

Low-Cost Attributable UASs | 37

Future of ABMS 25 | The New Deployment Model 42 | Space Force's STARCOM 50

AIR FORCE

MAGAZINE

OUT OF TIME

China's Threat Is Now.
Air and Space Dominance
Is Up for Grabs | 18



Published by the
Air Force Association

October 2021 \$8





GO BEYOND

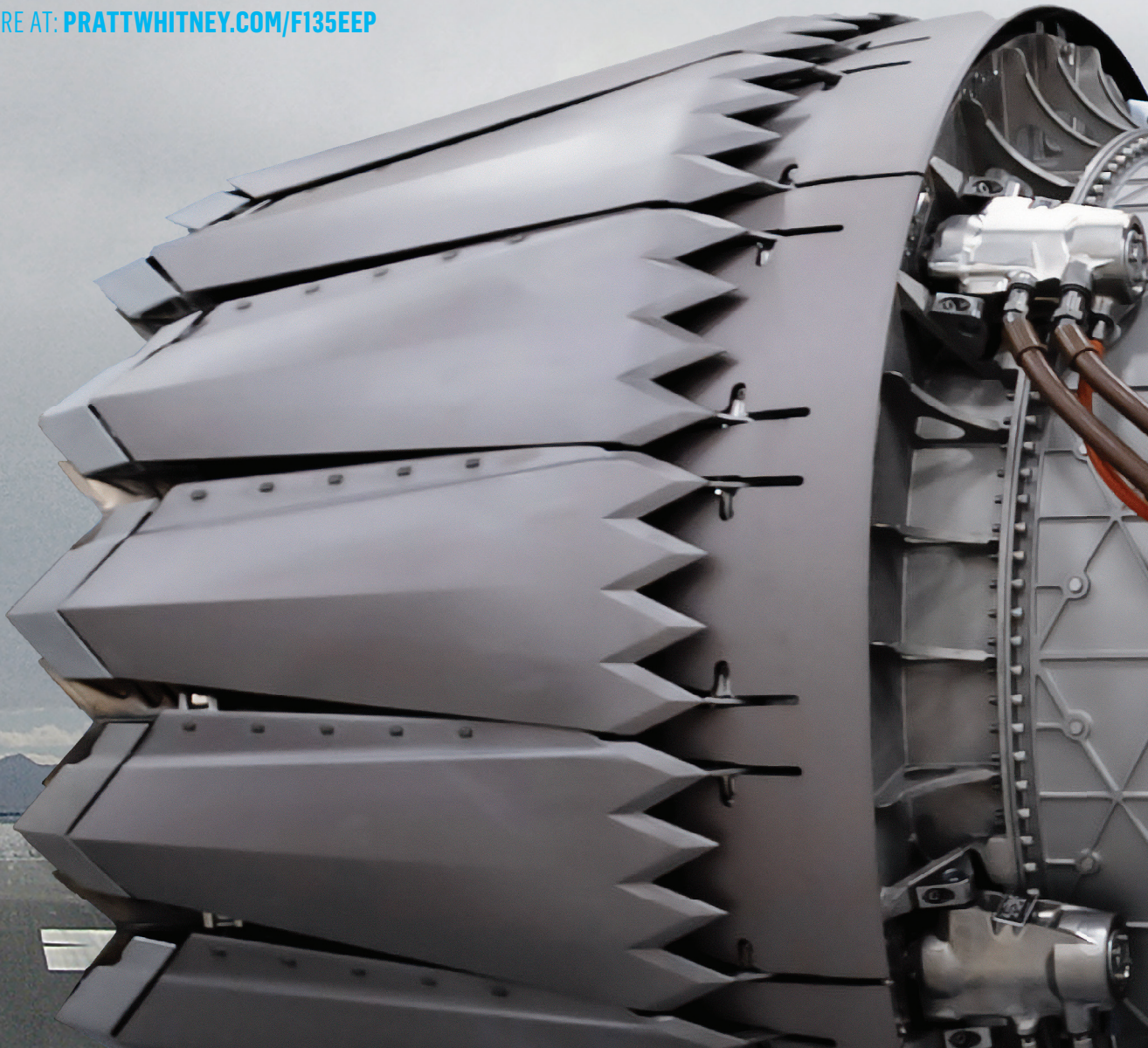
F135

ENHANCED ENGINE PACKAGE

COST EFFECTIVE. CAPABLE. LOW RISK.

As the air vehicle evolves, so must the engine. That's why we developed F135 EEP — the only variant-common modernization solution for the F-35 that can enable full Block 4 capability while reducing billions in sustainment costs.

LEARN MORE AT: PRATTWHITNEY.COM/F135EEP





Mike Tsukamoto/staff

AIR FORCE

October 2021, Vol. 104, No. 10

DEPARTMENTS

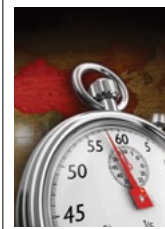
- 2 Editorial:**
China, Trust, and Politics
By Tobias Naegele
- 4 Letters**
- 6 Index to Advertisers**
- 8 Verbatim**
- 10 Airframes**
- 16 Strategy and Policy**
The Russian Way of War
- 18 World**
The Air Force Association's 2021 Air, Space & Cyber Conference; Kendall on China; Raymond on the Space Force; New B-52 Engines; and more ...
- 36 Faces of the Force**
- 59 AFA in Action**
Texas Sibling CAP Cadets Earn Spaatz Award; AFA President Lt. Gen. Bruce Wright Honors a World War II Veteran; Postal Statement
- 64 Heroes and Leaders**
Steven Bennett

FEATURES

- 37 Unmanned Flying Teammates**
By John A. Tirpak
The Air Force is developing semi-autonomous, low-cost unmanned aircraft to augment its crewed combat jets in a variety of missions.
- 42 USAF's New Deployment Plan**
By Amy McCullough
The Air Force Force's new Force Generation model will completely overhaul the way Airmen and units cycle through training and deployment.
- 46 Cislunar Space**
By Amanda Miller
The gap between Earth orbit and the moon is open, uncharted, and undefended.
- 50 STAR Command Stands Up**
By Abraham Mahshie
Preparing Guardians for the future is STARCOM's most important role.
- 54 Reimagining the Reaper**
By Maj. Gen. Lawrence Stutzriem, USAF (Ret.)
The Air Force's MQ-9 Reapers helped change the way we fight. They're not done yet.
- 61 Outstanding Airmen of the Year**
The program annually recognizes 12 enlisted members for superior leadership, job performance, community involvement, and personal achievements.

The 2021 Outstanding Airmen of the Year with their spouses and partners with Secretary of the Air Force Frank Kendall, center, Vice Chairman of the JCS John Hyten, Chief of Staff of the Air Force Gen. Charles Brown Jr., Chief of Space Operations Gen. John Raymond, Vice Chief of Staff of the Air Force David Allvin, CMSAF Joanne Bass, CMSSF Roger Towberman, Air Force Association Chairman of the Board Gerald Murray, and others at the Air, Space & Cyber Conference.

ON THE COVER



Mike Tsukamoto/staff; Maggie Wolff and David Chao/Flickr; Gino Crescoli/Photoby

Time's Running Out with China. See "USAF's Three Priorities: China, China, China," p. 18.

STAFF

Publisher
Bruce A. Wright
Editor in Chief
Tobias Naegele

Managing Editor
Juliette Kelsey
Chagnon
Editorial Director
John A. Tirpak
News Editor
Amy McCullough
Assistant Managing Editor
Chequita Wood
Senior Designer
Dashton Parham
Digital Editor
Greg Hadley
Senior Editor
Abraham Mahshie
Production Manager
Eric Chang Lee
Photo Editor
Mike Tsukamoto

Contributors
John T. Correll,
Amanda Miller,
Maj. Gen. Lawrence Stutzriem,
Shaun Waterman



ADVERTISING:
Kirk Brown
Director, Media Solutions
703.247.5829
kbrown@afa.org

SUBSCRIBE & SAVE
Subscribe to *Air Force Magazine* and save big off the cover price, plus get a free membership to the Air Force Association.
1-800-727-3337

Air Force Magazine (ISSN 0730-6784) October 2021 (Vol. 104, No. 10) is published monthly, except for two double issues in January/February and June/July, by the Air Force Association, 1501 Lee Highway, Arlington, VA 22209-1198. Phone (703) 247-5800. Periodical postage paid at Arlington, Va., and additional mailing offices. **Membership Rate:** \$50 per year; \$35 e-Membership; \$125 for three-year membership. **Subscription Rate:** \$50 per year; \$29 per year additional for postage to foreign addresses (except Canada and Mexico, which are \$10 per year additional). Regular issues \$8 each. USAF Almanac issue \$18 each. **Change of address** requires four weeks' notice. Please include mailing label. **POSTMASTER:** Send changes of address to Air Force Association, 1501 Lee Highway, Arlington, VA 22209-1198. Publisher assumes no responsibility for unsolicited material. Trademark registered by Air Force Association. Copyright 2021 by Air Force Association.

China, Trust, and Politics

Trust is the foundation of all relationships. Whether within the bonds of marriage, the confines of a command, the interface between man and machine, or even our interactions with government institutions, once trust is broken, confidence is lost.

In Afghanistan, when Bagram Air Base was shut down and American airpower was removed, the Afghani military quit. Lacking trust in their own government and abandoned by the U.S. forces that had made them successful, they no longer believed they could prevail.

Notwithstanding the heroic noncombatant evacuation operation led by the U.S. Air Force and supported by NATO allies and civilian volunteers, what the world witnessed was a global superpower making a hasty and humiliating withdrawal from Kabul, capitulating to the demands of a rag-tag Taliban gaggle that waited out the American occupation. Every one of our allies had to wonder what this portends for their own alliance. We will feel the repercussions for decades.

America's standing in the world is built on the bedrock of American trustworthiness and reliability. We are trusted because we deliver on our promises and because, historically, even when power transfers from one party to another, U.S. foreign policy remained largely consistent. Until recently.

Throughout the Cold War, the central themes remained the same, but with the exception of a brief period after 9/11, America has become increasingly polarized in foreign, as well as domestic, policy. As the world's only superpower, we lost the unifying element of a common enemy, and swung, sometimes wildly, from one foreign policy extreme to another. We stopped trusting each other.

Now we have a common foe again.

China is no longer just a rising economic power but a real and present danger—to its neighbors, to American interests, and to America itself. Air Force and Space Force leaders drummed that point home throughout AFA's Air, Space & Cyber Conference last month, with photographs and videos to prove their point. Missile silos, weaponized satellites, stealth jets, hypersonic missiles, man-made military islands, and advanced artificial intelligence are all elements of a Chinese arsenal purpose-built to counter U.S. capabilities.

Thirteen years ago, then-Defense Secretary Robert Gates derided the "tendency toward what might be called 'Next-War-itis'" among military leaders. He defined this "disease" as "the propensity of much of the defense establishment to be in favor of what might be needed in a future conflict." That conflicted with his view that "it is hard to conceive of any country confronting the United States directly in conventional terms—ship to ship, fighter to fighter, tank to tank—for some time to come."

Gates' failure to see into the future grew from a refusal to trust his Air Force commanders. Gates was frustrated by the cost of building more F-22s, which he thought were not worth the treasure they would cost to build. Gates killed the F-22 after building just under half the Air Force's required 387 Raptors. Then, three weeks after the "Next-War-itis" speech, he beheaded the Air Force by firing, at once, both Air Force Secretary Michael Wynne and Chief of Staff Gen. T. Michael Moseley. While the trigger was a series of nuclear security failures, the cause was their persistent and increasingly public objection to the risk he was incurring with regard to China.

With hindsight, it's clear that Wynne and Moseley were correct and

that Gates was naive. It's also clear that the damage he inflicted goes beyond a lack of airplanes. An entire generation of leaders grew up convinced that speaking truth to power doesn't pay.

Now we face our worst strategic crisis since the Cold War. Not only does China possess fifth-generation jets of its own, but it also boasts the biggest air force in the region. By contrast, the U.S. Air Force is saddled with non-stealthy F-15s, F-16s, and A-10s that make up 80 percent of its fighter force, aircraft that will be almost worthless in a high-end fight.

Gates saw the Raptor as "exquisite" and superfluous to the wars in Iraq and Afghanistan, but that was no more true of the Raptor than nuclear-powered submarines. Both were essential to deterring a future fight he didn't want to admit could come within a decade.

Now, America is "out of time," as Air Force Secretary Frank Kendall said at the Air, Space & Cyber Conference last month. China is maturing and advancing far faster than the United States. Our nation must either seize this moment or cede our advantages. China would like to think that American primacy is over, that a comeback is impossible. Air Force Chief of Staff Gen. Charles "C.Q." Brown Jr. disagrees. He says, "I don't believe in impossible." But he'll have to convince others that his future vision is correct. Civilian leaders: Trust that judgment.

Our nation must prepare for a new age of deterrence by cranking up investments in new weapons, scrapping old iron that no longer contributes, hardening our space assets to protect our most important strategic advantages, reorienting our thinking to shorten the kill chain, and embracing artificial intelligence and other emerging technologies to enable all of the above.

Trust in these concepts and material solutions must be carefully cultivated with honest assessments, demonstrations, and cost analysis. New weapons and technologies present new dependencies and vulnerabilities. Artificial intelligence algorithms are only as good as the data that inform them; bad data yields results that cannot be trusted. Adversaries don't have to destroy systems to undermine their utility; they merely need to create doubt.

It is the same with leadership. We must hold leaders to account for their performance and insist on clarity and integrity in their actions. We should not expect everyone to agree. But we must always be open to new or different ideas.

Trust is essential to preserving public confidence in our military, which rightfully remains among our nation's most trusted institutions. That trust is not a given, but earned.

News reports that Chairman of the Joint Chiefs of Staff Gen. Mark A. Milley twice spoke with his counterpart in China, in October 2020 and January 2021, were misconstrued by many as indicative of a general selling out his commander in chief. Milley's calls were appropriate, founded on intelligence assessments and intended to ease tensions and avoid conflict. That's part of his job. So was his meeting with military officials to discuss nuclear policy. We should be proud that our military leaders take such matters seriously.

Revealing secrets to Bob Woodward in the Washington Post while still serving as Chairman, however, demonstrates poor judgment. Whether that was Milley himself or some close staff adviser doesn't matter. Gen Milley politicized his role and cast a political cloud on the entire military in the process.

Trust being fragile, that was not a risk worth taking.

Lessons we can learn from Gates, Kendall, Brown, and Milley.

Maintain Your Operational Advantage with Sustainment Solutions from **Blackhawk Aerospace**

Blackhawk Aerospace brings over 20 years of providing engineering evaluations for the development of engine and propeller replacements to government and defense customers worldwide. Our technologically advanced systems allow customers to benefit from maintenance and operational cost savings, combined with increased performance, that ultimately results in expanded mission capabilities and extended life cycle for decades to come.

CONTACT US TODAY to learn more about how **Blackhawk Aerospace** can increase your operational advantage.



BLACKHAWK.AERO

 **BLACKHAWK**
A E R O S P A C E
S O L U T I O N S



Air Force Association

1501 Lee Highway • Arlington, VA 22209-1198

afa.org

Telephone: **703.247.5800**

Toll-free: **800.727.3337**

Fax: **703.247.5853**

AFA's Mission

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

To accomplish this, we:

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

Contacts

CyberPatriot info@uscypatriot.org
 Field Services. field@afa.org
 Government Relations. grl@afa.org
 Insurance. afa.service@mercercor.com
 Membership. membership@afa.org
 News Media. communications@afa.org
 StellarXplorers STLX_info@afa.org

Magazine

Advertising. kbrown@afa.org
 Editorial Offices. afmag@afa.org
 Letters to Editor Column. letters@afa.org

Change of Address/Email

In an effort to stay connected with AFA and your local chapter, please update your mailing and email addresses. Change of address requires four weeks' notice.

To update your contact information:

- **Email:** membership@afa.org
- **Visit:** The Members Only area of our website, afa.org
- **Call:** Our Membership Department at 1-800-727-3337

Mail your magazine label, including your first and last name, to our Membership Department at 1501 Lee Highway, Arlington, VA 22209-1198.

Hack Attack

Relative to the recent article titled "Hacking the Space Force" [August, p. 42], I'm continually baffled that the U.S. hasn't identified and met the increasing challenge of cyber warfare with a dedicated arm of the military. If the formidable threat this poses to our country and all of its infrastructure isn't enough, I don't know what is.

Tim C. King
 Reno, Nev.

Lowering the Bar

I just saw the ludicrous new PT Standards for the Air Force ["The New PT Test," September, p. 50].

What are they thinking?

Air Force physical fitness standards always lagged those of the Marines and the Army, but we at least tried to be able to function in a field environment in case of necessity.

I know many functions have changed since I retired, but it seems the new Air Force leadership is now lowering the bar even further to make Airmen (including women and all those new alphabetic genders) laughable military 'snowflakes' of the world—fit only for indoor office assignments.

I'm appalled!

Col. Ken Smith
 Honolulu

He Never Apologized

Major Stallings takes issues with the facts regarding Charles Lindberg, his Nazi medal and his antisemitism ["Letters: Lindbergh Defended," August, p. 5]. The facts are these: Lindbergh accepted "Verdienstorden vom Deutschen Adler," (Service Cross of the Order of the German Eagle) from Nazi Air Minister Hermann Goering on Oct. 18, 1938, at a party for him held at the U.S. Embassy in Berlin. Days later, Nov. 9, 1938, was Kristallnacht, making clear to anyone the Nazi's intentions toward Jews.

Lindberg did consider moving to Germany, which by then was synonymous with Adolph Hitler. Lindbergh forwarded his assessment of the Luftwaffe to General [Henry H. "Hap"] Arnold. Lindbergh was so impressed by the Nazi propaganda show that his reports contributed to defeatism by greatly overestimated German capabilities, who were actu-

ally behind the British and French in aircraft, tanks, and mechanization (see James Holland's, "The War in the West: Germany Ascendant 1939-1941," 2015).

The medal, a Maltese Cross surrounded by swastikas, was awarded to foreigners who were considered sympathetic to the Third Reich. Two other Americans who received the award were: Henry Ford, a notorious anti-Semite (publishing *The International Jew* and being the only American favorably mentioned in *Mein Kampf*), and Thomas Watson, the head of IBM, whose role in the Holocaust would only become clear later (see Edwin Black's "IBM and the Holocaust," 2001). Watson would later protest Germany's action against the Jews and returned his medal in June 1940. Henry Ford would also repent in February 1942 and returned his medal.

Charles Lindberg kept his medal and never apologized for his role in the America First Movement Committee, publicly proclaiming both pro-German and anti-Semitic sentiments right up to Dec. 7, 1941. Secretary of War Henry L. Stimson said in 1941, just before Pearl Harbor, "When I read Lindbergh's speech I felt that it could not have been better put if it had been written by Goebbels himself."

Lindberg never publicly or privately changed his views. He never apologized. His medals remained on display in the St. Louis Lambert Field terminal until 2012. Those are the facts. My opinion is that Lindbergh was a terrific pilot, but not a person to admire.

Lt. Col. Allen Parmet,
 USAF (Ret.)
 Kansas City, Mo.

WRITE TO US

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

Dragon Lady Down (But Why?)

Harvard professor Ploky's article on the Cuban Missile Crisis titled Dragon Lady Down [August, p. 50] was viewed with mixed reactions by SAC U-2 vets and history buffs like me who have nothing but admiration for the eleven 4080th Strategic Reconnaissance Wing pilots who served our nation during the most perilous 13 days in our modern history. There is no questioning of his assertion the shoot down of Maj. Rudolph Anderson Jr.'s U-2 on Oct. 27, aka Black Saturday, was the turning point of the crisis that threatened to turn the Cold War red hot. In fact, it led to the famous agreement between JFK and Khrushchev to end the crisis just 24 hours later.

The article focused on what happened from the Soviet side, beginning with what the author saw as a nefarious decision by two mid-rank generals to shoot down the unarmed U-2 in violation of Kremlin orders. Surprisingly, the author claimed "they got away with murder," a view that is at odds with military culture that factors in operational necessity when leaders are faced with making time-sensitive critical decisions affecting their mission or survival of combatant forces. The story behind the story presented by the professor was initially detailed by renowned journalist-historian Michael Dobbs in "One Minute to Midnight" back in 2008. Inexplicably, he failed to mention why the shoot down order was given, a secret discovered by Dobbs some 40 years after the crisis.

Turns out as Anderson's U-2 had overflowed the Guantanamo area, the generals realized his cameras would likely capture images of FKR-1 Meteor cruise missiles on their launchers in the open at a firing position 15 miles from the huge U.S. naval base. They had been moved there overnight to respond to an anticipated U.S. air attack. The FKR missiles carried a "tactical" nuclear warhead equivalent in yield to the Hiroshima atomic bomb and had a range of over 100 miles. The undiscovered FKR's were the Soviets ace in the hole for defending themselves and Cuba against an invasion that seemed imminent.

At that point, they could have

been launched on order of the Soviet commander, who no doubt would have been urged to do so by the Castro brothers, who personally assisted in locating a secure FKR support base in the nearby mountains. Needless to say, their employment against an unsuspecting invasion force likely would have resulted in a U.S. retaliation against the Soviet Union as JFK had warned.

Ironically, key questions remain unanswered on our side and some of the readers may have insight into them. Why was Anderson's mission not canceled, as SAC and NSA independently had actionable intelligence nine hours before he took off that the Soviet air defense system in Cuba was activated for the first time? As fate would have it, his mission was to probe the lethal envelopes of eight SAM sites, including the one at Banes that shot him down, but why, given it had been photographed by an RF-101 the day before? Worse, the crew of a SAC RB-47H ELINT aircraft intercepted the radar tracking his U-2 and radioed a warning to SAC HQ, so why was it not on a frequency monitored by Anderson? Minutes later, he was downed by a S-75 Desna SAM,

the same version used to shoot down Capt. Francis Powers' CIA U-2 over Russia two years before.

Anderson volunteered for what was his sixth mission over Cuba, and as the only combat casualty of the crisis, he deservedly was posthumously awarded the first Air Force Cross, especially as I noted in my book, "Without a Warning—The Avoidable Shootdown of a U-2 Spyplane During the Cuban Missile Crisis," when "no one had his back!"

Col. H. Wayne Whitten,
USMC (Ret.)
Lutz, Fla.

Professor Ploky's report evoked vivid memories from six decades ago. I was a graduate journalism student at Northwestern University during the Cuban Missile Crisis. Tensions ran high on campus and I worried about having a future in journalism, or any future at all, if nuclear war erupted. I later learned that a journalist played a key role in preventing an apocalypse. ABC News Washington correspondent John A. Scali served as a contact between the KGB's Soviet Embassy station chief, Col. Aleksandr Fomin [cover name at the time], and President [John F.] Ken-

(EXTREME)



Advanced thermal management for extreme military environments

Meggitt has developed cooling solutions for the most challenging flight conditions, missions, and extreme environments. From low supersonic flight, to high hot wet hover, to desert and arctic operations, our thermal management solutions are proven and ready to meet the challenge of the more electronic platform and battlefield.

Tel: +1 949 465 7700
E-mail: gerry.janicki@meggitt.com
www.meggittdefense.com

MEGGITT

nedey's Executive Committee, relaying critical messages to both parties. Scali responded to tougher Soviet bargaining conditions by warning Fomin that a U.S. invasion of Cuba was just hours away. This prompted the Soviets to settle quickly.

Scali's vital role was not publicly revealed until 1964. He joined President [Richard M.] Nixon's staff as an adviser in 1971 and was appointed U.S. Ambassador to the U.N. in 1973.

By acting as a messenger between two superpowers on the brink of nuclear war, Scali broke a basic rule of journalism: Reporters should not become part of a story they cover. But his breach of professional protocol helped save the world from disaster.

Richard Reif
Flushing, N.Y.

Smart Artificial Intelligence

The latest AI vs MAN efforts brought to mind the McAir manned domed simulator in the mid-80s ["The Classroom On Your Head," August, p. 38].

With an F-15 functional cockpit and an almost complete visual projection globe for maneuvering and air-to-air fighting, it was a popular PR stop as well as valuable development tool for many programs.

One feature of the PR presentation was the opportunity to fly against a maneuvering, visual opponent starting from a five mile head-on aspect and achieve a gun kill. The record was around 90 seconds and each pilot would have a go at trying to beat the time using their favorite secret tactic.

In one group there was a WSO [Weapon Systems Officer] and after all the pilots, he was jokingly offered

a chance. He accepted and in 37 seconds, he executed a head on gun pass and shot down the MiG. SCORE!!

The pilots went nuts yelling you can't do that. He answered, "Why not? It worked!"

Lt. Col. Charlie McCormack,
USAF (Ret.)
Danville, Calif.

Leadership Lost

General [Mark A.] Milley states we should have "situational understanding" and be open minded and widely read ["Verbatim, August, p. 9]. Considering the debacle in Kabul, it is quite apparent that General Milley has read very little about the fall of Saigon, or how the Taliban ousted the British from Afghanistan, or how a few years later the Taliban ousted the Russians from Afghanistan. Despite the heroic efforts our troops on the ground, we have lost a leadership role in world affairs. Perhaps General Milley should have spent more time gaining "situational understanding" of warfighting and less on "critical race theory."

Col. Peter W. Gissing,
USAF (Ret)
Roseville, Calif.

Ch-Ch-Ch-Changes

I piloted KC-135A models in the early 1980s and found your photograph of the cockpit of the current version very interesting ["Airframes," August, p. 18]. I recognized the throttles, the throttle friction lever, the speed brake handle, the elevator trim wheel, and a that was about it. Even the whiskey compass seems to have disappeared. Or perhaps it was blurred out of the photo for classification reasons. Ha! I am amazed at how that cockpit has changed, now for the better.

Capt. Robert Benzon
Winter Park, Fla.

Two Engines are Better

Captain Rea, "Letters: Hold My Beer," [August, p. 7] must not know that the F-4 with its two GE J-79 engines was no less vulnerable to the defenses of Route Pak VI over North Vietnam than my F-105 with its one robust P & W J-75.

The F-35, like the F-16, if hit by flak or missile or cannon fire, is no more likely to fall from the sky than a fighter with two engines. These are not the B-17s or B-24s that made it back to

Jolly Olde with "... one motor gone we can still carry on, coming in on a wing and a prayer."

Our legacy single-engine fighter, the F-16, is vulnerable to enemy stealth and long-range radar and missiles, but once the fight devolves to close-in visual, many enemy twins—and even our own F-15—will often come out ahead. (Fighter pilots know what that means.)

Lt. Col. John F. Piowaty,
USAF (Ret.)
Cape Canaveral, Fla.

Afghan Cover

With all due respect to Air Force Association—I have been a member of since the 1970s, and a life member since the 1980s—the cover headline that read, "Turning the Page on Afghanistan," was a blunt shock to the system. I realize that AFA has to toe a politically neutral stance, and for many valid reasons. But, frankly, we did not "turn the page" in Afghanistan. Instead, we came to the last page of the 20-year book and then decided to burn the book! After 20 years of blood, sweat, toil and treasure, the exact same gang of thugs and terrorists who were in charge of Afghanistan in 2001 are in charge again, but this time with vastly more power, support, and \$89 billion in advanced American military hardware in hand.

It seems whomever decided that cover should have strongly reconsidered.

Maj. Ken Stallings,
USAF (Ret.)
Douglasville, Ga.



INDEX TO ADVERTISERS

Blackhawk Aerospace.....3
 Blue Skies of Texas 35
 Bradford Group..... 49
 GE Aviation27
 Gulfstream9
 Gen. Larry Spencer 41
 Lockheed Martin Corp.....Cover IV
 Marvin Test Solutions, Inc..... 31
 Meggitt Defense Systems..... 5
 Mercer.....45
 Pratt & Whitney Cover II
 Rolls-Royce..... 7
 USAACover III

AFA's Aerospace Education Programs 60

POWER TO PROTECT

**American jobs, American engine:
Ready to Deliver.**

Rolls-Royce North America and our American workforce are ready to support the B-52 Re-Engining Program, with engines that will be manufactured in the United States.

We have a long and successful history as a propulsion provider for the U.S. Department of Defense. We're proud to build on that relationship, and to continue delivering world-class, American-made propulsion systems to give the nation's warfighters the absolute best technology edge. The F130 engine is the perfect fit for the B-52, with proven reliability, superb lifecycle cost and low integration risk, and once installed, can stay on wing for the planned B-52 lifetime. The F130 will provide vastly greater fuel efficiency while increasing range and reducing tanker aircraft requirements.



F130 for B-52

Proven. Efficient. Modern.

www.newB-52engines.com

The Advantage of Small



Mike Tsukamoto/staff

"You know we have Coronas every year—now we have three Coronas a year in the Air Force? I have a Corona every day. ... I don't think they've probably had a meeting—bang, bang, I mean, [Gen. David D. Thompson] walks across the street, we have a Corona. We're small. We can do things—we can do things because of our size. It gives us a great advantage."

—Gen. John "Jay" Raymond, ASC21.

Broke-Back Burden

"I'm sitting on about 20 F-15C models that are grounded right now, because the backbone of the aircraft is so cracked, I wouldn't get in them and fly them. I definitely wouldn't put my children in them to go fly. But right now, I still can't retire them."

—Air National Guard Director Lt. Gen. Michael A. Loh, ASC21.



Mike Tsukamoto/staff

Slow and Steady Can Lose the Race

"The biggest threat that I worry about is us. Because we move slow, we are deliberate. We don't take risks anymore. We are risk-averse. It takes us two years to do an experiment, then two years to build a requirement, and two years to get a budget, and 10 years to build a program that is supposed to last for 15 or 20 years. And in the meantime, somebody like China has built four different capabilities all to do the same thing. And they're moving unbelievably fast."

—Gen. John E. Hyten, Vice Chairman of the Joint Chiefs of Staff, at the Air Force Association 2021 Air, Space & Cyber Conference (ASC21).



Airman 1st Class Gage Rodriguez

Selflessness

"You look at the bottom of the Statue of Liberty, it says 'give me your tired, your poor, your homeless: all who are trying to seek freedom, right? You are the living embodiment of the Statue of Liberty, you are all that's good about America. ... What you just did was give 124,000 people freedom: freedom from oppression, freedom from fear, freedom from want, right?...That is no small achievement. And those 13 that were killed: 11 Marines, one Soldier, one Navy Corpsman, they died so others would remain free that they don't even know. That's the ultimate sacrifice."

—Army Gen. Mark A. Milley, Chairman of the Joint Chiefs of Staff, to Airmen aboard a C-17 Globemaster III at Joint Base Charleston, S.C.

Losing Formula



Mike Tsukamoto/staff

"If we're not careful, we'll end up with fifth-generation fighters shooting fourth-generation weapons at sixth-generation threats."

—Gen. Charles Q. Brown Jr., Chief of Staff of the Air Force, ASC21.

Home Rule

"We will not go back to what we were doing before. I am setting that goal for Airmen, to see if we can get 50 percent in telework all the time. ... We believe the younger generation, not more seasoned individuals like me, ... like being in the digital world, feel comfortable operating in that kind of arena. They embrace it. If we don't go do this, we will end up losing Airmen in the long term. It is a retention issue for the long term."

—Gen. Arnold W. Bunch Jr., commander of Air Force Materiel Command ASC21.



STRENGTH OF PURPOSE

Entrust your most sensitive missions to Gulfstream. With more than five decades of high performance, flexible platforms and proven reliability, there is no other choice for civilian and military operations over land and sea.



Gulfstream™

A General Dynamics Company



A U.S. Air Force aircrew, assigned to the 816th Expeditionary Airlift Squadron, prepare to load qualified evacuees aboard a U.S. Air Force C-17 Globemaster III during the evacuation of Americans and allied Afghans at Hamid Karzai International Airport, Afghanistan, Aug. 21, 2021. Mass evacuation by U.S. forces ended Aug. 30, but individual efforts continue.



Tech. Sgt. Alisha Derrick overcomes a rope obstacle during the Prime Base Engineer Emergency Force, or Prime BEEF, program at Camp Mad Bull on Joint Base Elmendorf-Richardson, Alaska, Aug. 4, 2021. Airmen worked in small teams on the multi-station obstacle course to prepare for situations they might encounter while deployed. The Airmen also hauled a Light Medium Tactical Vehicle by ropes and went through individual movement technique training, among other Prime BEEF activities.



Security Forces Airmen from the 48th Fighter Wing and troops from RAF Leeming, U.K., conduct a joint patrol with their new Boston Dynamics Spot robot on the flight line during Agile Liberty 21-2, Aug. 25, 2021. The joint exercises demonstrate interoperability and Agile Combat Employment capabilities with allies, using new technologies such as the robot “dog,” to increase their effectiveness. The robot is nimble and able to navigate rough terrain while it gathers data and performs automated inspection tasks. Spot is used by other allies, as well, including France, which used it in combat training last spring.

By John A. Tirpak

The Russian Way of War

Russia can't beat NATO in a toe-to-toe, all-conventional war; it's outgunned and its technology, in many cases, is not up to par. Rather, it has an all-domain, hybrid approach to an armed European conflict. It would combine its nuclear deterrent with cyber attacks, an intense, short-term campaign of disruptional, time-buying tactics, and a willingness to hit critical enemy civilian infrastructure. The idea is to convince the adversary quickly that it's just not worth it to keep fighting.

Before the shooting even starts, though, Russia's method is to undermine the cohesion of its enemies by dividing them politically and internally, making it harder for them to respond with unity to a Russian provocation, and harder to hang together when Russia starts inflicting serious economic pain.

Even if the outcome is a draw, Russia would count it as a win because NATO—which Russia sees as its greatest threat—would be so politically disrupted and destabilized by the war's economic damage that it would cease to be a threat. Indeed, it might fall apart as an alliance, potentially leaving Russia as the hegemon on the European continent.

In "Russian Military Strategy: Core Tenets and Operational Concepts," the authors of a new Center for Naval Analyses [CNA] assessment of Russian strategy, released in August—Michael Kofman, director of CNA's Russia Studies Program, and Anya Fink, research analyst in the program—see Russia's strategy as long term, and implemented across the spectrum of domains. They based their conclusions on study of Russian strategy and doctrine documents, public speeches and comments by political and military leaders, Russia's conduct of military incursions in Georgia and Ukraine, and its military exercises.

The fight is already underway, as Russia mounts a heavy effort to sow political discord among its opponents, interfering in their elections and destroying public confidence in their governments.

In outright war, Russia would not hesitate to strike at "economic potential, not seizing territory," hitting enemy critical infrastructure using missile and cyber attacks and special forces, the authors assert. It would also use "preemptive use of limited force" to neutralize "imminent threats." The Russian armed forces doctrine is to merge "defensive and offensive constructs without clear distinction," they said.

Shaping the political battlefield is meant to convince the enemy that "the costs of aggression would exceed desired benefits." The overarching idea is to use "undeclared warfare, containment, and coercion" to achieve Russia's military goals.

In conventional terms, Russia sees the future battlefield as "fragmented, or noncontiguous, without fixed battle lines, where radio-electronic means integrate with traditional fires and strikes to execute a 'complex defeat' of an opponent's military effort," the authors wrote. Russian ground forces would maneuver rapidly to



A Russian Ministry of Defense video shows an unmanned Russian S-70 Okhotnik combat drone flying with a fifth-generation Su-57 fighter on Sept. 27, 2019.

Russian Ministry of Defense video

"sap an opponent's strength," degrade enemy forces, and preserve their own. Russia would trade territory "to attrit an opponent until a firmer positional defense and counteroffensive can be mounted."

Russia "envisions warfighting defined by fire, strike, and maneuver, where tactical formations engage each other at distances, and recon-strike contours enable warfare at standoff ranges," the authors said. The "operative thesis" is that the enemy can be slowed and degraded, "parrying their offensive ground operation and deflecting an initial massed aerospace attack."

With cruise missiles and drones, Russia would target its enemy's economic centers of gravity and "economic potential, not seizing territory." Russia sees the first weeks of war as critical, aiming to deny its enemy a decisive outcome and force "high levels of attrition." With the economic damage and inconclusive engagements, Russia hopes the opponent will back down, seek "war termination on acceptable terms," and be too politically disrupted by the "ensuing internal instability" to pose further threat.

All this depends on highly coordinated action in many domains—a mirror to the Pentagon's joint all-domain command and control—acting on a unified strategic plan, and employing an all-of-government approach.

Moscow sees the opening round of a shooting war as "an integrated massed airstrike" by NATO against key centers of economic and political gravity in Russian territory. The Russians view NATO as having "strategic conventional capabilities" and high technology systems. Its primary fear is that of being hobbled and decapitated by U.S./NATO air forces, as happened "in Iraq, Yugoslavia, and Afghanistan." Russia's fears of such a crippling attack are "only compounded" by the U.S. crash program in hypersonics development, improvements in weapon accuracy, and "U.S. prompt global strike." Russia is most concerned about a surprise attack from the

air and space, conducted with high speed, over “several minutes to several days,” led by low-altitude, stealthy aircraft and missiles. If not stopped, Russia sees this phase as enabling the enemy to achieve its objectives “in a matter of days.” Consequently, much of its military force structure is built around blunting these attacks.

In a diagram from a 2020 military paper, Russian authors quoted by CNA describe an anticipated NATO attack led by hypersonic missiles, followed in quick succession by cruise and tactical missile strikes here—a strike led by Air Force unmanned aircraft, and finally by manned aircraft teamed with unmanned aircraft. This string of attacks as seen as taking place with as little as five minutes warning time, with the full thrust brought to bear in under an hour.

All of this would happen against a backdrop of what Russia calls a “self-forming adaptive network” of sensors and communications; broad area electronic warfare and employment of decoy systems.

The Russian counter-move would be partially preemptive, aimed to hit airfields and support infrastructure before the massive NATO volley can begin, as well as a heavy counterattack on command posts, electronic warfare systems, and air defenses. The authors quote a Russian defense paper as saying that “the experience of many wars shows that only active defense can guarantee success.”

Russia’s “aerospace defensive system” looks a lot like the U.S. multi-domain operations scheme. In a diagram from a 2009 Russian military paper, it blends sensor and jamming satellites with fighters launching anti-satellite attacks, low-level bombers attacking airfields and air/missile defense systems, and even using helicopters to shoot down incoming NATO cruise missiles. A high-flying spaceplane-like system could also defend against hypersonic missiles while Russia’s own hypersonic glide vehicles could strike rear areas of NATO. Russia’s S-400 air defense system is also shown launching missiles at ground targets.

In 2006, the Russian government published a document directing a merger of the air and space domains for the purposes of a new combined offensive/defensive organization to manage strategic aerospace operations, saying this would be in force beyond 2016.

In 2011, the new Aerospace Defense Forces of Russia absorbed the Space Forces, and in 2015, it absorbed the Air Force, as well as aviation forces, anti-aircraft missile forces, “radio-technical” forces, special forces and space forces. All of this is seen as necessary to cooperatively blunt a NATO air attack.

“The Russian military has long grappled with what they see as the principal U.S. way of war: massed aerospace offensive, destruction of critically important objects, and so-called ‘shock and awe,’ which may visit paralyzing levels of destruction on an opponent,” the authors said. While Russia sees this threat as the biggest one it faces, the authors say it is now viewed as “within the concept of multi-domain operations.”

For planning purposes, “this is what Russia sees as the decisive initial battle with a technologically superior aerospace power.”

Ground forces, meanwhile, “shift to assault only when the opponent has been sufficiently degraded via fires, strikes, and means of functional defeat.”

Russia’s scheme for war occurs in six stages, beginning before the war actually begins. At the low end—in peacetime and under military threat—Russia will conduct nonkinetic warfare (cyber and psychological operations) against enemies while publicly demonstrating new nuclear weapons, raising overall readiness and alert levels, and deploying weapons for potential use. In a “local war,” Russian strategy calls for “grouped use” of precision strike conventional weapons to inflict damage on enemy territory, strikes on conventional military targets, and threatening to use nuclear weapons.

Under “regional war”—war with NATO or China—Russia would employ “massed use” of precision weapons on enemy forces, adding “single or grouped use” of tactical nuclear weapons, possibly to

demonstrate that Russia is willing to use them.

In “large-scale war,” Russia would make “large-scale use” of nonstrategic nuclear weapons, and conduct both strategic and nonstrategic nuclear strikes on enemy economic targets. Finally, under “nuclear war,” Russia would unleash “mass use” of its nuclear triad against military and nonmilitary targets.

The precursor stage to war—setting a favorable atmosphere for Russia to prevail—employs “nonmilitary means,” which broadly include “political, information (both psychological and technical), diplomatic, economic, legal, spiritual/moral, and humanitarian measures,” according to a 2011 Russian defense paper. Overt tactics in this stage include “implementing economic sanctions, imposing economic blockades, forming coalitions and unions, breaking off diplomatic relations, and conducting information warfare,” it said. Prevailing political conditions will determine when and to what extent these means are used, and they must be constantly adapted to the fluid situation, the authors note.

Nonmilitary means of war are a “force multiplier,” Russian doctrine holds, which “serve to weaken and reduce an opponent’s forces and capabilities, and even completely eliminating a military threat.” Coordination between military and nonmilitary means are a must. In fact, a 2013 defense article by Russian Army Gen. Valery Gerasimov, head of the military forces, contends that “in a number of cases,” nonmilitary means of coercion “significantly surpassed the power of weapons in their effectiveness.” Gerasimov said the ratio of nonmilitary to military methods of warfare is 4-to-1.

In 2019, Gerasimov said he sees the military as coordinating (rather than directing) all-of-government, non-wartime approaches to conflict, while using military capability to back up all the others.

“Russian thinkers view information warfare as capable of disorganizing an opponent’s command and control, deceiving an adversary, sowing instability within an enemy’s borders, and demoralizing an opposing population or military to the point that they even lose the will to resist,” CNA said.

Since the 1990s, Russia has been referring to this approach as “sixth generation” or “new-type warfare.” Russia has employed these approaches in its blockade of oil exports to Western Europe, in its campaigns in Georgia and Ukraine, and in its interference in NATO member and U.S. elections.

“Unlike 20th century conflicts,” the authors observed, nonmilitary forces and methods “are not deployed in the initial period of war, but during peacetime, resulting in offensives and strategic operations beginning with already-prepositioned forces.” During this period, true military forces are moved into position to either threaten action or be ready to move into contested areas unopposed, or too quickly for an enemy to block.

“Operations are characterized as highly maneuverable, non-contact, with mass employment of high-precision weaponry, large scale use of special operations forces, robotic systems, weapons based on new physical principles, and the participation of a strong civil-military component.” The goal is to strike enemy formations across a wide front, simultaneously, borrowing a page from U.S. strategy known as “parallel warfare.”

The authors note that there’s no term like “anti-access/area denial” in Russian military doctrine. Russia puts “little faith” in fixed defenses or anti-access capabilities when there is such a profusion of penetrating, precision-guided munitions.

Russian doctrine “accepts that Russia is the weaker party” in a conflict with NATO, with fewer troops and generally inferior technology, the authors conclude—but it’s still working to redress that technological gap in selected areas, and still sees the value of mass in some applications. But its approach is decidedly asymmetric, as it aims to “shape the outcomes” of war “without presuming the likelihood of victory in a sustained conflict.”



Senior Airman Rebeckah Medeiros

F-22 Raptors fly alongside a KC-135 Stratotanker near Japan in April. The Raptors operated out of Marine Corps Air Station Iwakuni, Japan, as part of an Indo-Pacific Command Dynamic Force Employment exercise.

USAF's Three Priorities: China, China, China

Air Force Leaders Warn: The U.S. Will Lose Air Superiority Without Rapid Change.

By John A. Tirpak

The alarming speed of China's military advance is fueling new urgency in the Air Force to accelerate modernization and deter Beijing from military aggression. American primacy is in jeopardy, service leaders warned at AFA's 2021 Air, Space & Cyber Conference (ASC21).

"We are being more effectively challenged than at any other time in our history," said Secretary of the Air Force Frank Kendall. China's air force is at parity, and in some cases holds an edge over the U.S., he said, noting that China's nuclear forces are "acquiring a first-strike capability."

Over and over, speakers at the conference cited the urgent need to respond. "There is not a moment to lose," Kendall

said, calling for modernization across the entire air and space portfolio, from air operations to space and the electromagnetic spectrum. As Secretary, Kendall said, his top priorities, "in order ... are China, China, and China."

In a briefing for reporters, Air Force futurist Lt. Gen. S. Clinton Hinote, deputy chief of staff for strategy, integration and requirements, said China is no longer a future challenge. China used to be a problem "10, 15 years out in the future," Hinote said. Now "it is a current problem," and absent a major modernization push, USAF faces the likelihood of defeat in a war with China.

Hinote emphasized that the Chinese air force is already "at parity ... in key areas" with the capabilities of the U.S. Air Force, and in a few "important areas we're behind, tonight," although he didn't offer specifics.

“The light is blinking red,” Hinote told reporters. “We are out of time.”

China has the largest air force in the Indo-Pacific and the largest inventory of conventional missiles in the world, said Chief of Staff Gen. Charles Q. Brown Jr. It is also advancing its power-projection capability with new bases worldwide. Brown said he expects China to make good on its plans to be fully modernized by 2035 and “world class” by 2050.

“China continues to move its modernization timelines left at a rate that is outpacing” the U.S., Brown said in his conference address. “We must move with a sense of urgency today in order to rise to the challenges of tomorrow, because the return to strategic competition is one of our nation’s greatest challenges.”

Brown said the threat posed by this new strategic competition can be “just as catastrophic” as a sudden, 9/11-type attack. Delaying action now means the Air Force will be “too late” to confront it later.

Already, the Air Force faces the risk of not being able to achieve air superiority in a fight with China, a prospect commander of Air Combat Command Gen. Mark D. Kelly warned would be disastrous. The American way of war assumes control of the air, he said, and the other armed forces depend on that. He called for a national response on the scale of the Manhattan Project to restore a formidable lead over China in air combat capability.

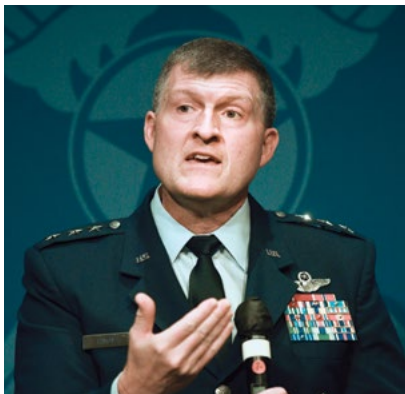
As America’s “apex peer adversary,” Kelly continued, China has created a government ministry with the singular goal of wresting air supremacy away from the United States. China is “not debating” the matter, but moving deliberately to accomplish it, he stated, warning ominously that if China fields “sixth-generation” fighter capability first—aircraft that go well beyond today’s fifth-generation F-22 and F-35—“it will end badly” for the U.S.

The U.S. must also gird for more difficult and costly conflicts, Kelly warned, saying China’s military is “designed to inflict more casualties in the first 30 hours of combat than we’ve endured over the last 30 years in the Middle East.”

China’s rise drove Kendall to “work hard to get this specific job,” he said, because if the U.S. is going to win the biggest fight “to keep our freedom, it will be because of the success of our air and space forces.”

As a West Point grad and 11-year Army officer, he respects the contributions of the other services, but “without control of the space and air domains, their missions become all but unexecutable,” he said.

The Air and Space Forces control the “global high ground,” can project power anywhere on the planet on short notice, and are able to “confront and defeat aggression immediately, wherever it occurs,” Kendall said. Only the air and space forces can come to the aid of allies and partners “with little to no notice.”



Lt. Gen. S. Clinton Hinote, deputy chief of staff for strategy, integration, and requirements, said the threat from China is not in the future. It is now.

Mike Tsukamoto/staff

Still, he said, to deter or defeat China, “we are going to have to change.” China and Russia studied the American way of war intensively for 30 years, and developed “asymmetric steps to exploit our vulnerabilities and to defeat us.”

ADDITION BY SUBTRACTION

Kendall called on Congress to stop its reflexive rejection of USAF efforts to divest aging aircraft that are irrelevant to the China fight, and said the Air Force must be empowered to focus on developing the war-winning force structure it needs.

“The Air Force will not succeed against a well-resourced and strategic competitor if we insist on keeping every legacy system we have,” he stated. Retiring unneeded assets now frees up funds to invest in new capabilities and manpower to take on new missions.

During his confirmation hearings, senators told Kendall they agreed with his view that USAF must reconfigure to deal with China, but “in the same breath” opposed USAF efforts to retire “take your pick—C-130s, A-10s, KC-10s, or MQ-9s—in that senator’s state,” he recalled.

While Kendall said he understands the “constraints” of constituent politics, “we need to find a better mechanism to make the changes we need. We must move forward.”

In a press conference, he told reporters he’s hopeful about a proposal from Sen. Jack Reed (D-R.I.), chairman of the Senate Armed Services Committee, designed to break the logjam surrounding divestitures by using a mechanism similar to that used in the Base Realignment and Closure (BRAC) process. Lawmakers would face a single up or down vote on a whole package of divestitures in his plan, rather than being allowed to tinker with what happens on any given base. This approach would give members cover from constituents seeking to punish any perceived lack of support for jobs back home.

The Air Force especially will adhere to the “one team, one fight” mantra put forth by Defense Secretary Lloyd J. Austin III, Kendall said. The Air Force and Space Force will continue to support each other, even as they support the other services to jointly provide “integrated deterrence.”

All the services depend on the Air Force’s kinetic airpower, mobility, and tanking capabilities, he noted, and they likewise depend on Space Force for “resilient surveillance capabilities.” Space Force will continue to provide services such as navigation, timing and weather, and is moving forward with a new Space-Based “Ground and Surface Moving Target Indicator,” Kendall said, as well as a new “resilient space architecture” writ large. The Air and Space Forces together will continue to “enable the terrestrial services to perform their missions.”

Kelly said 20 years fighting a war that never challenged the Air Force gave China time to focus on “the high-end fight, and fighting us,” and he singled out advances



USAF Chief of Staff Gen. Charles Brown Jr., at AFA's ASC21, said China's modernization push moves it closer and closer to sixth-gen fighter capability.

Mike Tsukamoto/staff

made by both China and Russia in electromagnetic spectrum operations. Paraphrasing British Gen. Bernard L. Montgomery's injunction that a military that can't control the air will be swiftly defeated, Kelly said, "If we lose the war in the electromagnetic spectrum, we lose the war in the air, and we lose it fast."

THE FIGHTER ROADMAP

Kelly laid out the Air Force's plans for its future fighter force, reducing from today's seven-fighter fleet to a "four-plus-one" scheme revealed earlier this year:

- The F-22 air superiority fighter will remain in the fleet until about 2030, when it will make a "hot handover" to the Next-Generation Air Dominance platform;

- The F-35 will be the "cornerstone" of the force;

- The F-15E and F-15EX will provide capacity and muscle;

- The F-16 will be a capacity-builder; and

- The A-10 will be the "plus one," retiring in the early 2030 time frame, when it will no longer be able to survive modern air combat.

In a press conference, Kelly said he doesn't understand the debate over whether to pursue both the fifth-generation F-35 and what he called the "4.5 generation" F-15EX, with its new flight controls, computers, and electronic warfare systems.

"I need both," Kelly said flatly, with the F-15EX needed to quickly replace retiring F-15Cs that were worn out over the course of the Iraq and Afghanistan wars and are now becoming unsafe to fly.

KENDALL ON HYPERSONICS

Kendall was skeptical of some USAF programs and promised a "deep dive" to ensure the service is getting full value for its investment dollar. "Unsatisfied" with the Air Force's hypersonic missile programs, which suffered a series of failures in recent tests, he noted that China and Russia have already fielded such capabilities. He also expressed frustration with "the degree to which we've figured out what we need" from hypersonic technology.

China and Russia have a "pretty clear" vision for hypersonics, but there is "still a question mark" as to how hypersonic weapons fit with the Air Force's strategy, Kendall said. He wants more comprehensive analysis to drive decisions about which weapons are needed for what missions, and also how many are needed to ensure a robust and meaningful capability. Kendall echoed previous Pentagon leaders and analysts who've questioned plans to acquire limited numbers of hypersonic missiles, at potentially more than \$10 apiece, for a fight with China that could run into thousands of targets.

Kelly told reporters hypersonic weapons offer a chance to hit targets swiftly, from great range, but that even during



Secretary of the Air Force Frank Kendall, speaking at ASC21, said China is at or near military parity with the U.S.

Mike Tsukamoto/staff



Gen. Mark Kelly, ACC commander, said losing air superiority to China would be disastrous for all U.S. military services.

Mike Tsukamoto/staff

their abbreviated time of flight, mobile targets can move. Acknowledging that the Air Force needs "fifth-generation weapons" to go with its fifth-gen fighters, Kelly said hypersonic weapons are not the only option.

"We will get there," Kendall said. First "we have to solve the problem ... of where we're trying to go—and then get there as quickly as possible."

Gen. Arnold W. Bunch Jr., who leads Air Force Materiel Command, told reporters that AFMC will "continue to put our focus" on hypersonic weapons. "We will continue to take ... educated risks as we move forward, so that we can get a capability out in the field," he said.

Kelly agrees USAF should have an "unambiguous" concept of operations for hypersonic weapons. "We should make sure, before we pull the trigger and commit resources to it, [that] everybody's on the same sheet of music," he said.


ABMS

One area where Kendall appears to be applying the brakes is on the Advanced Battle Management System (ABMS), a signature initiative of the prior administration. He has questioned whether the service is adequately "focused on achieving and fielding specific, measurable improvements in operational outcomes," as opposed to conducting useful but unfocused experiments. Congress has also viewed ABMS as scattershot, slashing funding requests for ABMS in each of the past two years.

Hinote said Kendall is asking "tough questions" about ABMS, and admitted that "in some cases, our answers weren't very good." But Hinote also emphasized the underlying need, not only for the Air Force, but for the joint force, saying he couldn't see how the U.S. can win a war without it.

Lt. Gen. Duke Z. Richardson, the Air Force's top uniformed acquisition official, said ABMS represents a "portfolio" of programs, rather than a single system, and that the connectivity provided in its Increment One capability is essential. "If we do nothing else," he said, Increment One is "worth doing." Richardson said the same will be true of Increment Two. USAF is "waiting for some 'big bang' " ABMS operational introduction, he said.

Brown, Richardson, and others praised Kendall's intellect and experience as major additions for the Department of the Air Force. "We won the jackpot," Richardson said, citing Kendall's acquisition, policy, and Pentagon experience. Having led the Pentagon's acquisition oversight, Kendall's unique insight into all the services' programs of record gives him a firm grounding that has enabled him to hit the ground running.

No major program has escaped Kendall's gaze, Richardson said. "He wants to make sure that we're focused on [China] ... from the perspective of the warfighter and the taxpayer," he said. "So we are trying to make sure that we are really laser-focused on that." 



Mike Tsukamoto/istaff

Gen. John Raymond introduces the new Space Force Class A uniform prototypes at AFA's 2021 Air, Space & Cyber Conference on Sept. 21. A PT uniform—black shorts with USSF's delta logo in white, and a gray t-shirt—is now in wear testing. Guardians will also wear the multi-service Operational Camouflage utilities with blue lettering.

State of the Space Force

By Amanda Miller

When Chief Master Sgt. of the Space Force Roger A. Towberman transferred over from the Air Force in April 2020, the Space Force achieved something Gen. John W. “Jay” Raymond supposed no service had done before: “We doubled in size overnight.”

By Sept. 21, 2021, the Space Force had sworn in 6,490 Guardians, the Chief of Space Operations told a packed ballroom at AFA's 2021 Air, Space & Cyber Conference. Among them are transfers, Air Force Academy and ROTC graduates, Officer Training School graduates, and enlisted members graduated from both Air Force and Space Force Basic Military Training.

This is a different kind of force, Raymond said, citing as an example a newly commissioned Guardian whose Type 1 diabetes would have disqualified him from service in any other branch because the disease renders him undeployable. In the Space Force, that won't be an issue.

The Space Force released its 25-page human capital plan, also referred to as a talent management model—“**The Guardian Ideal**”—laying out five objectives:

- **Connect in a collaborative environment.** The service will foster “a fearless organizational culture so all individuals can contribute” while removing barriers between officer, enlisted, and civilian personnel. Embedded within this objective is “The Guardian Commitment,” an individualized interpretation of the four values of character, connection, commitment, and courage.

- **Lead digital enablement.** “Enhanced digital fluency” will be an expectation of all Guardians, a “cadre of cyber warriors” with a “mastery of digital competencies,” including software coders, data scientists, and IT experts.

- **Generate and engage talent.** The service intends to reflect the U.S.'s “blend of diverse perspectives, cultures, ethnici-

ties, and experiences.” Objectives within the objective are to “strengthen personal connections” between Guardians; “provide decision transparency and accountability;” and to create an environment “that values candid feedback and bold, risk-informed actions and ideas.”

- **Develop and employ talent.** The document says Guardians should anticipate in “the near future” to see the competencies defined for each job in the Space Force to help inform individualized development plans and “develop necessary foundational and occupational competencies in each Guardian.”

- **Integrate resiliency.** Recognizing that “stress, adversity, struggles, and setbacks are a natural part of the human condition,” the service intends to adopt family readiness programs, keeping in mind that “many of our Guardians have meaningful relationships that do not involve marriage or children” and offering relationship coaching and counseling.

The force continues to grow, aiming to reach 8,400 Active-duty Guardians by October 2022.

UNVEILING OF UNIFORMS AND INSIGNIA

Raymond underscored the urgency for a unified response to growing threats from China and highlighted the need to leverage advances in commercial industry. But nothing garnered quite so much attention or buzz as the prototype Class A uniforms unveiled near the end of his address, as he called to the stage two Guardians with their deep navy blue jackets, with silver buttons and braid, and gray trousers.

The jacket's six buttons, aligned diagonally on the wearer's right, are symbolic of the Space Force's place as America's sixth military service. Its standing but open collar shows off the white shirt beneath. The buttons show off the Space Force's Delta, Globe, and Orbit seal, and mirror-finish U.S. pins highlight the high collar.

Reaction was predictably mixed, with some loving the new look and others decrying its unorthodox design. Raymond said the service will review comments and make tweaks in the coming months leading up to eventual wear testing.

A new Space Force PT uniform is already at that stage. With black shorts featuring the Space Force's delta logo in white and a gray T-shirt bearing the words "Space Force" in white on the back in a stylized font. Guardians will wear the multi-service Operational Camouflage Pattern utilities with blue lettering, rather than black, spelling out Space Force and the wearer's name.

Guardians will also soon begin to wear new enlisted rank insignia, featuring deltas and elongated hexagons—another nod to USSF as the military's sixth service. Towberman unveiled the new insignia a day before Raymond shared the service dress uniform.

MORE FOCUSED TRAINING

There's more to building a Space Force than designing spiffy uniforms, of course, and Raymond emphasized the service's intensified approach to Professional Military Education.

"We started with Undergraduate Space Training—completely revamped that," Raymond said. "Shifted that from an unclassified course to a Top Secret course focused on the threat and training our operators to operate in the contested domain from Day One."

Raymond said the Space Force has also updated its professional development courses at Airman Leadership School, the Noncommissioned Officer Academy, Squadron Officer School, Air Command and Staff College, and Air War College—"putting more space in the curriculum," he noted, while also developing new courses specifically for the Space Force, such as the new Space Fundamentals Course embedded in the Air Force Test Pilot School, now in its third class.

Other courses have been revamped to enable allies to take part. "We're already seeing that," Raymond said.

CONNECTING COMMUNITIES

Raymond cited other advances, including establishing the Space Warfighting Analysis Center, which he called "a small organization with PhD-level talent" who, "coupled with operators ... have built a new force design for our first case—missile warning/missile tracking." He said their work had "united the Department." Other new or improved institutions he cited include the Space Rapid Capabilities Office, Space Systems Command, the Space Development Agency, and the Missile Defense Agency.

"And for the first time, everybody's rowing in the same direction," Raymond said. The payoff, he predicted, will "reduce duplication, reduce costs, and increase our ability to go fast."

Meanwhile, the Space Force joined the Intelligence Community as its 18th agency. "Now we have an opportunity ... to dig deeper on the threats that we're seeing in the domain, to

understand those threats more fully, and really begin to work on this thing called the National Space Intelligence Center," he said. The new center is taking two squadrons from the existing National Air and Space Intelligence Center. In the past, Raymond said the center's purpose will be, together with the Intelligence Community, "to detect and characterize threats, defeat attacks, and respond to aggression."

Similarly, the United States is reaching across international boundaries to forge closer ties with international partners and commercial providers. Raymond cited an August gathering of 23 nations' space chiefs as an example. "What you'll see with these partners is we exercise together, we train together, we wargame together," Raymond said at the time. "We build capabilities together."

ABSORBING MISSIONS

The Space Force will take over Army and Navy satellite programs as soon as the fiscal 2022 defense budget becomes law, including the Army Satellite Operations Brigade and Naval Satellite Operations Center, which includes both satellites in orbit and on ground systems in the continental U.S., Hawaii, Guam, Germany, and Japan.

The Space Force had been working on the transfers for more than 18 months, with the intent "to consolidate, to increase our operational capability, to increase our readiness, and to do so in a more efficient manner," Raymond said.

Raymond called Space Force a "flat organization built for speed," with fewer echelons of command. The former Space and Missile Systems Center became Space Systems Command, with headquarters at Los Angeles Air Force Base, along with space launch units at Patrick and Vandenberg Space Force Bases now referred to as "deltas,"—equivalent to Air Force wings.

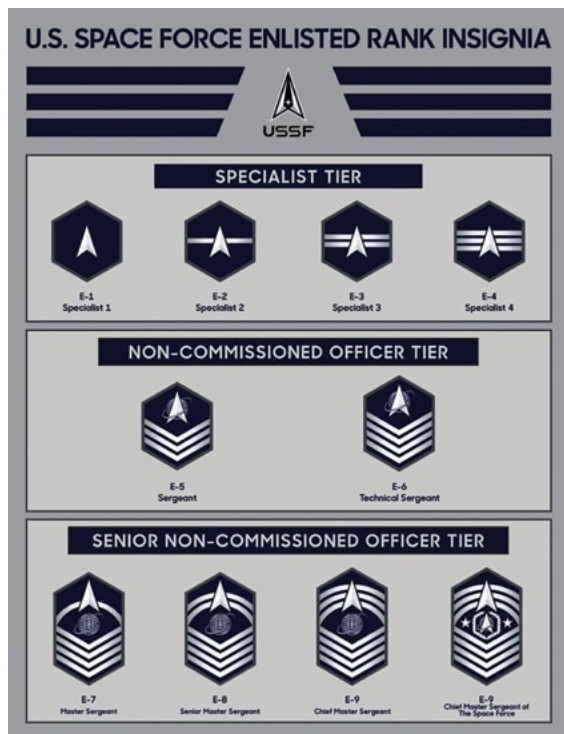
Space Training and Readiness Command followed shortly thereafter, with provisional headquarters at Peterson until a permanent HQ is selected. (See "STAR Command Stands Up," p. 50.)

Space Training and Readiness Command followed shortly thereafter, with provisional headquarters at Peterson until a permanent HQ is selected. (See "STAR Command Stands Up," p. 50.)

MOVING FORWARD WITH ACQUISITION

Department of the Air Force Secretary Frank Kendall said in August the key to any departmental reorganization is "to move quickly to get the big parts right." The big movements include moving the Space Acquisition Directorate under the new Office of the Assistant Secretary of the Air Force for Space Acquisition and Integration. Meanwhile the Space Force's Space Systems Command and its Space Rapid Capabilities, a direct reporting unit to the Chief of Space Operations, also retain acquisition roles.

The Space Development Agency had been expected to become a part of the Space Force, but Kendall announced it will report to his office instead. He was still vetting candidates for the first official to be formally named to the new assistant secretary job.



Space Force enlisted Guardian insignia were revealed on Sept. 20, featuring the delta logo and an elongated hexagon.

USSF





Gen. John Raymond, Space Force Chief of Space Operations, updated ASC21 attendees on USSF's evolving organization, space architecture, and space resiliency.



Army Gen. James Dickinson, Commander, U.S. Space Command, is concentrating on building and strengthening alliances in the Pacific.

Mike Tsukamoto/staff

International Space Engagement Helps Fill Strategic Gaps

By Abraham Mahshie

America's space-dependent way of life and its military space advantage is threatened by the new space weapons wielded by adversaries. But in just two years, Space Force is motivating traditional and new partners to fill strategic gaps and guarantee access to space through investment and information-sharing, as long as the right barriers can be broken down.

One month on from a chiefs meeting in Colorado Springs that brought together heads of space agencies from 22 nations, U.S. Space Command and Space Force are marching ahead with the global engagement necessary to strengthen America's space network and create a globally dispersed partnership.

U.S. Space Force Chief of Space Operations Gen. John W. "Jay" Raymond highlighted the growing partnership at the Air Force Association's Air, Space & Cyber Conference in National Harbor, Md.

"We had representatives from every continent except Antarctica," he said, noting how the international chiefs conference doubled its attendance from its first iteration two years prior.

"It is clear that we are stronger together," he added. "We operate together, we train together, we now are developing capabilities together. And for all the international partners that are here, thank you for being here. Again, we are stronger together. And we look forward to continuing to build that team."

The Colorado meeting focused heavily on the need for greater space domain awareness and norms of behavior in space to counter the types of threatening anti-satellite capabilities that adversaries like China and Russia have demonstrated on orbit and from the ground.

Commander of Space Operations Command Lt. Gen. Stephen N. Whiting said America's military edge can be made more resilient through its partners.

"Space brings us untold advantages, such as being able to overfly other countries legally," he said. "You can't fly in airspace above other countries because that's sovereign territory, but that also means that you are regularly and predictably over other people's countries in what we call their weapon engagement zone."

From a defense standpoint, that means while America is developing a more resilient space architecture, it must defend

the current architecture until hardened capabilities can be deployed.

“We are looking at all the kinds of capabilities you expect in a military organization: intelligence, cyber, command and control, force packaging, high-value capability, defense, offense, multi-domain,” Whiting said. “How do we bring all of that together to protect our assets?”

Supreme Allied Commander Europe and head of U.S. European Command Gen. Tod D. Wolters said space’s importance must not be underestimated.

“Once you get a taste of what space can do for you, it’s very, very infectious,” he said. “We should lead from the front in how we embrace space, how we embrace cyber, how it’s baked into our activities to generate peace,” Wolters said. “We should continue to take time as uniformed military members to adequately communicate to senior civilian leadership what it is we are doing in these two domains to generate peace.”

While America’s military leaders are protecting space assets and developing new, hardened capabilities, the Space Force is working on its own to strengthen international space partnerships and fill gaps in capability.

FINDING COMMON GROUND IN SPACE

Vice Chief of Space Operations Gen. David D. Thompson said partners are approaching the United States and asking how they can best add to allied capability. He cited said Australia as one example of a partner seeking to strengthening its partnership with the U.S., as well as Japan, which has been eager to host American payloads and improve data-sharing.

Thompson also cited European partners, including France and Germany, which stood up its own space command in July.

The U.S. SPACECOM commander, Army Gen. James H. Dickinson, has been hopscotching the globe to strengthen partnerships, according to deputy USSPACECOM’s director of strategy, plans, and policy Brig. Gen. Devin R. Pepper. Dickinson visited France, South Korea, and Japan in recent months, he said.

“We have what’s called an integrated priority list,” Pepper said. “That IPL [pronounced “ipple”], as we call it, lists the priorities, the things that we are most concerned about, and really the capability gaps that we have as a nation.”

The list informs allies “exactly where they can spend that next dollar.”

“The IPL helps them understand where we are asking for assistance when we need their help to close some of those gaps,” he said.

Maj. Gen. Hiroyuki Sugai, Japanese air and defense attaché at the Japanese Embassy in Washington, D.C., watched Raymond’s presentation live.

“Space is very competitive,” he said. “Some countries like ... China and Russia or North Korea launch missiles or satellites that might jam our satellites. That is a big threat.”

To protect itself, Japan is investing in space, building closer ties to its allies, and analyzing how to defend its satellites from the jamming threat. Japan plans to stand up a space situational awareness system in 2023 using deep space radar, establishing what Sugai called the nation’s “first space capability.”

“For every program, we need to align with Space Force, because we don’t have the capability for space,” he said. “It’s just beginning. We have a close cohesion with Space Force for how to build up our capability.”

Japan wants to make sure it’s space data-tracking systems integrate with Space Force systems in real time.

Today, Japan’s space operators are limited to a squadron of about 20—but more will be added over time.

Similarly, Germany is sending an important signal by standing up its new Space Command, German Air Force Col. Marco Manderfeld told Air Force Magazine.

“It’s an outside signal to our partners that we take space seriously, and that we take the collaboration seriously,” he said during the Space Foundation’s August Space Symposium in Colorado. The objective is “to send a strong signal of how we view space, and [that] we want to be part of an international community.”

Manderfeld said establishing the U.S. Space Force two years ago was an important political motivator for allied political and military leaders in Germany.

“To stand up space is also a question of resources and prioritization,” he said. “If you want to get resources, you have to make a strong case, and pointing out what efforts our allies undertake to make space real definitely helps in the development of our space capabilities.”

While Germany’s Luftwaffe does not have a designated space career field yet, there are space specialists who work closely with allies.

“Just look at the starlit sky—to use a picture—and how can you not see how big this problem is?” Manderfeld said. “It’s actually too big to tackle it alone, even for the U.S. with the Space Force resources.”

Germany has long seen space as ripe for collaboration in information-sharing from sensors, as well as analysis.

“There are gaps, and all the allies bring surge capabilities to the table that fill out these gaps,” he said. “Just verifying results that one of the allies brings to the table, and then discussing it and get[ting] a picture and more resilient idea of what’s happening up there.”

The geographic dispersion of allied capabilities is also valuable, said British Group Capt. Peter Warmerdam, assistant air and space attaché for the United Kingdom in Washington, D.C.

“We offer the U.S. a number of interesting locations across the globe,” Warmerdam said.

“We built our own U.K. Space Command. We are looking to integrate on a daily basis more and more,” he said, describing his nation’s extensive exchange program and liaisons at Space Command.

Space is “the metaphorical high ground,” Warmerdam added. “Space is intrinsically important to day-to-day life, and we recognize that there are people out there that perhaps don’t necessarily work to what we would see as acceptable behaviors in space.”

U.S. Space Command’s Pepper said establishing closer ties with partners means greater information-sharing and transparency among allies and partners in space.

“The first thing we have to do is, we’ve got to break down the security barriers,” he said. “We can’t talk to our allies without making sure that space is at a classification level that we can share with our allies.”

Pepper said easing today’s overclassification is critical to helping the Space Force articulate its challenges, communicate its capabilities, and cooperate with allies.

“We have to do this early,” Pepper said. “We can’t wait until 11 p.m., right before the fight starts, to figure out how we’re going to fight together. That’s too late. Being able to communicate and share information, share data, integrate our allies into the fight, is the most important thing that we’re focusing on right now.”





Staff Sgt. Danny Whitlock/ANG

On Aug. 7 the Utah Air National Guard, in collaboration with Collins Aerospace, successfully demonstrated advanced communication, mission computing, and sensor technologies to support JADC2 (Joint All-Domain Command and Control) and ABMS (Advanced Battle Management System) initiatives on a KC-135 Stratotanker at the Roland R. Wright Air National Guard Base in Salt Lake City.

The Future is Now

By Greg Hadley

Lt. Gen. S. Clinton Hinote, the Air Force's futurist, has seen all the wargames and simulations, looked at all the future weapon systems and anticipated capabilities. So, when it comes to keeping the U.S. ahead of peer competitors like China or Russia, the Air Force's deputy chief of staff for strategy, integration, and requirements says there is no one "silver bullet" that will make all the difference.

But there is something that comes close: the intelligent connectivity that would enable joint all-domain command and control (JADC2).

"It does seem to be one of those things that makes everything better, that makes the entirety of the all-domain force better," Hinote said at AFA's Air, Space & Cyber Conference (ASC) on Sept. 21. "And it does appear to have real needle-moving capabilities."

Later, speaking with reporters, he went further: "I don't know how the future Air Force, the future Space Force, the future joint force wins without JADC2."

To defeat China in the Pacific, the United States will need to bring to bear all of its capabilities in space, air, sea, under-sea, cyber, and on the ground, he said. "I can't find a way in our wargaming and our simulations to make it work. ... That hasn't changed at all. In fact if anything, that's gotten more important, as we've gone on and we've had several recent wargames."

Yet as the concept catches on among planners, funding for the programs that support JADC2—in particular the Air Force's Advanced Battle Management System (ABMS), have come under increasing scrutiny, both from Congress and from Air Force Secretary Frank Kendall.

HARD QUESTIONS

Since becoming Secretary July 28, Kendall has been pointed in his criticism of ABMS as focusing too much on experimentation and not enough on delivering specific operational capabilities to the warfighter.

As Secretary, Kendall said his focus is ensuring the department invests in demonstrations and experiments only

when “we can link them to true operational improvements and unless they move us down the field to lower-risk acquisition programs.”

ABMS is a case in point, he said. “My early observation is that this program has not been adequately focused on achieving and fielding specific measurable improvements in operational outcomes,” Kendall said.

In an interview with Air Force Magazine in August, Kendall said, “I think it’s absolutely correct that if we can integrate our capabilities and use them more efficiently, we’ll get a better outcome.” But the approach to ABMS was off, he suggested. “My observation from the outside was that we hadn’t focused that effort on specific outcomes for specific operational purposes.”

Former Air Force Acquisition czar Will Roper called ABMS the “Internet of Military Things,” evoking an intelligent web of interconnected sensors and shooters that could overwhelm adversaries by creating so many potential threat scenarios that they couldn’t guard against them all.

Since 2019, the Air Force has held four ABMS demonstrations, proving the concept but not driving toward widely fieldable capabilities. A fifth demonstration in the Pacific was canceled due to budget cuts in March. But as recently as August, the Utah National Guard demonstrated an upgraded KC-135 streaming data to a mobile ground party and another aircraft.

Kendall’s skepticism has fueled a relook, Hinote said.

“He is having us, in some ways, go back and figure out exactly what it is we’re trying to do, not in the overall big hand, little map way ... but he wants to know: Where is the targeting data developed?” Hinote told reporters. “Where does it go—he wants a waveform—where is the node if it needs to be fused? And where are we going to put that to make a decision off of it and execute on it? Those are valid questions, and because he has an engineering background, he holds our feet to the fire.”

OPERATIONS IN MIND

As a former undersecretary of defense for acquisition, Kendall brings a methodical approach to how he evaluates programs, said Preston C. Dunlap, the Air Force’s chief architect.

“One of Secretary Kendall’s principles is, going off on a journey in the wrong direction, all you’re doing is wasting time and money,” Dunlap said. “And so what he’s asked us to do is slow down just a little bit ... to make sure that the analysis and all the modeling says that that’s the direction we should go, even before we start doing experiments. So the purpose of the analysis is to make sure that if we actually deliver that system, that it will actually have a meaningful operational effect.”

ABMS was theoretically past the analysis phase last May, when Chief of Staff Gen. Charles Q. Brown, Jr. announced the program was moving to a new “more operational” phase.

ABMS’ first product, Capability Release 1, will enable the KC-46 tanker to operate as a data relay to allow direct data sharing between F-22s and F-35s. The Air Force wants to buy between four and 10 data link pods for KC-46 tankers to enable that transfer, amounting to about roughly half its ABMS budget for 2022.

Exactly what goes into Capability 1 has only been described vaguely so far. “What is clearly going to be true about Capability Release 1 is that the idea of a forward-edge node or a forward-edge network is clearly where we’re going to deal with it,” Hinote said. “Now the actual things, the actual radios

we use to make that happen and the waveforms we use to make that happen, we’re still [figuring out].”

“Putting ABMS on supersonic jets is exceptionally challenging—there’s never enough bandwidth, there’s always too much latency,” said Steve Nordlund, general manager of Phantom Works at Boeing—but there are ways to get around those problems.

Richard S. Stapp, Chief Technology Officer at Northrop Grumman, said there are ways to tackle those issues using modern technology. The key is understanding the specific problems that must be addressed.

“When you take your cell phone and you step out of the net, it continues to keep updated, it basically fuses information with what it has,” Stapp said. “But when you step back in, it picks it all up.”

Edge processing does essentially the same thing. Connections to a cloud data center may not be fast enough or even available all the time. But with enough local processing power and storage, those interruptions or delays can be virtually undetectable to the user.

UPDATE AS WE GO

Nordlund and Stapp spoke together on an ABMS/JADC2 panel with Brig. Gen. Jeffery D. Valenzia, ABMS Cross Functional Team Lead, and Ross Niebergall, the chief technology officer at L3Harris Technologies. Their conversation focused on the software needed to connect all the physical sensors, capture data, and fuse it into digestible information for warfighters.

To get that right, they said, they need to maximize input and participation from operators who can put their tools to work; incremental capabilities will be more helpful at this stage than trying to perfect a final product.

“We’ve got to get something into the hands of the user that they can pound on ... and give feedback,” Niebergall said. “But we’ve got to be in this continuously and recognize that the product is never finished and that’s the way it should be built in the first place.”

That software-centered mindset is at the heart of consumer products like smartphones, where updates can be rolled out rapidly over the air, but it’s much harder to work that way in traditional government contracting models, where requirements are supposed to be defined up front, not on the fly as they are developed.

“We spent so much focus over the last 100 years building hardware, that we started thinking of everything as hardware—we had to build it right the first time, make it perfect, make it so that it was meeting 100 percent of the requirements,” Niebergall said. “And the consequence of that was that it had minimal ability to evolve and change and be dynamic in how it operates.”

In a software-centered world, that model doesn’t fly anymore. As Air Force leaders, with Kendall at the forefront, increasingly emphasize competition with China, they are also calling for dynamic programs and systems to push change and combat peer competitors. And most of those leaders seem to still believe ABMS is crucial in those modernization efforts.

Now comes the task of fielding the very first capabilities, learning how those work in practice, and then adding improvements step-by-step. It couldn’t be further from the way weapons have been developed over the years.

ABMS “does not deliver a shiny platform on the end of a ramp when it’s done,” Valenzia said. “Instead, it’s a continuous improvement.”



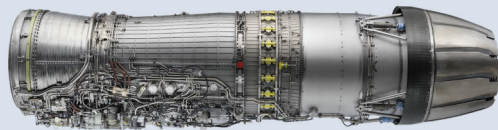


Integrated. Certified. Delivered.

F110 for F-15EX

Only GE's advanced F110 engine is fully integrated into the F-15EX Eagle II fly-by-wire system and has been delivered to the US Air Force, eliminating the risk of development time and cost.

The F110-GE-129E is built with capability in reserve to adapt to changing global threats and mission needs for decades to come. GE's F110—fully committed to F-15EX Eagle II since day one.



geaviation.com/F110



1st Lt. Hannah Durbin

Staff Sgt. Andrew Romero, 422nd Communication Squadron, participates in the USAFE-led cyber exercise, Tacet Venari, at Ramstein Air Base, Germany, April 22. Tacet Venari is Latin for Silent Hunt, which describes the goal of the exercise: to hunt for adversaries within USAFE-AFAFRICA weapons systems. The exercise is one of several DOD-wide efforts to provide mission assurance and enhance command and control by providing warfighters the skills needed to deliver defensive cyber operations.

Does AI Present a New Attack Surface for Adversaries?

USAF's ISR & Cyber Chief Warns Bad Data Could Undermine Trust in AI.

By Shaun Waterman

Increasing reliance on artificial intelligence (AI) to augment human decision-making raises the risk of attacks targeting critical data and AI algorithms, warned the Air Force's cyber policy chief at AFA's Air, Space & Cyber Conference.

"If our adversary is able to inject uncertainty into any part of that process, we're kind of dead in the water," said Lt. Gen. Mary O'Brien, deputy Air Force chief of staff for intelligence, surveillance, reconnaissance, and cyber. Speaking on a panel on information warfare along with 16th Air Force boss Lt. Gen. Tim Haugh and Air Force Chief Information Officer Lauren Knaussenberger, O'Brien said AI is like any other new weapon system: Getting it is only half the battle. Defending it is just as critical.

"Once we do get the AI, what are we doing to defend the algorithm, to defend the training data, and to remove any uncertainty?" she asked. To be effective, AI must be reliable, and warfighters must trust its insights and recommendations. But if hackers can infect the data to undermine that trust,

confidence would evaporate in an instant.

Accelerating the decision cycle to identify and cue targets rapidly in the heat of battle, AI will be essential, said Yvette Weber, Department of the Air Force associate deputy assistant secretary for science, technology and engineering, speaking in a separate session on autonomy. "Advancements in [AI and autonomous systems] are critical to accomplishing the core missions of a high end fight," she said.

In "highly contested environments, human machine teaming enables Airmen to process massive amounts of data, and more rapidly assist in human decision-making to arrive at targeting decisions," Weber said.

O'Brien, however, sees risk in the midst of those potential rewards. "There's an assumption that once we have the AI, we develop the algorithm, we've got the training data, [and] it's

giving us whatever it is we want it to, that there's no risk, that there's no threat," she said.

O'Brien called out Maj. Rena DeHenre, a young officer who advocated for a DOD AI Red Team in a recent post on the Over the Horizon blog. Citing a Cornell University research paper



Lt. Gen. Mary O'Brien

JoAnne Sorrentino/USAF

U.S. Air Force and Space Force students enrolled in the Cyber Protect and Defend Course study in the classroom, Feb. 11, at the I.G. Brown Training and Education Center at McGhee Tyson Air National Guard Base in East Tennessee, as part of Mission Defense Team training.



Master Sgt. Mike Smith/ANG

titled “Adversarial Machine Learning at Scale,” she argued that establishing Red Teams to hunt for vulnerabilities in military AI implementations is essential. “With a dedicated AI Red Team, DOD would have a central team to address and assess AI and ML vulnerabilities,” she wrote.

DeHenre is precisely the kind of maverick that O’Brien says she’s been encouraged to “protect and promote.”

In her paper, DeHenre lays out the ways in which an enemy could seek to twist U.S. reliance on AI to poison its decision-making processes. “Adversarial machine learning (AML) is the purposeful manipulation of data or code to cause a machine learning algorithm to malfunction or present false predictions,” she wrote, citing the final report of the National Security Commission on Artificial Intelligence (NSCAI).

The NSCAI report notes that “even small manipulations of these data sets or algorithms can lead to consequential changes for how AI systems operate.” Indeed, the commission wrote that “the threat is not hypothetical: Adversarial attacks are happening and already impacting commercial [machine learning] systems.”

Worryingly, the commission notes that “with rare exceptions, the idea of protecting AI systems has been an afterthought in engineering and fielding AI systems, with inadequate investment in research and development.”

Just as with any other software code, security will never be as good as it could be if it’s not built in from the start. “There has not yet been a uniform effort to integrate AI assurance across the entire U.S. national security enterprise,” the commission concludes.

Manipulations do not even have to be intentional. AI needs to be able to flex to handle anomalous data in its training and real-world sets, as well.

Hacking AI systems can be easier even than hacking conventional IT systems, some experts maintain. “Machine learning vulnerabilities often cannot be patched the way traditional software can, leaving enduring holes for attackers to exploit,” notes a research paper from Georgetown University’s Center for Security and Emerging Technology. The paper goes on to point out that some hacks don’t even require insider access to the victim’s networks, since they can be accomplished by poisoning the data the system is collecting.

Defending AI, the paper argues, requires both building

resilient systems and making them transparent and subject to human oversight, so the way they reached their outcomes can be understood. “Policymakers should pursue approaches for providing increased robustness, including the use of redundant components and ensuring opportunities for human oversight and intervention when possible,” the paper states.

Ed Vasko, director of Boise State University’s Institute of Pervasive Cybersecurity, expressed similar concerns during a session on 5G networking and cyber operations. “Every single technology transformation platform that I’ve ever seen and experienced” has become a target by collecting data, he said. “Every time that we take the data elements and expand them out and find even more and more telemetry data to make use of, the challenge that we end up with is that we create more and more data environments and more information environments for our adversaries to potentially attack.”

The risks go beyond vulnerabilities created by cloud architectures or application programming interfaces, Vasko said, because the sheer volume of data being collected and processed makes up the biggest attack surface.

“The amount of data is going to explode beyond anybody’s expectations at this point,” he said. “I’m not talking about access, I’m not talking about API platform connectivity. I’m actually talking about just the sheer collection of that data, and what that enables our adversaries to do and to think about.”

Vasko said the key difference between these new technologies and the processes they replace is that they effectively require Airmen and Guardians to relinquish their own judgment and instead trust the algorithm to interpret the data correctly and reach a conclusion. Joint all-domain command and control creates the opportunity “to actually change up how our fighters and our Guardians are thinking about leveraging their own senses,” Vasko said.

On the flip side, however, adversaries gain the potential to interfere in battlefield decision-making at the same machine speeds that these decisions can be made. Just as misconstrued intelligence might have informed—or misinformed—a decision in the past, altering the data that underlies a machine decision in the future could have disastrous consequences.

“If our adversaries are able to achieve any of that, and impact ... the JADC2 elements that are engaged to support our fighters, it’s game over,” he said. ★



Clay Cupit/USAF

A B-1B Lancer, tail number 85-0074, taxis at Edwards Air Force Base, Calif., Sept. 23, for its final flight. The aircraft is the last of 17 Lancers previously identified for divestiture by Air Force Global Strike Command and flew to the boneyard at Davis-Monthan Air Force Base, Ariz.

Last B-1B Bombers Retire Until B-21 Comes Online

By John A. Tirpak

Air Force Global Strike Command (AFGSC) has retired the last of 17 B-1B bombers from its inventory, leaving a fleet of 45 aircraft that will serve until the new B-21 stealth bomber is ready for duty, the command announced.

“The last aircraft departed Edwards Air Force Base, Calif., to fly to the boneyard at Davis-Monthan Air Force Base, Ariz.,” on Sept. 23, an AFGSC spokesperson said. The divestiture supports the Air Force’s “efforts to modernize America’s bomber fleet” as authorized by Congress, he said. The plan was to accomplish the divestiture by the end of fiscal 2021, which ended Sept. 30.

The smaller fleet will allow the remaining aircraft to receive more attention, spare parts, and generally achieve a higher level of readiness, AFGSC’s Director of Logistics and Engineering Brig. Gen. Kenyon K. Bell said. The cost-avoidance of operating the retired jets will also help pay for capability upgrades. The divestiture “was executed very smoothly,” he said.

Senior Air Force leaders at AFA’s Air, Space & Cyber Conference from Sept. 20 to 22 unanimously called on Congress to let the service divest other types of aircraft that are draining manpower and money away from new systems needed to deter or defeat China.

“The Air Force will not succeed against a well-resourced and strategic competitor if we insist on keeping every legacy system we have,” service Secretary Frank Kendall said in his keynote speech.


The 17 B-1 bombers were retired from a fleet of 62, which the Air Force said had been overworked by long years of providing on-call air support to troops in Afghanistan and Iraq. Many of the aircraft had severe structural fatigue, especially at the wing-pivot points, because the jets flew high and slow, instead of low and fast with wings swept, as they were designed to do.

“The aircraft we retired would have taken between \$10 million and \$30 million per aircraft to get back to a status quo fleet in the short term until the B-21 comes online,” Bell said.

Congress allowed the Air Force to divest the airplanes in last year’s National Defense Authorization Act.

Not all the airplanes went to the boneyard. One has been sent to Tinker Air Force Base, Okla., to serve as a prototype vehicle for test-fitting structural repairs, while another went to Edwards for ground testing. One will be torn down to create a digital twin at the National Institute for Aviation Research in Wichita, Kan., and still another went to Barksdale Air Force Base, La., to serve as a static display at the command’s museum. The digital twin will be used to develop structural repairs and capabilities improvements for the remainder of the fleet.

The remaining 13 aircraft are at the Davis-Monthan boneyard, where they will be in “Type 4000” storage. That means they’ll receive minimal protection—with latex spray on the engines and canopies—and be harvested for parts, but they will not be “recallable” from storage. Once everything of value is removed from them, the aircraft will be scrapped.

The Air Force has not said exactly when it plans to retire the remainder of the operational B-1B fleet. The service’s bomber roadmap from several years ago posited the B-1Bs phasing out in the 2031-2033 time frame. The move hinges on the successful development and fielding of the Northrop Grumman B-21 Raider, the first five of which are under construction at the company’s Palmdale, Calif., facilities, Kendall said at Air, Space & Cyber. The first of those aircraft is expected to fly in mid-2022. The Air Force has not said whether it expects to retire the B-1B fleet one-for-one as the B-21s come online, although Air Combat Command chief Gen. Mark D. Kelly described the swap as a “hot handover” from one fully operational system to another. 

Rolls-Royce Wins B-52 Engine Race

By John A. Tirpak

The Air Force has selected Rolls-Royce North America as its contractor for the B-52 Commercial Engine Replacement Program, or CERP, which will supply new F130 powerplants for all 76 of Air Force Global Strike Command's B-52H bombers, the Pentagon announced Sept. 24. If all options are exercised, the work is worth \$2.6 billion.

The F130 engine is already flying on the C-37 transport and E-11 BACN (Battlefield Airborne Communications Node) aircraft. The first part of the indefinite quantity-indefinite delivery contract is worth \$500.9 million. The contract calls for Rolls to supply 608 engines, to equip 76 B-52s with eight engines each, with manufacture and installation to be completed by Sept. 23, 2038. Rolls said the actual number of powerplants, including spares, is 650.

The engines will be built at Rolls' Indianapolis facilities, where the company said it has invested \$600 million in an "advanced manufacturing campus." The work will require 150 new hires, the company said. The contract value is substantially below initial estimates, which ran as much as \$10 billion for the CERP.


USAF received four proposals for the competitive contract, which also calls for spare engines, associated support gear, commercial engineering data, and "sustainment activities."

The CERP competition started in 2018 and was a three-way contest among GE Aviation, Pratt & Whitney, and Rolls-Royce. The Air Force pioneered a number of "digital" firsts on the program, insisting on a paperless proposal in which the competitors' engines would duke it out on computers. The service also insisted on access to tech data such that it could compete future work on the program among other companies.

The CERP is one aspect of a multi-pronged update of the B-52, which is also slated to receive a new radar, digital cockpit, and new connectivity upgrades. The Air Force plans to retain the B-52 into the 2050s, as a standoff weapon platform and as a direct attack aircraft when enemy defenses are limited or already beaten down. The last B-52H now in service was built in 1962, but is still flying with its original Pratt & Whitney TF33 engines.

The CERP is supposed to deliver up to 40 percent improved range and fuel economy for the B-52, reducing its tanker requirements and increasing its on-station loiter time. The engine is also supposed to be of such improved reliability that the engines need never come off the wing during the bomber's remaining service life.

Acting Air Force acquisition executive Darlene Costello said the CERP would likely be converted into a USAF major acquisition program given its scope and value.

Boeing, the original builder of the B-52, will integrate the engines, radar, and other new systems onto the bomber but did not play a role in selecting the winner of the CERP competition. A Boeing official said the company provided data to the Air Force on the relative ease or difficulty of integrating each of the competing powerplants but did not make a recommendation on selection. Boeing will decide whether and how to mount the engines in twin-engine pods or nacelles, as the TF33s are now arranged, and will do the necessary aerodynamic calculations as to the placement of the engines for optimum performance and least interference with the aerodynamic structure. A Boeing official said the B-52's disused nose-mounted infrared pods will likely be removed to improve airflow at the front of the bomber. 

Fast, Handheld, Rugged, Secure

The Power of Smart Armament Test Unlocked



MTS-3060A SmartCan™

- Rugged, lightweight, powerful, quick
- Paperless test procedures and reports
- Smart and legacy weapons systems support
- Consolidates all flightline test sets into one handheld solution



© 2021 The Marvin Group. All rights reserved. Product and trade names are property of their respective companies.



Hypersonic Missile Flies

By John A. Tirpak

The Hypersonic Air-breathing Weapon Concept (HAWC) vehicle, developed under a partnership of the Air Force and the Defense Advanced Research Projects Agency, made a free flight the week of Sept. 20, a DARPA spokesman said, but most details are being withheld. The vehicle, which was built by Raytheon Technologies with a hypersonic engine built by Northrop Grumman, flew faster than Mach 5, but DARPA declined to say how long the vehicle flew.

The engine “kicked on” seconds after being released from an aircraft, which DARPA and the Air Force declined to identify, although DARPA expressed appreciation to “Navy flight-test personnel.” The Navy has been conducting hypersonic missile research with F/A-18 aircraft.

The engine “compressed incoming air mixed with its hydrocarbon fuel and began igniting that fast-moving airflow mixture, propelling the cruiser at a speed greater than Mach 5,” DARPA said. In order for the scramjet engine to ignite, the vehicle must be moving at hypersonic speed, so a booster is used for that portion of the flight.

All of the “primary” goals of the test flight were achieved, including “vehicle integration and release sequence, safe separation from the launch aircraft, booster ignition and boost, booster separation and engine ignition, and cruise.”

The HAWC is exploring air-breathing hypersonic flight in parallel with the Air Force’s AGM-183A Air-launched Rapid-Response

Weapon (ARRW), which is accelerated to hypersonic speed by a rocket before being released and gliding toward its target.

HAWC builds on previous hypersonic scramjet projects, including the X-30 National Aerospace Plane, “as well as unmanned flights of NASA’s X-43 vehicles and the U.S. Air Force’s X-51 Waverider,” said Andrew Knoedler a manager in DARPA’s tactical technology office.

The Air Force has said it plans to pursue both the ARRW and the Hypersonic Attack Cruise Missile (HACM), as initial and future hypersonic attack capabilities, respectively. The HACM will be an air-breathing system, which would have longer range than the ARRW because it can use ambient air for an oxidizer, rather than relying on the boost effects of a missile. As ARRW glides to its target, it will lose energy because it is no longer powered. While the Air Force plans to put the ARRW on the B-52 in early iterations, it has said the HACM will be smaller and carried on fighter-sized aircraft.

DARPA announced one year ago that it had just completed captive-carry tests of HAWC and would make a free flight by the end of 2020, but that test was scrubbed, and apparently it took another 10 months to re-attempt it. Recent efforts to fly ARRW have not been successful, and an investigation into a July failed attempt is still underway.

Air Force Secretary Frank Kendall pledged an upcoming “deep dive” into the various hypersonic programs underway, looking for ways to improve and accelerate them.

Lockheed Martin is also working on HAWC, but DARPA did not mention the company in its release. ★



An artist's rendering of the Hypersonic Air-breathing Weapon Concept (HAWC) developed by DARPA and the Air Force.

DARPA

**Town Hall:
Leadership and
Family.**
Gen. Charles Q.
Brown Jr., Chief
of Staff, USAF,
and wife Sharene
Brown, as they
speak about
their family and
careers at the Air
Force Association's Air, Space
& Cyber Confer-
ence on Sept. 22,
in Maryland.



Mike Tsukamoto/staff

The Browns—and the Needs of Exceptional Families

By Amanda Miller

The Air Force's top officer-and-spouse duo shared a personal reason they take family readiness to heart in a town hall talk on the final afternoon of AFA's 2021 Air, Space & Cyber Conference.

Chief of Staff of the Air Force Gen. Charles Q. Brown Jr. and his wife Sharene said caring for their son with autism has helped to inform improvements to the Defense Department's Exceptional Family Member Program and that EFMP families have, in turn, informed a new quality-of-life initiative called Five to Thrive.

Sharene Brown revealed Five to Thrive for the first time during the town hall.

When the Browns go on base visits as a couple, he peels off one way "for mission stuff" while "she's doing Airman and family things," General Brown explained during the town hall Sept. 22 at ASC21. Those experiences helped shape Five to Thrive, Sharene Brown said, which will address issues related to housing, education, child care, spouse employment, and health care—in particular, access to health care and mental health care.

Without going into a lot more detail about the new effort, Sharene Brown said it's "so that we can make sure that our families are doing well." She added that for families in the Defense Department's Exceptional Family Member Program, the five focus areas "are our main focus—not only for us, but for all of you."

The Browns shared, with his permission, that one of their

two sons has autism. He's an adult now and blogs about it, "so he's made this a positive," Sharene Brown clarified.

It's also meant they're aware of the challenges of caring for someone while navigating the DOD system. Brown revealed that the family managed to stay stateside the first 24 years of his Air Force career to care for their son.

Sharene Brown referred to the family's experience in the Exceptional Family Member Program as "being part of the EFMP family."

Brown summed up recent improvements to the program that the couple have taken part in devising: streamlining some of the processes for accessing care and especially having brought in "a highly qualified expert to really focus on improving this process—because it is a process that had too much bureaucracy in it," he said.

A new method tested this summer, and rolling out incrementally, created something like "a speed pass if you have a minor issue," Brown said.

A central way for EFMP families to figure out what services will or won't be available at their next duty station is also getting up and running, so that "you get an idea—based on the condition you're dealing with," Brown expressed, "what's [the likelihood] that you'll be able to go" and "to ensure that you have support for your family member."

Each time Sharene Brown travels to a base with Chief Brown, she tries to meet with two or three EFMP families "to hear their story and hear their frustration—or how well we're doing or not doing," Brown said, referring to leaders.

"And I applaud her for doing that—because every family has a story." ❄

CMSAF: Airmen Remain Most Competitive Advantage Over Adversaries

By Amy McCullough

The U.S. military is at an inflection point, and if it fails to adapt to the current threat environment, it very well could lose the next fight. And while new platforms like the B-21 will play a critical role in competing, deterring, and winning in a high-end fight, it is U.S. Airmen that are the true secret weapon, Chief Master Sergeant of the Air Force JoAnne S. Bass said.

“We are indeed at an inflection point in history where the choices that we make today will have a lasting impact on the world that we have tomorrow, and every Airman needs to know that,” Bass said during her keynote address at AFA’s Air, Space & Cyber Conference on Sept. 20. “More importantly, we need to know what’s at stake if we just simply stay the course. We are serving in a time where we don’t have time for spectators. This is a time for all of us to step into the arena, and to get to work.”

Like the other Air Force and Space Force leaders speaking at the conference, Bass cautioned that time is running out. China, she said, is wrapping up its marathon and is now sprinting to the finish line to claim what it believes to be its “rightful position as the world’s dominant power”—a title it intends to hold by 2049.


“They seek to create a world where America as a global power is a distant memory, and where the rules of power are set by China,” she said. “And today we are in the last 30 years of China’s 100-year marathon, and under the leadership of Chairman Xi, they are sprinting to the finish line, because they think we are too weak, and broken politically, economically,

and militarily to stop them.”

That is why it’s critical that every Airman not only understand the threat, but also their role in deterring and defeating potential adversaries, Bass stated. China is not only focused on defeat, it wants to break the United States’ will to fight—and they will do whatever it takes to make that happen.

“They don’t feel bound by rules, laws, or norms that govern warfare,” she said. “This requires us to change our way of thinking and how we prepare our Airmen for the future. It is what is driving us to refocus our readiness efforts from contingency operations to a future high-end fight. Again, every Airman needs to understand that future conflict will look very different from what we have seen in the past 20 to 30 years. It will span across multiple domains, using any and all advantages and tactics on both military and nonmilitary targets. The high-end fight that we must prepare for could be unlike anything we have ever faced in history, and it will require us to accelerate the change we need today to win tomorrow.”

The service last spring released a series of core competencies expected of all Airmen, such as character and competence, that will serve as the roadmap to empowerment, Bass said. These skills will serve as the foundation of the future force, so Airmen will be able to competently execute the mission, lead at all levels, manage resources, and improve their units.

“We must trust in them to do so, from the most junior Airmen all the way up, because it’s our Airmen, our Airmen, that remain our most competitive advantage over any adversary that we may have,” Bass said. 



Chief Master Sgt. of the Air Force JoAnne Bass speaks at the 2021 Air, Space & Cyber Conference on Sept. 20. China thinks the U.S. is vulnerable politically, militarily, and economically, said Bass, but they don’t understand our greatest asset—our Airmen and Guardians.

Mike Tsukamoto/staff

AFRC Plans for Gaps Between Retiring Aircraft, Bringing in New Planes

By Greg Hadley

If Secretary Frank Kendall and other Air Force leaders get their way, the service will be retiring older aircraft in the near future as it looks to modernize. Specifically, legacy systems such as the A-10, KC-135, F-16, and C-130H are all primed for the chopping block, based on the USAF's recent budget requests.

Should that happen, as Kendall has insisted it needs to, the Air Force Reserve stands to be affected in a major way—roughly two thirds of the Reserve's 324 aircraft are C-130Hs, KC-135s, F-16s, and A-10s.

What's more, replacements for those aircraft are not necessarily on a one-for-one basis, at least not right away. The result, Air Force Reserve Chief Lt. Gen. Richard W. Scobee acknowledged, will likely be a gap between old airplanes going away and new ones arriving.

"In a perfect world, it would be heel to toe, you would have one butting up against the other," Scobee said during a media roundtable at AFA's Air, Space & Cyber Conference. "On a regular basis, I am reminded we do not live in a perfect world."

Scobee, who served as the Reserve's director of plans, programs, and requirements in 2013-14, is familiar with the challenges that come from programs shifting. In his eyes, there's a distinct time frame for which he would feel comfortable handling any sort of gap between old and new.

"I can gap a year," Scobee said. "And the way I do that is I don't

own one of anything. I have to have at least two of anything that goes on."

Indeed, AFRC has multiple units with F-16s, A-10s, and KC-135s. Should one of those units lose their aircraft, Scobee said the others will help pick up the slack to ensure pilots and maintainers can keep up their training.

"If you look at the fighters and those kinds of things, I'll have another unit," Scobee said. "So what we'll do is we'll share airplanes, we'll share flying hours, we'll share the opportunities to turn wrenches, and we'll be able to turn up some of the flying hours in order to keep people on the staff."

Should the gap last longer than a year, Scobee said, "It becomes very hard, because then, even with attrition, I'll lose a lot of people, and it'll take me a few years to gain them back." At the same time, the Active-duty Air Force and the Air National Guard should be able to help, as they have done in the past.

While the coming years will likely mark the biggest weapons systems changes facing the Reserve in years, Scobee noted that AFRC has experience changing over to other new equipment and readjusting its organizational structure.

"What it really boils down to is we have a plan for how we go forward," Scobee said. "As these changes occur, what we want everybody to understand is we have done this before. It's not that new to us, and we've been very successful. And everybody whose job may transition or change because of the new weapon system, we're going to take care of them individually." ✪



The Smart Senior Living Choice
for civilians and military of all services and ranks.

Blue Skies
of Texas
AT AIR FORCE VILLAGE

A Life Plan Community

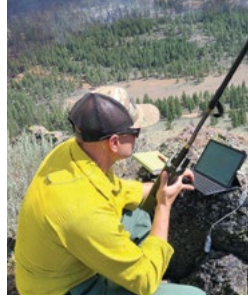
blueskiesoftexas.org | 888-252-9224

FACES OF THE FORCE



509th Bomb Wing Public Affairs

When **1st Lt. Nephtali Castillo** was becoming an engineer at the Polytechnic University of Puerto Rico, there were no commissioning recruiters available in Puerto Rico to allow qualified applicants entry to the service's officer corps. After several years in a civilian position and a stint in Commissioned Officer Training, Castillo is now leading Airmen—and ensuring others from his home island don't face the same hurdles. In 2020, he briefed then-Defense Secretary Mark T. Esper on the lack of commissioning officer recruiters, leading to change in a matter of weeks. In 2021, he pushed the 156th Airlift Wing of the Puerto Rico Air National Guard to dramatically cut down the time needed to complete the recruitment process, allowing multiple prospective Guardsmen to complete the Oath of Enlistment at the same time through videoconferencing.



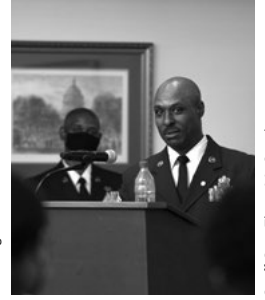
Staff Sgt. William Gray/ANG

Master Sgt. Brent Hill, Pennsylvania Air National Guard, a firefighter in his civilian life, put his military and civilian expertise to use in helping combat wildfires in California this summer. As a tactical air control party (TACP) specialist, he uses streaming video from an RC-26 to direct first responders combating the blaze. The approach is similar to how TACP specialists direct airpower from the ground in combat.



Tech. Sgt. Rachel Barton

Growing up in an Amish community in Michigan, **Senior Airman Eva Chupp** was worlds away from her new career as a KC-135R in-flight refueling specialist. Chupp lived without modern conveniences such as electricity and automobiles, but after her family left the community and she attended high school, she decided to join the Air Force. Now, she says, she can help educate her fellow Airmen on the Amish—and explain the value of military service to her Amish extended family.



Staff Sgt. Elora McCutcheon

Chief Master Sgt. Kendall Briscoe calls himself a "selfish" Airman who was "working hard, but playing harder" when he first enlisted. But when a senior noncommissioned officer took responsibility for him, Briscoe grew into a leader, rising to Executive for Enlisted Matters to the Assistant Secretary of the Air Force for Financial Management and Comptroller. By 2021, with 32 years of service, he was the longest-serving Active enlisted member of the Air Force. Briscoe retired on July 31.



Courtesy photo

Master Sgt. Christopher Florida (r) donated a kidney to his brother Dan, even at the risk of ending his military career. "I love the Air Force and would do just about anything to stay in ... but family will always be my exception and accepting that my career could be over was OK with me." His commander supported his decision and ensured he could stay as a living organ donor. The transplant was successful.



Regency International Pageant

Maj. Raliene Banks was crowned Mrs. Regency International in Las Vegas at the Regency International Pageant on July 31. She plans to use her win to advocate for women in aeronautics. An Air Force pilot for 13 years, before being grounded by an autoimmune disorder, Banks is now deputy chief of Agile Combat Employment for the Air Force.



CMSAF JoAnn Bass Facebook

In an image that went viral on social media, an Afghan child slept beneath an Air Force uniform jacket on the cargo floor of a C-17 Globemaster III during an evacuation flight from Kabul on Aug. 15, 2021. The jacket belonged to **Airman. 1st Class Nicolas Baron**, a C-17 loadmaster aboard REACH871 from the 816th Expeditionary Airlift Squadron at Al Udeid Air Base, Qatar, which airlifted a record-setting 823 people on that one flight.



688th Cyberspace Wing

Spotting a car crash near Robins Air Force Base, Ga., **Master Sgt. Shale Norwitz** extracted the occupants from the vehicle and led them to safety, then redirected the flow of traffic until law enforcement arrived. Norwitz credited his response to his military training and being on the autism spectrum. "That makes me good at being a strategic thinker and contributes to my innovation," he said. Norwitz advocates for those with autism spectrum disorder as part of the Air Force's Disability Action Team.

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

Unmanned Flying Teammates

The Air Force is developing semi-autonomous, low-cost aircraft to augment its crewed combat jets in a variety of missions.



Kratos

A Kratos XQ-58A Valkyrie, bottom left, USAF F-35 Lightning II, and an F-22 Raptor fly in formation during a test in December 2020. The Valkyrie served as a communications gateway through which the two fifth-generation fighter jets could communicate.

By John A. Tirpak

Robots will join the Combat Air Forces within the next decade, flying alongside manned airplanes, bearing extra munitions, assisting with surveillance and jamming, and even making kamikaze attacks to defend their wingmen.

These Low-Cost Attritable Aircraft Systems (LCAAS), in development since 2015, seek to affordably increase the size and capability of the fleet without adding more pilots or the airborne life-support systems they require. Unlike manned systems, these aircraft are designed for short operational lives and will never go through depot-level maintenance or service-life extensions.

The Air Force Research Laboratory (AFRL) and USAF's Life Cycle Management Center's directorate for fighters and advanced aircraft lead the development effort, conducting experiments to test airframe designs and the systems' computer brains, as well as the manned/unmanned teaming concepts.

What constitutes "low cost" is in the eye of the beholder. Gen. Mark D. Kelly, head of Air Com-

"We need to get the one 'win' and prove the concept; prove the capability and then have it accelerate from there."

—Maj. Gen. Heather Pringle, commander of Air Force Research Laboratory

bat Command, said in August that he's keenly interested in having an unmanned, stealthy, jamming aircraft for use as an adversary for training fifth-generation fighter pilots. Such an aircraft, provided it can demonstrate "a significant amount of endurance," would be valuable if it could be had for a quarter the cost of a manned "Red Air" platform. "That, to me, is 'low cost,'" he said.

Kelly acknowledged "nothing is cheap" and said the term "attritable" helps set the parameters. He predicted such aircraft will become "a growth industry."

Brig. Gen. Dale R. White, program executive officer for fighters and advanced aircraft, defined low cost as being "in the single-digit millions" for the aircraft itself. The ultimate price tag, however, will be determined by "the missions we put on it." As payloads and sensors are added, the fully loaded price "is going to grow to an expensive number," White cautioned.

"We need to get the vehicles down into the single digit [millions of dollars] ... but to be largely driven by the threat of the day," White said. The more capable the systems, the less expendable they become in combat, he said.

White drew a distinction between low-cost attri-

tables and “swarming” unmanned aircraft, which will be “a much cheaper price point because you’re talking very small, but capable, vehicles.”

A driving factor in developing low-cost attritable aircraft is the increasing sophistication of adversary air defenses, which have become harder to penetrate and more lethal the longer an aircraft lingers near them. Expendable aircraft offer a more affordable and lower-risk means to attack such defenses, compared to high-end piloted jets.

Maj. Gen. Heather L. Pringle, head of AFRL, indicated there are still trade-offs to be made to help senior leaders understand how the costs of such aircraft change based on desired range, payload, and sophistication.

“We’re still putting the different pieces and parts together,” she said. The aim is to develop common elements so the resulting vehicles “are easier to plug-and-play.” A common “chassis” could support mission-specific payloads and modules for defense suppression, intelligence, surveillance, and reconnaissance, or as a missile carrier. She said engineers are borrowing biological terms, like “genus” and “subspecies” as they tailor requirements for specific roles.

BEYOND REAPER

Unlike today’s unmanned aerial systems, such as the MQ-9 Reaper, these next-generation systems will fly without human operators. Rather, they will autonomously operate in conjunction with human pilot partners, whether attacking or jamming or watching that pilot’s “six” to protect against enemies. At least for now, only a human will be able to order them to release weapons.

Another “nice-to-have” goal of the program is to develop aircraft that don’t necessarily need runways to launch or

The First LCAAS?

The first Low-Cost Autonomous Attritable System may well be a stealthy, hard-turning jet meant to be a sparring partner for pilots of fifth-generation F-35s and F-22s, said Gen. Mark D. Kelly, head of ACC. Replicating adversary air will be ACC’s first “toe in the water” for such aircraft.

Blue Force Technologies was expected to receive a contract in September to develop its “Fury” jet for that role. The aircraft could potentially bear a new “FQ” nomenclature to signify a fighter drone. It would have reduced radar signature and the ability to make 9G turns, with enough endurance to fight all day on a single tank of gas. Company president Scott Bledsoe said the 28-foot-long, 17-foot wingspan Fury will be able to achieve Mach .95.

The jet will have an open architecture to support payloads and equipment from other suppliers without involvement from Blue Force, according to Bledsoe.

Fury could help ease ACC into operating with LCAAS, said former F-22 pilot and Blue Force adviser Andrew Von Timmeren. Combat pilots “need to practice manned/unmanned teaming” in a nonlethal environment before going to war with it, he said. Pilots need to develop trust in such systems, or else they will “ask you to just leave it home.”

Getting comfortable with an LCAAS in the Red Air mode—demonstrating that it “won’t crash into me or crash into the ground”—will let pilots be more open-minded about partnering with the jets in real combat.

Before he and other combat pilots will trust it in wartime, he said, “I need it to ... roll around in the mud with me and my bros.”



A General Atomics MQ-20 Avenger unmanned vehicle returns to El Mirage Airfield, Calif. June 24. The MQ-20 participated in Edwards Air Force Base’s Orange Flag 21-2 to test the Skyborg Autonomy Core System.



Kratos

A Kratos USAP-22 Mako—a derivative of the BQM-167A serial target—makes a no-runway launch in a May 2021, from Tyndall Air Force Base, Fla. The test was the first for the Skyborg suite of autonomous flight controls that will be the brains of a new generation of low-cost attritable aircraft.

recover from, which would expand the number of locations from which LCAAS could operate. This would tie in with the Air Force's Agile Combat Employment scheme, which seeks to broadly distribute forces to widespread locations in a conflict, thus complicating the attack problem for an enemy that wants to deny USAF the ability to operate.

The Air Force has dubbed the brains inside LCAAS "Skyborg," though the name has been frequently misconstrued as describing the aircraft itself. Skyborg is the artificial pilot that allows this class of systems to fly the aircraft without constant attention from a human operator. Within Skyborg is the Autonomy Core System, or ACS, which is government-owned intellectual property that can be applied to any aircraft the government chooses. Skyborg was named one of the Air Force's marquee "Vanguard" technology efforts in 2019.

Skyborg will require platform-specific programming to make best use of whatever LCAAS it's flying. To date, Skyborg has "flown" the Kratos XQ-58 Valkyrie, the Kratos UTAP-22 Mako, and the General Atomics MQ-20 Avenger.

Flying the system on aircraft built by two companies "demonstrates its ... portability," Pringle said.

Yet its autonomy will be limited. "We're not delivering artificial intelligence with this program," Pringle said. "We may add it at some point in the future, but we want this to be a trusted platform, where operators are comfortable partnering in the manned/unmanned teaming." The goal isn't to have Skyborg "out there alone and unafraid and operating on its own."

Thus, it's essential to understand Skyborg as an "autonomous collaborative platform," Pringle said.

"In autonomy, the pilot would tell the vehicle what to do, and not how to do it," she said, noting that the vehicle will execute according to its programming. The Air Force sees AI as taking that to another level, such that it "learns on its own what to accomplish and how to accomplish it," Pringle said. "That's not where we're going with...manned/unmanned teaming."

Nor will unmanned systems be able to overrule a teamed pilot by determining some other target is more urgent. But by being able to follow a pilot's commands, Skyborg does represent a new sophistication because it does not require "inputting those commands and executing stick maneuvers to get there."

With LCAAS, Pringle said, there will be "a lot less babysitting."

A Kratos UTAP-22—derived from the BQM-167A aerial target—made a rocket-powered takeoff in April from a ground vehicle and then flew for two hours and 10 minutes at Tyndall Air Force Base, Fla. Skyborg showed it could stay within "geo-fences" and perform "coordinated maneuvering" with manned aircraft, the Life Cycle Management Center said in a press release. White called the test "the first step in a marathon of progressive growth for Skyborg technology."

Skyborg flew in June on the Avenger, GA's privately financed, low-observable aircraft. During an Orange Flag exercise at Edwards Air Force Base, Calif., a human oper-

ator guided the jet from takeoff to altitude, then handed off control to the automated systems which flew it for the remainder of the two hour, 30-minute flight.

Kratos' XQ-58A Valkyrie has flown in five experiments, most recently with a version of Skyborg. The 29-foot-long angular aircraft offers what Kratos president Steve Fendley called "fighter-like" performance. In a December 2020 test flight, the aircraft flew formation with an F-22 and F-35, and operated as a communications gateway through which the two fighter jets could communicate. That demonstration was opportunistic, however, and is not seen as a typical mission for LCAAS.

While Skyborg is still considered a technology development effort, White said he expects it to become a program of record—meaning it will eventually go into production—in 2023, "as originally planned." In August, the Life Cycle Management Center announced that Kratos received \$13.2 million and General Atomics received \$7 million for further work on the Autonomous Core System. The contracts support further experimentation and integration of Skyborg aircraft in "large-force exercises." These deals followed 2020 contracts where Kratos got \$37.7 million, General Atomics \$14.3 million, and Boeing \$25.7 million to work on Skyborg.

White said in August that the transition to a program of record would have to be "balanced with all of the other requirements we have" across the fighter portfolio. "There's still some amount of work that we want to do, with respect to both the platform and the autonomy piece before we make the transition," he said.

The Air Force has struggled to mature promising prototypes into programs of record. Historically, few programs have bridged the gap, causing some to call it the "valley of death." But White said that the Air Force has commitments, from "warfighters and requirements writers," to develop Skyborg into a full-scale program.

Boeing will experiment with the ACS on the Airpower Teaming System unmanned aircraft it's developed with the Royal Australian Air Force. That aircraft features a stealthy appearance and modular sections to make it easy to change out payloads. White said work is underway to get the ATS approved for flight on U.S. ranges, and expects that work to begin next year.

Pringle said the next ACS experiments will be conducted on the Valkyrie in the fall. Demonstrations will become progressively more complex, with capabilities added building-block style, such as "flying in formation ... going to a waypoint and ... avoiding weather," changing altitudes and holding altitudes. Kratos is building a dozen Valkyries, but neither the company nor White would say if all of those are intended for an Air Force application.

Operational experimentation will begin by the "mid-2020s," Pringle said, "That will be a really important step in bringing the warfighters in," she said. They will "get to



General Atomics

Capt. Samantha Thorn, working from the Ridley Mission Control Center at Edwards Air Force Base, Calif., synchronizes efforts between a Skyborg-flown General Atomics MQ-20 Avenger and fighter aircraft during the Exercise Orange Flag 21-2. The Air Force calls Orange Flag its "premier multi-domain test event," and it was run in combination with Eglin Air Force Base's Emerald Flag exercise.

see the system in operation and give us feedback. We'll adjust as we need to."

Leading up to that will be more "Orange Flag and Emerald Flag" exercises, she said. Operational commands are helping design those demonstrations and "what we're trying to achieve at each of these phases of the experimentation campaign." It's a "crawl, walk, run" approach, she said, and the immediate goals are "getting the ACS on board, having it fly, having it work."

Pringle said she was thrilled to hear Kelly's enthusiasm for using an LCAAS variant as a Red Air platform, and encouraged by former Commander of Air Force Global Strike Command Gen. Timothy M. Ray, who last year said he could envision an LCAAS component in the bomber force.

Fighters are first, she said. "We need to get the one 'win' and prove the concept; prove the capability and then have it accelerate from there," Pringle continued. After that, "we're open to partnering" with AFGSC.

Pringle said developing a viable supply chain will also be important. "We would like to have a robust industrial base that can meet a variety of needs," she explained. In the current phase, "we want to ... see what companies are interested in these capabilities ... which ones would be interested in the common chassis, or the sensors ... or materials, etc. That's what a science and technology program is designed to do, is generate interest ... see what expertise is out there and where ... they need infrastructure partnerships."

The Air Force is hardly alone in this requirement. By the 2030s, the Navy expects to field more unmanned aircraft on aircraft carriers than manned airplanes, anticipating a 60/40 split. White said he would not "be so bold" as to speculate on how much of the Combat Air Forces will be unmanned in that same time period.

"The threat gets a vote ... about how [we] address it," White pointed out. But, "I'm very confident, based on the technology, [that] it will have a role in future systems and



Boeing illustration

Artist concept of a Boeing F-15EX flying in formation with four Boeing Airpower Teaming System (ATS) aircraft. Also known as the Loyal Wingman project, the modular aircraft are being developed in partnership with Australia, and are expected to fly missions independently using artificial intelligence.

warfighting inside our force.” While there’s “a discussion to be had,” as to a percentage of the force, “it’s too early to make that commitment.”

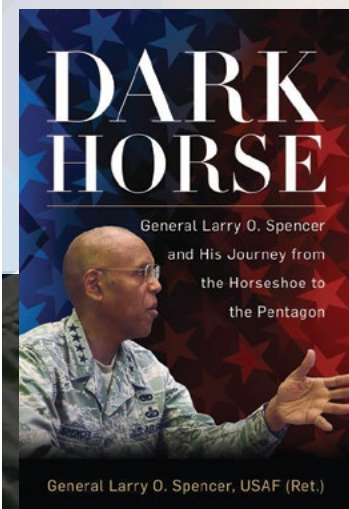
Nevertheless, “I will tell you that we’ve certainly got the attention of our leadership in terms of what we can do with these capabilities and we’re pretty excited about where we’re going.”

Pringle describes a “healthy skepticism” about LCAAS and the need to develop operators and training. Human factors engineers must work out how pilots in F-35s send

instructions to an LCAAS flying in formation, for example. That’s why experimentation is essential.

In a more distant future, Pringle said there’s “nothing that would prevent” Skyborg from being applied to other platforms—not just bombers, as Ray suggested, but transports or tankers. But “we’re not on that path, right now.”

First, AFRL needs to build that sense of “partnership and trust” with the Combat Air Forces to show the concept’s full potential, and that requires field-proven demonstrations. “There’s more work to be done,” she stated. ✪



“It has been said that there are two ways to live your life: as though nothing is a miracle, or as though everything is a miracle. My life has been a succession of miracles.”

DARK HORSE

General Larry O. Spencer and His Journey from the Horseshoe to the Pentagon

“General Larry Spencer is one of the most remarkable officers I have known in my 43 year career. His service to our country was extraordinary, culminating in a four-star assignment as the number two officer in America’s Air Force. His story of success defied the odds and his journey out of ‘The Horseshoe’ in south-east Washington, D.C., is compelling. His fortitude and his family are riveting. This narrative is that much more important in these tumultuous times where race and our own reconciliation with it will create our children’s future. Larry Spencer’s life story is an important milestone on that road. His example and grit are special in every way. Please read this book. It will move and inspire you.”

—Adm. Mike Mullen, U.S. Navy (Ret.), 17th Chairman, Joint Chiefs of Staff



<https://www.usni.org/press/books/dark-horse>



USAF's New Deployment Plan

Master Sgt. Scott Thompson/ANG

The Air Force Force Generation model will completely overhaul the way the service trains, equips, and deploys its forces.

A-10 Thunderbolt IIs, such as this one landing on a public highway in Michigan, can operate from bare bones bases and "warm" bases overseas, without depending on a large, complex support system of equipment and operators. Under the Air Force's new force deployment model Airmen will have more time to conduct high-end training like this.

By Amy McCullough

The United States no longer has boots on the ground in Afghanistan and has significantly drawn down its presence in Iraq. While demand for airpower continues, the Air Force is realigning how it responds to those demands.

"What's been successful in the Middle East for 20 years, is not the recipe for success against a peer competitor like China," said Lt. Gen. Joseph T. Guastella, deputy chief of staff for operations. "We have to adapt how we think, and how we present [forces], and train."

Ever since the first Iraq War, the Air Force generated airpower from well-established bases throughout the Middle East—including bases in Qatar, Saudi Arabia, Jordan, Iraq, and Afghanistan. Many, including Bagram Airfield in Afghanistan, grew to resemble a small city, supporting tens of thousands of troops, shops, cafes, and restaurants. Bagram had two runways, multiple hangars, a control tower, and more than 30 acres of ramp space to support USAF F-15E

In an era of strategic competition and potential conflict with China, combatant commanders will need a different model.

Strike Eagles, A-10 Warthogs, F-16 Fighting Falcons, unmanned drones, and U.S. Army helicopters staged for air operations during the war.

Under that construct, the Air Force deployed just the right number of Airmen needed to do a certain job, often in small groups, and sometimes just individuals. Units were broken up. Airmen fell in with others downrange, often meeting for the first time only after they arrived at their forward operating location.

"We kind of crowdsourced from the whole Air Force ... and we sent them to the Middle East," Guastella said. "Maybe they would do just-in-time training, but if you think about it, that kind of model is very, very efficient for a situation where you're not fighting a peer competitor ... where the base isn't truly threatened and the demands of generating airpower aren't threatened by a peer competitor."

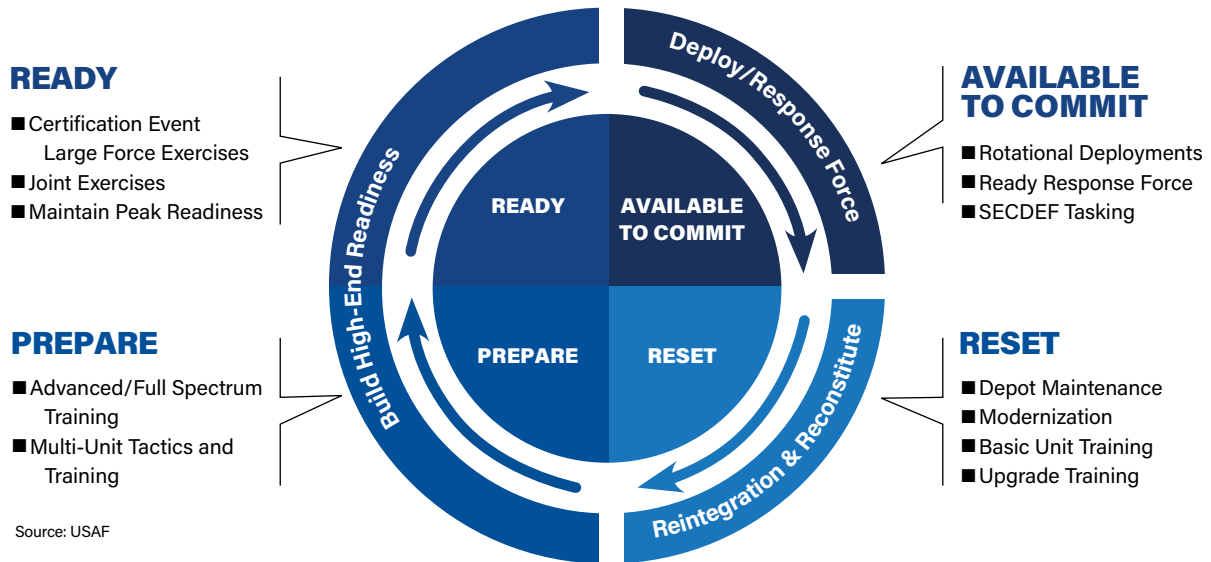
But in an era of strategic competition and potential conflict with China, combatant commanders will need a different model.

Chief of Staff Gen. Charles Q. Brown, Jr., unveiled the new Air Force Force Generation (AFFORGEN) model in an August interview with Air Force Mag-

Air Force Force Generation (AFFORGEN)

24-Month Cycle/6-Month Per Phase

The Air Force is revamping the way it trains Airmen and how it presents forces to combatant commanders with the goal of providing more time back home for the high-end training needed to compete with peer adversaries.



azine, saying his goal is to standardize deployment cycles throughout the service in a way that is “better aligned with how we present Airmen and airpower to support the joint operations.” At the same time, he said, “it actually preserves some of that readiness, not only for today, but for the future.”

AFFORGEN breaks down into four six-month phases:

■ **Commit.** During this phase Airmen are either deployed, or immediately deployable. Airmen can be deployed for six months to an established base or for one or more short-term rotations, such as a Bomber Task Force mission. Airmen in this phase are “the tip of the spear for the Air Force,” Guastella said.

■ **Reset.** After returning from deployment, Airmen get six months to get reacquainted with their families, update PT testing and other basic training qualifications, or make a permanent change of station move. Guastella said the reset phase “hasn’t really changed much, but it’s focused on individual readiness.”

■ **Prepare.** Instead of deploying immediately after reset, like before, Brown wants units to get time to focus on advanced and full-spectrum training needed to compete against a peer competitor. Early in the cycle, exercises likely will be local and confined to a specific squadron or area of their home base. The objective is to keep units together, so Airmen know the people they’re deploying with before they get to their destination and have already built established relationships with them.

■ **Ready.** Training now becomes more complex, scaling up to large force exercises such as Red Flag and Silver Flag, and demonstrating the ability to conduct Agile Combat Employment, where groups of multi-capable Airmen operate from remote and austere locations. “The goal is to build on the great training opportunities that we have already, but adjust them more and more to a high-end fight and accommodate more Airmen in this construct, so it’s not just those that fly and fix aircraft,” Guastella said.

The Air Force started deploying forces using this model late last year during increased Bomber Task Force deployments, but it won’t reach initial operational capability until 2023. The goal is to start with the combat elements, such as

fighters, tankers, bombers, intelligence, surveillance, reconnaissance, and command and control, and then finally bring the rest of the deployable force under the new model by 2024, Guastella said.

“This is a big deal,” he said. “It’s one of the biggest changes we’ve made to our Air Force in a long time in how we organize, train, and equip and offer forces to be consumed and employed for the defense of our nation.”

BREAKING THE MEAT GRINDER

The Air Force developed its Air Expeditionary Force (AEF) concept in the mid-1990s during the Balkan conflicts, with the goal of giving units a clear chain of command and a predictable deployment pattern. The service was divided into 10 AEFs that could deploy nose-to-tail in 90-day increments. It never really worked.

The relentless operating tempo driven by continuous operations enforcing two no-fly zones over Iraq, combat operations in the Balkans, and later wars in Afghanistan and Iraq were too great. The 90-day deployment cycle stretched to 120 days in 2004 and then to six months in 2010. Next, the Air Force adopted the tempo banding system, with unique deploy-to-dwell ratios for the Active-duty and reserve components and built-in variances for different career fields. The complex system was difficult to understand and failed to give Airmen any extra time for training between deployments.

Brown’s predecessor as Chief, Gen. David L. Goldfein, followed with AEF Next, again aiming to reset the force and ensure USAF could maintain its operational tempo while simultaneously improving the training mission at home.

In August 2016, shortly after becoming Chief, Goldfein wrote: “Squadrons have been asked to bear the brunt of an incredible deployment tempo and manpower shortages, which have had a direct impact on readiness and our warfighting mission.” Meanwhile, manning fell to 60 to 70 percent of requirements at Stateside bases, usually “with many key supervisors and leaders deployed or dual-hatted.” The result, he said: “We have degraded the core fighting unit of our Air Force.”

But AEF Next never fully developed over the course of

The Air Force started deploying some Airmen, such as Bomber Task Force missions like these B-52 Airmen at Andersen Air Force Base, Guam, under the new AFFORGEN model in 2021. All combat forces will deploy under the new model by 2023 and the rest of the force will follow by 2024.



1st Lt. Ryan Walsh

Goldfein's tenure and Brown arrived promising to again address the issue.

Under AFFORGEN, deployment cycles are supposed to standardize on a one-to-three deploy-to-dwell ratio for Active-duty forces, and a one-to-five mobilize-to-dwell ratio for the Guard and Reserve.

Guastella acknowledges, however, that airpower is still in high demand and some high-demand, low-density (HD/LD) career fields will continue to be called on more than others.

To protect those Airmen, the new system establishes a "redline" deploy-to-dwell of one-to-two, meaning six months deployed followed by one year home for Active-duty members, and one-to-four, or six months deployed for every 24-months home for reserve members. Anything more affects overall force readiness.

"What the model does is offer a degree of protection for the over utilization of those assets," Guastella said. "It allows us to explain the risk of consuming our force at an excessive rate, because if you chew up the force that we have, if you use all those HD/LD assets, and you keep sending them back over and over again, they never have the opportunities for that high-end training. Then you're actually buying risk in a number of years. It's not ... the meat grinder, if you will, where we have to send them back. It allows us to better articulate the ... long-term risk."

Success could hinge on reducing the Air Force's footprint in the Middle East.

"I think a reduced posture in the Middle East will also reduce some of the demand on us," Guastella said. "So, the combination of the imperative to be ready to fight in a high-end fight, and reduced appetite, if you will, for us in some of the lower-end theaters that we've been in—those two combine to enforce it and also then enable" the AFFORGEN system.

ACCELERATE CHANGE OR LOSE

When Brown became Chief, his first action was to release "Accelerate Change or Lose," encouraging new approaches to how Airmen train and operate. Brown argued that requirements had stood still while threats and reality shifted.

"The processes with which we build capabilities for our Airmen have not adapted to these changes; the ways in which we test, evaluate, and train with them do not meet our current or future demands," Brown wrote. "While we have made progress, our Airmen need us to integrate and accelerate the changes necessary to explore new operational concepts and bring more rapidly the capabilities that will

help them in the future fights."

AFFORGEN is designed to provide time between deployments to train for such future fights, such as incorporating Agile Combat Employment concepts into nearly every exercise.

Instead of lining up row upon row of expensive aircraft on the ramp at a main operating base in the combat theater, ACE envisions main hubs like Ramstein Air Base in Germany or Yokota Air Base in Japan supporting dispersed units spread out across a region, operating largely independently and without the usual on-site support.

The result is a new "hub and spokes" system, Guastella said, with "warm bases" established in forward locations. These bases may be kept "warm by a host nation," Amari Air Base in Estonia, for example. It also could include something much more primitive, like an airstrip on a Pacific island, that could be kept warm by contractors or a small number of agile Airmen rotating through periodically to get the airstrip up and running.

"That is resilience," Guastella said. "That is deterrence. And that's kind of a different way of thinking about the posture piece of it."


RIGHT-SIZING EXERCISES

Guastella said every element of training "needs to adjust to the new reality." That means changes to big exercises like Red Flag and more frequent exercises like Silver Flag, where civil engineers practice rapidly building and repairing runways. For example, Security Forces Airmen might practice securing an airfield perimeter at a remote location.

Some exercises, like deployments, will get smaller, Guastella said. "We just can't add more to a very busy schedule, necessarily, but we have to figure out what exercises create the most value."

New technology can help, enabling more to be done remotely, a lesson proven during the COVID-19 pandemic. "Not only has the technology revolution dramatically changed the ways in which humans and economies interact in the world, it has changed the way militaries can develop and project power," Brown wrote last year.

Likewise, Guastella says technology empowers Airmen to do more from wherever they are.

"Airmen equipped with the right technology can remotely do things that weren't even conceivable in the past," he said. "You can get more out of what you have. We're exploring this. It's in its infancy, I would say right now, but I think we can all recognize the potential based on the talent that we have." 



Now there's help with your out-of-pocket costs related to a hospital stay...

Introducing the NEW AFA Hospital Indemnity Insurance Plan

Your basic health insurance or TRICARE are generous in what they pay for—but they may not cover everything—especially when it comes to hospital stays. If you become ill or injured and are hospitalized for any length of time, your deductibles, co-pays and cost-shares could leave you with thousands of dollars in out-of-pocket expenses.

FACT: The average out-of-pocket cost for a hospital stay is more than \$4,500—even if you have health insurance.¹

That's why, given the recent health care crisis, AFA wanted to make sure its members had financial help if something happened to you.

The NEW AFA Hospital Indemnity Insurance Plan pays you additional cash benefits for every day you're hospitalized for a covered illness or injury. You can use these benefits to help pay your out-of-pocket expenses or however you wish!

Plus, it's easy to enroll in this coverage! AFA members under age 65 are guaranteed acceptance!² Learn more and enroll today:

- ✓ Guaranteed acceptance²
- ✓ Pays cash benefits directly to you
- ✓ Choice of benefit options to fit your budget
- ✓ Offers spouse and family coverage
- ✓ Affordable group rates



1-800-291-8480



afainsure.com

¹Report: Patients' out-of-pocket costs increased up to 14% in 2018, Tara Bannow, June 25, 2019. <https://www.modernhealthcare.com/patients/report-patients-out-pocket-costs-increased-up-14-2018> Viewed 8/12/21.

²This policy is guaranteed acceptance, but it does contain a Pre-Existing Conditions Limitation. Please refer to the website for more information on exclusions and limitations, such as Pre-Existing Conditions.

Coverage may not be issued in some states. All benefits are subject to the terms and conditions of the policy. Policies underwritten by Hartford Life and Accident Insurance Company detail exclusions, limitations, reduction of benefits and terms under which the policies may be continued in force or discontinued. Benefits will decrease by 50% at age 80.

Program Administered by Mercer Health & Benefits Administration LLC
AR Insurance License #100102691 • CA Insurance License #0G39709
In CA d/b/a Mercer Health & Benefits Insurance Services LLC



Underwritten by: Hartford Life and Accident Insurance Company Hartford, CT 06155

The Hartford® is The Hartford Financial Services Group, Inc., and its subsidiaries, including issuing company Hartford Life and Accident Insurance Company.

Hospital Indemnity Form Series includes GBD-2800, GBD-2900, or state equivalent.

94400 (10/21) Copyright 2021 Mercer LLC. All rights reserved.

Cislunar Space

The gap between Earth orbit and the moon is open, uncharted, and undefended.



NASA illustration

An artist's illustration shows NASA's Lunar Reconnaissance Orbiter, or LRO, in orbit over the moon as Earth rises in the background. The LRO will serve as a technological link to help open up access to the moon via intra-satellite navigation under the agency's CAPSTONE mission.

By Amanda Miller

Not much human activity has touched the moon or its surroundings in the half-century since American Apollo astronauts traversed the lunar landscape, but new concerns about China's interests and motives have leaders in Washington viewing with worry the vast void of cislunar space.

China's rapid evolution as a global space player and its announced intention to join with Russia in building a joint science base on the moon, raise concerns about what that kind of activity could yield in terms of future capacity to act and potentially wage war in space.

NASA plans to return American astronauts to the moon for longer periods to a base of its own, as the U.S. gears up its competitive drive in space. And governments and private entities the world over are eyeing the moon as a potential source of mineral

"You can't look at that Earth ... and say 'global' is sufficient enough for our perspective."

—Lt. Gen. John Shaw, deputy commander, U.S. Space Command

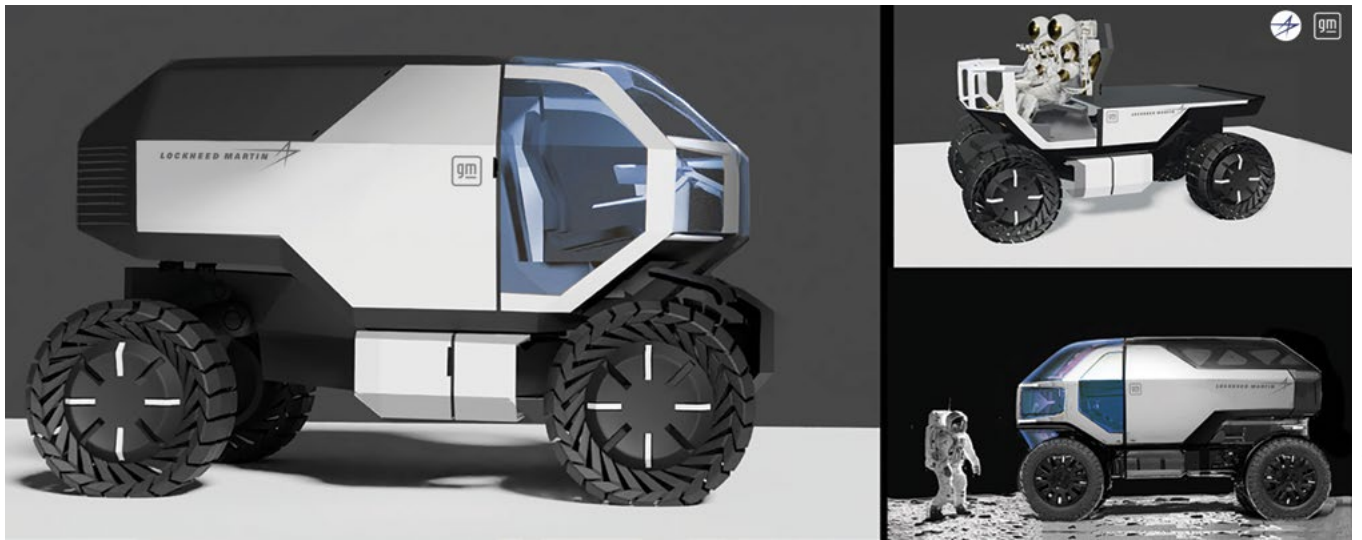
wealth or as a place to position communication or space transportation hubs.

Cislunar space—that vast void between terrestrial orbits and the moon—represents both an opportunity and a threat because it is not only empty, for the most part, but essentially indefensible. At least for now.

The Space Force and U.S. Space Command were created to address this risk and Defense Secretary Lloyd J. Austin III's tenets for responsible behavior in space provide a framework for the department to begin assessing its role beyond Earth's exclusive gravity well.

THINKING 'ASTROGRAPHICALLY'

Space Force Lt. Gen. John E. Shaw proposes that the world is no longer global. In a speech at the Space Symposium's annual Space Warfighter Luncheon in Colorado Springs, Colo., the deputy commander of U.S. Space Command introduced "a few new words for our collective lexicon." Space Command's area of



Courtesy of General Motors and Lockheed Martin

Artist's concepts illustrate initial ideas for a vehicle to transport astronauts, or to perform activities autonomously, on the moon. General Motors and Lockheed Martin are working together on the concept.

responsibility is hard to define, he said. Throughout history, a military AOR [area of responsibility] "has always been defined by lines on a map," Shaw said. "But what drove those lines were a number of things—the terrain, the political context that was there, the demographics of that part of the world, and probably most importantly, the threat that was there."

Space Command is different. "For the first time in military history—the first time—an AOR was defined not by geographic lines on a map," Shaw said. "No, we had a different one, we had an 'astrographic' AOR. That's word No. 1." The command's AOR includes not just cislunar space but everything beyond 100 kilometers above Earth.

"You can't look at that Earth ... and say 'global' is sufficient enough for our perspective."

Thus, he said, the military must start thinking in "super-global" terms, which he defined as "those things that are relevant to military matters or even geopolitical matters that encompass the globe and the relevant spaces beyond it, too."

Because "the space domain is really best defined, in terms of terrain, by those beautiful Einsteinian space-time curves known as gravity wells," Shaw continued, space operators should begin to think about maneuvering "upwell" and "downwell."

Later, asked by Air Force Magazine whether the U.S. would be able to detect a kinetic weapon launched at Earth from the moon, he answered only indirectly: "We need to get our capabilities to the point where we can easily see it."

China recently showed it could launch an object from the moon and accurately land it back on Earth. The mission was to return lunar samples to Earth, but the capability—which the U.S. does not currently have—has clear military applications.

Another way China had leapfrogged the U.S. in cislunar space: It placed a lander on the far side of the moon in 2019, the only time that's been done. Meanwhile, its primary mission accomplished. China has sent its lunar orbiter that was part of the sample return mission to a point in space relative to the Earth and sun around which the spacecraft will basically park in orbit, demonstrating the ability to traverse cislunar space.

CISLUNAR CHALLENGES

To get military professionals oriented to operating in this new frontier, an associate professor at the University of Col-

orado Boulder, a space executive, and the Air Force Research Laboratory's Space Vehicles Directorate together published the 23-page article "A Primer on Cislunar Space" in June.

The article, by Marcus J. Holzinger, Cloudstone Innovations CEO, C. Channing Chow, and Peter Garretson, tries to provide a sense of the scale and challenges in such a vast domain:

■ **Scale.** The moon's orbit is nine times farther from Earth than satellites in the highest orbits. Because cislunar space continues past the moon and includes the entire area influenced by the moon's gravity—including zones where the sun's gravity adds a third influence—the Space Force's potential "sphere of interest" is 1,700-times the size of conventional orbital space.

■ **Trajectories.** The Air Force and now the Space Force historically catalog the world's satellites, publishing the most comprehensive open-source data on their orbits. As future spacecraft take up positions in cislunar space, where the moon's gravity significantly affects spacecraft trajectories, the Space Force will be challenged to provide a similar level of tracking.

■ **Observation.** U.S. and allies' networks of radar and laser-ranging tracking sites aren't powerful enough to precisely locate objects in cislunar space. Any "active" systems of observation designed for the purpose "would likely require prohibitive levels of power to be effective," the paper argues. Passive observation, such as telescopes and antennae, however, "can have substantial utility since there is no dependence on 'pinging' the object." But cislunar distances are so great, telescopes and antennae may need to be placed on the surface of the moon or in repeating cislunar orbits to "offer commanding views of nearby space."

Unlike today's predictable orbits, trajectories in cislunar space won't repeat in neat circles or ellipses nor hold to a regular plane as they do around Earth. Instead, "a wide variety of families" or orbits will prove difficult to describe in conventional geometric terms. Most such repeating orbits will also be unstable.

Sketches of sample cislunar orbits included by the authors of the Primer article look like drawings made by someone who hasn't quite gotten the hang of their Spirograph set. NASA plans a near-rectilinear halo orbit for its Gateway lunar space station concept. That orbit takes a tighter path when it approaches the moon then swings farther out over a wider swath of sky. The pattern eventually repeats, and a curve is



NASA

Earth rise: The Earth looms over the Mare Smythii region of the moon, before the Lunar Module and the Command Module separated during the Apollo 11 Mission in 1969.

noticeable in graphs of its orbital plane when looked at from the side.

COMMERCIAL CONCERNS

Getting a jump on NASA's inevitable need for astronaut mobility on the moon, General Motors, which built the Apollo program's Lunar Roving Vehicle, joined with Lockheed Martin to begin sketching new vehicle designs more than a year ago. The two are jointly conceiving an entire transportation system for the moon's surface. As they work through technical challenges such as surviving the cold, dark lunar nights with enough power, or building equipment that can stand up to the brutal lunar surface, they're developing business models for monetizing that technology.

Just as satellite service providers aim to own and operate spacecraft and lease capability to the government, GM and Lockheed Martin are intrigued with the idea of owning and operating uncrewed lunar vehicles and selling transportation as a service.

"And not even just transportation," says Derek M. Hodgins, who leads strategy and business development for lunar exploration campaigns at Lockheed Martin Space. "But it's things like preparing the surface, leveling it out for landers, excavations when you start talking about resources, transporting materials, working autonomously when the crew's not there."

Their customers could go well beyond NASA, Hodgins says. "We look at the international landscape, and there's tremendous opportunity."

Smaller companies are also looking to get in on the action. Shey Sabripour, founder and CEO at CesiumAstro in Austin, Texas, sees big opportunities as the space business expands. After receiving development funding from the Defense Innovation Unit to develop mature phased-array communication technology and a Small Business Innovation Research grant

to study its feasibility for lunar operations. Now he envisions the system as part of a distributed communication network "all the way from here to the moon."

At Advanced Space in Westminster, Colo., co-founder and CEO Bradley Cheetham recently rounded up his team to start brainstorming about the military's cislunar expansion. His company's cubesat mission for NASA is to test navigating the future Gateway space station's halo orbit. It will trade navigational pings in space with NASA's Lunar Reconnaissance Orbiter, a new technique being demonstrated in the upcoming CAPSTONE (for Cislunar Autonomous Positioning System Technology Operations and Navigation Experiment) mission.

Cheetham says the U.S. needs to gain the ability to track objects in cislunar space and that this capability shortfall is a "today problem," rather than long term. He wonders what would happen if another country decided to stake out areas in orbit or on the moon for exclusive operations—even in the name of science. He doesn't perceive a problem with commercial entities to providing tracking and navigation services, such as Advanced Space provides, to both government and private organizations, using the same constellation. Indeed, he imagines helping "to establish these norms of operations as a commercial entity."

FIRST MISSION

It's too soon to try to define the limits of U.S. government or military activities in cislunar space. Depending on what assets could eventually be there, protecting government as well as commercial assets is likely to be inevitable, especially if those commercial assets qualify as critical infrastructure, similar to telephone networks, the electric grid, pipelines, or public water and sewer systems.

For now, space domain awareness is the central mission, as confirmed by Shaw and Lt. Gen. Stephen N. Whiting, commander of Space Force's Space Operations Command. But the Space Force is still defining the job at hand.

The military's adoption of the phrase "space domain awareness" is still relatively recent, younger even than the Space Force itself. Recognizing that space is a warfighting domain and that deterring malicious activity there is a critical national interest is more than just an update to the established discipline of space situational awareness, said Army Gen. James H. Dickinson, commander of U.S. Space Command, in an interview with reporters Aug. 24 at the 36th Space Symposium.

"One is different than the other," he said. Space situational awareness "is reporting on where something is in space—characterizing it that way," he explained. Space domain awareness "is a little bit more complicated," requiring observers to try to understand and assign motive—"the 'why'—the intent—behind having something in space and where it is."

Whiting suggests there's more to come beyond domain awareness. "Right now that's the starting place," he told Air Force Magazine. "Then we'll look to see if any other missions make sense for the cislunar domain." ❄️





THE DC-3 CLASSIC MEN'S WATCH

MULTI-FUNCTION CHRONOGRAPH WITH 2 SUB DIALS AND STOP WATCH FUNCTION

IMAGE OF DC-3 PLANE ON WATCH FACE

GENUINE LEATHER STRAP

PREMIUM GRADE STAINLESS STEEL CASE BACK ETCHED WITH DC-3 AND IMAGE OF THE PLANE



FOR THOSE OF YOU WHO JUST MIGHT CHANGE THE WORLD

The DC-3 airliner will go down in history as the plane that gave passengers their first transcontinental flights, and changing the face of travel forever. Now you can wear a custom collector's watch that is destined to become as popular as the aircraft that inspired it—**"THE DC-3 CLASSIC" Men's Watch.**

INNOVATIVE DESIGN AND THE BOLD DETAILS OF A CLASSIC

This distinctive multi-functional watch features a vintage white dial adorned with an image of the plane along with "DC-3" and "1937", the year the aircraft first went into service. The solid stainless steel case back also features an image of the plane and DC-3. Numerals are in contrasting black as are the two sub dials indicating minutes and seconds. Special functions include a chronograph with a stop

watch feature and a date display at the 6:00 marker. A genuine leather strap completes the classic look. This quality timepiece has a precision quartz movement and a quartz mineral lens... and it is backed by a full-year limited warranty and our unconditional, money-back, 120-day guarantee.

COLLECTOR'S EDITION - LIMITED TO 5000!

This hand-crafted collector's watch is a remarkable value at \$179.99*, payable in 5 installments of \$36.00. The watch arrives in a custom case along with a Certificate of Authenticity. Send no money now, just return the Priority Reservation below. **This is a limited edition watch—only 5,000 will ever be made!** So don't miss out—order today!

A CUSTOM-CRAFTED WATCH DESIGN FROM THE BRADFORD EXCHANGE

Order today at bradfordexchange.com/25429

©2020 The Bradford Exchange 01-25429-001-BIPR

LIMITED-TIME OFFER

Reservations will be accepted on a **first-come, first-served basis.** Respond as soon as possible to reserve your watch.

PRIORITY RESERVATION SEND NO MONEY NOW



9345 Milwaukee Avenue · Niles, IL 60714-1393

YES. Please reserve the "DC-3 Classic" Men's Watch for me as described in this announcement.

*Plus \$15 shipping and service. Please allow 4-6 weeks for delivery of your jewelry after we receive your initial deposit. Sales subject to product availability and credit approval.

Signature _____

Mrs. Mr. Ms. _____
Name (Please Print Clearly)

Address _____

City _____ State _____ Zip _____

E-Mail (optional) _____

01-25429-001-E61153

STAR Command Stands Up

Preparing Guardians for the future is STARCOM's most important role.



Thomas Coney/USAF

The first flight comprised entirely of U.S. Space Force Guardians graduated from Air Force Basic Military Training on May 6 at Joint Base San Antonio-Lackland, Texas.

By Abraham Mahshie

When he was 7 years old, one of Michael Parodi's greatest joys was to peer deep into the night sky with his father. On countless sweltering Houston nights, Parodi and his dad aimed their telescope over treetops and between clouds to see the stars and planets.

Then one night something looked different.

"We saw a satellite passing by," he recalled. "I always wondered how they got that up there and how they kept it up there."

Parodi, now 20, is a Specialist 1 among the first Guardians training to operate Space Force satellites.

"It's not every job that you ... wake up every morning and ... learn how to operate a satellite," he said. "How to block and create signals, and do the math to calculate how much power you would need to do that—and all that good stuff."

"It's a very unique experience," Parodi said of learning about orbital mechanics and the awe he feels as part of such an exclusive group. "I personally feel—it's a little goofy to say—but, I feel the smartest I've ever been, is right now."

Training and educating Guardians is the mission

Developing a Space Force culture for members steeped in other services' histories and giving them a sense of belonging is among the challenges STARCOM must still work through.

of the Space Force at Space Training and Readiness Command, or STARCOM, which stood up on Aug. 23. STARCOM is one of the Space Force's three Field Commands, the equivalent of a Major Command in the Air Force. Its mission comprises training, doctrine development, and wargaming—to give Guardians the skills and knowledge they need to employ and defend America's space assets. Space operators must know how to operate Space Force assets and how to deter and, if necessary, repel threats from adversaries if they threaten those assets.

THE STARCOM STAND UP

Brig. Gen. Shawn N. Bratton is the first commander of STARCOM, created after months of evaluation and planning by Air Force, Space Force, and National Guard experts.

"I'm a graduate of Air Force Basic Training 34 years ago," Bratton told Air Force Magazine. "The focus when I went through was on the air domain. I learned the history of the Air Force. I learned about different aircraft. I learned about adversary capabilities in the air domain."

Now he's in charge of laying the foundation for a new service entirely. "Guardians need those same things, but they need it for the space domain," he



Airman Kadrielle Shaw/USSF

Spc1 Michael Parodi, 533rd Training Squadron, Vandenberg Space Force Base, Calif., Aug. 2.

explained. “They need to understand the space environment. They need to understand the Space Force’s capabilities and our partner nations and other government partners and the capabilities that they bring. We need to understand what the adversary can do in the space domain and what those threats present to us. So you can see the parallels.”

The Space Force must focus on space. When STARCOM stood up in August, it took responsibility for Guardians’ education. For now, Guardians will continue to go through Air Force Basic Military Training (BMT) under Air Education and Training Command. But eventually, STARCOM planners envision developing their own basic training, officer training, and Professional Military Education curricula.

“To develop the culture for Guardians, and to have them focus on the things that the Space Force needs, that eventually leads to an independent training activity,” Bratton said.

New Guardians will complete basic training at Lackland Air Force Base, Texas, then head to Undergraduate Space Training at Vandenberg Space Force Base, Calif. Once complete, they take follow-on courses for their space warfighting discipline: orbital warfare, space electronic warfare, or space battle management. Those courses are taught at Peterson Space Force Base, Colo., then more advanced coursework are taught at other locations.

Space Force Guardians complete all seven Air Force Basic Military Training graduation requirements, just like Air Force trainees, said 37th Training Wing spokesperson Annette Crawford. In addition, they must complete 13 hours of special Space Force coursework covering the National Defense Strategy, Space Force doctrine and organization, and space history. The curriculum is taught by Space Force military training instructors. Additional classes are taught by Guardians based around the world, teaching from their worksites.

“These capstone, virtual events include an unclassified space threat brief and a workforce relations panel where

USSF trainees hear and conduct discussion with officer, [senior noncommissioned officers], civilian, and contractor teammates,” Crawford said.

New Guardians are issued iPad Pro tablets during BMT and carry them from location to location.

Vandenberg then hosts classes for Guardians following officer training school or basic training. Both officers and enlisted space operators now attend similar but separate classes at the Vandenberg schoolhouse, which also folded into STARCOM.

The National Security Space Institute at Peterson then hosts Space 200 and Space 300 classes for both officers and enlisted trainees.

After coursework at Peterson, Guardians may attend advanced courses at Air Force training centers. Other Guardians may report directly to their duty location for on-the-job training on their specific systems.

Some specialized training will remain in Air Force schoolhouses. Intelligence professionals, for example, will continue their training at Goodfellow Air Force Base, Texas. “There’s

world-class training there that it may make more sense just to continue to leverage that training,” said Bratton. “There is a responsibility here as well to leverage things that already exist, not just create new things for the sake of creating new things.”

AN EXCLUSIVE GROUP

Parodi was taking a coding class in his first semester at San Antonio College in Texas when he first considered joining the Space Force. He enjoyed mathematics and physics and took a natural liking to writing code and studying the electromagnetic spectrum. Paying for tuition, however, was stressful.

He thought of his father and reached out to an Air Force recruiter.

“I thought, the best way to make him proud would be to serve my country,” Parodi said. “And I thought, a good way of doing that would be for what I thought would be the most innovative of the branches. When you think space, you think [of] the future.”

Parodi beat the odds. He had no idea that more than 5,000 civilians had applied for just 40 openings when the first Space Force civilian jobs were posted in 2020, or that just 50 service members from across the services were initially selected for transfer into the Space Force from among 3,700 applicants.

Parodi made his interest in Space Force very clear. “I placed all of my job options as Space Force,” he recalled. An Armed Services Vocational Aptitude Battery, or ASVAB, average score of 96 helped.

“I didn’t realize how exclusive it was, but I’m very glad that I was selected,” Parodi said. “I think I lucked out big time.”

Parodi and his flight of about 30 Guardians went through BMT under a microscope as the first all-Guardian training flight.

“There was an expectation by the other flights that we would be ... exceptional, at everything we were doing,” he said. “So, there was this atmosphere of everybody kind of

Brig. Gen. Shawn Bratton, then planning lead of the Space Training and Readiness Command Task Force, joined a virtual class at Goodfellow Air Force Base, Texas, on May 17. Bratton visited the base to discuss the future of U.S. Space Force training programs with leadership and Guardians.



Senior Airman Ashley Thrash

looking up to us—or wanting to beat us. It really created a competitive environment.”

His fellow Guardians competed well, pushing for higher physical fitness scores, academics, even cleaner dorm rooms. Parodi estimates his classmates tripled their PT scores by the end of basic and finished in the top three for academics. Were his fellow Space Force trainees stereotypical bespectacled nerdy science kids?

“I wouldn’t say that that’s an incorrect picture,” he said. “We are, I would say, a very nerdy community—a lot of *Monster* [energy drinks], a lot of video games, ... but very intelligent.”

THE GUARDIAN TRAINING PIPELINE

Space Force Guardian trainees will spend about six months between basic training and advanced classes in their career choice: space, cyber, or intel operations, and the sub-discipline where they specialize. Officers can also go into engineering and acquisitions programs.

Guardians may have the opportunity to pass more quickly, however, if the Air Force model of competency-based education and training is adopted for the Space Force. In that scenario, Guardians could soon test out of classes.

“I think the way to do that is to make your training very modular so it’s easy for folks to either go through more quickly or to skip over earlier modules,” Bratton explained. “We’re absolutely trying to build that into our training pipeline.”

STARCOM classrooms already encompass the full spectrum of learning styles. Traditional lectures with a professor at a podium and students taking notes are complemented by hands-on and simulation training.

Bratton described some of the inventive ways the Space Force is leveraging technology.

At Vandenberg, students work through problems with hardware as if communicating directly with a satellite. An officer cadre in another classroom used virtual reality headsets to understand how an adversary threat might present itself.

At the Goodfellow intelligence school, Bratton saw a scenario where intelligence students joined with cyber students from Keesler Air Force Base in Mississippi and space students at Vandenberg, all contributing to problem-solving in a distributed manner.

ORGANIZATIONAL TRAINING

STARCOM envisions advanced training exercises with large force employment, similar to Nellis Air Force Base’s Red Flag, where allied and partner nations practice flying and fighting together as a single team.

Space Force recently hosted “Space Flag,” drawing together space operators, intel professionals, and cyber operators for a week of training. The Schriever Wargames, which explores the military’s use of new space systems, is another a higher-level activity that will fall under STARCOM. “This is where we bring in our international partners,” Bratton said. “Both training and education happens there, as well as just relationship building with international partners, and there we work through more difficult problems, policy issues, classification issues.”

Some advanced education will remain in the hands of the Air Force, such as the weapons school at Nellis Air Force Base in Nevada. Space Force will continue to educate intel and cyber professionals at Nellis, where STARCOM will manage the 328th Weapons Squadron.

CONVERTING NEW GUARDIANS

Developing a Space Force culture in Guardians as they

A Permanent Home for STARCOM

When Space Training and Readiness Command officially stands up, it will comprise all of the former Air Force units related to space training and tactics and range activities. Where STARCOM will put down its roots as a command is still an open question, and local communities are already lining up to make their pitches for why STARCOM should locate near them.

"We absolutely will need to partner with industry and academia," said Brig. Gen. Shawn N. Bratton, STARCOM's first commander. "There's so much activity right now in private industry, in the civil sector, and with our international partners."

Rep. Mike Waltz (R-Fla.), whose district is directly north of Cape Canaveral Space Force Station, Fla., told Air Force Magazine his community is "very interested in the pending STARCOM." Space, he said, "is in our DNA since the 1960s, when Cape Canaveral was built from scratch."

The retired Army Green Beret described the area as the "space triangle," with points in Cape Canaveral, Orlando, and Daytona Beach, where Embry-Riddle Aeronautical University boasts a strong space program.

"The future of space to me is public-private partnerships," Waltz said. "The ... small sat companies, obviously, SpaceX, Blue Origin, OneWeb, you name it, are all there in Florida."

Space Florida's Mark Bontrager, a former commander of the 45th Support Group at Patrick Air Force Base [now Space Force Base] who was involved in the state's bid for Space Command, says all the same strengths apply to STARCOM. A key advantage he points to is the Department of Defense's own recent investments in the National Center for Simulation in Orlando, where simulation, modeling, and training is developed for the Army, Navy, Marine Corps, Coast Guard, and Air Force.

"It's just a hell of a lot cheaper to train people" using simulation, Bontrager said. "That extra piece needs to be brought to bear to support the warfighter ... to be able to win a war in

the space domain. Because our adversaries aren't sitting on their laurels."

Rep. Doug Lamborn (R-Colo.) countered that his district, in Colorado Springs, Colo, should host STARCOM.

"I'm totally convinced that STARCOM should be in Colorado Springs," he said. "The National Security Space Institute (NSSI) is there in Colorado Springs, already at Peterson Air Force Base."

Lamborn emphasized that NSSI is currently providing more advanced training for space warriors, while Vandenberg Space Force Base in California, which is also vying for STARCOM, provides basic level training.

In addition to much of STARCOM's mission already taking place in Colorado Springs, Lamborn said seven of the Space Force's nine deltas are in Colorado Springs, with an eighth up the road at Buckley Space Force Base outside Denver.

"If complex problems arise or topics need to be analyzed or dealt with in detail, the people who are going to most likely have the answer are going to be already in the Colorado Springs area," he said, noting the proximity of instructors for special classes. "All the things that STARCOM is going to be involved in is going to be readily available."

Bratton declined to discuss his view on the specific qualifications for selecting STARCOM's permanent location, but he said excitement is helping to drive interest.

"I'm very excited about this idea, the responsibility to prepare all Guardians to succeed, to succeed in their careers, to be successful in supporting their families, but most importantly, to be successful in the mission to conduct space operations," he said. "It's an incredible challenge, but an incredible opportunity to take these great things that the Air Force has done, these great ideas that these Army and Navy members are going to bring into the Space Force and just turn that into something that's even better than it is today."

enter the military is one thing, but the Space Force now faces a different challenge: helping Soldiers, Sailors, Airmen, and Marines transfer into the Space Force. Developing a Space Force culture for members steeped in other services' histories and giving them a sense of belonging is among the challenges STARCOM must still work through.

The first 50 Guardians to transfer into the Space Force from anyplace other than the Air Force were identified in June. Another 350 will be named by the end of the year. Bratton says the service will take a case-by-case approach in determining what training will be necessary for each of those new Guardians. They don't need to start over from scratch, he said.

"What we do need to give them is the space-specific kind of acculturation training."

The Space Force is building a special course for the inter-service transfers. Follow-on training will be tailored specific to their background and needs.

Space Training and Readiness Command is not a direct corollary to the Air Force's Air Education and Training Command. Indeed, training and education is less than half the command's portfolio. STARCOM will be the Space Force's primary test and range command and will assess new hardware before it is turned over for operational use.

The STARCOM operational test authority evaluates the system capabilities after launch, similar to operation tests


at Edwards Air Force Base, Calif., for the Air Force.

"So the acquirers go and get them, and work with industry to get us the best stuff, STARCOM will wring that out and make sure that it's ready to go for operations before Space Operations Command takes it over," explained Bratton. "At some point you're going to launch it into space, and we want to make sure it works before we turn it over to the operators."

Such tests are currently conducted at Edwards Air Force Base, Calif., and Nellis. The Space Force is envisioning creating its own range and testing infrastructure, with investment comparable to Edwards and the Army's National Training Center at Fort Irwin, Calif.

The difference is that while satellites cannot be tested on conventional ranges, ground stations can be; for space-based systems, STARCOM intends to leverage digital engineering and modeling to simulate testing.

Thinking back on that night years ago, when he stared through the telescope with his father at a tiny satellite trace across the sky, Parodi contemplated his current studies in orbital mechanics. Back then, all he could do was wonder how it got there, how it was controlled. Now he's learning how to do that himself.

"Learning how they do that, it's very gratifying to have had a [question] from way back when I was 7 years old answered in my adult years," Parodi said. "I actually understand the science behind it. It's highly motivating." 

Reimagining the Reaper



The Air Force's MQ-9 Reapers helped change the way we fight. They're not done yet.

Senior Airman Wymdermere Shaw/ANG

The Air Force plans to begin divesting MQ-9 Reaper drones from its inventory, arguing they are not survivable in contested air space. Rather than divest, USAF could adapt the aircraft to a host of other missions.

By Maj. Gen. Lawrence Stutzriem, USAF (Ret.)

Faced with an inventory full of aging equipment, the Air Force is proposing to slash legacy aircraft it believes cannot survive in a high-end fight. The aim is to divert dollars needed to support these legacy platforms to modernization programs. While this approach has not succeeded in the past, leaders still feel it is the last card they have to play, given a cultural unwillingness to demand a greater share of the defense budget pie.

Putting the debate over the wisdom of this approach aside, the recurring plans to prematurely divest the Air Force's fleet of more than 280 combat-proven MQ-9 Reapers are especially concerning. These aircraft are far younger than most of their Combat Air Force counterparts, and their value remains highly relevant. This is the second time the Air Force has pushed this concept forward, but last year Congress pushed back. The reality is that the Air Force needs a range of capabilities and capacity. MQ-9s offer both. Pragmatically, they are also bought and paid for. Given that mission demand is not slated to decrease, the service should focus its attention on how to use existing capabilities in innovative, powerful new ways. Meanwhile, it should also look toward pointed upgrades that increase the value delivered by existing assets.

To this point, rather than focus its efforts on MQ-9 divestiture, the Air Force should instead invest in their survivability,

the resiliency of their command and control systems, and enhance their autonomy and advanced sensing capability. Doing so is in keeping with Chief of Staff Gen. Charles Q. Brown Jr.'s vision. Adapting faster does not obviate the need to adopt smarter, more cost-effective ways to maintain strong deterrence and to fight effectively in future conflicts. Mission demand paired with limited budget resources means doing more with the capabilities the service has on hand. With modest investment, the \$12 billion MQ-9 Reaper enterprise can expand far beyond its current mission portfolio.

UNIQUE ROLE CONTINUES

The Air Force strategy to cut legacy aircraft today to help fund new programs reduces capacity that remains in high demand. The service is accepting increased risk in the intermediate term on the bet that it can transform the overall force in the long term. The problem with this approach is that the service fundamentally doesn't control mission demand—that card lies with the adversaries. And at present, despite what's convenient on a budget spreadsheet, mission demand for a wide range of missions at the low- and mid-tier level is not falling. That is why Gen. Stephen J. Townsend, commander of U.S. Africa Command, and Gen. Kenneth F. McKenzie Jr., commander of U.S. Central Command, are among the most concerned about how a shrinking Reaper force threatens their ability to prevent insurgents and terrorists from expanding influence across multiple regions. It's about putting out the

proverbial brush fires before they become major conflagrations. The rapid rise of ISIS stands as “Exhibit A” in this regard. Even today, there are too few Reapers to support surging operational requirements.

Importantly, these requirements are unlikely to decline following the U.S. withdrawal from Afghanistan. Long-endurance platforms executing over-the-horizon ISR will be critical to keeping tabs on terrorist groups and their activities in Afghanistan and elsewhere. The MQ-9 is the only platform that can deliver both persistent ISR and, when necessary, strike at no risk to aircrews. The Reaper boasts the lowest cost-per-flying-hour of any high-end combat aircraft.

STEALTHY ALTERNATIVES

While the Air Force has dabbled with thoughts of a stealthy Reaper replacement that could operate in contested threat environments, its actual commitment is unclear. The Air Force published a Request for Information (RFI) seeking insight from industry for a future Next-Generation Multi-Role Unmanned Aerial System Family-of-Systems. The aim appears to be to absorb the MQ-9’s functionality into a broader concept that includes an MQ-Next. But an RFI falls well short of a plan or a program. Recent statements by service officials suggest there is no present funding behind this effort, and a path forward remains unclear. Oversight entities are concerned regarding this muddled vision, with a 2021 House Committee on Appropriations report calling the Air Force’s decision to end Reaper production premature. That is a major reason why they rejected retirement plans, noting that USAF investment in a replacement aircraft was lacking.

Indeed, funding a Reaper replacement in the near-term seems unlikely; the Air Force is already struggling to find funding for big-ticket modernization programs like the B-21 bomber, KC-46 tanker, F-35 fighter, T-7 jet trainer, a UH-1 replacement, the Ground Based Strategic Deterrent (GBSD), the Advanced Battle Management Systems (ABMS), and a Next-Generation Air Dominance family-of-systems.

With the acquisition plate overflowing and money running thin, killing Reaper without a replacement poses imprudent

risk. Not only do these aircraft execute traditional missions against adversaries like ISIS, al-Qaeda, and the Taliban, but they also can meet important mission demands further up the threat ladder. While it’s true that an MQ-9 will not survive over downtown Beijing amid the most advanced air defense systems, that cannot be the ultimate arbiter regarding what is in the Air Force inventory or not. The reality is that there are a range of demands, and types like the MQ-9 can execute certain missions and take on more risk to free up our most capable assets, like the F-22, F-35, B-2, and B-21, so they can focus their efforts where they will count the most. Burning down hours on these airframes—of which the Air Force has far too few—simply does not make sense. The service already owns aircraft more affordable to fly and replace that can meet mission demand.

Added to this, the service can also explore how to increase the MQ-9’s survivability so that it can meet an ever-broader swath of demand. As Air Force Secretary Frank Kendall stated during confirmation hearings before the Senate Armed Services Committee in May 2021, “We have made a big investment in that platform [MQ-9], and it would be a shame to not be able to utilize it against more sophisticated threats.”

CASE IN POINT

To those who say retaining MQ-9 is unaffordable, it’s important to assess the cost of Plan b. To this point, the Air Force recently procured a half-billion-dollar fleet of E-11 manned business jets to carry a communications package that relays data between airborne platforms that cannot normally share information. While this was a less expensive approach than designing a military-unique aircraft, MQ-9 Reapers already in the inventory could do this mission at a substantially lower cost, provide higher mission capable rates, and stay on station multiple times longer to provide greater persistence than the business jets. Using unmanned systems would also free up a squadron of jet pilots, easing the Air Force’s chronic pilot shortage, which has remained stubbornly around 2,000 for several years. Reapers flying this communication mission would also not engage the ISR and strike operators needed for

Agile Combat Employment is well suited to the Reaper’s Automatic Takeoff and Landing Capability, which enables operators to fly the drones from Creech Air Force Base, Nev., while deploying only skeleton ground crews to service them in theater.



Staff Sgt. Omari Bernard



Airman 1st Class William Rio Rosado

Long-endurance drones like the Reaper could be adapted to carry air-to-air interceptors or directed energy weapons to counter air and missile threats to remote U.S. bases. Unmanned MQ-9s could perform this mission at a fraction of the cost of manned fighter aircraft.

typical ISR missions. Rather, the aircraft's technical maturity would allow for more autonomous operations, with a single ground station and operator controlling multiple aircraft. This offers a key advantage: commanders could accept more risk in forward areas when tensions escalate because pushing a Reaper forward would not put a pilot or other Airmen at risk.

Former Air Force Assistant Secretary of Acquisition Will Roper said that the more an MQ-Next can take on, the "less we're having to spend for those missions [that are] otherwise generating an asset bill for the Air Force." Although Roper's logic was sound, it applies just as much to the MQ-9 today as it did for MQ-Next. A modest additional investment can ensure the MQ-9 remains a viable, multi-mission platform for the next two to three decades. Programs involving the Air National Guard, Air Combat Command, and Air Force Special Operations Command have already opened the horizon for new uses of the Reaper.

WIDE-AREA SURVEILLANCE

The E-11 example is not the only area where an MQ-9 could provide better mission effect at lower cost. The Reaper can also add value in the wide-area surveillance mission. Both Russia and China have been expanding their dominance over the "gray zone" adjacent to their territory, which they wish to control. Their approach exploits the time and distance U.S. forces face when operating far from U.S. territory. AFA's Mitchell Institute's Mark Gunzinger and Lukas Autenried highlight this fait accompli approach in a recent report, explaining: It results in "an escalation dilemma that effectively coerces the United States and its allies into accepting the new status quo."

Early warnings and indicators, therefore, are critical to stopping such an action before it can start. They are a vital component to executing effective deterrence measures and contribute tremendously when juggling complex scenarios, where rolling back hostile action could risk all-out war. Just

look at what Russia has done in Crimea, and China in the South China Sea. The United States and its allies are fundamentally opposed to these unilateral territory grabs, but are they willing to go to war over them? Thus far, the answer is no. We need to present policy officials with a better set of options, and early warning is a clear part of that solution path.

To this point, the Center for Strategic and Budgetary Assessments in 2020 proposed a concept called deterrence by detection, which asserts that influencing an adversary's decision calculus "will require an intelligence, surveillance, and reconnaissance (ISR) network composed of systems that are cost-effective, persistent, and interoperable with a broad array of allies and partners." This will require capabilities that can conduct long-duration surveillance operations, rather than predictable episodic monitoring that adversaries can react to in order to mask their actions. As already established, long-endurance unmanned aircraft such as MQ-9 Reapers that could host payloads of upgraded active and passive sensor technology to provide wide-area ISR data are ideal for this mission.

AIR AND MISSILE DEFENSE

Defending forward bases is also another area where MQ-9s could add distinct value. The spectacular performance of American airpower during Operation Desert Storm, Bosnia, Kosovo, and the opening phases of Operations Enduring Freedom and Iraqi Freedom drew notice from potential adversaries around the world. As future Vice Chairman of the Joint Chiefs of Staff Adm. James A. Winnefeld asserted in a 1994 RAND research brief, "Airpower had demonstrated most convincingly that—skillfully employed under the right conditions—it can neutralize, if not completely destroy, a modern army in the field."

From 1990 forward, China and Russia both developed capabilities and warfighting strategies designed to blunt the

U.S. Air Force's ability to surveil, hold at risk, or destroy targets globally. A huge component of this centered upon attacking U.S. and allied bases throughout the Indo-Pacific region.

Responding to this threat demands a new layered and integrated approach to base and area missile defense. The MQ-9 could become a key component in this regard, given that it already has sufficient payload capacity, space, and power to integrate advanced AESA radars and other electronic systems. Long-endurance RPAs [remotely piloted aircraft] can also carry kinetic air-to-air interceptors and directed energy systems capable of destroying multiple air and missile threats launched at the U.S. military's forward bases and forces. New operating concepts and capabilities that harness the capability advantages of RPAs—including the Air Force's MQ-9 Reaper force—are needed to ensure these bases will survive an enemy's first blow to generate war-winning combat power. Importantly, the MQ-9 can take on this new use more effectively and at a fraction of the cost of manned aircraft.

To those who question the cost of such an investment, it's important to ask the inverse: what's the cost of failing to do this? A force destroyed on the ground in fast order would cede immediate victory to the opponent, especially given that the United States divested the majority of its attrition and lost forces following the Cold War as a budget efficiency measure.

MARITIME AND LITTORAL OPERATIONS

A U.S. joint force exercise in September 2020 offered a glimpse into a likely future scenario for remotely piloted aircraft in the realm of maritime operations. During exercise Agile Reaper at Naval Air Station Point Mugu, Calif., three MQ-9 Reapers from the Air Force's 29th Attack Squadron identified targets, conducted mock airstrikes, and provided a common operating picture for air and maritime forces. In this execution, they also covered vast swaths of territory flying hundreds of miles an hour, not 20 knots as would a vessel at sea. Working collaboratively with Navy Third Fleet and Marine Corps personnel, the Airmen taking part in Agile

Reaper demonstrated how the Reaper could contribute to maritime domain awareness. Netting an effect *at sea* does not mean having to operate *on* the sea. In a conference with journalists after the exercise, Lt. Col. Brian Davis, commander of the 29th Attack Squadron, highlighted the strategic benefits of the project. "We've only scratched the surface of the MQ-9's capability," he said. "We are transitioning to an ability to generate combat airpower anywhere, to include the maritime domain, and we are tactically quite good at it."

Exercise Agile Reaper also demonstrated the Air Force's ability to rapidly deploy MQ-9s to austere locations in a maritime setting. Technological enhancements could further reduce the deployed manpower needed to operate the Reaper, enabling operations from a more dispersed, small-footprint basing posture.

COMMUNICATIONS RELAYS

In a mission similar to the E-11 one earlier cited, RPAs can also offer mission value when it comes to facilitating line of sight (LOS) communications—operations that can pose a significant challenge in mountainous terrain. The lack of real-time line-of-sight communications hinders commanders' ability to communicate and direct their forces. The problem only gets worse when incompatible communications systems are involved or where satellite communication is either inaccessible or denied by an enemy.

RPAs could be adapted into sophisticated communications nodes, expanding networks' reach at the edges of the battlespace and acting as waveform translators.

ARCTIC DOMAIN AWARENESS

While MQ-9s are best known for operating in the Middle East and Central Asia, they also offer distinct value in the Arctic, where the rise in temperatures over the past decade has increased competition among Russia, China, and the United States for trade routes, natural resources, and military access. Equipped with extremely minimal assets capable of operating



Major Tiffany (last name withheld for security reasons), 29th Attack Squadron assistant director of operations, recovers a MQ-9 Reaper during Exercise Agile Reaper April 21, 2021, on San Clemente Island, Calif. Exercise Agile Reaper operations began at Point Mugu Naval Air Station, Calif., where MQ-9s rapidly deployed to San Clemente Island, testing the agility of the MQ-9's capabilities.

Senior Airman Kristin Weatherly

in Arctic conditions, the U.S. Navy and Coast Guard have few ways of detecting potential threats in the polar regions. On top of this, crews on these vessels are generally fighting to survive amid the brutally harsh conditions. This limits the attention they can spend focused on the mission. It also limits the speed and reach of their operations.

In a September 2020 lecture, former U.S. Coast Guard Commandant Adm. Paul F. Zukunft described the nation's "significant domain awareness challenges ... in the high latitudes." He recounted one incident in which a Coast Guard cutter on patrol discovered a joint Russian and Chinese exercise near Kamchatka that was taking place without any awareness among the U.S. Intelligence Community.

By harnessing the attributes of speed, reach, endurance, and range, the Reaper could be an attractive option for improving Arctic domain awareness. It comes down to surveying thousands of miles in a few hours without putting a human crew at risk. Real-time data links afford instant situational awareness. In 2016, General Atomics tested an extended-wing Reaper that increased loiter time from 27 to more than 40 hours. Redirecting and adapting some Reaper capacity for this new use would fill a serious gap in U.S. domain awareness in the Arctic. Increased awareness yields better options for policy leaders and reduces the risk of surprise.

DEFENSE AGAINST CRUISE MISSILES

As with air base defense, RPAs can also help defend the homeland from missile attacks. In March 2021, Air Force Gen. Glen D. VanHerck noted that Russia can now launch very-long-range cruise missiles from their own airspace to strike targets in the U.S. homeland. That will pose a significant challenge to U.S. missile attack warning systems. He noted that, without the ability to detect cruise missile attacks before or at the point of launch, the chances of stopping an attack are greatly reduced.

MQ-9s, however, could offer a radically new approach to air defense. The Ghost Reaper initiative defines a new operating concept to conduct wide-area surveillance, process information as it's collected, and provide early warning of potential cruise missile attacks. This concept would leverage technologies and concepts within JADC2 and ABMS and accelerate their transition to address a requirement that is critical to the defense of the U.S. homeland. During periods of heightened tensions, a web of RPAs could extend air domain awareness into the Arctic to give U.S. commanders more time to make decisions than relying solely on end-game missile defenses. It would also provide an airborne capability that adds resiliency to the current architecture of fixed radar sites that are more vulnerable to being suppressed or destroyed by attacks. Ghost Reapers could also perform the battle manager role when teamed with Air National Guard fighter interceptors and could be armed with its own air-to-air interceptors, bringing additional firepower to the mix. Finally, Ghost Reapers could do all this at a fraction of the cost of manned aircraft.

DEFENSE SUPPORT OF CIVIL AUTHORITIES

Some 14 Air National Guard units in 11 states conduct MQ-9 Reaper operations, contributing to operational RPA missions overseas, as well as supporting domestic civil agencies with emergency response. The adaptability of the Reaper means the Air Force and the Air National Guard can further expand the ways it can be used to detect and mitigate the effects of natural disasters and other manifestations of the changing climate.

RECOMMENDATIONS

Before the Air Force is allowed to cut short MQ-9 production and plan for the retirement of these aircraft, it must explore the potential to use it in new and innovative ways well into the future:

1. DOD should fund the integration of a self-protection capability on the MQ-9 so it can operate in contested environments. Despite millions of hours of combat operations, the Air Force has not integrated awareness/protective capabilities on the MQ-9A, such as those found on other fourth-generation combat aircraft. Survivability solutions are readily available with self-protection pods that provide MQ-9As survivability against infrared and radio frequency guided threats in contested environments.

2. Congress should direct DOD to conduct a study on new uses for MQ-9 Reapers. DOD should analyze the potential to use MQ-9 Reapers through 2040 in new ways that can help fill critical gaps in capability and capacity.

3. Conduct a cost-per-effect assessment. Congress should direct a cost-per-effect assessment of the MQ-9 Reaper that looks at both current missions and proposed new uses through 2040, comparing those costs to other weapons systems competing for the same work.


4. Expand the Air National Guard Ghost Reaper Program. The Air Force should expand the Ghost Reaper initiative to accelerate the fielding of JADC2-associated capabilities.

5. USNORTHCOM and NORAD should assess the viability of using an airborne network of RPAs to improve detection and engagement of Russian cruise missile attacks. A strategic imperative exists to solve critical gaps in homeland cruise missile defense. An advanced network of RPAs may be a near-term alternative that is both effective and affordable.

6. Protect the Air Force's RPA community. Airmen, civil employees, contractors, and others in the MQ-9 Reaper community are ideally suited to help the Air Force migrate toward its planned future force of semi-autonomous and autonomous unmanned systems empowered by artificial intelligence and capable of teaming with manned aircraft. The history of RPAs is one of continuous innovation, and the Airmen who successfully made those innovations are extraordinarily valuable. There is no better argument for continued investment in the MQ-9 than the value of its warfighters. Congress should direct the Air Force to formulate a long-term personnel resource plan to cultivate and protect the Air Force RPA community from being undermined by aircraft modernization and short-term budget choices.

CONCLUSION

Not all weapons systems seen as vulnerable in contested airspace are truly obsolete. The Air Force's own history shows how remarkably adept Airmen are at using existing capabilities in new ways. Killing the MQ-9 Reaper without exploiting its potential for new uses would be a blow to America's airpower advantage.

In remarks to the Air Force's 2019 RPA squadron of the year presentation, Air Force Deputy Chief of Staff for Operations Lt. Gen. Joseph T. Guastella asserted that the MQ-9 Reaper changed the character of warfare. Now it is time for the Reaper community to elevate their game for peer-on-peer competition. In this era of heightened threats, and facing the reality of a Taliban-controlled Afghanistan, the Air Force's RPA enterprise is hardly a legacy force. It is more relevant today than ever before. 

Updates on AFA's activities, outreach, awards, and advocacy.

AFA Honors WWII Bombardier

Lt. Armand Sedgeley was a WWII B17 bombardier who flew 38 missions from North Africa and Italy. More than 50,000 Airmen gave their lives in the brutal fight over Nazi Germany. In all humility we can never thank and honor him enough for his selfless, exemplary courage. As General Doolittle founded our Air Force Association 75 years ago, we will never forget and never stop advocating for our Airmen and Guardians—of all ages!



Lt. Armand Sedgeley was on a mission to destroy enemy supplies at a rail yard near Verona, Italy, when his B-17 came under fire from a German Messerschmidt Bf 109. It was Valentine's Day, 1944, and Sedgeley, a bombardier, survived the attack that killed three crew members instantly and fatally wounded another.

Along with his navigator, Sedgeley took up a machine gun position, returning fire and managed to shoot down the German aircraft, while their pilot aimed the badly damaged B-17 toward an Allied airstrip in Corsica, France. When he realized the strip was too short for the big bomber, he ditched into the Mediterranean Sea.

AFA President Lt. Gen. Bruce "Orville" Wright visited Sedgeley recently in Colorado Springs, Colo., presenting the surviving hero with an AFA 75th anniversary coin. "It's a small token of thanks for a man who may never get the recognition he truly deserves," Wright said.

Three of Sedgeley's fellow survivors were awarded the Silver Star Medal for their actions that day. Sedgeley believes his squadron approved the honor for him as well, but the paperwork was lost, and he never received the award.

The story might well be forgotten if not for John Fine, a deep-sea diver who explored the sunken B-17, and is now leading an effort to recognize Sedgeley with the Silver Star while he's still alive. Such a recognition at this late date would be nearly unprecedented. Without original records—Sedgeley's personnel file, along with those of millions of others, was lost in a 1972 St. Louis warehouse fire—documentation is hard to come by. But Fine continues to advocate for awarding the 99-year-old survivor the Silver Star. "USAF rejected it," he said. "No live witnesses, no record. He did not get it at the time, therefore [they] will not give it to him now."

But Fine and others, including AFA Texoma Region President Paul Weseloh, continue to work the issue, and Colorado Sen. Cory Gardner, has also voiced his support. To find out more about how you might help, contact Weseloh at texoma.president@afa.org.

US Postal Service Statement of Ownership, Management, and Circulation

1. Publication Title: Air Force Magazine
2. Publication Number: 0730-6784
3. Filing Date: Sept. 29, 2021
4. Issue Frequency: Monthly, except for two double issues, Jan./Feb. and Jun/July.
5. No. of Issues Published Annually: 10
6. Annual Subscription Price: \$50.00
7. Complete Mailing Address of Known Office of Publication (not printer): 1501 Lee Highway, Suite 400, Arlington, VA 22209-1198. Contact Person: Eric Chang Lee. Telephone: 703-247-5849
8. Complete Mailing Address of Headquarters or General Business Office of Publisher (not printer): 1501 Lee Highway, Suite 400, Arlington, VA 22209-1198
9. Full Names and Complete Mailing Addresses of Publisher, Editor, and Managing Editor: Publisher: Bruce A. Wright, 1501 Lee Highway, Suite 400, Arlington, VA 22209-1198; Editor: Tobias Naegele, 1501 Lee Highway, Suite 400, Arlington, VA 22209-1198; Managing Editor: Juliette Kelsey, 1501 Lee Highway, Suite 400, Arlington, VA 22209-1198
10. Owner: Air Force Association, 1501 Lee Highway, Suite 400, Arlington, VA 22209-1198
11. Known Bondholders, Mortgagees, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages, or Other Securities: None
12. Tax Status (For completion by nonprofit organizations authorized to mail at nonprofit rates): Has not changed during preceding 12 months
13. Publication Title: Air Force Magazine

14. Issue Date for Circulation Data Below: Sept. 1, 2021		
15. Extent and Nature of Circulation	Average No. Copies Each Issue During Preceding 12 Months	No. Copies of Single Issue Published Nearest to Filing Date
Monthly Journal of the Air Force Association		
a. Total Number of Copies (net press run)		
b. Paid Circulation (by mail and outside the mail)		
(1) Mailed outside-county paid subscriptions stated on PS Form 3541 (include paid distribution above nominal rate, advertiser's proof copies, and exchange copies)	58,503	56,506
(2) Mailed in-county paid subscriptions stated on PS Form 3541 (include paid distribution above nominal rate, advertiser's proof copies, and exchange copies)	0	0
(3) Paid distribution outside the mails including sales through dealers and carriers, street vendors, counter sales, and other paid distribution outside USPS	421	380
(4) Paid distribution by other classes of mail through the USPS (e.g., first-class mail)	0	0
c. Total Paid Distribution [sum of 15b (1), (2), (3), (4)]	58,924	56,886
d. Free or Nominal Rate Distribution (by mail and outside the mail)		
(1) Free or nominal rate outside-county copies included on PS Form 3541	0	0
(2) Free or nominal rate in-county copies included on PS Form 3541	0	0
(3) Free or nominal rate copies mailed at other classes through the USPS (e.g., first-class mail)	0	0
(4) Free or nominal rate distribution outside the mail (carriers or other means)	61	61
e. Total Free or Nominal Rate Distribution [sum of 15d (1), (2), (3), (4)]	61	61
f. Total Distribution [sum of 15c and 15e]	58,985	56,947
g. Copies Not Distributed	5,302	6,192
h. Total [sum of 15f and g]	64,287	63,139
i. Percent Paid [15c / 15f x 100]	99.90%	99.89%
16. Electronic Copy Circulation	16,241	28,683
a. Paid electronic copies		
b. Total paid print copies (15c) + paid electronic copies (16a)	75,165	85,569
c. Total print distribution (15f) + paid electronic copies (16a)	75,226	85,630
d. Percent paid (both print & electronic copies) (16b / 16c x 100)	99.92%	99.93%

17. Publication of Statement of Ownership
If the publication is a general publication, publication of this statement is required. Will be printed in the October 2021 issue of this publication.

18. Signature and Title of Editor, Publisher, Business Manager, or Owner: Eric Chang Lee (signed), Production Manager. Date: Sept. 29, 2021

I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits material or information requested on the form may be subject to criminal sanctions (including fines and imprisonment) and/or civil sanctions (including civil penalties).

Texas Civil Air Patrol Siblings Earn Spaatz Award

By Bob Gehbauer

Two brothers in the Civil Air Patrol's Redbird Composite Squadron were simultaneously awarded CAP's highest cadet honor, the Gen. Carl A. Spaatz Award, on May 23. They are among just 87 active recipients of the award and the rank of Cadet Colonel.

Cadet Col. Jacob Brown completed his requirements on Aug. 22, 2020, and his older brother, Cleveland Brown Jr. followed on Feb. 27, 2021. Due to COVID-19 restrictions, the award ceremony was delayed, allowing the two brothers to be recognized together.

It takes an average of five years to progress through 16 achievements and earn the Spaatz Award, including developing self-discipline, personal responsibility, the ability to lead and persuade, and the foundation for a future career in aviation, space, or technology. The final step is a rigorous four-part exam, testing physical fitness, moral reasoning, leadership, and aerospace education.

CAP is a family affair for the Browns. The cadets' father, Capt. Cleveland Brown Sr., is the squadron's commander, and their mother, 1st Lieutenant Shemitia Brown, is a cyber education and personnel officer for the Redbird Composite Squadron.

Retired Lt. Gen. John Campbell, president of AFA's Seidel Chapter in Dallas, Texas, presented the Spaatz Award certificates, noting that he knew the first-ever Spaatz Award recipient, the late Col. Douglas C. Roach. Former President George W. Bush



Civil Air Patrol

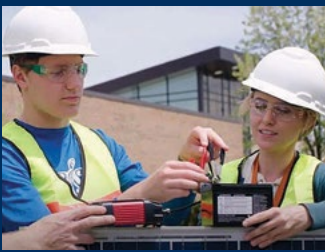
The Brown brothers accept CAP's highest cadet honor flanked by their parents. Pictured left to right are: Lt. Gen. John Campbell; Renee Edwards (Texas' 30th Congressional District Director); 1st Lt. Shemitia Brown; Cadet Col. Jacob Brown; Cadet Col. Cleveland Brown Jr.; and Capt. Cleveland Brown Sr.

sent a congratulatory letter for the occasion, a recognition made possible because Captain Brown had served on Bush's Secret Service detail.

Cleveland Jr. graduated in June from Lakeridge High School and has entered the United States Coast Guard Academy; Jacob has begun his junior year at Lakeridge High and hopes to follow in his older brother's footsteps. ★



The Air Force Association is proud to cultivate tomorrow's leaders through grants, awards, and scholarships.



Learn more about our programs and sponsorship opportunities at [AFA.org/education](https://www.afa.org/education)

Generously Sponsored by:



OUTSTANDING AIRMEN OF THE YEAR

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



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

SMSgt. Mark R. Schneider II

Paving & Construction Senior Enlisted Leader
200th Red Horse Squadron, Camp Perry, Port Clinton, Ohio (ANG)
Home of Record: Temperance, Mich.

SMSgt. Mark Schneider led a 109-member personnel team delivering a \$160 million life-support area in support of Operation Inherent Resolve. Supervising the foreign operating base build-



out, he streamlined the delivery of 17 construction projects, providing beddown for 3,000 personnel and three combatant commands. His knowledge and experience expedited the multi-national acquisition of \$3.2 million

in project materials, accelerating the \$13.1 million project portfolio two months ahead of schedule. He steered the construction of two airfield upgrade projects supporting 49 aircraft valued at \$25 billion and spearheaded a NCO leadership course, instructing 37 personnel, amplifying squadron leadership expertise.

SMSgt. Marcus D. Banks

Installation Management Flight Superintendent
316th Civil Engineer Squadron (PACAF)
Home of Record: Joint Base Andrews, Md.

SMSgt. Marcus Banks led 162 engineers in the sustainment of 1,000 facilities and Kunsan Air Base, South Korea's, power projection platform. His actions propelled 6,000 multinational F-16 sorties that helped quell North Korean aggressions. He led a tiger team and developed a strategic plan for 38 dormitories, which resolved



5,000 repairs and 178 emergencies. His leadership closed five congressional inquiries and upheld the quality of life for 2,800 joint service members. He advanced the wing's coronavirus defense plan, driving two courses of action

and delivering 2,000 restriction of movement rooms. His efforts isolated 1,000 threats with zero base spread and safeguarded 4,200 warfighters. As the unit control center superintendent through four exercises and three typhoons, his team proved the wing's base and airfield recovery capabilities and restored base operations within seven hours.

MSgt. Hannah E. Walters

Operations Superintendent
67th Special Operations Squadron, RAF Mildenhall, U.K. (AFSOC)
Home of Record: Rochester, Ill.

MSgt. Hannah Walters led a 91-member team during a multinational exercise where she showcased United States and partner nation interoperability. Her leadership helped cement NATO alliances and counter adversarial efforts within the European theater. Additionally, Walters orchestrated a remote-area survey and certified one forward



area refueling point, two drop zones and eight base facilities, paving the way for European Command (EUCOM) to operate in the Arctic region. She also provided command and control for 24 air and maritime assets during a search and rescue mission. She drove a CV-22 exercise that validated the wing's afloat forward staging capability, and Walters also excelled academically

by completing a bachelor of science degree and the Joint Special Operations University's enterprise management course, where she earned honor graduate recognition.

TSgt. Kelli A. Floyd

Infrastructure Section, NCOIC
20th Contracting Squadron, Shaw Air Force Base, S.C. (ACC)
Home of Record: Loogootee, Ind.

TSgt. Kelli A. Floyd was the sole enlisted unlimited contracting officer in Air Combat Command. She used her expertise to establish the Department of Defense's first ever micro-grid, a ground-



breaking contract worth \$24 million and providing 100 percent energy resilience for the 15th Air Force, Air Force Central Command, the 20th Fighter Wing, and all mission partners for the next 20 years. As noncommissioned officer in charge she led a pandemic support team that sourced personal protective equipment for 7,000 people and established the Air Force's

first contract for protective face coverings, three days before the Department of Defense mandate. She was short-notice tasked to attend the Noncommissioned Officer Academy, where she led her flight of 15 members through a five-week virtual course and was named distinguished graduate.

TSgt. Christopher M. Bennett

Air Traffic Control Instructor

334th Training Squadron (AETC)

Home of Record: Sheppard Air Force Base, Texas

TSgt. Christopher Bennett excelled as a deployed Combat Airspace Manager for a special operations' detachment in direct support of Operation Inherent Resolve. He fused conventional



and special operation tenets while integrating airpower assets into 10 international strike packages. Bennett sterilized tactical airspace for 29 special force raids while developing anti-drone weapon employment safety procedures. Additionally, he secured 3,100

commercial flights through hostile airspace from Turkish and Russian airstrikes. Bennett's efforts enabled and enhanced kinetic, nonkinetic, and intelligence collection operations throughout Iraq and Syria, which led to the capture of 14 high-value targets and eliminated 94 enemy combatants. He was awarded the Army Combat Action Badge for his role in the coalition preparation and response to the Iranian missile attack on United States bases in Iraq, culminating in a Bronze Star Medal nomination. He received presidential list honors while working on his advanced degree, completed a second CCAF [Community College of the Air Force] degree in Instructor of Technology and Military Science, and garnered the John L. Levitow award upon graduation from the Noncommissioned Officer Academy.

TSgt. Justin D. Bennett

Anti-terrorism Program Manager

RAF Lakenheath, U.K. (USAFE-AFAFRICA)

Home of Record: Orlando, Fla.

TSgt. Justin Bennett superbly managed the United Kingdom's largest anti-terrorism program by directly contributing to 42 force protection projects valued over \$22 million, while being the wing's focal point for anti-terrorism measures for the Chief of Staff's initiative of accelerating change through agile combat employment. His actions fused the wing's first agile combat employment mission with United States allies, enabling 4,700 sorties for USAFE's largest fighter wing. Bennett's commitment to excellence, personally and professionally, led to his selection by his peers to be the wing's 5/6 vice president. He mentored 2,000 peers and piloted six profes-



sional development courses while completing 18 credit hours to finalize his master's degree in Intelligence Studies. He guided three Air Force site-activation task forces by coordinating 54 anti-terrorism security designs to construct a \$3 billion F-35 campus for the arrival of EUCOM's first fifth-generation aircraft, which culminated in his selection as the Air Force's security forces support staff noncommissioned officer of the year.

SSgt. Kristy L. Riley

Training Supervisor

924th Maintenance Squadron, Davis-Monthan Air Force Base, Ariz. (AFRC)

Home of Record: Escondido, Calif.

TSgt. Kristy Riley served as the training supervisor for 189 Total Force munitions Airmen. At the same time, she filled the squadron unit training manager role for two squadrons with 741 personnel, scheduled 656 courses and achieved a 99 percent current rating, the best in a 2,589 member maintenance group. Riley's ingenuity was instrumental in overcoming a four-month backlog



due to coronavirus travel restrictions, during which she taught nine virtual courses and trained seven non-local Air Force reservists on 84 training tasks. She networked four field training detachment missile courses for 24 Airmen, eliminating a six-year certification shortfall, while saving \$10,000 in

travel costs. Her overhaul of the combat munitions training program, revision of the local explosive safety course, and oversight of the flight's upgrade program resulted in her being awarded a superior performer and superior team award during the 2020 Air Combat Command unit effectiveness inspection. Riley is credited with saving two civilian lives by coordinating the pulling of a drowning victim and a second failed rescuer to land and administered first aid.

SSgt. Valerie M. Graw

Cyber Operations Controller

88th Communications Squadron Cyber Operations Center (AFMC)

Home of Record: Wright-Patterson Air Force Base, Ohio

SSgt. Valerie Graw led nine personnel and steered cyber operations for Wright-Patterson Air Force Base during the coronavirus pandemic. Her team resolved 5,800 network outages and enabled the increase in Air Force virtual private network users from 60,000



to 428,000, which resulted in her selection as Air Force Materiel Command's 2020 Cyber Systems Airman of the Year. Additionally, as the installation sole maintenance tracking system administrator, she created and managed accounts for 400 users

and eight Air National Guard units. Her actions protected \$6 million in information technology assets and shielded the Department of Defense's second-most attacked network. Finally, she earned her CCAF degree in Information Systems Management and graduated Airman Leadership School in the top 10 percent, garnering distinguished graduate and academic achievement awards.

SSgt. Colleen F. Mitchell

Aerospace Medical Technician

Uniformed Services University of the Health Sciences/AFELM
Med DOD (AFDW)

Home of Record: Land O' Lakes, Fla.

SSgt. Colleen Mitchell was the sole aerospace medical technician assigned to Manda Bay, Republic of Kenya, in support of Operation Octave Shield. She risked her personal safety to assist



USAF establishing a casualty collection point during the first ever Al-Shabaab attack on a U.S. military base in Kenya. She activated and led a team of four augmented medical personnel to provide immediate triage and assessment for predicted casualties upon direct impact

of 10 confirmed mortar attacks, 38 rocket-propelled grenades, and numerous small arms fire exchange at the camp compound and the airfield. She courageously provided emergent prolonged field care for more than 16 hours, assisting in stabilization of two critical and four acute stress casualties. Mitchell also flawlessly executed Manda Bay's first walking blood bank, where she pre-screened 12 individuals for stand-by donation.

SSgt. Alex M. Sandmann

NCOIC, Electronic Security Systems

Air Force Global Strike Command, Minot Air Force Base, N.D.
(AFGSC)

Home of Record: Carrollton, Ga.

SSgt. Alex M. Sandmann leads two Airmen and directs the testing and maintenance of over 7,100 sensors located in the WSA [Weapons Storage Area] and flight line. His team ensures the protection of 89 sectors, 25 B-52 Stratofortress, and 21 facilities valued at \$5.5



USAF billion. He organized a fix action for four badging systems by coordinating with six organizations eliminating the need to reissue 3,000 badges. Sandmann's ingenuity led to the development of three alarm-testing tools that cut average

testing time by 50 percent, saving 2,400-man hours annually. He oversaw the installation of a \$1.7 million temporary alarm system during the WSA upgrade, cutting posting by 80 percent. He earned his CCAF in criminal justice, was awarded the Airman Leadership School Commandant and Distinguished Graduate Awards, and completed the Electronic Security System Manager's course, earning his special experience identifier.

SrA. Jamonica M. Smith

Raven Team Member

Air Mobility Command, Joint Base McGuire-Dix-Lakehurst, N.J. (AMC)
Home of Record: Wadesboro, N.C.

SrA. Jamonica Smith led Raven and fly-away security teams for the deactivation of four forward operating bases in Afghanistan, contributing to the United States and Taliban peace treaty. She conducted a humanitarian mission in support of the United States Agency for International Development where she ensured the safe delivery of 370,000 pounds of coronavirus equipment and



USAF medicine, improving the quality of life for Yemen's locals. While deployed, she directed 34 special operations and aircrew members during a ground attack in Forward Operating Base Shank. Her fearlessness enabled a combat evacuation, protecting numerous

lives and \$167 million in Department of Defense assets. She also volunteered countless hours as a domestic violence response team member where she staffed crisis support lines for more than 80 hours and instructed five training seminars in efforts to mitigate the impacts of abuse in the local community.

SrA. Giovanni Pacheco

Career Development Journeyman

50th Force Support Squadron, Schriever Air Force Base, Colo.
(Airmen support of USSF)

Home of Record: Chicago

SrA. Giovanni Pacheco led a three-member team to ensure 1,800 personnel actions were completed on time. Additionally, he directed 30 permanent change of stations amid a global pandemic,



USAF ensuring mission critical personnel arrived at their next station. Airman Pacheco's expertise led him to drive the first-ever virtual Enlisted Forced Distribution Panel with 138 eligible members and 23 allocations. He also revamped the wing's

Duty Status FAM, which certified 64 POCs enabling satisfactory program health. Pacheco energized professional development courses and instructed in-house training to 135 Airmen across the installation. Senior Airman Pacheco was chosen for the Air Force Cycling Team to support the Air Force's "We Are All Recruiters" program in the Annual Great Bicycle Ride Across Iowa with an attendance of 15,000 members, during which he completed 510 miles.

By John T. Correll

NO OTHER WAY

When Steven Bennett made his decision, he was well aware that no pilot had ever ditched an OV-10 and survived.

In the spring of 1972, the United States was well along on its withdrawal from the Vietnam War. Only one large Army unit was still there, and it was getting ready to go home. Remaining U.S. strength consisted mostly of Air Force and Navy airpower and a dozen U.S. naval vessels in the Tonkin Gulf.

North Vietnam saw an opportunity and made a radical change in strategy, departing from its customary insurgency-style warfare to instigate a major conventional operation, the "Easter Offensive." The main fork of it pushed directly across the Demilitarized Zone into Quang Tri province.

The invaders captured Quang Tri and advanced toward Hue, a strip known to the French in years past as the "Street Without Joy." American fliers called it "SAM-7 Alley" because of the proliferation of the Soviet-built shoulder-fired missiles. It was deadly, especially against low and slow aircraft.

South Vietnam launched its counteroffensive in June. Late on the second day, June 29, a South Vietnamese platoon was in trouble, under attack by a North Vietnamese force of several hundred.

The call for help went to Capt. Steven L. Bennett, 26, a forward air controller flying an OV-10 Bronco out of Da Nang and directing American close air support fighters. Firepower from the U.S. ships in the Gulf was laid by Capt. Mike Brown, a Marine Corps artillery observer in the back seat of the OV-10.

No tactical air support was available in time to be of any use. The naval guns were not a solution, either. "The ships were about a mile offshore, and the friendlies were between the bad guys and the ships," Brown said. "Naval gunfire shoots flat and it has a long spread on impact. There was about a 50-50 chance they'd hit the friendlies."

Bennett decided to do what he could with his four small 7.62 mm machine guns. The North Vietnamese began to pull back but on Bennett's fifth pass, a SAM-7



Capt. Steven Bennett was posthumously awarded the Medal of Honor for his action and sacrifice on June 29, 1972, in South Vietnam.

"Naval gunfire shoots flat and it has a long spread on impact. There was about a 50-50 chance they'd hit the friendlies!"

—Capt. Mike Brown, a Marine Corps artillery observer in the back seat of the OV-10

came up from behind, hit the OV-10's left engine, and tore holes in the canopy. The left landing gear hung down like an injured leg, and the small airplane was afire.

Bennett had to get the airplane to a landing field or he and Brown would have to eject. He fought to drive the airplane up and to the right, but he could not gain altitude. Flying at about 600 feet, he dumped his rocket pods and fuel tank.


The OV-10 was in "command ejection" mode. It could not be reset in the air. Both seats were controlled by the pilot, who would have to punch them out, the back one first.

However, ejection was not an option. Brown had no parachute. It had been shredded by the explosion. Bennett could have ejected alone, but that would have been fatal for Brown when the rocket motors from the front seat passed directly over the rear cockpit.

Momentarily there was hope. The fire subsided and Da Nang was only 25 minutes away. North of Hue the fire fanned up and began spreading. No choice now but to crash-land in the water.

The cockpit area was almost certain to break up on impact. The broad expanse of plexiglass canopy provided excellent visibility but not much structural support. No pilot had ever survived an OV-10 ditching.

The OV-10 dug in hard, cartwheeled, and flipped over on its top, nose down in the water. Submerged, Brown struggled free of his straps, went out the side, and paddled to the surface. He tried to reach Bennett but the airplane was sinking fast. Bennett, trapped in his broken cockpit, sank with it. They recovered his body the next day. He was awarded the Medal of Honor posthumously.

Steven Bennett had made his decisions consciously: to press the attack on the North Vietnamese despite the known danger to his small aircraft—and then to ride the crippled aircraft into the sea so that his backseater would have a chance to live, even though it meant leaving almost no chance for himself. He knew the odds. There just wasn't any other way. 

Air Force Historical Support Division

USAA AUTO INSURANCE

DEDICATED COVERAGE FOR THE ONES WHO NEVER QUIT

Don't stop now. Start getting the service you deserve. Members switched and saved an average of \$707¹ per year on USAA Auto Insurance.

Visit [USAA.COM/AFA](https://www.usaa.com/AFA) or call 877-618-2473



**WHAT YOU'RE MADE OF
WE'RE MADE FOR™**



Paid ad. No federal endorsement of advertiser is intended. MCCC Sponsor. No federal or DoD endorsement implied. The Department of the Navy does not endorse any company, sponsor or their products or services. Neither the Coast Guard nor any other part of the federal government officially endorses any company, sponsor or their products or services. ¹Average annual savings based on nationwide survey of new customers who switched to USAA and saved from Jan. 1, 2017 to Dec. 31, 2018. Use of the term "member" or "membership" refers to membership in USAA Membership Services and does not convey any legal or ownership rights in USAA. Restrictions apply and are subject to change. Automobile insurance provided by United Services Automobile Association, USAA Casualty Insurance Company, USAA General Indemnity Company, Garrison Property and Casualty Insurance Company, based in San Antonio, TX; USAA Limited (UK) and USAA S.A. (Europe), and is available only to persons eligible for P&C group membership. Each company has sole financial responsibility for its own products. Air Force Association receives financial support from USAA for this sponsorship. © 2021 USAA. 275125-0121-AFA

The key to remaining ahead of the threat is making the most of every asset.

The F-35 is an advanced node in the 21st Century Warfare architecture uniquely designed to leverage all joint assets to outpace any adversary. In any domain. Regardless of the threat, the F-35 is a decisive advantage – today and in the future.
Learn more at [F35.com](https://www.f35.com)

Lockheed Martin. Your Mission is Ours.®

