027 and won't be nuclear-capable for at least three years after it reaches initial operational capability; and the Columbia-class ballistic missile submarines, the replacement for the U.S. Navy's Ohio-class subs, won't enter service until 2032 or later, Huessy said.

Richard estimated in October that Russia is "close to 75 percent complete" with its nuclear modernization efforts, and that, along with its conventional weapons advancements, is still very much a "pacing threat."

"Russia has expanded the number of circumstances under which they would consider the employment of a nuclear weapon, or at least they're now willing to say it publicly," Richard said in an Oct. 21 prerecorded speech for the Center for Strategic and International Studies' virtual nuclear security conference. "Although this circumstance is distressing, it should not come as a surprise."

His comments came one day after Russia agreed to freeze its entire nuclear arsenal for a year—including tactical weapons—as long as the U.S. did not bring up additional conditions. Extending New START would provide time, the Russians said, "to hold comprehensive bilateral talks on the future of nuclear missile control, with the mandatory discussion of all factors that can influence strategic stability."

Robert O'Brien, President Donald J. Trump's national security adviser, told Politico days later both sides still needed to agree to verification procedures.

Meanwhile, U.S. allies are on edge. Twenty European countries called on the United States to extend the treaty, saying it has "directly contributed" to stabilizing European security.

"While we support the call to discuss the next generation of arms control and the need to consider the role of the Chi-

nese nuclear arsenal, extending New START and engaging in good faith dialogue with other nuclear powers are not mutually exclusive," wrote the 82 signatories from the nearly two dozen countries in an Oct. 13 letter to U.S. congressional leaders. Countries represented in the letter included: Austria, Belgium, Bulgaria, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Italy, Latvia, Lithuania, Luxembourg, the Netherlands, Poland, United Kingdom, Slovenia, Sweden, and Switzerland.

"As was evident in the process that led to New START, time is needed to negotiate solutions that meet the laudable goals put forward by both the United States and Russia during their strategic stability talks this year. In short, extending the duration of New START is not an end. It is a mutually beneficial tool for maintaining stability, transparency, and predictability while we write a new chapter of arms control together," states the European letter.

In prewritten answers submitted before his October 2019 confirmation hearing, Richard called New START an "important transparency mechanism for maintaining U.S.-Russian stability," providing "insights into the Russian strategic triad, which significantly contributes to our understanding of their force posture."

But he added that Russia's development and fielding of tactical nuclear capabilities outside of New START limitations warrants "further analysis, dialogue, and interagency review prior to making a final determination of a five-year extension."

STRATCOM Deputy Commander Lt. Gen. Thomas A. Bussiere said the U.S. military is "agnostic" as to whether the treaty should be extended.

"We can perform our military mission with or without the New START Treaty," he said in an August 2020 press briefing alongside Marshall S. Billingslea, special presidential envoy for arms control, following discussions with Russia in Vienna. "We do believe, however, that it does provide increased international security. But there's a difference between the arms control protocols and the military necessity and operational utility."

STRATCOM has repeatedly said it is ready and able to respond to threats to the homeland whether the treaty is extended for one year, five years, or allowed to lapse.

## GLOBAL ISSUE

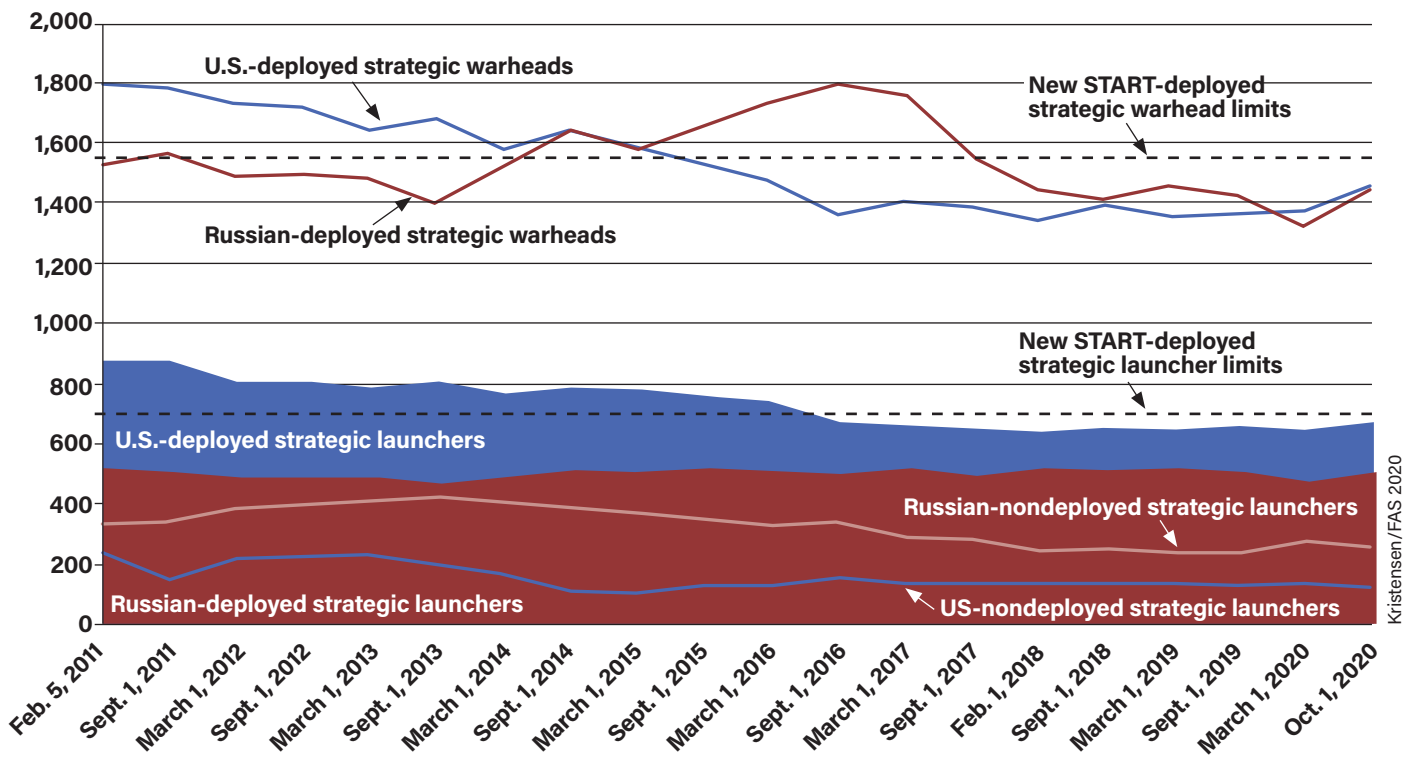
There are some 14,000 nuclear weapons owned by nine countries across the globe, but the vast majority of those weapons belong to the U.S. and Russia. As of Sept. 1, 2020, the United States had 675 deployed ICBMs, SLBMs, and heavy bombers, while Russia had 510—each well below the ceiling set in New START. The State Department said the U.S. had 1,457 warheads on deployed U.S. SLBMs and heavy bombers, versus 1,447 warheads on deployed Russian SLBMs and heavy bombers.

Overall, the world's nuclear weapons have been reduced by 75 percent since the height of the Cold War. But the calculus on whether nuclear weapons should be employed continues to evolve, wrote three lions of national strategy—former Secretary of State George P. Shultz; former Defense Secretary William J. Perry, and former Senate Armed Services Committee Chairman Sam Nunn (D-Ga.) in an Oct. 22 commentary in *The Washington Post*.

"Many of these arms are on high alert, ready to be launched in only a few minutes, based on the decisions of a handful of fallible humans and their fallible computers," they wrote. "Cyber-interference with command and control and the warning systems of any nuclear-armed nation significantly increases

# Strategic Nuclear Forces Under New START

The New START went into effect Feb. 5, 2011, and in the decade since, both the U.S. and Russia reduced the number of strategic launchers at their disposal, holding the totals for launchers and warheads beneath the treaty's maximum. Here's how the totals have changed in that time:



Source: Federation of American Scientists

Kristensen/FAS 2020

the risks of false warnings and nuclear war-by-blunder.”

U.S. Strategic Command is conducting an “exhaustive assessment” of current global threats, as adversaries such as Russia and China force the U.S. to rethink the way it approaches strategic deterrence, Richard said.

“I’ve challenged my command to revise our 21st-century strategic deterrence theory that considers our adversaries’ decision calculus and behaviors and identifies threat indicators or conditions that could indicate potential actions,” he noted.

The analysis will include a look at emerging capabilities, changing norms, and potentially unintended consequences of conflict. Pentagon officials say other world powers have “blurred the lines” when it comes to conventional and nuclear conflict, creating a challenge for the U.S. military, which tends to organize, train, and equip its forces based on whether their mission is nuclear-related or not.

That shift in thinking is driven by newer tactical nuclear weapons, which aren’t controlled by New START. Lt. Gen. Richard M. Clark, then USAF deputy chief of staff for strategic deterrence and nuclear integration, said in August the service had started to shape policy around the concept of “conventional and nuclear integration,” viewing them as two points on a spectrum instead of as separate concepts.

“We have to be able to reconstitute our capability. We have to be able to plan and execute integrated operations, multi-domain, whether conventional or nuclear, and most importantly, we have to be able to fight in, around, and through that environment to achieve our objectives,” Clark said.

Richard argues the ultimate goal—ensuring that the benefit of restraint outweighs the benefit of possible action—has not changed. However, “We have to account for the possibility of

conflict leading to conditions that could seemingly very rapidly drive an adversary to consider nuclear use as their least-bad option,” he said.

## CHINA’S GROWING THREAT

By the end of this decade, the U.S. will face two nuclear-capable competitors, each of which requires a different deterrence strategy. Richard said it’s important not to underestimate China’s capabilities or nuclear ambition.

“They always go faster than we think they will, and we must pay attention to what they do and not necessarily what they say,” he said. China, for its part, has said it will match U.S. nuclear strength by 2030.

Richard said China’s investments in “sophisticated” command and control capabilities and ongoing efforts to build up its own nuclear triad seem to contradict its general claim that deterrence should require as small an arsenal as possible.

The need for transparency from China with regard to its nuclear capabilities is the main driver for the U.S. push to bring China into the New START negotiations, Huessy said.

“They say ... ‘we don’t even have the warheads on the missiles,’” he said. “The question is, ‘Why are you building submarines if you’re not going to have warheads on the missiles?’ You aren’t going to send the submarines to sea empty. That doesn’t make any sense at all.”

China has about 300 nuclear warheads, less than one-fifth as many as the U.S. and Russia. The disparity will complicate any trilateral agreement.

“Neither Washington nor Moscow would agree to reduce to China’s level,” writes Steven Pifer, a nonresident senior fellow in the Arms Control and Non-Proliferation Initiative

at the Brookings Institute, a Washington-based think tank. “Nothing suggests either would agree to legitimize a Chinese build-up to match their levels ... Beijing presumably would not be interested in unequal limits.”

Without an agreement in February, the U.S. and Russia could each respond by “maintaining the status quo,” according to an August 2020 Congressional Budget Office (CBO) report on the potential cost of expanding U.S. strategic nuclear forces. But it’s also possible either or both sides “could take various actions to compensate for the lack of treaty limits, perhaps to address a real or perceived buildup of forces by the other party,” the report said.

The CBO looked at the potential cost of expanding the number of warheads from no more than 1,550 allowed under New START to levels specified in previous arms control agreements.

Increasing the number of warheads to the 1,700 to 2,200 allowed under the Strategic Offensive Reductions Treaty, also known as the Moscow Treaty, which was signed on May 24, 2002, and was later superseded by New START, “would not increase the Department of Defense’s costs” relative to current modernization plans, which call for fielding a new generation of strategic delivery vehicles. CBO estimates both would cost about \$240 billion over the next few decades.

The U.S.-Soviet Strategic Arms Reduction Treaty, known as START I, signed on July 31, 1991, and expired on Dec. 5, 2009, allowed for 6,000 warheads. The cost to increase the total number of U.S. warheads to that level would be about \$88 billion, plus \$4 billion to \$10 billion annually. Increasing the number of delivery vehicles, which the CBO deemed “the more flexible approach,” would cost \$410 billion, plus \$24 billion to \$28 billion a year.

Even if funding was not an issue, however, it would take time for the U.S. to build back its arsenal.

The Minuteman III missile could support two warheads, Huessy said, but it would take three and a half years to complete that project.

When it comes to uploading additional warheads to launchers, Mark Schneider, senior analyst with the National Institute of Public Policy, said, “In the short-term everything depends on how much tritium [a radioactive isotope of hydrogen used in nuclear weapons] we have available, and if it is in the con-

tainers used in warheads. If we have it, we can upload bomber warheads in days or weeks, SLBM warheads over months, and ICBM warheads in years. If we don’t have enough tritium, we can upload the warheads as low-yield.”

Expanding the nuclear arsenal isn’t the only response if New START expires. The U.S. also could expand its intelligence capabilities, which likely would require launching more satellites into orbit or purchasing more commercial satellite imagery—both expensive options, according to the CBO. For example, it cost \$1.1 billion to produce the fifth and sixth Space-Based Infrared Satellite-High missile detection systems.

Other options include expanding missile defenses, expanding conventional forces—such as hypersonic weapons and conventional intermediate-range ballistic missiles—and/or expanding nonstrategic nuclear forces.

The 2019 Missile Defense Review noted that the Ground-Based Midcourse Defense system, which is made up of silo-based long-range interceptors, could be expanded in Alaska if necessary. It would cost about \$5 billion to build 40 new silos and purchase the interceptors, by CBO estimates. However, the program is undergoing a “complete redesign,” which could significantly change those figures.

The B61 bomb, which is carried by the F-15E as well as some NATO aircraft, is the United States’ only nonstrategic nuclear weapon.

“According to one report, about 150 of those bombs are based in Europe in support of NATO, and some are stored in the United States. Unclassified sources estimate that Russia, by comparison, maintains a substantially larger stockpile of about 1,800 nonstrategic warheads that can be delivered by several different vehicles,” according to the CBO.

The Defense Department is looking to even this field by developing a new nuclear-armed, sea-launched cruise missile, which is expected to cost about \$9 billion to develop, as stated by the CBO.

“I recognize that great power competition doesn’t equal conflict, or that we’re on a path to war,” Richard said. “But as the commander in charge of employing strategic deterrence capabilities for the nation, and for our allies, I simply don’t have the luxury of assuming a crisis, conflict, or war won’t happen.”



Minuteman III nuclear missiles, which replaced Peacekeeper missiles in the 1970s, will in turn be replaced by the Ground-Based Strategic Deterrent, which won’t enter service until 2029. Here, Airmen maintain a 50-year-old Minuteman III at the F.E. Warren missile complex in Wyoming.

Senior Airman Abbigayle Williams

# Pegasus Paradox

The Air Force is satisfied Boeing will fix the KC-46—but full-rate production is still at least three years away.



Tech. Sgt. Daniel Fernandez

The first time a KC-46 from the 18th Wing refueled Kadena Air Base, Japan, F-15Cs was during the exercise WestPac Rumrunner on Oct. 16. The beleaguered tanker program will receive an interim fix to its remote vision system while Boeing readies a permanent fix, called RVS 2.0, expected to be ready in 2024.

By Brian W. Everstine

If 2020 was a struggle for much of America, it proved a turning point for the Air Force's beleaguered KC-46 program. Air Force and Boeing Company officials now see strength in a program that had long been a sore point for both.

"How excited we are about the KC-46," Air Force Assistant Secretary for Acquisition Will Roper told reporters in September. "How odd it is to say that, especially in the five-sided building, but we're making amazing progress. And I think for everyone, the contractor Boeing, for the Air Force, I think we've turned a new page, and we're excited about that."

The KC-46 started the year with four "Category One" deficiencies, the most serious being the boom operator's remote vision system (RVS). The camera distorted and, in some light, obscured the boom operator's view. In addition, repeated incidents of tools and trash found inside aircraft after delivery forced repeated delivery suspensions in 2019.

But soon after the global pandemic struck, the Air Force and Boeing agreed on a wholesale RVS redesign and closed out an issue that rendered the aircraft's cargo locks unreliable. While the KC-46 is still late on its testing schedule—and Boeing has announced

**The new remote vision system "far exceeds the imagination of what we were even talking about back in 2011!"**

—Michael Hafer, Boeing's director of global sales and marketing

about \$1 billion in additional cost overruns above the previously announced \$4.8 billion—the company assured its investors there's a bright future for the tanker.

"The tanker's been a drag on us for three or four years ... but we are beginning to clear the hurdle with our customer with respect to performance in their fleet and their need for that tanker," Boeing CEO David L. Calhoun said during a quarterly earnings report in October. He said the KC-46 will "begin to transition next year" into a strength for the company.

## FIXING THE RVS

The new remote vision system is the biggest reset for the tanker since it began production. The RVS redesign aims to fix the primary reason the aircraft is still at least three years away from being fully operational.

The new system, developed in concert with the Air Force's 711th Human Performance Wing, will include new, higher-definition 4K color cameras; a larger and higher resolution screen for the boom operator; a laser ranger to accurately measure the distance between the boom and the aircraft it is refueling; and augmented reality.

The system "far exceeds the imagination of what we were even talking about back in 2011," said Michael W. Hafer, director of Boeing's KC-46 global sales and

marketing. Boeing is covering the \$551 million development costs, but the Air Force is making that possible by allowing the company to receive \$882 million in payments withheld for noncompliance issues. The two struck the deal in April, as Boeing was reeling from the nationwide shutdown due to COVID-19, and financial markets were in freefall.

“We wanted to send a clear signal in the deal that this is our tanker for the future,” said Roper at the time.

By autumn, Boeing was down-selecting subsystems. The company expects to deliver 12 aircraft kits in 2023 and begin installing the redesigned vision system on new aircraft in 2024.

“I’m very encouraged with the open collaboration between Boeing and the Air Force on that,” said Air Mobility Command boss Gen. Jacqueline D. Van Ovost in September. She indicated that beyond meeting Boeing’s goal, “we will do everything we can to accelerate” the development timeline.

In the meantime, Boeing is developing an interim fix. “RVS 1.5” tweaks system software to improve performance and could be fielded in the second half of 2021.

Van Ovost said she saw some of the improvements during a visit to Boeing in early September and its images appeared to be clearer. Hafer said the first flight tests for RVS 1.5 wrapped in early August, focusing on “dynamic image stability” and reducing problems caused by shadows and glare. “We’ve actually brought up some improvements in both hardware and software that eliminates most of that,” he said.

Whether the improvements are good enough remains in question, according to Van Ovost. “The proof is in the pudding when it comes to whether or not it actually would provide operational, additional capability, or additional safety to the boom operator and to our receiver aircraft,” Van Ovost said. “If I can’t increase operational capability ... then there may not be a whole lot of reason to put it on the airplane and retrofit airplanes. Because if I have to take airplanes out of cycle to do that, then I have less access to those aircraft. So it’ll be what our boom operators, our testers have to say about the final configuration.”

She also said she would nix RVS 1.5 tweaks if they meant the permanent fix would be delayed.



Techn. Sgt. David Carbajal

Gen. Jacqueline Van Ovost, Air Mobility Command boss, says the interim RVS fix—dubbed RVS 1.5—will be nixed if it delays a permanent fix.

“There’s nothing that we would do that would slow down getting to 2.0 and getting it on our airplane,” she said. “That’s the most important thing: to get to the full requirements that we agreed to ... RVS 2.0 at no cost to the government.”

She added: “If it slips RVS 2.0 installation at all, I would not be in favor of slipping because that’s the end game, that’s the requirement that we set out and that Boeing agreed to deliver.”

In June, the Air Force officially pushed back its full-rate production decision until 2024—seven years later than the original goal. Officials said initial operational test and evaluation (IOT&E) cannot be completed until the RVS problems are resolved and the production configuration can be tested.

“Accordingly, the Air Force will defer the KC-46 Full-Rate Production decision until after the completion of IOT&E, and the receipt of the statutorily required Beyond Low-Rate



Staff Sgt. Chris Thornbury

The new RVS will include higher-definition 4K color cameras, a larger and higher resolution screen for the boom operator, a laser ranger, and augmented reality. Staff Sgt. Devaughn Granger, left, showed Air Force Secretary Barbara Barrett the functionality of the KC-46 Pegasus boom on June 10 during a day-to-night flight.

USAF will not resolve tanker capacity problems until the KC-46's problems are completely solved and it comes fully on line. Here, KC-46As perform an Elephant Walk on July 1 at McConnell Air Force Base, Kan., testing tanker aircrews and maintenance personnel on their ability to rapidly generate multiple sorties during a weather evacuation exercise.



Staff Sgt. Chris Thornbury

Production report from DOT&E," the Air Force said. "Given its confidence in deficiency resolution timelines for both the aerial refueling boom and remote vision system, the Air Force is rescheduling the KC-46's Full Rate Production Decision milestone to late fiscal year 2024."

As of September, the tanker had made more than 17,700 contacts and passed more than 22 million pounds of fuel, according to Boeing. The aircraft had flown a "coronet" deployment (escorting fighters over long distances to provide them with fuel) of a group of Navy F/A-18 tankers, additionally refueling the Navy's Blue Angels during the spring "Salute to America" tour across the country. It also flew a long-distance aeromedical evacuation training sortie covering five bases to test that capability.

"As opportunities come up, we like to exercise the portions of the envelope that reopen this airplane as much as possible with our Total Force that's flying the airplane," Van Ovost said in an interview. "We want to accelerate the capability of the training for these aircraft, the simulation capability, so that we can move as much as possible into the simulator and minimize training time on the physical airplane itself."

Future block upgrades, called Pegasus Combat Capability, or PC2, will improve communications, survivability, and possibly add autonomy, Hafer said. New radios, survivable communications, and "a resilient communications node" for secure voice and data links across multiple networks could be ready in two to four years.

Roper stated in September that RVS 2.0 and future upgrades promise a potential "all the way up to the doorstep of semi-autonomous and autonomous tanking."

"The Air Force has committed to put in those algorithms, because when you build a properly designed RVS, you've done everything needed to do autonomous tanking," he said. "The only thing you're missing are the algorithms to actually do it. ... We don't have requirements for ... tanking autonomously, we don't know where, when, how. [But] now's a great time to start studying that, and to do it in conjunction with what comes next."

Hafer said Boeing is "setting the framework" for autonomy. "We're spending some of our independent research dollars on developing that capability," he said. "It's just a new and exciting field."

Reliably providing fuel in contested areas will become a "strategic question" for the Air Force, Roper said.

"How can you defend a tanker against an onslaught of fighters who know that every tanker you kill is like killing a lot of fighters, or bombers, or drones it supports," Roper said. "We're definitely going to be thinking about autonomy as a way to change the risk calculus, having something smaller without people [so] that we could take more risk."

## MEETING A COMING SHORTFALL

Solving all the KC-46's problems will help meet future tanking demand, but it won't solve all the Air Force's tanking problems. Even with RVS and other upgrades, the service still faces a shortfall in overall tanker capacity.

U.S. Transportation Command leaders argued last spring that Air Force plans to retire 29 KC-10s and KC-135s in 2021 were premature and risky. Fiscal 2021 defense policy bills, still not completed at press time, include language blocking many of the planned retirements.

"The op tempo is actually quite high," said TRANSCOM boss U.S. Army Gen. Stephen R. Lyons in August. "We have not yet met our program objective of 479 tankers. We will be healthy in the outyears," but not until the KC-46 is fully deployable, he added.

To help fill the gap, the Air Force said in late October it is moving forward on its "bridge tanker," previously known as "KC-Y," in an open competition to replace KC-135s. Van Ovost, speaking at the virtual Airlift/Tanker Association conference, said Air Force Secretary Barbara M. Barrett has committed to the "nondevelopmental" program based on an existing aircraft. The goal is to immediately follow KC-46 deliveries with the new tanker, beginning in about 2027.

Two existing tankers meet this criteria: upgraded KC-46s and the Airbus A330 Multi-Role Tanker Transport, which lost to the KC-46. No specific schedule for this program has been announced, nor is there a clear plan for setting the requirements for a third new tanker—the KC-Z.

"We're still undergoing basic studies on the types of attributes that this aircraft would have," Van Ovost said. "Whether it's autonomous, or whether there's a pilot in it; whether it needs to be stealth-like, or just needs to be really large." ✪





Tech. Sgt. Armando Schrier-Morales

Vice Chief of Space Operations Gen. David Thompson swore in the first four enlisted Space Force recruits at the Baltimore Military Entrance Processing Station, Fort George Meade, Md., Oct. 20, 2020.

# Space Force Training Takes Shape

**USSF will take USAF training protocols and fine-tune them to suit the fledgling service.**

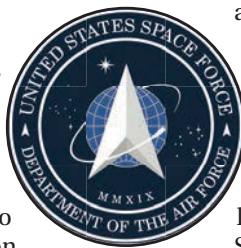
By Rachel S. Cohen

**W**hen the Space Force's top general talks about the future of training, he offers a metaphor for the militarization of the cosmos: airline Capt. Chesley "Sully" Sullenberger versus a fighter pilot.

Sully—the now-retired US Airways pilot who heroically landed his Airbus A-320 in the Hudson River after a bird strike damaged his engines on takeoff—represents the quality of Space Professionals up to now.

The fighter pilot—who must fly at least as well as Sully while also evading and fighting off attack—represents skills space personnel will need in the future.

"We have grown up building Sullys," says Chief of Space Operations Gen. John W. "Jay" Raymond. "We have the world's best space operators. ... We're world-class trained at that. ... But "we now have to shift that to a fighter pilot mentality, have a better understanding of the threats, having a better understanding of how to operate your capabilities through those threats, having a better understanding of potential



**"It's a different way of doing business."**

—Gen. John Raymond, Chief of Space Operations, USSF

adversaries. It's a different way of doing business."

As the Pentagon prepares for a second space age, rife with challenges such as signal jamming, anti-satellite missiles, and a growing obstacle course of space debris, simply flying satellites well won't cut it, Raymond says.

Since President Donald J. Trump signed legislation birthing the U.S. Space Force a year ago, the Space Force is building that next generation of service members.

The first seven Space Force enlisted hopefuls shipped out to the inaugural, seven-and-a-half-week Basic Military Training (BMT) at Joint Base San Antonio, Texas, on Oct. 20. Piggybacking on the Air Force's long-standing Basic Military Training process, the first cohort includes five men and two women ranging in age from 18 to 31. Five are White and two are Black. Those who graduate will become the first Space Force members to have been recruited and trained as Space Professionals, rather than transferring in from another branch of service.

The Space Force aims to bring in 312 enlisted recruits in 2021, and 300 to 500 per year after that,

as the service looks to maintain or possibly grow its size. It also wants about 250 new officers a year. That's a fraction of the approximately 30,000 new Airmen the Air Force brings in annually.

Chief Master Sgt. Shane Pilgrim, the Space Force's chief of enlisted force development, said the service eventually plans to consolidate its space, intelligence, and cyber recruits into single cohorts at BMT. That would bring the average size of a Space Force basic training group up to 30 or 40 instead—from the initial 10 or fewer.

Indeed, there may not ever be a standard or ideal number, according to Senior Enlisted Adviser Chief Master Sgt. Roger A. Towberman.

"Why do we have to choose? Maybe we do six at a time, and then ... one time next spring, we'll do a class of 30 and we see how that works," Towberman said. "It really is an ecosystem and everything's connected to everything else. I can change something so that basic training works better, and it may make technical training work worse, or it may put the recruiters in a position where they've got to make compromises in order to meet the numbers that they need to keep us on track."

The Space Force will seek recruits and officers in places USAF may not have looked in the past. It aims to strengthen ties to historically Black colleges and universities and hopes to attract more women interested in science and technology.

"We are also targeting demographic areas in the country that are traditionally not fertile grounds for recruits," Pilgrim said.

In contrast to a conventional focus on standardized testing, the Space Force intends to leverage its more intimate size by focusing instead on interviews and a personal assessment process. Those chosen to join the service will receive a tablet with courseware and helpful videos about two months before BMT, and will be paired with mentors to help them prepare.

"Because of our size and scale, we can do things on a more personal level," Pilgrim said.

Once at basic training, recruits will join Air Force BMT recruits, separated by gender, for most training, breaking into Space Force flights only for space-specific training, similar to the way new special warfare Airmen are trained.

For now, just three Space Force training instructors (TI) are assigned to Lackland Air Force Base, Texas, and they will lead Space Force BMT flights. "So that's how we're building in these space experiences—having the flight led by a space TI,

having specific courseware to space—but they are still going through Air Force BMT for all intents and purposes."

The Air Force has gradually built more space knowledge into its education regime for all Airmen, teaching the importance of satellites and radars to the rest of the combat force. More specialized Space Force training will go even deeper.

Towberman charged personnel experts to create a unique recruit experience focused on teamwork, warfighter ethos, professionalism, and comprehensive fitness. The service wants its training to feel different from the other armed forces, while still infusing necessary military discipline and the unique space operations culture.

In addition to standard training on personal conduct, physical fitness, and military fundamentals, space recruits will learn "law, policy, orbital mechanics, electromagnetic waves and signals, space environment, space systems, command authorities, and joint space warfighting," according to a Space Force release.

"We looked at adding a course on our space organization, ... [and] some stuff about our doctrine and our defense space strategy" to explain why the Space Force was created, Pilgrim said. The planning team wanted to create opportunities to discuss space dominance and orbital threats in an unclassified forum, and to cover the past several decades of military space history.

Recruits should likewise learn about the Space Force's workforce, which employs a greater percentage of officers and civilians than the Air Force, Pilgrim said.

"We also assessed whether some of the courses there, such as the combat arms training, were relevant in the current format to what we're doing in our mission in the Space Force, and the expeditionary training as well, because our mission is different," he added.

Space operations are less physical than other military specialties and require fewer deployments, Pilgrim said. "Our training should relate to what we do for our national defense mission."

## DIGITAL NATIVES

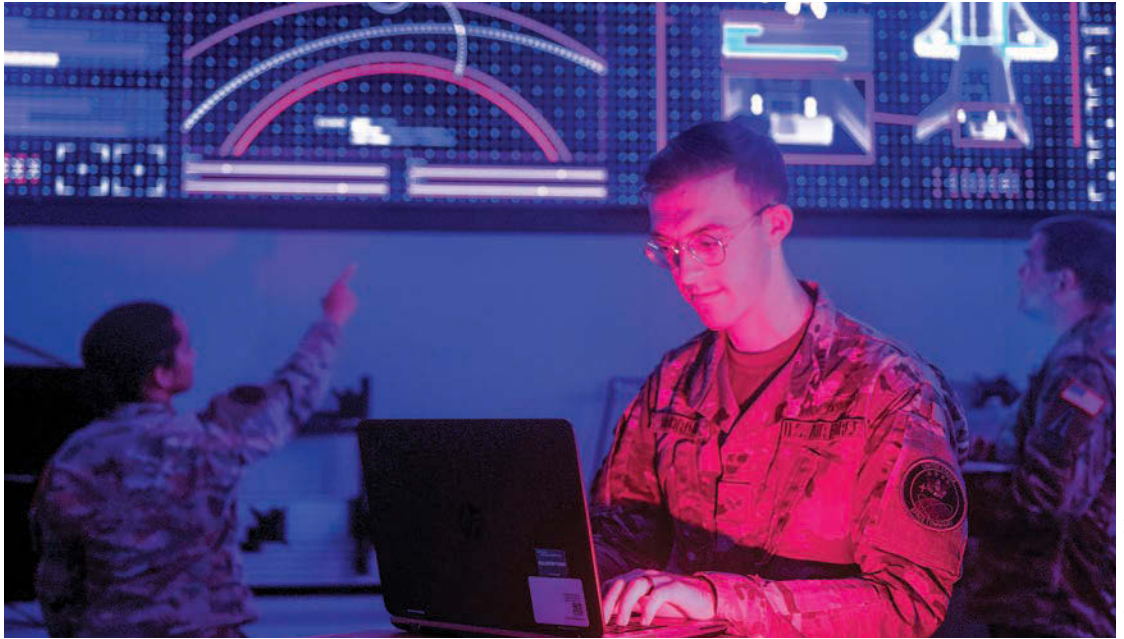
As the first branch of the armed forces launched in the computer age, the Space Force pledges to break away from manual processes, starting with the way it educates and trains its workforce.



Air Force Col. Nikki Lindhorst (center), Air University space chair, welcomed Space Force 2nd Lieutenants Elizabeth Kowal, left, and Amy Coba after the Officer Training School Class 20-08 graduation Oct. 16, at Maxwell Air Force Base, Ala. Lindhorst presided over a ceremony for newly appointed officers from Class 20-08 to the Air Force and Space Force.

Airman 1st Class Jackson Manske

Senior Airman Bailey Bourque, 18th Space Control Squadron combat development division technician, works on software development for future space operations at Vandenberg Air Force Base, Calif. Space Training and Readiness Command oversees USSF command and control preparation at the base.



Tech. Sgt. Patrick Harrower

“We are going to incorporate some video-enhanced courseware, some stuff where we can actually leverage technology to bring the experience of current Space Professionals into BMT,” Pilgrim said. Instead of PowerPoint slides, he’s hoping to bring in guest speakers via livestream or prerecording.

Pilgrim believes a tech-savvy approach is not only valid now, in the midst of the COVID-19 pandemic, but will endure beyond.

“Our tablet initiative allows us to stay connected without being physically connected as much to the recruits, prior to them coming to basic,” he said. “Once they get into that pipeline, they have established controls that are tried-and-true at BMT that will be implemented and will keep them safe.”

Over time, Space Force basic training could grow large enough to warrant its own squadrons and a fuller space curriculum. Everyone should have a basic understanding of space operations, whether they’re a satellite operator or an intelligence analyst, Pilgrim said.

“Gradually, we can build and morph into that. We need to run where we can and crawl where we need to,” he said. “As we get through a couple iterations of this, I think we will learn rapidly, and it’ll be a constant double loop where we go back and reassess.”

Space Force BMT graduates’ next stops will be one of three bases: Space operators will go to Vandenberg Air Force Base, Calif.; cyber specialists will go to Keesler Air Force Base, Miss., and intelligence specialists will go to Goodfellow Air Force Base, Texas. Officer Training School (OTS) graduates appear to be following the same path.

For new officers, the Space Force is leveraging the Air Force’s OTS; its first two graduates, both women, completed the seven-and-a-half week course in October. A service spokeswoman declined to provide more details, but their next stops will match those of enlisted members.

## BUILDING STARCOM

The Space Training and Readiness (STAR) Delta is responsible for Space Force technical and advanced training. The command is provisional and will evolve over the next year to become the future Space Training and Readiness Command (STARCOM). Currently located at Peterson Air Force Base,

Colo., STAR Delta encompasses the 3rd Space Experimentation Squadron, 17th Test Squadron, 25th Space Range Squadron, 527th Space Aggressor Squadron, 705th Combat Training Squadron Operating Location Alpha, and Air Force Warfare Center Det. 1 at Schriever Air Force Base, Colo.; the 319th Combat Training Squadron, Air Force Operational Test and Evaluation Center Det. 4, and National Security Space Institute at Peterson; the 328th Weapons Squadron at Nellis Air Force Base, Nev.; and the 533rd Training Squadron at Vandenberg.

Once established as STARCOM, it will oversee training and readiness for each specific skill set within the Space Force, including missile warning at Buckley Air Force Base, Colo.; command and control at Vandenberg; and navigational warfare and satellite communications at Schriever.

The Air Force started beefing up its space education even before STAR Delta came to be, and will now continue to evolve as the Space Force raises awareness of the threats facing assets on orbit and on the ground, and offers a more holistic view of how those tools fit into the larger warfighting picture. For example, the 533rd Training Squadron is adding rigor to its courses, along with more classified content for both undergraduate officer and enlisted training, said STAR Delta Commander Col. Peter J. Flores.

“Those courses are much more complex now than they were in years past,” he said. “They are broader in their perspective, in terms of what are the threats? We’re asking people to think about how to prevail in that contested, degraded, operationally limited environment.”

Incorporating content marked “Top-Secret/Sensitive Compartmented Information” is important in a line of work that is shrouded in secrecy. Adding that content to the curriculum gives students a more complete understanding of what they might be up against as countries compete for dominance in orbit.

“Some of the concepts can seem pretty abstract,” said Maj. Gen. DeAnna M. Burt, then the director of operations and communications at Space Force headquarters, in April. “But when students see it applied to a real-world scenario, suddenly it sticks.”

Last year, Burt noted that instead of simply learning what the different orbital layers around the Earth are called and

how high they sit, undergrads will also learn why the military uses each layer, how space operations differ from air ops, how to determine when systems are being jammed, and more.

“If I have to move satellites and keep them in mission, if I have to move and stop doing mission in order to save that vehicle, what does that look like?” she said. “Why would I do that? What are all those agencies doing to each other, and how are they talking and integrating in a fight?”

Introducing those concepts in school means students will have less to learn when they get to their duty stations—and be better primed to learn more quickly on the job. To accommodate the additional coursework, undergraduate space training has also expanded from 76 days to either 87 days for enlisted students or 110 days for officers.

There’s more work to do to find the sweet spot for how many people should move through space operations training each year. Pandemic precautions have limited class sizes, “strangling” the education pipeline, Flores said. Bringing in new members from the Army, Navy, and Marine Corps, as well as Air Force personnel who transfer into space operations, will affect that in the future.

Courseware and staffing may change over time as class sizes fluctuate and stabilize.

“Does everybody need to show up on Day One for undergraduate space training for a multi-month operation?” Flores asked, posing one of many questions he’s trying to answer now. “Or if you’re coming from some other discipline that preps you for that, can we turn some of that into ... online courses that then limits the amount of time you have to spend on the ground?”

## TECHNICAL SCHOOLS

For technical training, the Space Force now offers 15-day courses in space warfighting disciplines such as orbital warfare, electronic warfare, and space battle management. About 120 students have graduated from those classes so far, Chief of Space Operations Gen. John W. “Jay” Raymond said in September.

Building that curriculum to meet the needs of Space Force doctrine is the biggest challenge for the 319th Combat Training Squadron, Flores said. Indeed, officials are mulling whether the Space Force could use the same instructors for both initial and technical training.

“Do we have to do basic training separately from anything?” Towberman mused. “Could we do basic training as part of tech school and it’s just called training and you just show up and you do it all together in one location?”

Burt has compared weapon system training to how the Air Force matches Airmen with planes: the service first teaches them to fly, then splits them to learn about different categories of aircraft, then assigns them a particular airframe. Space personnel will learn their systems “down to every knob and bolt and screw” like Airmen would the F-35 Joint Strike Fighter, she said.

## BUILDING ON HISTORY

Wherever possible, the Space Force is leveraging existing Air Force institutions to deliver its education and training needs. As it is with Air Force BMT and OTS, the Space Force is relying on Air University, its Senior Noncommissioned Officer Academy (SNCO), and the U.S. Air Force Academy (USFA) to help educate its future leaders.

Last April, USFA graduated 86 cadets who commissioned into the Space Force as second lieutenants. They were among the very first officers to enter the service.

Air University is adding space warfighting to its core curriculum at Airman Leadership School, doubling its Schriever Space Scholars program to include about two dozen participants, and launching the West Space Seminar through the Air War College. Soldiers, Sailors, Marines, and foreign military personnel are all playing an increasingly large role in professional space education, as well.

“All Space Professional students will be enrolled in the ‘Space Grey Rhinos’ space concentration, where they will study space as an instrument of power and policy,” Air University announced in an August release. “Students will participate in the Air University Advanced Research capstone project, researching space topics and presenting ideas to the U.S. Space Force in a final outbrief.”

Air University graduated its first Space Force members from the SNCO Academy in September. Reserve Officer Training Corps participants will also get a heavier dose of orbital issues in their collegiate program.

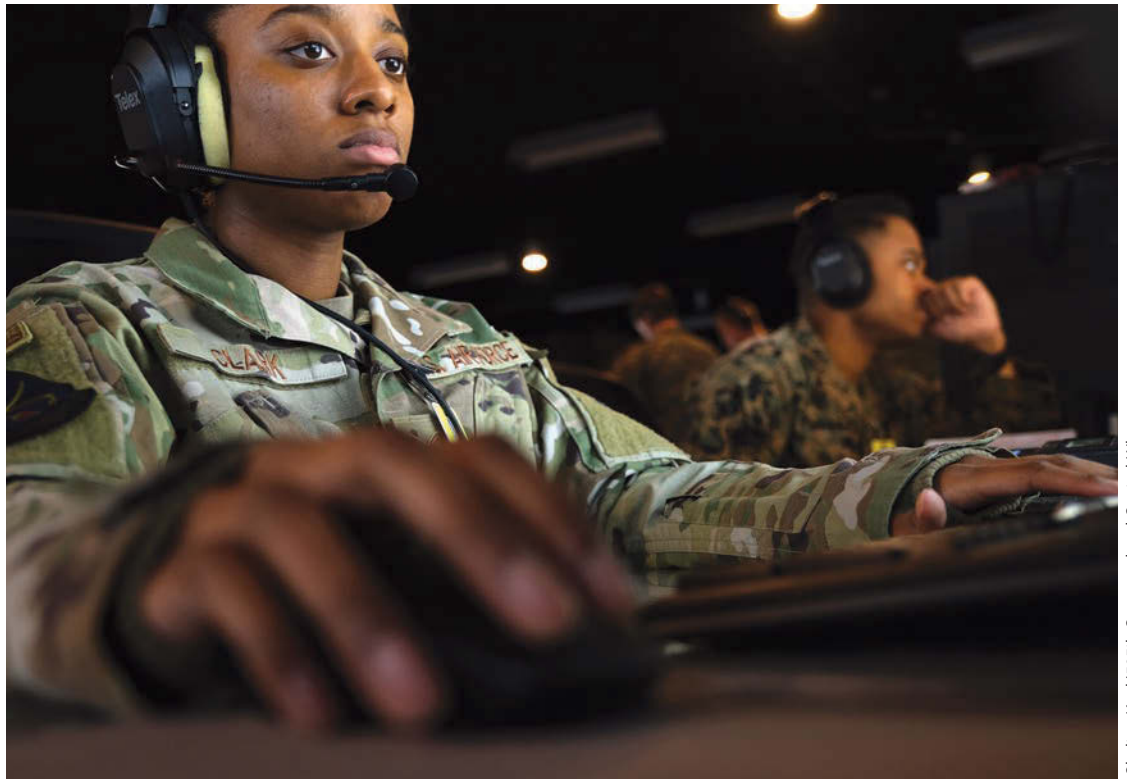
Over time, adding “space flavor” may transcend orbital studies to include cultural elements central to USSF in future professional military education (PME), Towberman says.



Capt. Alexander Panek (left) demonstrates virtual reality training for Maj. Gen. Stephan Whiting, head of Space Operations Command, during a visit to Vandenberg Air Force Base, Calif., in July. The Space Force expects all its members to be “fluent in digital.”

Senior Airman Aubree Owens

Members of the U.S. Air Force and U.S. Army work side by side to refine their skills during exercise Virtual Flag 20-1—a real-time tactical-to-operational-level event using air, land, space, cyber, and maritime scenarios integrating live, virtual, and constructive elements to train warfighters.



Shelton Keel/505th Command and Control Wing

“If we decide that we want to work more on interpersonal communication skills, we might change interpersonal communication in PME,” he said. “That wouldn’t be a space thing, right? It would be a Space Force thing.”

Diversity and inclusion training will be part of Space Force BMT, for example, and members will practice broaching sensitive topics with a computer avatar so they feel more comfortable discussing those issues in real life.

Another bedrock competency for the Space Force will be digital literacy. Space Force members will take 6,000 spots in the Department of the Air Force’s Digital University, an online course catalog of IT and cybersecurity training and computer science language coursework, Raymond said in September. The objective is to apply those skills across the enterprise. For Space Flag, the Department of the Air Force’s premier large-scale space training exercise, STAR Delta wants to improve its modeling and simulation capabilities so more people can participate more often.

Over two weeks last August, STAR Delta held its first major exercise—the ninth edition of Space Flag—at the Boeing Virtual Warfare Center in Colorado Springs, Colo. The event split 34 participants into red, white, and blue cells. Blue players practiced moving space assets on orbit to respond to threats; white players provided command and control; and the red players worked to disrupt the blue team’s operations.

It’s often hard to practice orbital offense and defense without actually being there. Flores said building more advanced simulators can help show how things might play out in an electronic or physical war. Those artificial environments need to be as realistic as possible and include the National Reconnaissance Office, other countries, private contractors, and anyone else the Space Force would need to work with in a fight.

“When crew members come in—whether they’re cyber, space, intel—they can come in and it will feel, it will taste, and it will smell like the environment they’re expected to operate in, with all the inputs,” Flores said. “As they make decisions through that fight, the system can react to that and

can give them feedback on how things went.”

Space Flag is organized by STAR Delta Operating Location Alpha (OL-A), which transferred to the Space Force this year after being part of Air Combat Command for the prior seven years. The organization provides some of the glue connecting air and space assets in combat.

“[We’re able to] project electronic intelligence data into HH-60 cockpits to help the aircrews locate downed Airmen anywhere on the globe,” OL-A director Kevin Rhoades said in a press release earlier this year. “We generally do this over [continental U.S.] ranges, but recently supported an expeditionary rescue squadron downrange in the [United States Central Command area of responsibility].”

The service is also looking to Red Flag, on which Space Flag is based, and other ventures at Nellis for best practices in training.

“I think everyone understands that warfighting is warfighting,” Burt said. “The kinematics and the domain may be different, but how we fight, and the doctrine, and the way we get offense and defense ... are no different from one domain to the other.”

Schriever Wargame, an annual futures event that brings together hundreds of military and civilian participants from across the globe, may eventually fall under STARCOM, as well. The game is now under Pentagon oversight.

The important thing to remember, Towberman says, is that the Space Force is still new, still ironing out the many details necessary to establish the training and culture it needs to be successful in the future.

The service is embarking on what Towberman calls “small-batch solutions” as a means to float trial balloons on everything from workout uniforms to training in focus groups.

“We don’t have to come up with a final answer that’s going to apply to the full force for what we think is the next 10 years,” he said. “We can say, ‘Hey, let’s do something that applies to a small group.’ And try it out and see what it looks like. Then if we like it, we’ll scale it.”

The proliferation of satellites in low, mid, and geosynchronous orbit is driving decision-makers to change the way they view national security space. The JEM Small Satellite Orbital Deployer releases a constellation of miniature CubeSats developed by Japan, Nepal, and Sri Lanka in June 2019.

# Commercial Solutions Answer Space Force's Call

NASA

## National Security Space must start to use commercial satellite architectures.

By Tom Taverney

**W**e are moving to a new era in space, from a time when the United States was the clear dominant power to an era of competition. During this era of U.S. space dominance, space was basically a safe haven. Today, however, space is a truly international domain, used by up to 60 countries and a robust and growing commercial industry. The United States now has near-peer competitors in China and Russia and evolving competitors in India, North Korea, and Iran. As a result, space has become more congested and dangerous with a diversity of real and emerging threats.

Our National Space Strategy, released in March 2018, makes this clear: "While the United States would prefer that the space domain remain free of conflict, we will prepare to meet and overcome any challenges that arise." The new reality is that growing congestion

**"It now makes increasing sense for the Department of Defense to take advantage of commercial space to drive innovation, reduce risk, improve schedules, and manage costs."**

could cause the unintentional loss of systems through collisions, and a determined adversary can threaten or eliminate our Space Systems. As the June 2020 Defense Space Strategy states, "China and Russia each have weaponized space as a means to reduce U.S. and allied military effectiveness and challenge our freedom of operation in space."

Meanwhile, commercial space has transitioned from following to leading innovation in communications, launch, and high-volume production buses, it now makes increasing sense for the Department of Defense to take advantage of this market to drive innovation, reduce risk, improve schedules, and manage costs in National Security Space (NSS).

The National Defense Authorization Act of 2018 directs DOD to leverage commercial space to provide affordable resiliency for space-based operational sensors. While at the senior leadership level there is agreement on this, comfort with existing processes and approaches drives traditionalists to make de-





An artist illustration shows an SES-2 communications satellite in space. USAF's experimental Commercially Hosted Infrared Payload, or CHIRP, successfully reached space aboard a SES-2 communications satellite in September 2011.

SES illustration

mands that commercial providers cannot rationally meet, including security classification of the development process, expensive and time consuming oversight, nuclear hardening requirements, and more. We need to find a way to reward the use of commercial space and not penalize it. The fact is, a determined adversary can eliminate nodes or systems whether they are NSS or commercial.

While the Defense Department takes advantage of commercial launch and is becoming more comfortable and adept at buying the service—not the rocket—there are still many DOD special requirements for buying a commercial service. As a result, the department pays 30 percent or more than anyone else for a Falcon-9. The Defense Department asks for more “special services” because the payload is often a multibillion-dollar vehicle that, if lost, can’t be replaced for another decade. As we move to a resilient proliferated future, where the cost of space systems drops to the hundreds of millions or less and delays are more manageable if losses occur, we can rethink launch-reliability requirements, as well as necessary oversight. We also can investigate and update the way we buy other commercial space capabilities, such as satellite buses and communications.

### **RESILIENCY BY LEVERAGING COMMERCIAL SPACE**

To ensure mission capability, the U.S. National Space Strategy calls for moving to resilient constellations that not only survive the loss of individual nodes, but continue operating without affecting the mission. Gen. John E. Hyten, Vice Chairman of the Joint Chiefs of Staff, called this essential in 2019: “We should move away from procuring a handful of ‘exquisite’ costly satellites that make for ‘large, big, fat, juicy’ targets. Instead of ‘fragile and undefendable,’ I am in favor of more resilient, more distributed capabilities, such as cheaper, small satellites. A constellation of such small satellites is likely to enable both greater dispersion of our space assets and the ability to rapidly recover in the event of an attack.”

To take full advantage of commercial space capabilities we

must significantly increase our use of commercial buses and their ongoing production lines; commercial launch services; and commercial communications.

The National Space Strategy states: “Strategic partnerships with commercial firms will continue to enable access to a more diverse, robust, and distributed set of space systems and provide easily releasable data.” It goes on to say that the United States will pursue such partnerships “in areas that both stabilize costs and improve the resilience of space architectures.”

Resiliency will require much larger production quantities, driving the need for affordable cost and responsive schedules. Future buses must accommodate a variety of payloads and orbits without being redesigned, providing more flexibility to the Space Force and other customers. Responsibility for integration, and compatibility will fall to the payload—a radical change from today, where the bus, rather than the payload, must adapt.

DARPA’s Blackjack, Space and Missile Command’s (SMC’s) CASINO, and other proliferated low-Earth orbit (pLEO) systems follow this model. Additionally, SpaceX, Amazon, Telesat, and Samsung are among those moving in this direction. After OneWeb went into bankruptcy, the British government and Bharti Global purchased its assets in July 2020 and now plan a \$1 billion investment to revive the company. Thus, a growing variety of commercial bus options complement the many commercial GEO buses that are already very mature. Commercial buses are even moving into MEO, such as SES/Boeing partnering on the O3b bus.

This means DOD can purchase buses off existing production lines. If the mission payload is the central focus, the payload contractors can be required to assure compatibility with a commercial bus or buses, even as bus production lines evolve to meet market demands. SMC has taken an aggressive posture on implementing a commercial bus approach by beginning development of modular bus/payload interface standards, such as the Payload Users Guide describing the standard interface for SMC’s Long-Duration Propulsive ESPA (EELV Secondary

Payload Adapter) program, using Northrop Grumman's standard ESPA Star bus, which can be downloaded from the Internet by any prospective payload developer.

Defense Department customers will ask: "How will we get the systems engineering, quality, and mission assurance/reliability standards, etc., that we had in the past?" DOD customers can learn from commercial satellite customers, who—while very schedule- and budget-driven—also demand full satellite capability—usually for 15 years or more on orbit. If the Space Force presents commercial bus providers with sufficient, sustainable demand, they will respond; if not, they won't.

Another cultural barrier is trust: Will the satellite be there when needed? The fact is, it's not clear today that current Space Force systems will all be there in a peer fight. With commercial-based systems, however, the loss of a payload will likely be less, given that the difference in cost would enable the Space Force to have more vehicles on-orbit, making the overall system more resilient to attack.

Other barriers to using commercial communications satellites and commercial buses are the requirements for Class A development, intrusive data rights, and nuclear hardening. Our adversaries have demonstrated that our individual satellites are vulnerable to laser blinding, jamming, spoofing, kidnapper satellites, cyber tampering, and kinetic anti-satellite weapon threats. Given the numerous nonnuclear means of interfering with or destroying satellites, it's clear a determined adversary can attack individual satellites/nodes—possibly with plausible deniability. Meanwhile, there appears to be little or no evidence that our adversaries are considering nuclear detonation as a preferred course of action to destroy or disrupt U.S. satellites. Therefore, perhaps nuclear hardening should no longer be a driving requirement for future DOD architectures.

While it may not be likely that Russia or China would attack commercial communications, the risk to those systems would rise if military capability were on-board. The key to a successful space posture is for the mission of the satellite constellations to endure despite the loss of individual nodes, and therefore make it far less useful to attack individual commercial nodes. As more communications satellites move to LEO, there is increased risk that a rogue nation such as Iran or North Korea could initiate an attack, given that it is far easier to attack in LEO than in GEO/HEO or MEO.

The current practice of requiring all satellites to survive prompt dose and HEMP (high-altitude electromagnetic pulse) hardening drives costs up and slows down schedules, limiting the number of satellites DOD can buy. This impedes our space

security objectives and drives us to create large and expensive space targets that are vulnerable to other destructive and disruptive capabilities. We are enabling rather than deterring our adversaries from using anti-satellite capabilities.

Meanwhile, an increasingly mature and innovative commercial space marketplace is hardening its systems against total radiation doses from the natural radiation environment, sufficient to handle all but the worst prompt dose and HEMP effects. Existing "Class A" and "long life" requirements mean more expensive parts, more processes, and more paperwork produced by more engineers. That costs money.

## LEVERAGING COMMERCIAL LAUNCH

In a recent study by RAND regarding the launch market, "Assessing the Impact of U.S. Air Force National Security Space Launch Acquisition Decisions" (Rand Document Number: RR-4251-AF-2020), the authors classified launch into three categories: government, commercial, and commercial-like. The found that "the launch reliabilities under all three types cannot be considered statistically different with 95 percent confidence."

The commercial launch industry today is driving down cost and seems to have cracked the last real barrier to launch reliability. At a time when NSS is moving to more light/medium lift and a higher-risk tolerance, the commercial launch industry is dramatically improving reliability in the market segment most needed by the NSS community.

The current SMC Launch Service Provider (LSP) acquisition seeks to certify at least two commercial providers for DOD launches and offer them a certain number of missions. Future acquisitions could offer the ability to certify and "on-ramp" additional commercial launch service providers as DOD needs and market forces permit. The team and processes created by SMC to certify the LSP missions should be maintained, and refined, to enable future competitors to enter the DOD marketplace. Allowing any and all launch companies that want to be in the NSS stable to become certified would enable every launch to be competitive.

The United States should move away from having launch contractors bid for a number of launches and instead select the best solution for each particular launch. While there will continue to be an ongoing need to have a stable of qualified contractors, we need to also include the option for programs to select competitive commercial launch options that meet program requirements. Recently, SMC commercially acquired two R&D launches from VOX Space. A strong first step in this direction. The key to future success will be for DOD to clearly define and adopt rapid reconstitution requirements

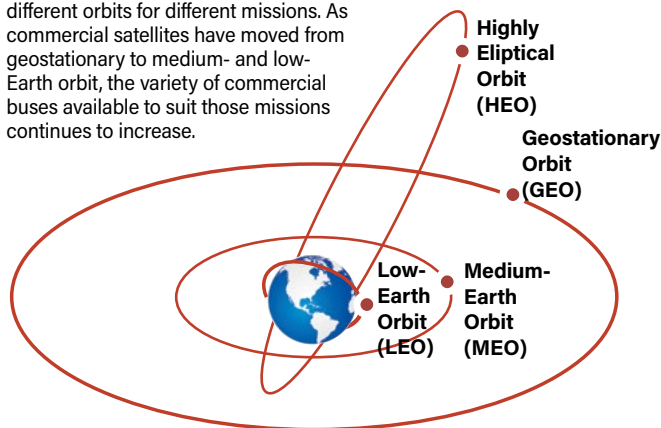
In an era of reusable boosters, NSS should not care about reusability, but focus instead on capability, reliability, cost, and schedule. If reusability gives a contractor a cost, schedule, or reliability advantage, fine: That is the contractor's approach and the contractor's call—each solution competes on its own merits.

Commercial satellites can rapidly switch launch vehicle providers to allow them to get a better price and meet schedule demands if a specific vehicle is delayed. Defense Department missions should adopt this same approach.

Rapid reconstitution is the ability to get replacement space capability assets on-orbit to replace on-orbit losses, building back up the constellation resilience as losses occur. Obviously ground spares and rapid launch are the keys to this. Much like resilience, the ability to achieve "rapid reconstitution" is predicated on assured availability on a very short timeline. It means a provider with boosters in a development flow that can be pulled; flexible boosters that can be rapidly

## Multiple Orbits

National Security Space platforms use different orbits for different missions. As commercial satellites have moved from geostationary to medium- and low-Earth orbit, the variety of commercial buses available to suit those missions continues to increase.





repurposed, or numerous qualified providers positioned to respond rapidly.

## SPACE-BASED COMMUNICATIONS

The U.S. National Space Strategy says, “DOD will leverage and bolster a thriving domestic civil and commercial space industry.” In the case of communications, DOD is already heavily invested in commercial ground and user equipment. This is a stated goal of Space Force’s Vision 2030. The path to get there will require robust dialog between DOD acquirers, warfighters, and commercial providers.

Michael D. Griffin, former undersecretary for research and engineering, prior to departing the Pentagon earlier this year, likened the requirement to replacing the venerable High Mobility Multipurpose Wheeled Vehicle (HMMWV). “We’d be lost if we tried to get a traditional defense prime to design, manufacture, and sustain a HMMWV for us, but we’d be equally lost if we had just bought a commercial SUV off the line and fitted it with DOD stuff in an ‘aftermarket’ mode. Neither would address our need, which was in a few words ‘commercial-style production of a DOD design.’ We employ commercial automakers to build it. Much of the design is in fact ‘commercial.’ I mean, we aren’t custom-building the engines, the alternators, the steering mechanisms, etc., etc., but the overall design is a design to meet DOD requirements. It is not a commercial design, (though there are commercial adaptations, but, bottom line, we are using commercial contractors, methods, assembly lines, and business practices to build a design to DOD requirements. That is the pattern that I think will prove most fruitful for us in the majority of cases going forward.”

Commercial COMSATS boast radiation and cyber robustness that is the equal, or sometimes even better than military-dedicated capabilities. Commercial COMSAT businesses can also turn technology faster than DOD, and DOD wants to take advantage of their diverse frequencies, waveforms, and form factors.

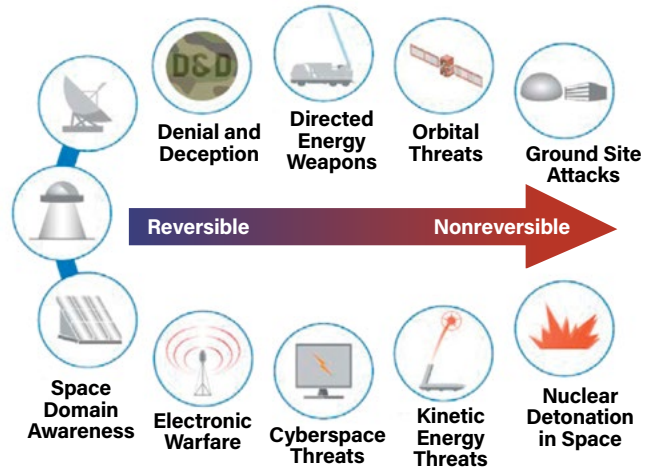
The U.S. government must establish trusted commercial partnerships to ensure industry can provide the right capabilities when and where they are needed. This needs to be a true partnership where COMSATCOM is treated as vital infrastructure. COMSATS are clearly “fat, juicy targets,” especially the secure and protected systems; wideband nonsecure and nonprotected systems may be less attractive, but not out of the question; attacking commercial COMSATs would represent a major escalation, but it is feasible that Russia and China could attack these, too.

With the threat environment and landscape becoming more contested, congested, degraded, and operationally limited, warfighters must also have the option to roam between military and commercial satellites to achieve mission assurance. We must refresh and upgrade SATCOM capabilities to ensure roaming across multiple bands, orbits, and networks. The utilization and integration of commercial SATCOM capabilities with existing military SATCOM empowers DOD to rapidly access a diverse, disaggregated, and resilient communications network, complicating the enemy’s targeting calculus.

Technological advances within the commercial sector are enabling security measures to mitigate cyber threats, reducing potential vulnerabilities, and limiting the impact on national security interests. For example, high-frequency reuse strategies, like targeted spot beams, are inherently more jam resistant. Commercial SATCOM partners have been able to leverage and incorporate U.S. government requirements by design, enabling inherently more resilient platforms. This effort has led to com-

## Counterspace Continuum

The more important space is, the greater the need to counter its capabilities, both in terms of reversible short-term effects and outright destruction.



mercial capabilities having “DOD-grade” security built in.

Finally, with resilience defined as our major defense against attack, how better to achieve that than to purchase capability from multiple large constellations? Doing so promotes competition and the inherent price and technology advantages that brings, while also assuring options should any single system fail. Commercial companies are now developing new capabilities much faster and more affordably than the U.S. government can.

We need to grow into this new view of space operations over time, starting with a mix of commercial and DOD purpose-built systems and moving, as commercial systems become more robust than purpose-built systems, to an all-commercial model. This can increase both agility and versatility by selective use of different types of constellations and a variety of altitudes to react to what is needed at any given moment.

## MISSION-FOCUSED PROCUREMENT

The Department of Defense is already making changes to how it acquires space systems, and leaders have openly expressed a goal to better leverage commercial space. The new Space Force, through SMC and RCO (Rapid Capabilities Office), SDA (Space Development Agency), and the assistant secretary for space acquisition has made strides, but more must be done.

We should move immediately:

- Make mission/payload contractors the prime contractor, responsible for purchasing a commodity bus that supports their mission.

- Purchase commercial buses from a range of suppliers to increase innovation and drive prices down.

- Move toward purchasing launch services on the open market, just like commercial space does, and invest in boosters before they are needed in order to be able to call on them when needed for rapid reconstitution.

- Accelerate the purchase of commercial communications capability and integrate commercial satellite services as part of a resilient DOD network.

- Invest in the technology to be able to roam between dissimilar communications architectures to further increase resilience. ✪

**Tom “Tav” Taverney** is a retired Air Force major general and a former vice commander of Air Force Space Command.



Original photos: Senior Airman Christina Griffiths  
Illustrations: Mike Tsukamoto/staff

# Range and Flexibility

Why bombers are the most flexible leg in the nuclear triad.

The Air Force plans to procure 220 B-21 Raiders, shown here in this photo illustration, which will begin to join the force late in this decade.

By Col. Mark Gunzinger, USAF (Ret.)

**T**he ability to launch retaliatory strikes in response to nuclear aggression is the foundation of America's nuclear deterrence strategy. Since the 1960s, a triad of intercontinental ballistic missiles (ICBM), ballistic missile submarines carrying submarine-launched ballistic missiles (SLBM), and nuclear-capable bomber aircraft underpinned this strategy. Today, the United States Air Force's B-52H and B-2 bombers are the most flexible leg of the triad and are highly survivable once they are generated and ready to sortie from their air bases within minutes. Beginning in the mid-2020s, the next-generation B-21 "Raider" stealth bomber will join the inventory, eventually replacing the Air Force's B-2s and conventional-only B-1B bombers.

Air Force B-52Hs have been operational since the early 1960s and will remain in the force until at least 2040. Originally designed as high-altitude bombers capable of delivering nuclear gravity bombs over intercontinental ranges, B-52s modified to carry conventional weapons played a critical role during the Vietnam conflict and in every major air campaign since. For instance, B-52s flew an average of



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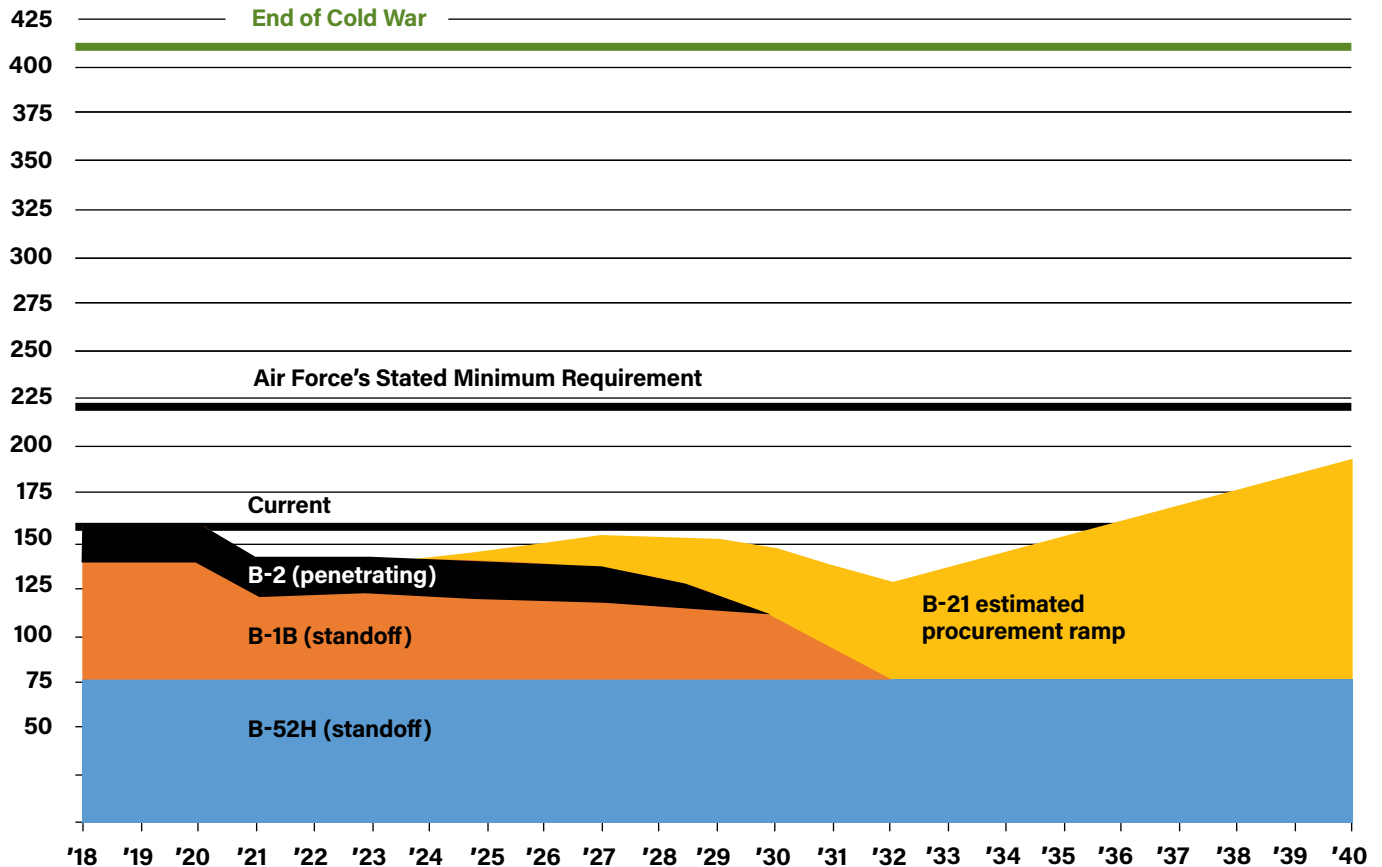
50 sorties per day and delivered 40 percent of all the weapons dropped by coalition forces during Operation Desert Storm against Iraq in 1991.

While B-52Hs can deliver a variety of short-range weapons such as Joint Direct Attack Munitions against targets in permissive threat environments, they are not stealth aircraft and must launch long-range standoff weapons against targets located in contested areas covered by modern integrated air defense systems (IADS). A single "BUFF," as B-52s are nicknamed, can carry up to twenty 2,000-pound class Joint Air-to-Surface Standoff Missiles (JASSMs) that are designed to penetrate contested areas, and an extended range JASSM-ER will allow them to strike from standoff distances of 500 nautical miles or more. B-52Hs are stationed at Minot Air Force Base, N.D., and at Barksdale Air Force Base, La.

At this time, B-52Hs are the only USAF bombers that can carry nuclear-capable air-launched cruise missiles (ALCMs). The Air Force began developing the AGM-86B ALCM in the 1970s to improve the B-52's ability to strike targets defended by Soviet-era surface-to-air missiles and other threats. First fielded in 1982, with a projected service life of 10 years, AGM-86B ALCMs are subsonic, long-range

# Tracking the Bomber Shortfall

The U.S. Air Force had more than 400 bombers at the end of the Cold War. The Air Force says it needs 225 bombers to meet the National Defense Strategy. Unless plans change, the Air Force will fall short of that requirement for the next 15 years—or longer.



Note: Projection based on current inventory information provided by USAF, data from the FY21 President's Budget, and an estimate of a notional B-21 procurement ramp.

weapons. A B-52H can carry up to 20 ALCMs armed with W80-1 warheads. Beginning in the late 2020s, the Air Force will replace its ALCMs with the long-range standoff (LRSO) weapon. The LRSO will carry a W80-4 nuclear warhead and have the ability to penetrate advanced IADS, operate in GPS-denied environments, and hold high-value targets at risk from significant standoff ranges. LRSOs will ensure B-52Hs remain a viable part of the triad well into the future.

USAF's B-2 stealth bombers joined the force beginning in the early 1990s. B-2s have flying wing designs that decrease their radar and infrared signatures, reducing the probability they will be detected by enemy air defenses. The B-2's design, radar-absorbent materials, onboard sensors to detect threats, secure connectivity, and ability to fuse information from multiple sources give it the ability to penetrate contested areas. B-2s can deliver large payloads of conventional and nuclear weapons on targets with precision in all weather conditions, and they are certified to carry B61-7/11 and B83 nuclear gravity bombs. Although these weapons will be retired in the mid-2020s, a life extension program will replace current B61 variants with the B61 Mod 12 that will have new and refurbished components, as well as a tail kit to improve its accuracy.

B-2s will soon be joined by next-generation stealth B-21s capable of penetrating future threat environments. Beginning in the mid-2020s, the Air Force intends to procure at least 100 B-21 aircraft that will be capable of carrying conventional weapons, the LRSO, and B61-12 gravity bombs.

## WHY IS THE BOMBER FORCE RELEVANT TODAY?

America's global interests are now being threatened like never before. China and Russia pose security challenges that the United States has not confronted since the Cold War—some potentially existential in nature. At the same time, rogue states like North Korea and Iran have ballistic missiles and aspire to develop the ability to deliver nuclear warheads over long ranges, and non-state actors continue to plot attacks against the U.S. and its allies.

The concurrency of these threats has stretched America's military resources thin. With vital interests on the line, the Department of Defense (DOD) will modernize the forces and capabilities that are most critical to executing the 2018 National Defense Strategy. Weapon systems like USAF bombers that are capable of attacking targets with conventional or nuclear weapons over global ranges are a top priority. Long-range strike bombers, when paired with an effective campaign strategy aimed at vital targets, are one of the most effective tools available to America's commanders. Unlike most elements of the joint force, bombers with large payloads of conventional weapons can respond within hours to strike targets located inside contested areas. This early firepower will be essential to achieving time-sensitive objectives for theater commanders—a realistic scenario could require them to rapidly halt Chinese or Russian aggression against an American ally.

The Air Force's nuclear-capable bombers also complement other legs of the triad. B-2s and B-52Hs can generate to alert

**Airmen load a joint air-to-surface standoff missile onto a B-1B Lancer at Andersen Air Force Base, Guam. B-1Bs were designed to penetrate Cold War-era Soviet air defense and are not capable of operating in areas defended by advanced IADS.**



Senior Airman River Bruce

status within a matter of hours, disperse to multiple airfields to reduce their vulnerability to nuclear strikes, or deploy overseas to reassure allies and demonstrate resolve in a crisis. Unlike SLBMs and ICBMs, bombers can be launched and recalled without employing their nuclear weapons, giving U.S. National Command Authorities another means to signal resolve. Bomber crews can modify their mission profiles, change targets in flight as directed, and determine if their weapons should be withheld. Bombers can also regenerate after a sortie to prepare for follow-on missions or to reestablish deterrence after an attack. Penetrating bombers are the only triad leg capable of locating and attacking highly mobile or relocatable targets such as ICBM transporter-erector-launchers. This is a key reason the Air Force chose to procure the B-21.

### **THE AIR-BREATHING LEG OF THE TRIAD**

After three decades of cuts and delayed modernization, the B-21 program will create a future bomber force that is appropriately sized and has the right mix of penetrating and standoff strike capabilities needed by U.S. combatant commanders. Although there is strong national support for the B-21, a few critics continue to question the need for it. Factors contributing to DOD's decision to procure the B-21 generally fall into two categories. First, USAF's bomber force is too small to meet the demands of the National Defense Strategy, and, second, there is a need for a next-generation bomber that can penetrate future contested operational environments.

The Air Force's total inventory of 76 B-52Hs, 62 B-1Bs, and 20 B-2s is the oldest and smallest bomber fleet the service has ever operated. Since the Cold War, the bomber force declined from about 400 aircraft to 158 total tails, primarily due to DOD's desire to generate savings and its belief that a smaller bomber force would suffice for limited conventional conflicts with rogue states such as Iran and North Korea. Both rationales were behind the Department of Defense's 1997 decision to cap the B-2 program at 21 aircraft instead

of buying all 132 B-2s required by the Air Force.

The long ranges, large payloads, and multi-mission capabilities of bombers are exactly the kind of attributes theater commanders need to deter aggression. However, multiple studies have concluded the current bomber force cannot generate enough conventional strike sorties for a *single* major conflict with a peer adversary plus sustain nuclear deterrence simultaneously, and thus recommended the Air Force grow the inventory as quickly as possible. Furthermore, B-52Hs and B-1Bs designed to penetrate Cold War-era Soviet air defenses are not capable of operating in areas defended by advanced IADS, and the stealth B-2 force is far too small. In short, a larger and more balanced mix of penetrating and standoff bombers is needed. Recent Air Force Chief of Staff Gen. David L. Goldfein said the future force that wins will have "a combination of that which works from inside and that which works from outside. ... [A] balance [of long-range penetrating and standoff strike forces]." Goldfein also testified, "Our assessment—and that's been backed up by independent assessments—that a moderate risk force is 220 bombers, of which 145 would be B-21s." Finally, DOD's 2018 Nuclear Posture Review determined that delays in procuring B-21s would "reduce the ability of our strategic forces to penetrate adversary air defenses, limit the diversity of our response options, and compromise our ability to send the visible deterrence and assurance signals for which strategic bombers are particularly well-suited."

The need for aircraft with next-generation stealth such as the B-21 is another recurring issue. Stealth skeptics typically point to advances in computing power, the increased accuracy of radars that operate in low-frequency bands, and other air defense improvements that could erode America's stealth asymmetric advantage. Those who believe stealth is not worth the investment often fail to consider that DOD's development of next-generation stealth technologies continues to outpace advances in defensive systems. This is a key reason the Defense Department decided to acquire the B-21. Aircraft stealth is the result of a multi-pronged approach that

includes minimizing aircraft signatures in multiple bands of the electromagnetic spectrum (low observability) and at all aspects. B-21s will have next-generation radar-absorbent materials, increased processing power to fuse information from onboard sensors and external sources, and low probability of intercept/low probability of detection data links that will maximize opportunities to collaborate with other weapon systems. All-aspect, low observability in multiple frequency bands combined with these other capabilities will enable B-21s to penetrate adversary defenses well into the future.

Another critical point for Airmen to stress is that stealth does *not* make aircraft invisible to enemy sensors—it denies an enemy information required to launch a successful intercept. Many who view stealth as a waning advantage fail to understand this. Given that information dominance is increasingly critical to success in modern warfare, the need for stealth will actually grow in importance, not diminish.

Critics have also questioned the need to replace the ALCM, arguing the LRSO will be a redundant or even a destabilizing capability. Although there are many reasons for why the LRSO is needed, DOD most frequently cites concerns over the ALCM's future viability, its reduced survivability in modern threat environments, and implications to U.S. nuclear deterrence as a whole if it is not fielded.

The AGM-86B ALCM is the only air-launched nuclear cruise missile in the U.S. military's inventory. Although it was designed in the mid-1970s to have a planned service life of 10 years, life extension programs will keep ALCMs in the inventory until approximately 2030. Similar to other USAF nuclear weapon systems, there is a limit to how long ALCMs can be sustained. Former USSTRATCOM Commander Gen. John E. Hyten testified to Congress that ALCMs have "sustainability and viability issues from age-related material failures, advancing adversary capabilities and diminishing manufacturing sources. Parts and materials designed for a 10-year service life are now 35 years old, and are obsolete," and the ALCM's service life extension programs "cannot keep pace with the rate of discovery of deficiencies." Moreover, required testing will reduce the number of operationally available ALCMs below the required level by the year 2030.

Concern over the ALCM's ability to penetrate increasingly lethal Soviet air defenses caused the Air Force to initiate a program to replace its ALCMs shortly after they became operational. The resulting AGM-129 advanced cruise missile (ACM) had stealth coatings, forward-swept wings, and other design features to improve its ability to penetrate contested areas. For budgetary and other reasons, DOD terminated ACM production early, did not replace its ALCMs, and eventually retired its ACMs. If the ALCM is not replaced by the LRSO, its inability to penetrate would deprive the air-breathing leg of the triad of a means of conducting standoff nuclear strikes. In effect, this would eliminate B-52Hs as a viable part of the triad since these non-stealth aircraft must use standoff weapons to strike into contested areas.

Critics assert cruise missiles are destabilizing capabilities that increase the chance of a nuclear exchange since enemies cannot determine if they carry a conventional or nuclear warhead. The truth is that bombers with nuclear cruise missiles may be the *most* stabilizing element of the triad. As the 2008 Schlesinger Commission concluded, "If this standoff capability is allowed to disappear, then the ability to signal strategic capability through the generation and dispersal of B-52s will be compromised." The Department of Defense has fielded multiple cruise missile variants in the past without



Senior Airman Tessa Corrick

**B-52s have been in the USAF inventory since the early 1960s. They'll remain in active service for decades longer, thanks to planned upgrades including new engines, sensors, and more. In October, B-52Hs lined up for an Elephant Walk at Barksdale Air Force Base, La.**

Russian and Chinese objections, and China and Russia have done the same without concern they could be destabilizing.

## CONCLUSION

Air Force bombers provide options to U.S. combatant commanders that are unmatched by other conventional or nuclear-capable forces. A right-sized force of dual-capable B-52Hs and B-21s will be able to deter nuclear threats to the homeland and simultaneously conduct large-scale conventional strike operations during a major conflict with a peer adversary. No other leg of the triad will have this multi-mission capability, which is a key reason that DOD supports growing the bomber force to at least 220 total aircraft by buying B-21s. USAF nuclear-capable bombers offer options to signal America's resolve in ways that cannot be matched by other triad capabilities, and they can recover after strikes to help reestablish deterrence or prepare for follow-on operations.

The Air Force's ability to provide these capabilities will diminish if much-needed modernization programs are prematurely ended or delayed, as they have been in the past. Without next-generation B-21s, the bomber force will lack the capacity needed to execute the national defense strategy and will lose its ability to conduct long-range penetrating strikes into contested environments. This would greatly simplify an enemy's air and missile defense challenge. The LRSO is also needed to ensure B-52Hs remain a viable part of the triad capable of holding at risk targets located in contested areas. According to former Vice Chairman of the Joint Chiefs of Staff Gen. Paul J. Selva (Ret.), LRSO will complicate an enemy's air defense challenge by "presenting many more small and low-observable penetrators than a single bomber with gravity weapons can present on its own. In combination with a penetrating bomber, LRSO will significantly reduce a potential adversary's ability to achieve sanctuary within his borders." ★

CAP's COVID-19 response leveraged its fleet of more than 550 Cessna 172 and 182 aircraft. CAP Colorado Wing Commander Col. John Rhoades ferried personal protective equipment to remote hospitals in May.



Civil Air Patrol

# Putting the CAP on COVID-19

## How Civil Air Patrol rallied to the nation's call in the face of a global pandemic.

By Jennifer-Leigh Oprihory

**C**ivil Air Patrol has been coming to the nation's rescue in one form or another since its founding about a week before the Japanese bombed Pearl Harbor.

The official auxiliary of the U.S. Air Force helps assess damage after natural disasters, assists with domestic search and rescue operations, and helps the Air Force train for intercepts in the National Capital region. So, when the COVID-19 pandemic struck and the nation called once again, CAP volunteers were ready. From March through October—and beyond—CAP logged its second-longest campaign in its history, paling only to its response in World War II.

"As of [Oct. 26] we have had more than 4,800 CAP members participate in this mission and we are standing at 33,449 volunteer days of duty since we began back in early March," said Lt. Col. Rick Woolfolk, who oversees the organization's daily COVID-19 response reports, in a statement provided to Air Force Magazine.

CAP's COVID-19 response up to then included at least 1,406 air sorties, 3,688 ground sorties, 9,918 photographs, and involved 555 aircraft and 2,597 ground vehicles, according to CAP data.

Flying missions include deliveries of personal protective equipment (PPE), COVID-19 test kits and samples, and other medical supplies. In one wing's case, they even transported a person: a leader from the Colorado Hospital Association who used PPE-delivery flights as an opportunity to touch base with health care workers on the ground to help formulate a pandemic-response playbook.

The organization used its ground vehicles to deliver PPE, as well as to transport meals to locations where suspected COVID-19 patients were being quarantined.

"Pretty much all of the aircraft being used are ... common fleet aircraft, predominantly Cessna 182s, as far as the missions go for the airborne reconnaissance, and then we actually used

our Gipps [Aero] GA8s and some Cessna 206s to do some of the transportation missions," said CAP Director of Operations John Desmarais.

But CAP's National Commander Maj. Gen. Mark E. Smith said the auxiliary's 66,000 members, "folks wanting to get out of the house and go out and make a difference in their local communities," made the response possible. Here's a look at some of the ways CAP responded.

### FEEDING THE HUNGRY

COVID-19 left millions unemployed and entire communities hungry. CAP flew to the rescue, delivering over 900,000 tons of bulk food and more than 7,000 meals through late October.

The Indiana Wing started out helping the Marion Community Schools and the Department of Agriculture deliver food to the community, said Maj. Bill Vendramin, Great Lakes Region director of public affairs. Soon the drive expanded to include events at Lucas Oil Stadium (home to the Indianapolis Colts), the Indianapolis Motor Speedway, and the Indiana State Fairgrounds. Event partners included the Salvation Army and the Gleaners Community Food Bank, a Detroit-based organization that helps counter hunger in southeastern Michigan.

Cadet 2nd Lt. Camden Dorothy—a member of the wing's 086 Squadron who completed 22 deployments to food banks and pantries and donated almost 100 volunteer hours as part of the response—said the missions boosted morale among cadets, giving them an opportunity to connect with other squadrons.

California Wing members packed millions of meals for public school students and Colorado Wing members volunteered with the Food Bank of the Rockies. The Arizona Wing partnered with the Maricopa County Department of Public Health to deliver prepared meals to people under quarantine, said Capt. Margot Myers, the Arizona Wing's public affairs officer. The cadets' deliveries filled a Public Health Department staffing need and kept quarantined individuals fed.

## DELIVERING MEDICAL SUPPLIES

When the pandemic triggered shortages of masks, gloves, and other personal protective equipment across the U.S., especially in remote areas of the country, CAP flew to the rescue. “Wings have delivered over 580,000 medical gloves and ... 50,000 face shields,” Woolfolk said, and helped process truckloads of equipment.

Lt. Col. Mike Daniels, the director of public affairs for Colorado’s Wing, said CAP partnered with the Colorado Hospital Association, the state government, and others to distribute PPE for health care workers across the state.

“We’ve flown well over 60 sorties,” Daniels said in September. “We’ve also done a number of ground sorties delivering PPE through our Civil Air Patrol vehicles and members on the ground.”

The Kansas Wing, meanwhile, flew supplies of the antiviral drug Remdesivir from central Kansas to rural hospitals in western Kansas, saving time over ground transportation, Woolfolk said.

And CAP’s North Carolina Wing used its ground vehicles to transport PPE and other supplies from “state emergency management field warehouses” to destinations including nursing homes, wing Public Information Officer Lt. Col. Lynne Albert told Air Force Magazine.

“This turned out to be our most extensive ground-based operation in the North Carolina Wing’s history,” she said. “So we went in a completely different direction on this mission for COVID.”

The wing used all but two of its 27 vehicles for the tasking, and racked up over 50,000 miles on the road, she noted.

## HOLDING BLOOD DRIVES

In Arizona, Civil Air Patrol partnered with the Red Cross to run emergency blood donation centers.

The wing had experience running such sites periodically, but when other sources shut down at the start of the crisis, CAP was able to answer some of the need. The wing offered facilities and volunteers and had six donation centers running by mid-September.

As of Oct. 25, the wing’s effort had amassed 1,054 units of blood.

## TRANSPORTING TEST KITS

By Oct. 25, CAP had transported 22,352 test kits and 99,921 test samples.

Woolfolk credited the Texas Wing with spending nearly 1,200 flying hours transporting test kits to and test samples back from remote parts of the state so they could be processed in laboratories “in San Antonio, Austin, Houston, and Dallas.”

## MAKING MASKS

The New Jersey Wing’s members and their families made more than 10,300 masks to give to people in need. CAP cadets accounted for 77 of the 127 volunteers involved in the effort as of Aug. 31.

“By sewing masks for those who need them, I feel like I am helping more people than just myself,” said Cadet 2nd Lt. Alondra Rosas, a member of the Jersey City Composite Squadron, in a release. “The mission is a way for me to give back to the people who need help, because I know they would do the same if the occasion ever came up.”

Elsewhere in the state, CAP members helped the River Road Rescue Squad in Piscataway Township put together more than 500 fluid-impervious gowns for use by emergency

medical services personnel, a release said.

First Lt. Justin Ragsdale, an adult member of the Arkansas Wing’s 99th Composite Squadron, 3D-printed more than 400 holders for surgical-mask straps to make PPE more comfortable for health care workers in hospitals near Memphis, Tenn., CAP wrote.

## AERIAL PHOTOGRAPHY

CAP supported a number of agencies with aerial photography to provide situational awareness of crowds and traffic patterns at COVID-19 testing sites and food-distribution centers.

## GETTING TECHNICAL

Two Civil Air Patrol members also launched a radio network for volunteer operators to exchange situation reports (SITREPs) from the field. The so-called “Chicken Soup Initiative” was co-founded by 2nd Lt. Michele Bremer, CAP’s deputy head of national headquarters communications planning.

“The initiative launched April 10 with 41 stations reporting,” the release stated. “Since then, more than 1,100 contacts from 162 stations have produced more than 600 location- and event-specific SITREPs.”

The North Carolina Wing also set up a virtual Incident Command Post—a Microsoft Teams-based hub where point people from various aspects of the wing’s COVID-19 response could stay in constant online collaboration—that eventually went “nationwide,” Albert said.

“Other people have emulated us, which just allowed us to just rock this mission,” she said.

## THE WAY AHEAD

Civil Air Patrol is in the midst of “a pivotal year” that could be “one of the most important” in its history, Smith said.

“The reason I say that is there’s just been a congruence of a bunch of different things that have come together at just this time, that it’s imperative for us to work and to work well over this next year, to really position and shape Civil Air Patrol for future success.”

These intersecting factors include:

- “Transformational changes ... ranging from business process re-engineering to budget team, to the volunteer experience.”

- Fostering greater inclusion among CAP’s ranks in the wake of civil unrest that broke out across the country following George Floyd’s Memorial Day death in police custody.

- Incorporating recommendations from a USAF-commissioned “independent study” of CAP to help it improve “as an organization.”

Heading into that with more fully prepared volunteers than ever before will help, Desmarais said.

Prior to the pandemic, he explained, the organization worried that remote training would cause a lapse in members’ qualifications, but the coronavirus pandemic instead drove up the number of volunteers qualified to support missions by approximately 5,000.

“This is the highest we’ve been in years,” he said.

And with all that activity and volunteering, CAP wings managed to escape serious infection.

“Civil Air Patrol has not seen a high infection rate within our membership,” Headquarters CAP Public Affairs Manager Steve Cox wrote in an Oct. 28 email to Air Force Magazine. Testing is voluntarily and self-reported, but of 941 members known to be tested, only 149 tested positive nationwide. ❁



To the irritation of the British, the aircraft most associated with the offensive was the U.S. B-17, flying in the high-altitude, daylight precision bombing mode. Here, seen from another bomber, a B-17 flies through heavy flak during a raid on Ludwigshafen, Germany, in September 1944.

USAF/AFA Library

# The Allied Rift on Strategic Bombing

The British and the Americans disagreed on almost everything about the Combined Bomber Offensive.

By John T. Correll

**T**he British armed forces were drawn down and nearly exhausted in 1940. They had survived the Battle of France and—against the odds and expectations—defeated the Germans in the Battle of Britain.

In the doing, however, their losses were so severe that Prime Minister Winston Churchill declared, “We were an almost unarmed people.” Churchill still believed the war could be won because, he told his son Randolph, “I shall drag the United States in.”

The Japanese beat him to it. The United States entered the war following the attack on Pearl Harbor

**“The moment has come when the bombing of German cities simply for the sake of increasing the terror ... should be reviewed.”**

—British Prime Minister Winston Churchill

and at Churchill’s urging, agreed to make the conflict in Europe the first priority, ahead of the war in the Pacific.

The Americans wanted to launch a cross-Channel invasion of occupied Europe as soon as possible, but at the insistence of Churchill and the British, concurred in a “Southern strategy” that first challenged the Germans in North Africa, Italy, and through the “soft underbelly of Europe.”

Accordingly, until the D-Day landings in 1944, the only significant Allied operations in the West against occupied Europe or the German homeland were the bombing by the U.S. and British air forces.

The official starting date for the Combined Bomber Offensive (CBO) was June 10, 1943, but that is an



administrative distinction, based on when certain orders were issued. The offensive must be considered in broader perspective, taking in the first British bombing missions in 1939 and arrival of the first U.S. B-17s in England in July 1942.

The British and Americans disagreed on almost everything about the offensive. The U.S. was committed to high-altitude, daylight precision bombing. The British, having tried that approach and failed, were equally persuaded of wide-area bombing at night.

The Allies backed away early from several targeting sets, including oil and ball bearings, despite good results. Others, such as German submarine pens, were continued for political reasons even though available weapons were not effective.

If the CBO is considered in detail only, it can appear—as various critics have said—that it was not worth the cost or that the Allies, working at cross purposes, were less than successful. Specific objectives were often incompletely met, if they were met at all.

In fact, the dissimilar British and U.S. approaches worked together—although not in the way intended—to divert critical German resources to air defense and to inflict devastation on airfields, cities, industries, and the transportation network. No other factor was of equal importance to bombing in destruction of the German capacity to sustain and continue the war.

## THE AMERICANS ENTER

The main partner of the RAF Bomber Command in the Combined Bomber Offensive was U.S. 8th Air Force. Brig. Gen. Ira C. Eaker led an advance echelon to England in May 1942, followed by the commander, Maj. Gen. Carl A. Spaatz, in June.

The British expected the newcomers to join in the ongoing bomber program and to accept the leadership and experienced judgments of the British. That did not set well with the Americans, but for the time being, they deferred considerably to the British. As their share of the forces and funding increased, though, so did their independence of action.

The B-17s did not fly their first mission until Aug. 17. Three days later, half of 8th Air Force's manpower and 1,100 of its airplanes were taken away and ordered to North Africa, where they formed the new 12th Air Force to implement the Southern strategy. Spaatz also went to Africa as part of the package.

Eaker, who took command of 8th Air Force, was left with only about 150 heavy bombers. It was no surprise that the results were meager. In January 1943, Eaker said, "We are bombing Germany now with less than a hundred heavies." Not until May was Eaker able to put missions of 150 bombers into the air.

Eighth Air Force had some B-24 Liberators but was associated mainly with the B-17 Flying Fortress, which dropped more bombs than any other U.S. aircraft in World War II.

## AREA BOMBERS

The biggest issue dividing 8th Air Force and Bomber Command was precision versus area targeting. The British began strategic missions against Germany in September 1939 with their own presumption of precision attack, but it did not go well. On average, only a third of the bombs hit within five miles of the aiming point. In the Ruhr Valley—Germany's industrial heartland, defended by guns and fighters—strikes were even less accurate.

In late 1941, the RAF broke off the attempt at precision bombing and in February 1942, the British Defence Committee ordered a switch to night area bombing, principally against urban centers.

In their public announcements, the British said that any



USAF/AFA Library

The B-17 dropped more bombs than any other U.S. aircraft in World War II. Above, Capt. W.E. Sticklen is at the Flying Fortress bombardier position in Bassingbourne, England, on April 20, 1944.

harm to German civilians was corollary, not deliberate. "The targets of Bomber Command are always military but the night bombing of military objectives necessarily involves bombing the area in which they are situated," said Air Minister Sir Archibald Sinclair.

Among themselves, British leaders acknowledged a different objective. The so-called "de-housing" paper, sent to Churchill from his scientific adviser, Lord Cherwell (Frederick A. Lindemann), in March 1942, said that if heavy bomber missions were sent against 58 large German cities. "The great majority of their inhabitants (about one-third of the German population) would be turned out of house and home. ... There seems to be little doubt that this would break the spirit of the people."

Air Chief Marshal Sir Charles Portal, chief of the Air Staff, supported that goal. With a strong effort, he said, 6 million German homes could be destroyed and 25 million Germans made homeless.

"From beginning to the end of the war, ministers prevaricated—indeed, lied flatly, again and again—about the nature of the bomber offensive," said British historian Max Hastings in his authoritative book, "Bomber Command."

Churchill's fingerprints are difficult to find on the de-housing policy. However, he said that "as the war went on, we hoped to shatter almost every dwelling in almost every German city." After the attack on Dresden in 1945, he said that "It seems to me that the moment has come when the question of bombing of German cities *simply for the sake of increasing the terror*, though under other pretexts, should be reviewed." (Emphasis added.)

Air Marshal Arthur T. "Bomber" Harris took over Bomber Command in February 1942, a week after the Cabinet directive

Air Marshal Arthur "Bomber" Harris, seated, with Air Vice-Marshals Ronald Graham and Robert Saundby, pores over plans in his office. Harris did not invent area bombing at night but he was its strongest advocate.



H. Hensser/RAF via Imperial War Museum

on area bombing. Although the policy did not originate with him, he became the leading advocate of it. He opposed allocation of Bomber Command aircraft to what he called "panacea targets," such as oil plants and aircraft factories. He did not believe Cherwell's notions about de-housing and German morale. His conviction, pure and simple, was that area targeting got the best strategic results.

In 1942, the big, four-engine Lancaster entered service with Bomber Command and became the definitive British bomber of World War II. It was well-suited to area targeting, carrying a regular bomb load of 14,000 pounds, more than twice that of a B-17.

"Although spasmodic precision attacks would take place for the rest of the war, of the total tonnage of bombs dropped by Bomber Command throughout its campaign, three-quarters were directed against urban targets," historian Hastings said. Whatever its effectiveness on industrial infrastructure, area bombing did not eviscerate German morale as predicted.

## PICKLE BARRELS

The popular claim before the war was that U.S. bombardiers, using the acclaimed Norden bombsight, could put a bomb in a pickle barrel from high altitude. "We do not regard a 15-foot square as being a particularly difficult target from 30,000 feet," said Ted Barth, president of the company that made the bombsight.

That was stretching it considerably, although results from in training and exercises were good. Accuracy was measured by the "circular error probable (CEP)," the radius of a circle in which at least 50 percent of the bombs landed.

In 1939, the average CEP was 254 feet from an altitude of 1,500 feet. However, 97 percent of the total bombs were dropped from lower than that, and aircrews routinely got even better CEP scores on low-level bomb runs.

Precision attack in combat was a different matter. Enemy air defenses forced the B-17s to fly at higher altitudes. Holding to a leisurely, straight-and-level course, led to great risk. Aiming points were obstructed by clouds, smoke, and debris.

"Rather than dropping bombs into pickle barrels, 8th Air Force bombardiers were having trouble hitting the broad side of a barn," said historian Stephen L. McFarland of Air University. Average CEP soared to 1,200 feet.

Not all of the strikes were wild misses, though. By definition,

half of the bombs fell inside the circumference of the CEP. Some of them were direct hits. The price for this achievement was a high loss rate for daylight precision bombers. CEP eventually improved when P-51 and P-38 escort fighters came into service to establish air superiority and give the B-17s a better chance on the bomb run.

Churchill had President Franklin D. Roosevelt almost convinced that the B-17s should join Bomber Command in operating at night. Before that happened, Churchill met with Eaker during the Allied conference at Casablanca, Morocco, in January 1943, and Eaker talked him out of the idea. His key point was the value of keeping the Germans under attack both day and night.

The Casablanca Conference called for the Combined Bomber Offensive, which officially began June 10 by order of the Combined Chiefs of Staff. They approved both area and precision operations and assigned four specific target sets: submarine construction yards, the aircraft industry, transportation, and oil plants.

"Army Air Forces remained committed to daylight precision bombing until the end," historian McFarland said. "American Airmen intentionally aimed fewer than 4 percent of their bombs at German civilians."

## DIVERSIONS

"The division of the Combined Bomber Offensive prevented the Americans from playing any part at all in the strategic offensive against Germany in the course of 1942," sniffed Noble Frankland, director of the Imperial War Museum in London. "Nor did it result in any worthwhile contribution from the distinctively American offensive in the course of 1943."

Responding to Frankland, USAF historian Robert Frank Futrell said, "The essential problem in this period was that the 8th Air Force was too small," and "the targets handed down to it (especially the almost invulnerable submarine pens) were little calculated to accomplish any great decision."

In special situations, the British—except for the stubbornly resolute Bomber Harris—were in favor of attacking precision targets. The prime example was the hardened submarine pens on the French coast.

German submarines were regarded by both the British admirals and public opinion as a compelling threat and they had to be struck, even though they were defended by German



RAF via Imperial War Museum

The best British bomber was the big Lancaster. It carried more than twice as many bombs as the B-17, enabling it to cover a wide area in its targeting.

fighters and conventional bombs had no effect on them.

In the first quarter of 1943, fully 63 percent of the 8th Air Force missions and 30 percent of the RAF missions were against the submarine pens.

“Wave after wave of heavy bombers all but obliterated the French ports of Lorient and Brest where the German submarine pens were based, without once inflicting serious damage on the reinforced concrete structures that protected the U-boats,” said British historian Richard Overy.

Likewise, both British and American heavy bombers were diverted to V-1 Vengeance weapon sites when German “buzz bombs” began falling on London in 1944. U.S. bombers and fighters flew 44,702 missions against the V-weapon sites, and the British flew 24,211.

### STOPPING SHORT

For one reason or another—the aircraft loss rate, gaps in intelligence information, or the objections of naysayers—the Combined Bomber Offensive more than once failed to follow up on initiatives that had shown promise.

■ In the famous “Dambusters” raid of May 1942, RAF Lancasters destroyed two large hydroelectric dams—among the largest man-made structures in the world—in northwest Germany. Each bomber carried an experimental four-and-a-half-ton bomb. When the reservoirs collapsed, they sent millions of cubic feet of water rushing down the industrial Ruhr Valley in a tidal wave sometimes 40 feet high.

It demolished every road and rail bridge for 30 miles and the damage extended for 100 miles. Factories, buildings, and war materiel stockpiles were destroyed and production was disrupted. It took the Germans months to rebuild the critical infrastructure, but the British did not strike again, even when the wooden scaffolding around the construction presented an easy target. Harris was unwilling to commit any more Bomber Command aircraft for non-area purposes.

“That night, employing just a few bombers, the British came close to a success that would have been greater than anything they had achieved hitherto with a commitment of thousands of bombers,” said Albert Speer, the German armaments minister.

■ The oil supply was an obvious choke point. Germany had almost no petroleum resources of its own and depended on foreign supply. A third of its aviation and diesel fuels came from Ploesti in southern Romania. That was too far for B-17s to reach from England, but in

range for B-24s, which mounted a strike in August 1943 from Benghazi in Libya.

The battle plan fell apart. The B-24 formation became separated in flight, approached Ploesti from three different directions, and the attack was badly disjointed. Nevertheless, the raid knocked out 46 percent of Ploesti’s oil production. Given the high bomber losses and poor execution of the raid, there was no support for more oil strikes despite the extraordinary success against the fuel plants and refineries at Ploesti.

■ According to Speer, the ball bearing facilities at Schweinfurt in Bavaria “were crucial to our whole effort.” The aviation industry alone used 2.4 million ball bearings a month. Half a dozen plants in Schweinfurt produced almost two-thirds of the total supply.

B-17s bombed Schweinfurt twice, in August and October 1943, and destroyed 67 percent of the ball bearing production. However, almost 20 percent of the attacking bombers were lost, which led British historian Noble Frankland to declare that “America’s ‘Waterloo’ was at Schweinfurt in October 1943.”

It looked different from Speer’s perspective, especially when the bombers did not come again. “The Allies threw away success when it was already in their hands,” he said. The Germans scraped by, meeting their needs from existing inventory and the production capacity that remained. As soon as bearings came off the line, they were picked up by porters and carried in backpacks to assembly points.

### THE OFFENSIVE IN FULL

As preparations began for the D-Day invasion, Spaatz, now a three-star general, returned to England in January 1944 as commander of U.S. Strategic Air Forces in Europe. Maj. Gen. Jimmy Doolittle came along as 8th Air Force commander. Eaker took command of Mediterranean Allied Air Forces.

The shortage of B-17s ended abruptly. Whereas Eaker had struggled to put several hundred aircraft together for missions in 1943, Doolittle launched a force of 660 heavy bombers within a week of taking command. Between September 1943 and May 1944, bomber strength increased from 461 to 1,655.

Doolittle concentrated his attack on the Luftwaffe, in the air and on the ground. The Germans were able to maintain aircraft production for a while by mobilizing parts of industry not mobilized before and dispersing from 27 main plants to 729 smaller ones.

Fighter output declined in the last half of the year, but the larger problem for the Luftwaffe was that Spaatz made the



USAF

**Lt. Gen. Ira Eaker, deputy commander of the U.S. Army Air Forces, was sent to England to form and organize its Bomber Command.**

synthetic oil industry a high-priority target. The supply of aviation fuel dropped from 175,000 tons in April to 5,000 tons in September. German fighters sat idle on the ramp.

The combination of British and American attacks of various kinds left the Germans no choice but to set up a massive air defense network.

"The barrels of 10,000 guns were pointed toward the sky," Speer said. "The same guns could have been employed in Russia against tanks and other ground targets. Had it not been for this new front, the air front over Germany, our defensive strength against tanks would have been more than doubled as far as equipment was concerned."

"Seventy-five percent of all German 88s (their best artillery piece and also best tank killer), were being used as anti-aircraft guns," said Phil Meilinger, former dean of the School of Advanced Airpower Studies. "The aluminum used to make AAA (anti-aircraft artillery) shells was enough to have built an additional 40,000 airplanes."

## JUDGMENTS

"Allied air power was decisive in the war in Western Europe," the U.S. Strategic Bombing Survey (USSBS) said. That claimed too much. The land, sea, and air components all had a share in the credit. However, the USSBS point cannot be dismissed altogether.

Berlin fell to the Soviet army May 2, 1945, and surrendered May 7. In the 10-month ground offensive in Western Europe, the British and American armies had advanced from Normandy to the Elbe, where they had stopped, 65 miles from Berlin. They did not attempt to capture the city since it had been decided already that Berlin would be well inside the postwar Soviet occupation zone.

"Without the Combined Bomber Offensive, it does not take a rocket scientist to figure out that an additional half-a-million soldiers and 10,000 high-velocity guns on the Eastern Front might have had a disastrous impact on the Red Army's ability to fight the war in the East," said U.S. historian Williamson Murray.

Speer told Eaker after the war that "without this great drain on our manpower, logistics, and weapons" as a result of the bomber offensive, "we might well have knocked Russia out of the war before your invasion of France."

## PACIFIC VARIATION

The event generating the most disapproval of the Combined Bomber Campaign was the bombing of Dresden by British Lancasters and U.S. B-17s in February 1945. The moral outcry it raised continues many years later.

Dresden, an old and graceful German city on the banks of the Elbe had considerable history and charm, but it was also a major transportation hub through which the Germans could reinforce the Eastern Front and counter a new Russian offensive that was driving toward Berlin.

British intelligence warned that the Germans might be about to reposition 42 divisions from France, Italy, and elsewhere to the Eastern Front. The Russians asked the Allies to bomb the key transportation juncture at Dresden.

"Two waves of Royal Air Force firebomb attacks and a follow-up U.S. Army Air Forces raid all but obliterated Dresden," Rebecca Grant said in a report for Air Force Magazine. "Huge incendiary assaults created a firestorm that consumed everything in its path."

Critics, mostly in the postwar period, depict Dresden as a war crime, not a legitimate military target, and coming too late in the war to make a difference.

When the United States finally turned its attention to the Pacific, there were not that many large military industrial sites in Japan. Accordingly, the B-29s of 20th Air Force employed incendiary bombs in area bombing of Japanese cities.

That, however, was not the case with the two decisive B-29 missions that induced the Japanese surrender by the use of the atomic bombs. Both of them were classic daytime high-altitude, precision bombing attacks.

On Aug 5, 1945, Maj. Thomas Ferebee, the bombardier on the Enola Gay, used the Norden bombsight linked to the Honeywell C-1 autopilot, to find his aimpoint, a T-shaped bridge in Hiroshima. He obtained the target from 10 miles out at 30,700 feet and the bomb detonated 800 feet from the bridge. On Aug. 9, the Bockscar bombardier, Capt. Kermit K. Beahan, released his weapon from 31,000 feet. It hit 1,500 feet from the aimpoint in Nagasaki. ❖

**John T. Correll** was editor in chief of Air Force Magazine for 18 years and is a frequent contributor. His most recent article, "Balloonists in the Family Tree," appeared in the November issue.



The capture of Berlin by the Soviet army owed much to support from the Combined Bomber Offensive. Here, a soldier raises the Soviet flag over the Nazi Reichstag as the Battle for Berlin comes to a close May 2, 1945.

# Thrive After-School Program Wins CAP Award

By Chequita Wood

The Civil Air Patrol (CAP) 2020 Aerospace Connections in Education (ACE) National Collaboration Point of Light Program Award was presented to a triad team: CAP's Indiana Wing River City Composite Squadron; the Air Force Association's P-47 Memorial Chapter 141; and the Thrive after-school program in Mt. Vernon, Ind. This new award was created to recognize the collaboration between these three entities of which Thrive students were the benefactors. The K-6 ACE program is designed to introduce students to aerospace-themed lessons focusing on science, technology, engineering and math (STEM) topics, character education, and physical fitness.

Thrive, a non-profit organization, serves students from West Elementary School and Mt. Vernon Junior High School (K-8th grade). Thrive Executive Director Joy Millay said that Thrive "seeks to foster curiosity and discovery in our students, because that is how we create life-long learners. The ability to create curiosity is what made our partnership with CAP and AFA so incredibly valuable to our students."

Strong collaboration included both CAP and AFA members helping teach ACE lessons to the students. "Few moments in life bring



Courtesy

**AFA's P-47 Memorial Chapter 141 member Col. (Ret.) Mark Brugh (left) and CAP's River City Composite Squadron Commander Capt. Michael Schultheis work on a flight simulator with Thrive students.**


teachers more happiness than watching children get excited about science," said Jessica Volz, a Thrive teacher and ACE member. "

CAP's Lt. Col. Brian Schmuck initiated the partnership program with Thrive, enlisting assistance of squadron adults and cadets, as well as Col. (Ret.) Mark Brugh, from the P-47 Memorial AFA Chapter 141. Chapter 141 sponsored the distinctive ACE shirts for the students and provided engaging flight training using the free flight simulator STEM Kit provided by CAP.

Nationwide, the CAP ACE program reached new records during the 2019-2020 school year, with more than 500 schools, over 76,000 students, and nearly 1,300

teachers from every state and two overseas DOD schools involved. AFA, as an official supporter of the ACE program, provided national ACE award grants and ACE program certificates for all students.

CAP, as a Total Force partner, plays a leading role in aerospace/STEM education, and its members serve as mentors to over 25,000 young people participating in CAP's Cadet Program.

For more information about AFA chapter involvement in CAP's free aerospace/STEM programs, contact [afa@capnhq.gov](mailto:afa@capnhq.gov). 



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- 1 Lt. Col. Frederick I. Eglin.
- 2 Aircraft at Eglin AFB, Fla., 1964.
- 3 An Eglin F-35 over Destin, Fla.

# EGLIN

## Undefeated

His was a certified “rags-to-riches” story, a colorful tale of early misfortune, unexpected good luck, hard work, and redemption.

This was the life story of Lt. Col. Frederick Irving Eglin, namesake of Eglin AFB, Fla., which was so named soon after Eglin perished in a 1937 aircraft crash.

“Fritz” Eglin—no one used his given names—was born in New York City. His parents died when he was still a small child. In and out of orphanages, he survived the mean Bowery streets and went to high school, but did not graduate.

Eglin, however, was a gifted athlete; he caught the eye of an alum of Wabash College, who got him into the sports-crazy school in Crawfordsville, Ind. Eglin received a train ticket. It was enough.

He arrived destitute, with no money, few clothes, and no friends. He began as a “special student,” because he lacked a high school diploma. Yet he soon got a job and hit the books, hard.

He began to excel in the classroom. Also, Eglin started in varsity football, basketball, and baseball. In his junior year, he was elected class president. He graduated with honors and became the school's athletic director.

Yet Eglin was restless. In school, he had enlisted in the National Guard and was called to federal service for a stint on the Mexico border. The U.S. entered World War I in April 1917, and Eglin was immediately commissioned and sent off to pilot school.

Eglin was awarded wings and a regular commission in the Air Service. In the war years, he was an instructor



2



3

pilot. Post-war, he commanded air squadrons in the Philippines and Stateside.

Eglin was going places. He impressed all as a serious, stoic officer, with a penetrating gaze, and he dressed immaculately.

Eglin rose to become commander at the Advanced Flying School at Kelly Field, Tex. He went on to study at the Air Corps Tactical School and Command and General Staff College. Eglin was promoted to lieutenant colonel and assigned to GHQ Air Force, the Army Air Corps' principal combat arm.



Not long after, Eglin's luck ran out. On Jan. 1, 1937, he was flying an A-17 attack bomber from Langley Field, Va., to Maxwell Field, Ala. His flight path took him into heavy rain and fog. Eglin could not have known it, but he was headed straight for the 2,407-foot peak of Cheaha Mountain, highest in Alabama.

The A-17 crashed through a half-mile of tree tops, slammed into the mountain, and burst into flames. Eglin died instantly, as did a backseater, Army Lt. Howard E. Shelton. Eglin's remains are interred at Arlington National Cemetery in Virginia.

Because of Eglin's reputation as a top pilot and the tragic nature of his passing, the Air Corps moved swiftly to honor him, naming a Florida base “Eglin Field” in August 1937.

Today, Eglin is the focal point of USAF armament development. The 96th Test Wing at Eglin is the test and evaluation center for Air Force air-delivered weapons, navigation, and guidance systems. Also at Eglin: the 33rd Fighter Wing and 58th Fighter Squadron, two F-35 Lightning II outfits.

### FREDERICK IRVING EGLIN

**Born:** Feb. 23, 1891, New York, N.Y.  
**Died:** Jan. 1, 1937, Calhoun County, Ala.  
**Education:** Wabash College, Crawfordsville, Ind.  
**Occupation:** U.S. military officer  
**Services:** Indiana National Guard; US Army—Signal Corps; Air Service; Air Corps  
**Main Eras:** World War I, Interwar Period  
**Years Active:** 1911-1937  
**Final Grade:** Lieutenant Colonel  
**Interred:** Arlington National Cemetery

### EGLIN AIR FORCE BASE

**State:** Florida  
**Nearest City:** Valparaiso  
**Area:** 725 sq mi / 464,000 acres  
**Status:** Open, operational  
**Opened as Valparaiso Bombing/Gunnery Base:** June 14, 1935  
**Renamed Eglin Field:** Aug. 4, 1937  
**Renamed Eglin Field Military Reservation:** Oct. 1, 1940  
**Renamed Eglin Field:** Dec. 28, 1944  
**Renamed Eglin Air Force Base:** June 24, 1948  
**Current owner:** Air Force Materiel Command  
**Former owners:** Air Corps Training Center; Southeast Air Corps Training Center; Fourth Corps Area, U.S. Army; AAF Proving Ground Command; Air Proving Ground Command; Air Materiel Command; Air Research and Development Command; Air Force Systems Command  
**Home of:** 96th Test Wing; 33rd Fighter Wing; 58th Fighter Squadron; 53rd Wing; Armament Directorate

Courtesy: USAF; Staff Sgt. Joely Santiago



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