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A Predator at Creech AFB, Nev. See "Elegy for the Predator," p. 18. Photo by MCS2 Brian T. Glunt, USN.

Deterrence, 2018-Style

American space and cyberspace capabilities are enticing targets to those who wish the US harm.

As the clear world leader in space-based capabilities, which permeate almost every aspect of military and civilian life, the US needs to defend space and prevent its satellites from being these inviting targets.

Highly contested and secretive cyberspace is critical to modern warfare and advanced economies, but has no dominant power. The US is in need of better cyber defenses and forensics.

In this new era of great power competition, Russia and China aren't looking to take on American strengths, they are looking for vulnerabilities. For thousands of years, "militaries have vied for dominance on land and sea," Deputy Defense Secretary Patrick M. Shanahan recently noted, and war has now been waged in the air for more than a century.

"Today we are at the dawn of a new era, facing the reality of war's changing character," Shanahan said May 4 as US Cyber Command (CYBERCOM) was elevated to a unified combatant command. "Cyberspace and outer space" have emerged as contested domains, "equal in importance with land, sea and air."

CYBERCOM's promotion to full unified command status reflects the rapidly increasing importance of the newer combat domains. CYBERCOM previously reported to US Strategic Command (STRATCOM), which itself assumed the duties of the old US Space Command in 2002.

The reprioritizations may continue. Defense leaders are still debating whether space again needs a dedicated unified command of its own, and if the military should split off a space corps separate from the traditional Air Force.

These new combat domains pose new questions, such as:

- How would the US respond if an enemy decides to attack military satellites on orbit?

- What is the proper response to a cyber attack that shuts down the national electric grid?

- What if an electromagnetic pulse (EMP) attack fries the nation's electronics but doesn't directly kill anybody?

Enemies "can counter the advantage the United States has built," Air Force Gen. John Hyten, STRATCOM commander, said last September at AFA's Air, Space & Cyber Conference (ASC17).

They can do it "in nukes, space, cyber, electronic warfare ... so they're going down that path, and they haven't hidden it," he noted. "At the end of the decade, they're going to be a long way there."

The principles of deterrence have not changed: Enemies must know that attacking the US will cost them more than they can stand. They must understand the US has credible responses—and the will to use them.

It is important to think broadly. "If you just think about space and you just think about cyber, you're not thinking about what is motivating our adversaries to go that way," Hyten added.

As the dominant player in space, the US clearly has the most to lose from war in orbit. So war that extends into space must be avoided. Part of the deterrence will come by making clear enemies can't get away with certain types of attacks.

China understands if it were to sink a Navy ship in the international waters of the South China Sea, the US response won't



Real-time cyber attacks are displayed on a map at the 275th Cyberspace Operations Squadron, Warfield ANGB, Md.

necessarily be a naval response in that sea. Similarly, Russia knows if it shoots down an Air Force transport in international airspace over the Baltic Sea, the US won't necessarily respond with airpower over the Baltic.

The same credible ambiguity is needed in space and cyberspace.

The National Security Strategy released at the end of 2017 sends a powerful message that is only now getting the attention it deserves.

Many countries believe "the ability to attack space assets offers an asymmetric advantage and as a result, are pursuing a range of anti-satellite (ASAT) weapons," the strategy reads. But then comes the kicker: "Any harmful interference with or an attack upon critical components of our space architecture that directly

The US will respond at a time, place, and in a domain of its choosing.

affects this vital US interest will be met with a deliberate response at a time, place, and domain of our choosing."

This is exactly the right message: credible ambiguity.

Enemies also hide behind opacity. Russia, China, and other adversaries try to exploit indecisiveness by denying the actions they take (such as the initial invasion of Ukraine) or doing things that fall just short of what might force a nation to respond (such as building artificial islands in international waters).

Cyber warfare is notoriously difficult to trace. Malicious actors "use cyberattacks for extortion, information warfare, disinformation, and more [with] a troubling degree of deniability," the National Security Strategy observes. "When faced with the opportunity to take action against malicious actors in cyberspace, the United States will be risk-informed, but not risk-averse" in considering its options.

These options should not be limited to cyberspace. A powerful deterrent will make sure enemies understand an attack in space or cyberspace could bring a response beyond space or cyberspace. This should now be coming into focus.

Reader, She Married Him

While I enjoyed your Namesakes article on F. E. Warren, you left out a small detail [May, p. 144]. While Gen. John J. Pershing may be considered a "Famous Friend," he was more than that. Pershing married Warren's daughter Helen Frances Warren in 1905. She died in a fire along with three of their four children in 1915.

CMSgt. Ron MacCarthy,
USAF (Ret.)

Eden Prairie, Minn.

Warrant Officers of Course

I wholeheartedly endorse the sentiment of CMSAF Kaleth O. Wright as cited in the Almanac issue's ["Verbatim: Enlisted Pilots?" p. 32] that the authority and responsibility for the employment of weapons lies with officers. That was a gutsy thing to say—though it is the unvarnished truth—in the midst of our current pilot shortage crisis. So many people who should know better are clamoring to introduce enlisted pilots or to bring back the aviation cadet program. I'm sure the chief will take some heat for that but I hope he sticks to his guns.

Contrary to the claims by some that a college education doesn't make a better pilot, an Air Force Safety analysis in the late 50s showed just the opposite, that the aircraft accident rate of non-college graduates was 50 percent higher than that of college graduates, commissioned officer or not. As aircraft grew in size, performance and lethality—and in expense—that became the primary reason the aviation cadet program was terminated.

The Air Force today needs a warrant officer pilot program along the lines of the Army's. Among all the NATO members,

USAF is the only service that does not have a warrant officer or technical officer within its rank structure. An associate degree or 60 semester hours of undergraduate study should be the minimum educational qualification. Warrant officers could fill half the tanker and transport billets and 80 percent of the RPA pilot positions. There should also be an equitable path to commissioned status at an equivalent rank for Air Force warrant officer pilots. Under current Air Force rules, an Army chief warrant officer with six years of service, an MBA, and 3,000 flying hours who seeks a commission in the Air Force must start all over as a second lieutenant. Ask me how I know.

Lt. Col. Gary L. Peppers,
USAF (Ret.)

Cape Coral, Fla.

Dress for the Job You Want

An article in "Letters" to *Air Force Magazine* (USAF Almanac) June 2018 issue ["Dress Code," p. 8] by Mr. Juris Bergs mentioned his disappointment with the military dress codes of this age. I read his letter with great interest since I have the same observations and disappointment as he has. I was in the US Air Force during the Cold War, from 1956 to 1962. While we were allowed to wear civilian clothes when off duty or when traveling, we always had to wear Class A or B dress uniforms when wearing uniforms off base or when traveling. This included "spit shined"-type shoes. We took pride in wearing our uniforms and the strict dress codes of that time. It gave an appearance of professional discipline.

Today, the military wears fatigues that are unattractive and look like pajamas. It is rare to see anyone wear a dress uniform, assuming they still exist. This gives the impression of being undisciplined and unprofessional, and I am not the only person who believes this. It is very disappointing. I can understand wearing fatigues in a war zone, but not outside a war zone.

Carter B. Endsley
Punta Gorda, Fla.

A Little Respect, Here?

In response to Lt. Col. Cammack's letter ["Letters: Once Bitten, Never Shy," June, p. 9], I wish to comment about his doubting the veracity of my letter in the March

issue. I do not believe that the F-84F was ever required to use a 9,500-foot take off on a 10,000-foot runway although I know for a fact we often did so, and more at times. But with the New Jersey 141st TFS, operating as the 7108th Wing in France during the Berlin Crisis in 1961-62, we often used 6,800-7,000 feet or more while operating from on the 8,000-foot runway at Chaumont Air Base in France. Departing from Harmon Air Base in Newfoundland to Lajes in the Azores, my log book shows the distance as 1,681 nm. The requirement for us to go at Harmon was we had to have a minimum tailwind component of 25 mph, we sat in place for two to three days before the Air Force told us we had that requirement for take off on Nov. 1, 1961. We calculated, using the weather figures given to us from Air Force weather aircraft flying the route we proposed, that we would have about 1,000 pounds of fuel at our destination, Lajes Air Base—well within our minimum requirement. We were towed into place in flights of four aircraft to the runway, with winds at the time requiring a take off to the west. The weather, as I remember, had a 1,000-1,200 foot base with clouds tops at 20,000 feet.

As No. 3 on the third flight, I was on the wing of my flight leader, Lt. Col. Lee. At some point after we had taken off and were past the point of no return, the Air Force weather A/C determined there was now a headwind component of some 20 mph, those flights behind us and still within the return to take off point safely were all recalled to return to Harmon. Those that had continued, about six to eight flights or so, arrived at Lajes in a minimum fuel condition. I personally shut down with 400 pounds showing on my fuel gauge, some of our aircraft flamed out at—or shortly after—landing, my wing man being one. We, those that had made Lajes, departed

WRITE TO US

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—The Editors

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Lajes the next morning on Nov. 2, 1961, and landed at Chaumont Nov. 3, 1961. We, the 7108th, operated for almost one year with those larger drop tanks.

As to Lieutenant Colonel Camack's other doubts, I know that several earlier models of the F-84 had several severe problems, but later F models were very successful and the figure I used in referring to the drop tanks was a rough remembrance, the larger of the two sizes of drop tanks on the F-84F—one was 230 gallons, the other was 430-450 gallons and roughly 16-18 feet long—AND we were directed by the Air Force NOT to ever drop them due to the shortage of those tanks in Europe.

As to my comment in my original letter about pulling up to 60,000-70,000 feet to dive bomb our target; that was an obvious typographic error on my part in my letter or the printing of the letter at the *Air Force Magazine*, which I sent to the magazine after seeing the letter but never printed. Considering the number of times that USAF has called upon the Air National Guard to help in hotspots, Vietnam, and certainly in the ongoing current conditions in the Middle East, I think Cammack's mocking the Air National Guard to be uncalled for.

Maj. Robert V. Thompson,
USAF/NJANG (Ret.)
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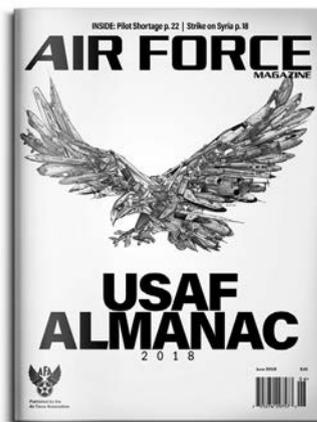
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Editor's Note to Readers:

Last month's USAF Almanac cover featured the drawing "Eagle-X" by artist Don Stewart. Below is the "spotter's guide" for those wanting to score their ability to identify the 62 aircraft seen in that illustration. While the majority are Air Force "X-planes," the work includes joint service test aircraft and at least one fictional, futuristic "X-vessel."

- X-1 Glamorous Glennis
- X-2 Starbuster
- X-3 Stiletto
- X-4 Bantam
- X-5 Sweep-Wing
- X-6 Nuke
- X-7 Flying Stovepipe
- X-8 Aerobee
- X-9 Shrike
- X-10 STS Demonstrator
- X-11 Atlas Rocket
- X-13 Vertijet
- X-14 VTOL
- X-15 Rocket Plane
- X-21A Laminar Flow
- HL-10 Lifting Body
- X-24B Lifting Body
- X-25 Solocopter
- X-26B Motorized Sailplane
- X-27 Lancer
- X-28 Osprey Puddle Jumper
- X-29 Forward-Swept Wing
- X-30 NASP
- X-31 Vector
- X-32 JSF Concept Demonstrator
- X-34 Reusable Launch Vehicle
- X-33 Venture Star
- X-36 Tailless Fighter
- X-38 ISS Rescue Vehicle
- X-40 Space Maneuver Vehicle
- X-41 Falcon HTV
- X-43 HyperX
- X-45 UCAV
- X-48B Blended Wing Body
- X-55 ACCA
- AD-1 Pivot-Wing
- Avrocar Saucer
- Futuristic Hypersonic Platform



- NX-01 Enterprise
- XA-38 Grizzly
- XB-70 Valkyrie
- XB-42 Mixmaster
- YB-49 Flying Wing
- XC-99 Heavy Cargo
- XC-120 Packplane
- YC-14 Transport
- YC-125 Raider
- XF-14 Shooting Star
- XF-84H Thunderscreech
- XF-85 Goblin
- XF-91 Thunderceptor
- XF-92A Dart
- XF-103 Thunderwarrior
- XF-107 Ultra-Sabre
- XF-109 SS VTOL
- XP-54 Swoose Goose
- XP-55 Ascender
- XP-56 Black Bullet
- XP-67 Moonbat
- XP-79 Rocket Wing
- YP-59 Airacomet
- XR-12 Rainbow



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Boeing 767-2C freighters, minus specialized military equipment, wait to be converted to KC-46 tankers at the Boeing plant in Everett, Washington.

KEEPING THE PEGASUS SOLD

Everett, Wash.—The Air Force was supposed to have started receiving its first tranche of 18 operationally capable Boeing KC-46 Pegasus tankers by now. Boeing acknowledges they're late, but insists the principal holdups are government-required paperwork and agreement on contract terms. The company says the airplanes will be in USAF's hands by the end of this year.

The Air Force is less confident, and says it expects the aircraft to show up for duty in the spring or summer of 2019.

The contractual deadline is October.

Boeing launched a full-court press in May to shore up support for the tanker, trying to reassure the public and congressional leaders the program is on solid footing.

In late April, a letter signed by 50 members of the House was sent to the heads and ranking members of the Armed Services and Appropriations committees acclaiming the virtues of the KC-46 and the Air Force's sharp need for the airplane, urging the chairmen to "support the procurement of 18 tankers" in the Fiscal Year 2019 defense bills.

Days later, Boeing flew 22 defense and aerospace journalists to the company's Everett, Wash., facilities to see the KC-46 manufacturing effort and answer questions about the state of the program. (*Air Force Magazine* accepted travel and accommodations from Boeing to attend).

Major substructures and systems of the KC-46 are built in Wichita, Kan.; the KC-46's first base will be McConnell AFB, Kan.

Tinker AFB, Okla., will be the KC-46 depot, while Altus AFB, Okla., will be the tanker's second base. Final assembly takes

place in Everett. Many of the signatories of the House letter hail from districts in those three states.

What reporters saw in Everett and at Boeing Field, about 30 miles away, was a fleet of 34 KC-46s in various stages of production, ranging from empty "green" fuselage shells to nearly complete gray-camouflaged aircraft. The bulk of the airplanes were in the form of 767-2C freighters; largely completed airplanes with all the necessary wiring and strengthening, but still waiting on all the specialized military equipment needed to make them into tanker/transports. That equipment comprises refueling booms and hoses, as well as other fuel transfer equipment, military radios, avionics, self-defense systems, electromagnetic



A painted and converted Air Force KC-46 tanker at the Everett plant.

hardening, specialized lighting, extra fuel tanks, and additional plumbing necessary to make it all work.

Boeing officials said their "goal" is to whittle down to 30 days the conversion time to make a 767-2C into a KC-46, but the company has not yet done so. Boeing's final conversion building can handle four tankers at once.

The 767-2C and KC-46 completed tasks necessary to receive final Amended and Supplemental Type Certifications from the FAA in April. Since the KC-46 is derived from a commercial aircraft, it must meet FAA standards before meeting military standards.

Reporters also saw an even busier effort next door, where dozens of 737s of several different versions and Navy P-8 Poseidon maritime patrol craft—derivatives of the 737—are in production. Boeing is producing more than 35 737s a month, and Air Force Secretary Heather Wilson said in March congressional testimony she thinks the company puts precedence on its commercial line; what she called one of USAF's "frustrations" on the program.

Leanne Caret, CEO of Boeing defense, told reporters the KC-46 is Boeing's "top priority."

Boeing acknowledged from the beginning of the KC-46 program it had underbid on price in order to win the contract. It said at the time the volume the tanker would add to the company's production lines, along with prospects for future USAF and foreign tanker sales, would make it worth the company's while to absorb some of the development cost, contractually capped at \$4.9 billion. The fixed-price contract made Boeing responsible for any overages beyond that figure.

As of its first quarter 2018 report, Boeing has taken more than \$3 billion in pretax charges on the tanker program. Those overages have "continually decreased over time," as technical problems have been ironed out, Caret said in an Everett press conference. She noted the KC-46 remains in development, but pledged the company would "do the right thing" to deliver an aircraft that meets the Air Force's "intent."

Noting the large number of conversion-ready fuselages at the Everett plant, Caret said production will soon "start really ramping up." She chalked up the current delay to "working through flow times," and various DOD and FAA inspections and paperwork. She said the government and Boeing are working together as a collaborative team to get those first 18 aircraft delivered. That milestone is called Required Assets Available, or RAA, which is necessary to declare operational capability with the KC-46.

The KC-46 contract calls for 179 airplanes to be delivered through about 2028. The Air Force expects to field 15 of the new tankers every year until then.

FIXING DEFICIENCIES

The Air Force in May was refusing to take deliveries of any KC-46s because of two problems, which Boeing officials maintained require a software fix only—not hardware—and that other problems that have made headlines in recent months are either well understood or aren't covered in the contract. However, they promise to work with USAF to fix them.

The two problems involve the boom operator's imaging system and a series of uncommanded disconnects when the tanker is deploying the probe-and-drogue-style hose refueling system.

The Remote Vision System allows the boom operator, who sits behind the cockpit in the KC-46, to see what's happening at the back of the plane, wingtip-to-wingtip. It generates an image, which allows the boomer—wearing special glasses—to



KC-46s under construction at the facility in Washington.

see the situation in 3-D on a series of screens. It's focused to a point about 30 feet behind the airplane. This image can be seen in ambient light or, if blackout conditions are required for the mission, in infrared, with the Long-Wave Infrared (LWIR) system.

In "very low sun-angle situations," the aircraft can throw a shadow on the boom operation, which obscures the point of contact, said Sean Martin, company air refueling test operator. Also, sunlight can reflect off the receiving aircraft into the camera, obscuring the view for the boomer. Both problems can be fixed by "tweaking" software, he said. As part of that effort, Boeing will also change the controls on the boom operator's system to make it "more intuitive" to users, each of whom seem to prefer slightly different settings of the lighting, Martin reported.

The second issue involves the KC-46's hose-type refueling system, used by the Navy, Marine Corps, and many allied air force jets. If the hose bends too much, too close to the tanker, or there's a pull on the hose exceeding 620 pounds, the hose automatically disconnects from the receiver aircraft. Again, Martin said, software changes will correct the situation.

Another problem that has been in the news is that there have been contacts between the KC-46's boom and receiving aircraft outside of the protected area surrounding the receiver's fuel receptacle, scraping the skin of the receiving aircraft. The Air Force has expressed concern that if this happens with a stealth jet, its low-observable coatings could be compromised, potentially forcing a mission cancellation. The KC-46 has no way to detect such contacts, although no refueling tests have been done with stealth aircraft to date.

Caret said the scraping issue is "not new," and has happened before with the KC-135 and KC-10. However, there was no requirement written into the contract that the KC-46 have a means to detect such contacts. Boeing is working with the Air Force to address the potential problem, she asserted.



ACC is preparing a Fighter Roadmap to answer questions as it shifts increasingly to a fifth generation fleet.

THEY'RE TOUGH TO FOLD

As the Air Force gets ready to build its Fiscal 2020 Program Objective Memoranda, or POM—the five-year plan that will govern the service's spending through 2025—service and industry leaders have acknowledged that a number of program- or portfolio-specific “roadmaps” are being built to inform that plan.

Air Combat Command chief Gen. James M. Holmes told *Air Force Magazine* in late April a “Fighter Roadmap” is being developed to answer many of the challenging questions facing ACC as it tries to shift from a largely fourth generation fleet to a fifth generation fleet.

“We’d like to lay it out in front of the [Pentagon] leadership this fall as we work through the details of the ‘20 POM,” Holmes said in an interview, “and get agreement on it there, so we can take it to the Hill.”

With Congress, he said, ACC will “socialize” the document with interested members who may have concerns about specific programs, fleet sizes, or basing. Holmes said this would be similar to what Air Force Global Strike Command boss Gen. Robin Rand did “with his Bomber Roadmap” in the summer of 2017.

Despite what many thought would be a radioactive agenda for retiring the B-1 and B-2 bombers within the next 15 years or so, Global Strike Command’s Bomber Vector has run into little opposition on Capitol Hill. Rand assured members of Congress—as did Air Force Secretary Heather Wilson in April—that any base now fielding B-1s or B-2s will not close, but simply swap them for new B-21 bombers, which will become available starting in the mid-2020s.

The service made that official in early May, announcing that Dyess AFB, Texas; Ellsworth AFB, S.D.; and Whiteman AFB, Mo.; are the reasonable alternatives to receive the B-21 when it comes online. (Barksdale AFB, La., and Minot AFB, N.D., will continue to fly the B-52, which will remain in service through 2050.)

Holmes said the fighter roadmap will explain what new air dominance platforms USAF needs, how fourth and fifth generation fighters will communicate with each other, what new air-to-air and air-to-ground weapons are required, and how

systems like the F-15, F-16, and A-10 will gradually be phased out as F-35s comprise a larger proportion of ACC’s inventory, among other details.

The ACC plan will also chart the way forward for USAF to build up from 55 fighter squadrons today to about 70 squadrons circa 2025, as the service believes this is the required force to meet the new National Defense Strategy. The roadmap will detail “the logic and the math” underlying that requirement, Holmes said.

Deputy Defense Secretary Patrick M. Shanahan revealed to reporters in April that the Pentagon’s new Undersecretary of Defense for Research and Engineering, Michael D. Griffin, is building a hypersonics roadmap, also to be developed in time for the 2020 POM, and which will probably be complete this summer.

“Overlap of the technical challenges is pretty high,” Shanahan told reporters in Washington about the various approaches and potential systems applying hypersonics technology. Because all the services—and many entities such as DARPA—are pursuing hypersonics research, Griffin will be looking for common building blocks to feed all the research efforts. Where the projects should differ, Shanahan said, is mainly in whether the systems being developed are “ground-, sea-, or air-launched.”

Griffin will focus on the “consolidation and ... prioritization” of those projects to avoid duplication of effort and identify the most promising approaches, Shanahan said.

Roadmaps are being developed down to the system level. The KC-46 tanker has not yet been fielded, but a roadmap to improve the aircraft is already being built, according to Boeing KC-46 program manager Mike Gibbons.

Gibbons told a handful of reporters during the Boeing plant visit the KC-46 could be upgraded with new artificial intelligence and sensors to make the air refueling operation “autonomous,” which would make it possible to eliminate the boom operator position.

That position might not even have made it onto the first iteration of the KC-46, Gibbons reported, but the Air Force wanted to reduce risk on the project and did not want to introduce any changes to requirements that could add delay to the program. Autonomous refueling was demonstrated by Airbus last year on its A310 tanker, and the Navy’s new MQ-25 carrier-based tanker will be unmanned.

The Pegasus could also be fitted with new communications gear to fulfill a long-term Air Force idea to make it an “Internet provider in the sky,” Gibbons reported. ✪



The X-51A Waverider, shown here tucked under the wing of a B-52, will demonstrate hypersonic flight.

Photos: John Tirpak/staff; SSgt. Andrew Lee; USAF

PUTTING DOWN ROOTS

AL UDEID AB, QATAR —

As the home to the largest expeditionary air wing in the world and the combined air operations center directing air operations throughout the Middle East, this enormous, dusty base outside of Doha has housed tens of thousands of US airmen since it began hosting American operations in the 1990s. Now, the Qatari government is hoping to make the arrangement a little more permanent.

Qatar's defense minister, Khalid bin Mohammed al-Attiyah, announced during a visit to Washington in late January that his country hoped to expand the base with 200 new homes for American troops and their families, new schools, and other support facilities.

As of February, a week after al-Attiyah's initial announcement, 35 US troops had their families living with them in the country: A "small but growing number," Col. Tom Bongiovi, commander of the 379th Mission Support Group, told *Air Force Magazine*.

The families live off base in a compound, with leased housing arranged by the US Army Corps of Engineers, and the children attend a private school or are homeschooled. Some of the spouses work on base, while others work in the local economy, Bongiovi said.

"It will very soon become a family-oriented place for our American friends there," al-Attiyah said when announcing the facility improvements, according to Al Jazeera.

"We want more of the families to be stable and feel more comfortable in their stay."

Qatar is a "unique, strategic location" in the CENTCOM area of responsibility, and "the Qatari military and government have been critical partners in the fight against ISIS and the Taliban with their support of Al Udeid Air Base," Col. Jeffrey Schriener, acting 379th Air Expeditionary Wing commander added in an email.

"The dynamic growth of Doha and the surrounding area have made this an inviting place for our small number of command-sponsored families. We look forward to seeing continued development and opportunities as the run up to the World Cup continues," he added.

The proposal from Qatar came as the country prepares to host the 2022 World Cup and about eight months after Saudi Arabia and several other Muslim countries in the region broke all diplomatic and commercial ties with the Gulf Cooperation Council Country, cutting off air, sea, and land connections to Qatar.

In April, al-Attiyah visited Washington again and met with Defense Secretary Jim Mattis. An official statement released from the Pentagon after the meeting said the two leaders discussed "mutual security interests, including the campaign to defeat ISIS, support for the NATO mission in Afghanistan," and improvements to Al Udeid.

The move to build family housing and other facilities would not be the first time the Qatari government paid for permanent buildings for US use. The Qataris previously funded the construction of the US Central Command Forward headquarters building at a cost of \$190 million and the Air Forces Central Command headquarters, Combined Air Operations Center, and the wing operations center at a cost of \$255 million for all three. Qatar also funded the outside runway and parallel taxiway that enabled the 379 Air Expeditionary Wing's ability to operate the B-52 from Al Udeid.



Amn. Austin Collings, a fuels distribution specialist, connects a hose to a fuel hydrant on the flight line at Al Udeid AB, Qatar.

The outside runway cost \$467 million, while the parallel taxiway cost \$143 million, according to information provided by an Air Force spokeswoman.

"The American taxpayer is getting a good deal here," Bongiovi said.

Brig. Gen. Jason Armagost, commander of the 379th AEW, said it is "a time of opportunity," though he stressed that the wing was still awaiting guidance on the matter.

"We're always aiming at a more enduring presence to support the airmen," he said, noting that six-month rotations are a challenge for continuity of engagements with the host country. Longer stays would help with that, he said, though there are many factors to consider.

The Air Force has struggled with some housing on the base in the past. In 2015 and 2016, many airmen came forward to complain about extensive mold in what officials said were temporary living facilities.

Air Force Surgeon General Lt. Gen. Mark A. Ediger told *Air Force Magazine* in 2016 the service was working to improve the maintenance of those facilities and to fix or replace buildings they would continue to use. He also noted that a construction project finished that year would allow 2,000 more troops to move out of temporary facilities and into permanent buildings that would be easier to maintain.

Armagost said the wing was "on top of" the challenges, but new permanent housing would help. The facilities with problems were not designed to be lived in in a sweltering, humid desert environment for 15 years, he said.

The base houses more than 10,000 US troops, and hosts the 379th Air Expeditionary Wing, the CAOC, the largest vehicle fleet in the Air Force, the largest blood transshipment center in the Department of Defense, and DOD's largest fuel supply point. ★

Jennifer Hlad is a freelance journalist based in the Middle East and a former *Air Force Magazine* senior editor.

Photo: MSgt. Phil Speck/ANG



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Schwartz, in Memoir, Says F-22 was Traded for B-21 Bomber



USAF wasn't going to get both out of Defense Secretary Gates.

A Raptor soars out of JB Elmendorf-Richardson, Alaska. The F-22 has proved invaluable to operations in the Middle East.

By John A. Tirpak, Editorial Director

The top Air Force leadership went along with former Defense Secretary Robert M. Gates' termination of the F-22 fighter—after producing less than half the required number—because they believed they couldn't win the argument. At the time, getting approval to build a new bomber, now known as the B-21 Raider, was more important.

In "Journey: Memoirs of an Air Force Chief of Staff," now in bookstores, retired Gen. Norton A. Schwartz said his predecessor, retired Gen. T. Michael Moseley, "never gave up in his principled attempts to get those 381 F-22s," for which Gates fired Moseley and then-Secretary of the Air Force Mike Wynne. Schwartz was named to replace Moseley, and Michael B. Donley was brought in as Wynne's replacement.

Although there were at least a dozen internal and external studies confirming

The B-21 Raider must be fielded "with discipline," Schwartz said.



381 as the right number of F-22s, "I wanted an independent assessment to determine the minimum number," Schwartz wrote, "and what we came up with" was 243 aircraft. Gates rejected that number too, "even though we had shaved over 35 per-

cent off the Moseley/Wynne demand for 381," Schwartz said. That difference of 60 airplanes would have cost "\$13 billion at a time that defense budgets were being tightened," and Gates wanted that money for "things like remotely piloted aircraft

Robert Gates (left), Michael Donley, and Gen. Norton Schwartz after Donley's swearing in at the Air Force Memorial in 2008.



and MRAPs [mine-resistant ambush-protected vehicles].”

Schwartz and Donley concluded “the F-22 debate had consumed enough oxygen, and it was time to move on,” Schwartz said, and the two were “certainly not going to go to the Hill behind Secretary Gates’ back and lobby for more. ... That was never going to happen on our watch.”

Schwartz acknowledged that some thought this was “too pristine a judgement” and that “anything in Washington is fair, but I say ‘no.’ I had never been disloyal to a boss, and I wasn’t about to start then.” Schwartz wrote extensively in the book about how Gates fought for his nomination to be Chief against congressional resistance.

Gates, in his own memoir, “Duty: Memoirs of a Secretary at War,” argued that the F-22 was useless in the Afghanistan and Iraq counterinsurgencies, was a Cold War relic, and that a Chinese stealth fighter wouldn’t be along until the 2020s, so nothing would be lost by killing it.

In actual fact, the F-22 has been essential in the Syria campaign and China fielded its first operational stealth squadron in 2017. Every Air Combat Command chief since Gates’ tenure has warned that the F-22 force is far too small for the demands placed on it.

There was “a method to our madness,”

Schwartz said. “We felt that the real coin of the realm was the replacement bomber” and “we had our work cut out for us” convincing a “very skeptical civilian leadership” that the B-1 and B-52 would not last forever, that the B-2 fleet was too small, and that a replacement aircraft, in numbers, was urgently needed.

Gates terminated the next generation bomber—the project preceding the B-21—for what Schwartz agreed were “rational reasons.” The NGB “had grown too big” and was carrying too many missions and requirements. It was to have an air-to-air missile capability for self-defense, Schwartz revealed, describing that requirement as “not completely nonsensical” but unaffordable. The attitude was that “cost was no object” on the NGB, Schwartz claimed, and that didn’t meet with Gates’ worldview, “So he cancelled it.”

In explaining the termination of the NGB to Congress and the press, Gates claimed that the B-2’s unit cost had swelled unreasonably and this is why it had been cancelled in its day, but that was exactly backward. It was cutting the planned 132 B-2s to 20 that caused its unit cost to swell, because all of the research and development costs associated with it had to be amortized across a force less than a sixth as large as had been planned.

Schwartz and Donley believed there was a “valid need” for a new bomber; an “unquestioned requirement” to provide such an option for a future president, “both for warfighting and deterrence purposes.” Two decades on, Schwartz and Donley had to convince Gates that the Air Force “would not repeat the experience of the B-2.”

They argued that USAF had to have 80-100 new bombers, and the service would swear to keep the cost as the prime consideration and not break a ceiling of \$550 million in 2010 dollars. Moreover, they promised the aircraft would rely heavily on off-board sensors, jammers, and other capabilities to keep the cost down, as part of a system of systems.

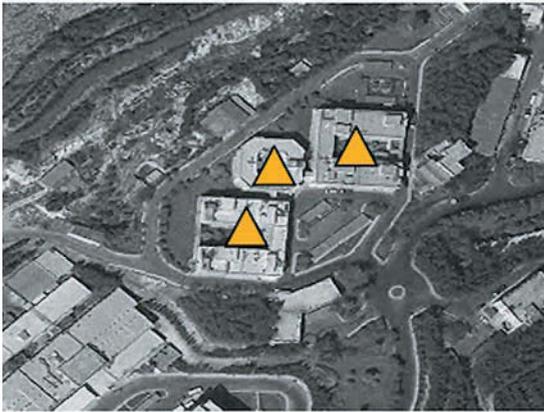
“We had to convince him of all of this” or, like the NGB, what became the B-21 Raider “would be dead in the water,” Schwartz asserted. Ultimately, Gates relented, apparently persuaded that “we as an Air Force could field such a system with discipline.”

Schwartz said he and Donley are proud of having “succeeded in persuading Gates” that the B-21 would be pursued with “discipline like he had not seen, and so it’s up to our successors to deliver on that promise. The Air Force has to, if it is going to bring this one home.”



WHY SYRIA'S CHEMICAL WEAPONS DIDN'T DISPERSE

Before



After



The Pentagon on April 14 showed reporters before and after pictures of the Barzah research and development site, which was struck by a total of 76,000 pounds of explosive in a US-led strike on Syria.

UNCLASSIFIED

Preliminary Damage Assessment: Barzah Research and Development Center

Russian trolls have been dismissing the effectiveness of the US-Anglo-French strike on Syria's chemical weapons infrastructure since April's 14 attack, saying, in effect, that if a true chemical weapons site had been hit, then any stored weapons at the facility would have been released, injuring or killing civilians in the area. No such release has been detected.

US officials have only said that the strike was designed to "mitigate" such a dispersal of toxic gases.

Asked what those "mitigation" efforts may have been, Air Combat Command chief Gen. James M. Holmes, in an interview April 15, declined to comment specifically on the Syria situation, "because I wasn't involved in it."

However, "in generic terms," he said, when attacking a chemical weapons site, the calculus involves "a thorough target study," that models "the wind, the weather, and everything else."

Then, "the weaponizing solution is to choose the right weapon and the right number of weapons, to reduce the risk" of a chemical weapon getting out.

Holmes advised paying close attention to the number of weapons employed against the target. "Numbers matter in terms of reducing the risk of stuff being spread around and how much you ... burn up on-site."

The Barzah Research and Development Center was struck by 57 Tomahawk Land-Attack Missiles (TLAMs) and 19 JASSM missiles, each with a warhead of at least 1,000 pounds of explosive, but with considerably more destructive effect, meaning the site was hit by more than 76,000 pounds of explosive.

By contrast, hardened targets struck in the two Iraq wars were typically taken out by two 2,000-pound bombs.

—JOHN A. TIRPAK

PILOT ERROR BEHIND WEAPONS SCHOOL A-10 CRASH

Two A-10 Warthogs collided during US Air Force Weapons School training last year near Nellis AFB, Nev., because of a pilot's unintentional failure to follow altitude deconfliction guidelines. That, coupled with task oversaturation, a misperception of the changing environment, and environmental factors resulted in minor injuries to the pilots but destroyed two aircraft.

The two pilots, assigned to the 57th Wing at Nellis, were able to eject during the Sept. 6, 2017, crash and only suffered minor injuries. The two Warthogs were destroyed at a total cost of \$30.7 million, with environmental cleanup cost of \$108,000, according to an April Air Combat Command Accident Investigation Board report.

The pilots were flying a close air support training mission at

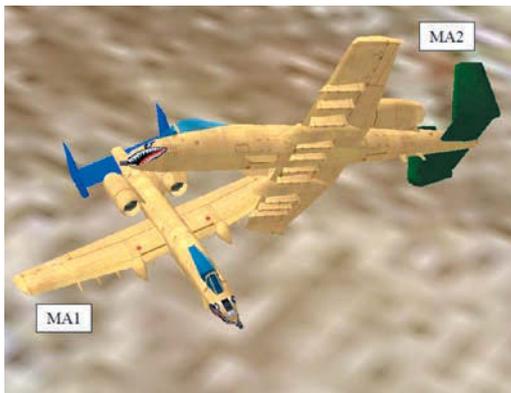
night as part of a Weapons Instructor Course qualification for one of the pilots, with the second flying as the instructor. During the flight, the student pilot climbed above the assigned altitude block during a series of commands. The student pilot did not hear an audible notification that signaled the altitude climb, and therefore did not radio to the instructor to deconflict, according to the investigation.

This caused the student pilot's aircraft to fly into altitude designated for the instructor, who did not have sight of the other A-10. The two aircraft collided, rendering both uncontrollable. The pilots then ejected.

The investigation determined the student pilot uninten-

tionally failed to establish the altitude deconfliction procedure. Additionally, the board president found that the upgrading pilot was handling communications on multiple radios and had many tasks, causing oversaturation. The first pilot had a misperception of the changing environment, though the aircraft's systems for showing the altitude were working. While both pilots were using night vision goggles, their A-10s had external lights off which made it difficult to discern each other's position, the report states.

—BRIAN W. EVERSTINE



An illustration from the accident investigation board report shows the two A-10s' positions moments before the collision.

USAF CALLS FOR ONE-DAY STAND-DOWN, SAFETY REVIEW FOR FLYING WINGS

The Air Force is directing its flying wings to stand down operations and maintenance for one day in the spring to try to find causes in a string of ongoing mishaps and ways to improve overall safety.

By May 21, all Active Duty wings with flying and maintenance functions must ground operations for one day to hold safety discussions with officers and senior noncommissioned officers to review flying and maintenance safety, the Air Force announced on May 8. Air National Guard and Air Force Reserve units have until June 25 to conduct the stand-down. Those wings that cannot ground their flying operations—for example those deployed in support of ongoing operations—are urged to take as much time as they can to review their safety situations without impacting the mission, Air Force Chief of Safety Maj. Gen. John T. Rauch Jr. said.

"I am directing this operational safety review to allow our commanders to assess and discuss the safety of our operations and to gather feedback from our airmen who are doing the mission every day," USAF Chief of Staff Gen. David Goldfein said in a press release.

The announcement comes as the service has seen an increase in the number of fatal aviation crashes, including the May 2 Puerto Rico Air National Guard WC-130H crash in Savannah, Ga., that killed nine airmen. From Fiscal 2008-2018, the Air



Maj. Gen. John Rauch Jr. has ordered a one-day stand down for all Active Duty flying wings to give airmen a chance to privately and candidly discuss safety concerns.

Force lost 84 airmen to aviation accidents. Eighteen of those took place in Fiscal 2018 so far. No trend has yet emerged from the cluster of mishaps this year, Rauch said.

While the number of fatalities has risen, the Air Force said the combined manned and unmanned Class A mishap rate has fallen from last year.

There is not a formal process for the stand-down and safety review, with wing commanders given discretion on when and how to conduct the discussions. Major commands are working with wings on how to plan the stand-down to lessen the impact on operations and training.

There is also not a plan for a formal report at the end of the review, and since much of the discussion focuses on safety issues, there will not be a formal release of findings, Rauch said. The Air Force wants to give cover for the discussions so airmen can speak more freely without worrying about public release.

The direction is for wings with a flying function to stand down, including remotely piloted aircraft units, though other wings are allowed to participate in their own way. For example, Air Force Space Command reached out and said they want to participate in reviewing their safety protocols in a step to be "proactive," Rauch said.

—BRIAN W. EVERSTINE

IS IT TIME TO GET SERIOUS ABOUT THE E-4 NAOC AND MISSILE DEFENSE IN ALASKA?

The Defense Department is going to have to begin looking at modernizing the E-4B National Airborne Operations Center (NAOC), a top Air Force general told a Senate Armed Services subcommittee hearing in April.

The NAOC, a militarized version of the Boeing 747-200, is designed to support the President and top defense officials during a national emergency or in case of destruction of ground command and control centers.

Testifying before the Strategic Forces Subcommittee, Gen.

Robin Rand, commander of Air Force Global Strike Command, said while no money is in the Future Years Defense Program yet, "I think we are going to begin some very serious discussions in the next weeks and months to follow" not only on the NAOC but also the group of systems that include the Navy's "Take Charge and Move Out" communications relay and airborne command post aircraft.

"I will pitch my opinions and ideas to the Chief of Staff of the Air Force and to [US Strategic Command Commander] Gen.



[John E.] Hyten, and there's no doubt a need to get very serious about this," he told the panel.

Also during the hearing, Sen. Dan Sullivan (R-Alaska) pushed Rand and other witnesses to speed construction of a new missile defense silo field at Fort Greely in Sullivan's home state, which has been requested by the Trump administration.

Sullivan challenged estimates he'd heard that the completion would take four or five years.

"So, we won World War II in four to five years," he said, adding that he



Air Force Gen. Robin Rand, commander of Air Force Global Strike Command, testifying before a Senate Armed Services subcommittee.

thought that length of time is "unacceptable."

One of the witnesses, Deputy Assistant Defense Secretary for Nuclear and Missile Defense Policy Robert Soofer, started to note that weather is a factor, but Sullivan was not persuaded.

"Well, trust me, we built the Alcan Highway in World War II, which was 1,100 miles, ... in eight months, right? We can do this stuff. We can do it. We're American, we can do it. So the weather is not a big deal in Alaska, trust me," he said.

At Sullivan's request, the witnesses all agreed to accelerate the program.

—STEVE HIRSCH

DOD HIGHLIGHTS SOARING GPS III COSTS

The cost of military GPS III terminals and ground systems and of Joint Direct Attack Munitions increased significantly from 2016 to 2017, while program costs for the C-130J and Evolved Expendable Launch Vehicle program saw cost decreases of at least \$1 billion.

The Defense Department in April released its most recent Selected Acquisition Report (SARs) to Congress, outlining performance changes across 83 programs from December 2016 to December 2017. There was a net cost increase of \$33.2 billion, or 1.78 percent, for the programs. Cost increases were due primarily to increases in the quantities procured, extended development and procurement schedules, engineering changes to hardware and software, and increased program cost estimates, according to the report.

Military GPS User Equipment Increment 1 saw the largest cost increase by percentage, jumping \$265.1 million, or 22.7 percent, from \$1.1 billion to \$1.4 billion. The increase is attributed mostly to efforts "to align with the approved Milestone B cost estimate," which is considered the official start of the program, and a revised estimate of DOD funding, according to the report.

GPS III satellites have an advanced signal, known as M-code, that make it more difficult to jam the satellites. Lockheed Martin is under contract to provide the first 10 GPS III satellites, and Harris Corporation will provide the navigation payloads for each vehicle. The Air Force on March 14 awarded SpaceX a \$290.6 million contract to launch the first three GPS III satellites between 2019 and 2020.

Program costs for the GPS III Next Generation Operational Control System, or OCX, skyrocketed \$665.3 million from \$5.4 billion to \$6 billion. When OCX Block 0 was finally delivered to the Air Force in November 2017, Space and Missile Systems Center commander Lt. Gen. John F. Thompson called it "a historically troubled program."

The Government Accountability Office also has blasted the OCX program, noting last May it was five years behind schedule and Block 1 is not slated to be ready until 2021. That means many of the advanced features built into the GPS III system—like en-



Lockheed Martin employees work on a GPS III satellite.

hanced cybersecurity—will still be more than three years away, according to the GAO.

The \$1.2 billion cost increase for Joint Direct Attack Munitions, on the other hand, is attributed to the fact that DOD has purchased an additional 34,690 tailkits. The department is upping its JDAM orders as it looks to replenish munitions stocks depleted in the ongoing war against ISIS and other terrorist groups in the Middle East and Africa and meet increased demand for Laser JDAMs, according to the report.

Two Air Force programs saw cost decreases of at least \$1 billion, including the C-130J program, which decreased 9.9 percent from \$15.8 billion to \$14.2 billion due primarily to removal of the Block 7/ 8.1 upgrade.

The Evolved Expendable Launch Vehicle program also saw a cost decrease of 3.4 percent, or \$2 billion, from \$59.2 billion to \$57.2 billion, due mostly to the fact that the number of launches decreased from 168 to 160.

—AMY MCCULLOUGH

Photo: Lisa Norman/USAF; Lockheed Martin

■ Airman Who Died Identified

The Air Force identified an airman who died March 27 at a temporary lodging facility on Andersen AFB, Guam. He was A1C Bradley Hale, 20, deployed from Barksdale AFB, La.



A1C Bradley Hale

A medical examiner from Kadena AB, Japan, flew to Guam to conduct an autopsy. Aurelio Es-

pinola, chief medical examiner at Anderson, told the *Shreveport Times*, that Hale's death was ruled a homicide after three incision wounds were found on his neck.



The F-16C after it crashed near the runway at Lake Havasu City Arpt., Ariz.

■ F-16 Crashes, Pilot Ejects

An F-16C from the 56th Fighter Wing at Luke AFB, Ariz., crashed the morning of April 24 during a routine training flight. The aircraft diverted and attempted to land at Lake Havasu City Municipal Airport, which is located between Luke, Davis-Monthan AFB, Ariz., and Nellis AFB, Nev., according to the Air Force.

"During landing the aircraft departed the prepared surface and the pilot ejected from the aircraft. The pilot is in good condition and is being transported to Havasu Regional Medical Center," states the release.

The pilot ejected and landed on the runway, while his F-16 skidded off the runway and "through a fence." The pilot was up and walking around by the time first responders arrived.

■ Ospreys Deploy to Yokota

The Air Force deployed the first five CV-22 Ospreys to Yokota AB, Japan, on April 5, but it doesn't expect to formally activate its first CV-22 unit in Japan, which would signal the first permanent beddown of the type at the base, until "sometime this fall," Pacific Air Forces spokesman Capt. Rake Keavy told *Air Force Magazine*.

The Pentagon had announced last year the Osprey deployment, which was originally slated for 2017, would be delayed until 2020. However, the schedule "was adjusted" to address "regional security concerns in line with the recently released 2018 National Defense Strategy." Additional personnel will deploy over the next several months, according to USAF.

Although the original plan was to send 10 Ospreys to Japan by 2021, Keavy said the current basing plan "calls for a phased basing of nine aircraft to Yokota Air Base." The US government will continue to "coordinate closely with the government of Japan on the time line as adjustments may be required depending on the situation," Keavy said.

■ Engine Failure at Tyndall, Days Before Fallon Mishap

An F-22 from the 90th Fighter Squadron at JB Elmendorf-Richardson, Alaska, suffered an engine failure just days before another Raptor from the same squadron also experienced an engine failure at a Nevada Navy base.

The F-22 was at Tyndall AFB, Fla., on April 6 when its engine failed during "typical training maneuvers," according to a statement from the 673rd Air Base Wing. The pilot was not hurt and was able to land safely without any incident. The aircraft remains at Tyndall while the mishap is under investigation.

On April 13, an F-22 training at NAS Fallon, Nev., suffered engine failure during takeoff and skidded on the runway. "In relation to the incident at NAS Fallon, each aircraft mishap is under separate investigation and no determinations have been made at this time about whether there's any commonality between the two," according to a USAF spokesperson.



A T-6 Texan II over Vance AFB, Okla.

■ USAF Still Looking for "Smoking Gun" Plaguing T-6 Fleet

The Air Force still doesn't have the "smoking gun" for the ongoing hypoxia-like events plaguing its T-6 trainer fleet, but the service is pushing forward with a safety investigation board to determine exactly what is going on.

Maj. Gen. Glenn Davis, the mobilization assistant to the commander of Air Force Materiel Command, will lead the safety investigation board.

The entire T-6 fleet has returned to flight after being grounded in February because of ongoing hypoxia-like incidents reported by pilots, though at least 12 pilots have reported similar episodes since the grounding was lifted.

Photos: USAF, SrA. Corey Pettis



■ TRANSCOM: Unstable Funding, Maintenance Shortfall Impacting KC-135 Readiness

The Air Force's aging KC-135 fleet has taken a "dip" in readiness recently as the fleet faces issues of maintenance capability and a lack of parts, all at a time when the KC-46 faces additional delays, the head of US Transportation Command USAF Gen. Darren W. McDew told the Senate Armed Services Committee.

McDew said the Stratotanker fleet has a "number of factors" working against its readiness—largely the capability of maintainers and parts—all compounded by a series of continuing resolutions that have forced the Air Force to "make tough decisions" on what it can and can't fund and when. McDew said he hopes continued regular funding will help the KC-135 fleet become healthy.

The first delivery of the KC-46 Pegasus has been delayed, with the Air Force now expecting it in the fall. McDew said he and senior Air Force leaders are committed to getting a KC-46 delivered when it is "operationally capable."

■ "Nuke Sniffer" Fleet's Availability Too Low

The Air Force's move to retrofit three KC-135Rs into WC-135Rs is needed now because the current "nuke sniffer" fleet cannot meet Defense Department and combatant command requirements, USAF Chief of Staff Gen. David L. Goldfein told lawmakers in April.

The Air Force asked for funding in its Fiscal 2019 budget request to retrofit three tankers into Constant Phoenix aircraft because the current WC-135s are "wearing out," and their current mission capable and availability rates are not high enough, Goldfein told the Senate Armed Services Committee. WC-135s have regularly been activated in the wake of North Korean nuclear tests, and the conversion plan "allows us to give more time to be able to accomplish this mission," Goldfein said.

■ B-1s Return as Afghanistan Fight Ramps Up

B-1 Lancers have returned to the Middle East after a record-breaking deployment by USAF's B-52 Stratofortresses.

On March 31, B-1B Lancers from Ellsworth AFB, S.D., touched down at Al Udeid AB, Qatar. The Lancers replaced B-52s that had been flying combat operations in support of the anti-ISIS fight in Iraq and Syria and the war in Afghanistan since 2016.

During their two-year deployment, the B-52s set records for the airframe in numbers of weapons dropped and continuous sorties flown.

The B-52s conducted a total of 1,850 missions targeting ISIS and the Taliban, dropping nearly 12,000 weapons across US Central Command's area of responsibility, according to an Air Forces Central Command release. In June 2017, B-52 crews deployed from the 23rd Bomb Squadron at Minot AFB, N.D., and flew 400 consecutive B-52 missions without a maintenance delay, breaking a record that stood since Operation Linebacker II in 1972, according to AFCENT.

■ Failure to Deconflict Caused Collision

Two South Carolina Air National Guard F-16C pilots failed to deconflict airspace after one of the pilots ran low on fuel, causing them to collide during training in Georgia in June 2016, according to an Air Force investigation released in April.

The two pilots, assigned to the 157th Fighter Squadron at McEntire JNGB, S.C., were able to eject and suffered minor injuries in the mishap. Both aircraft were destroyed at a total loss of \$60.8 million. The pilots were flying an instructor pilot upgrade training mission in the Bulldog Military Operating Area near Louisville, Ga.

The Air Combat Command Accident Investigation Board found that the crash was caused by the second pilot failing to "fulfill his primary responsibility to ensure flight path deconfliction." Additional contributing factors were the first pilot not terminating tactical maneuvers following a "bingo" fuel call, and both the pilots overly relying on visual cues from external aircraft lighting.



An F-15 on the line at Kingsley Field, Ore., in April.

■ F-15 Unit Lifts Grounding

The Air Force's main F-15C advanced training base returned to flight on March 29 following a grounding that lasted about a week after maintainers noticed "structural issues" with the aircraft, a base spokesman told *Air Force Magazine*.

The 173rd Fighter Wing at Kingsley Field, Ore., grounded its 30 Eagles because of a "possible maintenance issue" focused on "structural issues" that needed a closer look, wing spokesman TSgt. Jefferson Thompson said in an email. The Air Force's F-15 Aircraft Structural Integrity Program went to the base to look at the issue.

The 173rd Fighter Wing is responsible for advanced F-15C fighter training for the Total Force, and the grounding was not expected to impact the wing's training schedule or F-15 operations.

■ The War on Terrorism Casualties:

As of May 11, a total of 50 Americans had died in Operation Freedom's Sentinel in Afghanistan, and 62 Americans had died in Operation Inherent Resolve in Iraq, Syria, and other locations.

The total includes 108 troops and four Department of Defense civilians. Of these deaths, 48 were killed in action with the enemy while 65 died in noncombat incidents.

There have been 268 troops wounded in action during OFS and 64 troops in OIR.

—News section compiled by Steve Hirsch, Senior Editor

Puerto Rico ANG Honors Fallen Airmen

—Amy McCullough

The Puerto Rico Air National Guard on May 4 held a private memorial service at Muniz ANGB for the nine airmen killed when their WC-130 crashed near Savannah, Ga. The aircraft was one of the oldest in the Air Force's inventory and was on its way to the boneyard at Davis-Monthan AFB, Ariz., where it was to be retired.

"I want to express my deepest and most sincere condolences to all impacted by this tragedy. Especially to the families and loved ones of our nine fallen airmen," wrote Col. Raymond Figueroa, the wing commander, in a message to airmen. "Our hearts, prayers, and support go out to you at this very difficult time. Family doesn't ask to help, we just do everything we can automatically. Please count on me, personally, and all my staff to provide any assistance you need."

The crash was the third fatal crash in as many months for the Air Force. On March 15, seven airmen were killed when their HH-60G Pave Hawk crashed in Iraq, and on April 4 USAF Thunderbirds pilot Maj. Stephen Del Bagno died when his F-16 crashed in Nevada during training. The Air Force announced in April it was examining accident rates after the recent series of fatal crashes, and the House Armed Services Committee approved an amendment to the Fiscal 2019 National Defense Authorization Act that would establish a National Commission on Military Aviation Safety.

Maj. Carlos "Dulzura" Perez-Serra was a master navigator and evaluator with 23 years of service and more than 2,400 flying hours. He served as the chief of weapons and tactics for the 156th Operations Support Squadron.



He previously served as a life-support journeyman.

He is survived by his wife, two sons, and a daughter.

Maj. Jose "JR" Roman was a WC-130 pilot assigned to the 198th Airlift Squadron. Roman, who served as the chief of training and flight commander for the 198th AS A-Flight, had 18 years of service and more than 3,700 flying hours as both an instructor and evaluator pilot.



Roman began his Air Force career as an aerial porter.

He is survived by his wife and two sons.

2nd Lt. David "Lani" Albandoz served 16 years of which 14 were spent as a C-130 loadmaster. Albandoz was the co-pilot on the flight, having recently completed co-pilot certification. He had logged more than 2,000 flying hours with the 198th Airlift Squadron.



Albandoz also served as a Missile Defense Agency mechanical engineer in Alabama.

He is survived by his wife and daughter.

SMSgt. Jan A. Paravisini-Ruiz was a maintenance management analyst with 21 years of service. He was assigned to the 156th Maintenance Operations Flight and previously served as a metals technology specialist. Paravisini's oldest son recently joined the wing with plans to serve as an aircraft navigator.



He is survived by his two daughters and son.

MSgt. Victor "Vitin" Colon was assigned to the 156th Operations Support Squadron as an aircrew flight equipment craftsman. He had 22 years of service. He served as the subject matter expert for the Guard's state partnership program with the Dominican Republic Air Forces.



He is survived by his wife and two daughters.

MSgt. Mario "Sully" Brana was a flight engineer with more than 180 total flying hours. He was assigned to the 198th Airlift Squadron and had 17 years of service.



Brana previously served as a flight engineer and an aircraft maintenance craftsman.

He is survived by his mother and daughter.

MSgt. Jean M. "Audi" Audiffred Rivera was an aircraft maintenance craftsman and flying crew chief who was assigned to the 156th Aircraft Maintenance Squadron. Rivera had 16 years of service and had previously served as air advisor for the International Security Assistance Force in Afghanistan.



He is survived by his wife and two sons.

MSgt. Eric "Quillo" Circuns was a senior evaluator loadmaster with more than 2,900 flying hours and 31 years of service. He was assigned to the 198th Airlift Squadron. He previously served as an avionics craftsman before cross training to the Logistics Readiness section where he served as a supply material handling specialist.



He is survived by his wife, two step-daughters, and a son.

SrA. Roberto Espada had been in the Air Force for three years.

He was an aircrew flight equipment journeyman assigned to the 156th Operations Support Squadron. Outside the military, Espada worked as an accountant.



He is survived by his grandmother.

Elegy For The



The MQ-1 revolutionized modern warfare, but now it is no more.

By Brian W. Everstine, Pentagon Editor

The MQ-1 Predator, the remotely piloted aircraft that ushered in the era of drone warfare and permanently transformed modern combat, flew into the sunset during a March 9 retirement ceremony in the Nevada desert. Its mission has been taken over by the MQ-9 Reaper.

So indispensable was the MQ-1 to Air Force operations during its 24-year life span—during which the type amassed more than 2 million flight hours—that a Predator was flying a combat mission in the Middle East on the day of the retirement ceremony. It was a fitting swan song for an aircraft that spent more than 92 percent of its service life in combat.

“The MQ-1 has helped shape the character of warfare,” said Col. Julian C. Cheater, the commander of the 432nd Wing at Creech AFB, Nev., home to the RPA for 23 years.

James G. “Snake” Clark, a former Air Force colonel known as the “godfather” of the aircraft, described the spindly aircraft as “a glider with an Austrian-built (Rotax 214) snowmobile racing engine that races into combat slower than the SUVs on the Beltway in Washington, D.C.”

The Predator traces its lineage back to a \$40 million contract from the Defense Advanced Research Projects Agency to Leading Systems Inc. for the “Amber” medium unmanned aerial vehicle.

Abraham Karem, an engineer born in Baghdad, Iraq, and raised in Israel,

spent years developing early UAVs in his California garage before designing Amber, which came in at a cost of \$350,000 per aircraft. These early variants faced reliability challenges stemming from frequent operator error and no “standard procedures” for flight, Karem told *Air Force Magazine* last year.

Amber’s successor, the GNAT-750 long-endurance tactical UAV, flew in 1989. Variants of this aircraft flew surveillance over air bases, supply caches, and troop movements in Albania, Bosnia, and Croatia.

In 1990, General Atomics Aeronautical Systems Inc. bought Leading Systems and continued developing UAVs. In January 1994, the company received an Advanced Concept Technology Demonstration contract for

Predator



An MQ-1 Predator (left) and an MQ-9 Reaper stand ready at Creech AFB, Nev.



Airmen perform a preflight check on an MQ-1 in 2013.

Photos: SSgt. Vernon Young Jr.; MC2 Brian Glunt/USN



GNAT-750 was the first long-endurance remotely piloted aircraft. It would evolve into the RQ-1 Predator.

a medium-altitude endurance UAV based on the GNAT-750. It evolved into what would become known as the RQ-1.

Used experimentally in a Roving Sands exercise in 1995, the RPA was a success, and a US Army composite unit deployed the aircraft in Albania as part of Joint Task Force Provide Promise between July and November 1995.

Pentagon leaders quickly saw the aircraft's value, and about a year later a prototype Predator deployed to Europe to fly as part of NATO Operations Deny Flight and Deliberate Force in Bosnia-Herzegovina. At the time, the aircraft was an Army asset and was operated in theater by soldiers using a plywood runway.

In the early days of Predator operations, the Air Force pressed to take over the mission. Air Combat Command in July 1995 stood up the 11th Reconnaissance Squadron at Indian Springs Air Force Auxiliary Field, Nev., in anticipation of being assigned the RQ-1.

In April 1996, Defense Secretary William J. Perry made the shift official, and USAF transitioned the RQ-1 from a test platform to an operational system flown by US Atlantic Command.

USAF pilots flew the Predator remotely from Tazsar, Hungary, for Operation Joint Endeavor—the implementation of the Dayton Peace Accords regarding the conflict in the Balkans. At the time, the Predator “cockpit” was a converted NASCAR auto trailer fitted with computers, controls, and monitors. The aircraft transmitted color television and infrared video surveillance.

Predator showed real potential as an intelligence, surveillance, and reconnaissance tool in its early years, but the program experienced growing pains.



Three Predators in a hangar at a base in southern Afghanistan. MQ-1s were integral to operations in the early years of operations in Afghanistan and Iraq.

The aircraft flew low and slow and suffered a frightful accident rate of 43 lost per 100,000 hours, compared with two or three per 100,000 hours for manned aircraft. Inexperienced maintainers and a lack of spare parts contributed to the mishaps.

The drone flew so slowly that in Bosnia, a Serbian helicopter reportedly flew alongside a Predator and shot at it with door-mounted machine guns.

For the first five years of Predator operations, it was purely a watcher system, providing what commanders at the time called “staring” ISR. It wasn't until 1999 that Air Force leaders began to think about using the RQ-1 to provide targeting data.

In April of that year, then-USAF Chief of Staff Gen. Michael E. Ryan called Snake Clark to inquire about this possibility and tasked him to observe Predator operations in Kosovo. They

were flying 24-hour-a-day operations in search of hostile forces.

Clark reached out to the USAF's Big Safari office at Wright-Patterson AFB, Ohio, which modifies aircraft for special missions, such as the RC-135 Rivet Joint and EC-130H Compass Call.

After evaluating Predator, Big Safari suggested the aircraft's sensor ball be replaced with a new unit, used by the Navy, that could not only observe with a camera but designate a target with a laser.

Just 18 hours after USAF approved Big Safari's recommendation, the service was buying the new sensor ball, and just 38 days later an upgraded Predator was flying missions over Kosovo.

By 2000, Air Combat Command wanted not only to fit the whole fleet with laser target designators but to give the aircraft armament as well.

Members of the 11th Reconnaissance Squadron preflight a Predator at an undisclosed location during Operation Enduring Freedom.



AIC Chris Korenaga checks the camera system of an RQ-1 Predator at Balad AB, Iraq. The unmanned aerial vehicle performed surveillance and reconnaissance patrols around the base's perimeter.

ACC wanted Predator to be both sensor and shooter.

Because of the aircraft's small size and relatively weak wings, Big Safari determined it could only carry the Army's Hellfire missile—a small anti-tank weapon carried by helicopters. During a 2001 test, a Predator successfully fired a Hellfire at the Nellis Test Range in Nevada, destroying a tank. This feat occurred just 61 days after ACC's order to arm the Predator, at a cost of \$2.9 million.

Now that it could shoot, within a year, the RQ-1 became the MQ-1 ("M" standing for "multimission" under USAF nomenclature rules).

A NEW ERA OF WARFARE

Testing the armed Predator was still underway at Edwards AFB, Calif., on Sept. 11, 2001, when terrorists struck the US. Just over two hours after the

attacks on New York and Washington, D.C., USAF received presidential approval to deploy the newly lethal Predator. Two days later, a C-17 landed at then-Andrews AFB, Md., with three Predators, 13 Hellfire missiles, ground control stations, ... and a rented Jeep that had to be returned to Hertz at Reagan National Airport in Washington, Clark said.

One of the three MQ-1s that then deployed to Afghanistan was tail number 3034—the first to fire a Hellfire in testing. This same Predator was also the first to fire a Hellfire in combat over Afghanistan, and it is now on display at the Smithsonian's National Air and Space Museum in Washington.

The Predator was integral during the early years of operations in Afghanistan and Iraq, becoming more

effective with the addition of upgraded video capabilities, remote split operations, and improved weapons.

In 2005, 11 years after the beginning of the ACTD program, the MQ-1 officially reached initial operating capability.

Predator production ended in 2011, with delivery of the 268th aircraft. At the same time, demand for persistent ISR was skyrocketing. In 2004, the Air Force flew just five combat air patrols, which translated to 20 Predators flying 24-hour orbits over targets of interest. By 2016, though, USAF was flying 60 CAPs, while the Army was flying its own RPAs, and still more government-owned drones were being flown by contractors. It still wasn't enough to meet commanders' voracious demand.

The Predator's operations in Afghanistan and Iraq ushered in the era of "drone warfare," with a persistent eye watching potential targets and even providing close air support for US and allied ground forces. Predators flew ISR and strike missions as part of ongoing missions in Yemen, Somalia, and Libya.

Since 2008, MQ-1s flew almost 70,000 sorties—executing almost 2,700 strikes.

MQ-1s did not just serve in combat. Predators were requested to provide reconnaissance of the storm-ravaged city after Hurricane Katrina hit New Orleans in 2005, but the Federal Aviation Administration had no rules for allowing RPAs to operate in domestic airspace over inhabited land. Predator camera systems wound up being mounted on skyscrapers in the Katrina relief effort.

However by 2006, Air National

An RQ-1 Predator approaches the runway at Aguadilla, Puerto Rico.



Guard-operated Predators were given the green light for use in disaster responses of various kinds. They flew ISR during wildfires and after hurricanes domestically and assisted international aid efforts after earthquakes hit Port-au-Prince, Haiti, in 2010.

In 2014, Predators were the first to respond to what would become a four-year-long effort, so far, against ISIS. As the fighters with that group rapidly took over parts of Iraq, Predators were dispatched to the area and told to “go north,” Cheater said.

There were no rules of engagement at the time; no detailed guidance. Predators were the eyes for the US and its coalition partners as ISIS surrounded Mount Sinjar in Iraq and began trying to wipe out the Yazidi people. The response from the international community was Operation Inherent Resolve.

Since then, MQ-1s flew in every major battle against ISIS, including the liberation of Mosul, Iraq, and Raqqa, Syria. MQ-1 operations prevented ISIS from destroying dams and helped save the Yazidis.

Predators saw 17 years of constant combat in the Middle East as a mainstay of operations. From its first operational missions through early 2018, the Predator flew a total of 135,750 sorties and 2,061,864 flight hours. Of that total, 1,904,287 flight hours were in combat—92.4 percent of its flying total.

As MQ-1 operations expanded, Predator’s footprint at Creech swelled considerably. Previously known as Indian Springs, an auxiliary airfield for Nellis used mainly for marshaling Red Flag forces, the surrounding area had little more than “a casino

and a gas station,” Clark recounted. The surrounding area was so vacant that few would notice—much less care—if a Predator crashed. Creech has since become the global hub of RPA operations.

The original cadre of just one squadron—the 11th Reconnaissance Squadron (redesignated the 11th Attack Squadron in 2016)—grew into a wing at Creech that also governed Active Duty, Guard, and Reserve MQ-1 squadrons across the country.

The unit—which Clark described as “pirates and misfits” for cobbling a capability out of small amounts of money and appropriating space, resources, and missions along the way—“wrote Air Force history,” Clark said.

“Those who have designed this aircraft, who have flown this aircraft, who have supported it in some way have epitomized this ability to take an idea and rapidly transform it into a vital resource,” Cheater said.

FUTURE OF THE ‘AWAY GAME’

The MQ-1 was an integral part of every combat operation since 1995, but USAF is already well into the MQ-9 Reaper era.

The Reaper fleet is expected to surpass the Predator fleet’s peak, with a total of 346 aircraft to be flown at several bases across the service. To find the pilots to fly them, the Air Force has opened its pilot ranks to enlisted airmen, letting them train to fly the RQ-4 Global Hawk—which does not release ordnance—so more officers can take the controls of MQ-9s.

In 2015, USAF requested a large funding increase to build up its MQ-9 fleet, as well as its ranks of pilots and main-

tainers, to keep it healthy as the service’s ISR commitments expand.

Despite the retirement ceremony, as of April USAF still had 128 MQ-1s in its fleet. Many of these have been placed in crates, with some still awaiting “demilitarization” before they are sent to a final destination, according to ACC. The Air Force doesn’t anticipate the US will sell these aircraft to allied nations, and some have already been chosen for display in museums in the US and England.

The Predator’s ability to have constant eyes and ready weapons over a battlefield a world away from its pilot means the US is able to have an “away game” against the “world’s most ruthless enemies,” without putting airmen in peril, Cheater said.

“Wars are destructive,” Karem noted. For the United States, the goal is “to win with the minimum casualties ... both us and them. And I think armed UAVs being able to ... look at the targets for a long time and throw a small missile, can do that better than an F-16 coming with a 2,000-pound bomb.”

Although hardly an air show crowd pleaser, with its spindly profile and low-power engine (and indeed, it never flew in air shows, as all available aircraft were dedicated to operations throughout its service life), Predator was a highly significant warplane in the changes it brought to modern warfare, Karem said.

“While the Predator may fly slowly, our enemies are afraid of it for good reason,” Cheater observed. “We have been able to reach long distances, to fly sorties for longer than 22 hours, to launch a precision Hellfire missile through a specific window to remove callous snipers, and as a result, our joint and coalition forces sing the praises of the mighty MQ-1.”



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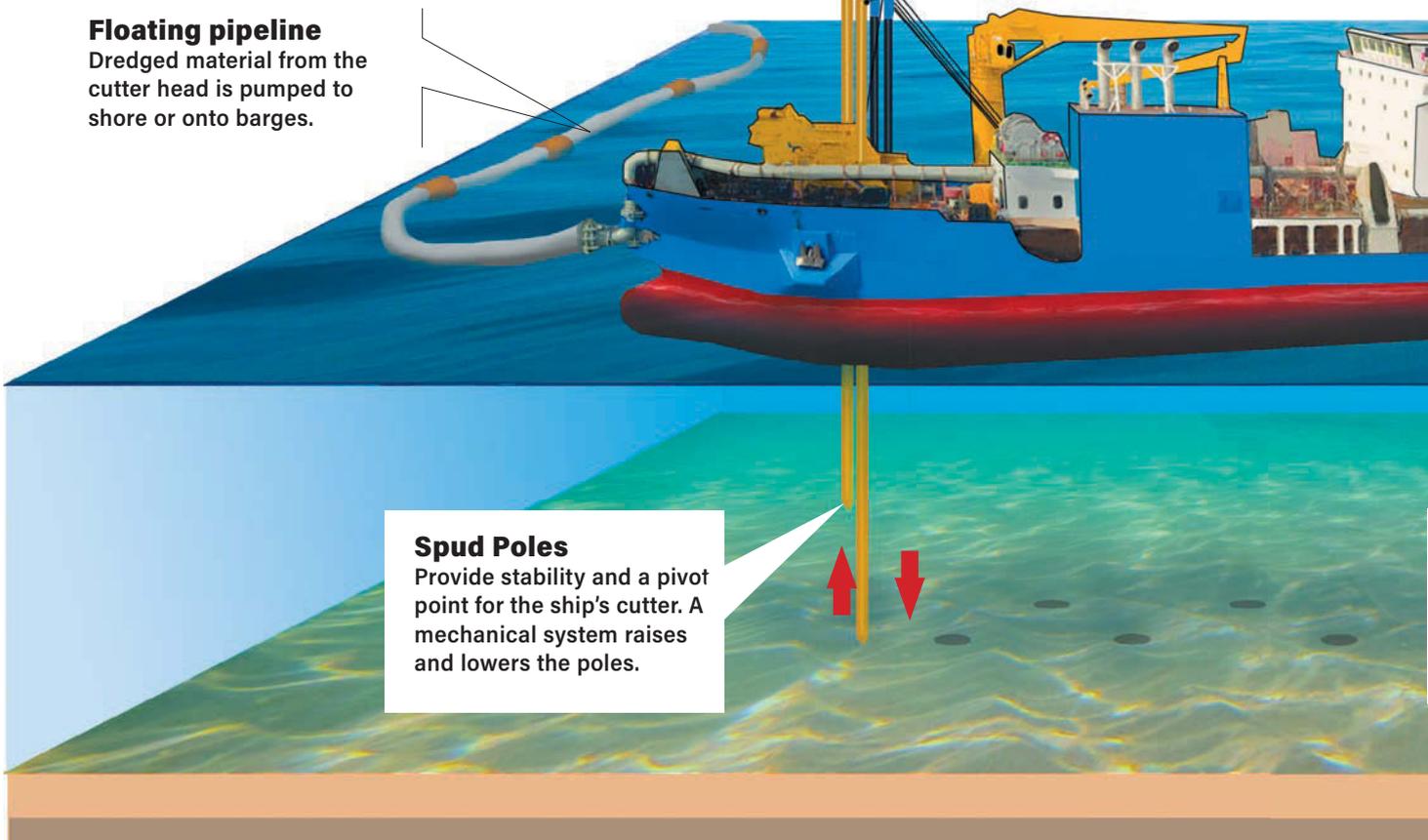
1
Fiery Cross Reef as it appeared on Jan. 22, 2006. A small Chinese outpost is barely visible at the lower left of the reef.



2
China began dredging operations at Fiery Cross Reef in 2014. This image shows an island taking shape.

Floating pipeline

Dredged material from the cutter head is pumped to shore or onto barges.



Spud Poles

Provide stability and a pivot point for the ship's cutter. A mechanical system raises and lowers the poles.

ABOUT THIS SHIP

In November 2017, China launched its newest dredging ship, the *Tian Kun Hao*. Described as a “magical island maker” by its builder, CCCC Tianjin Dredging Co., Ltd., it is China’s largest self-propelled cutter suction dredger. The ship measures 460

feet long and 91 feet wide. This powerful vessel can crush underwater rocks and move sand and mud at over 211,000 cubic feet per hour, enough to fill three standard swimming pools, while working at a depth of over 100 feet.

China's powerful new dredging ship may join the effort to transform reefs into military installations.

OTHER DREDGING VESSELS



Trailing Suction Hopper



Plain Suction Ship

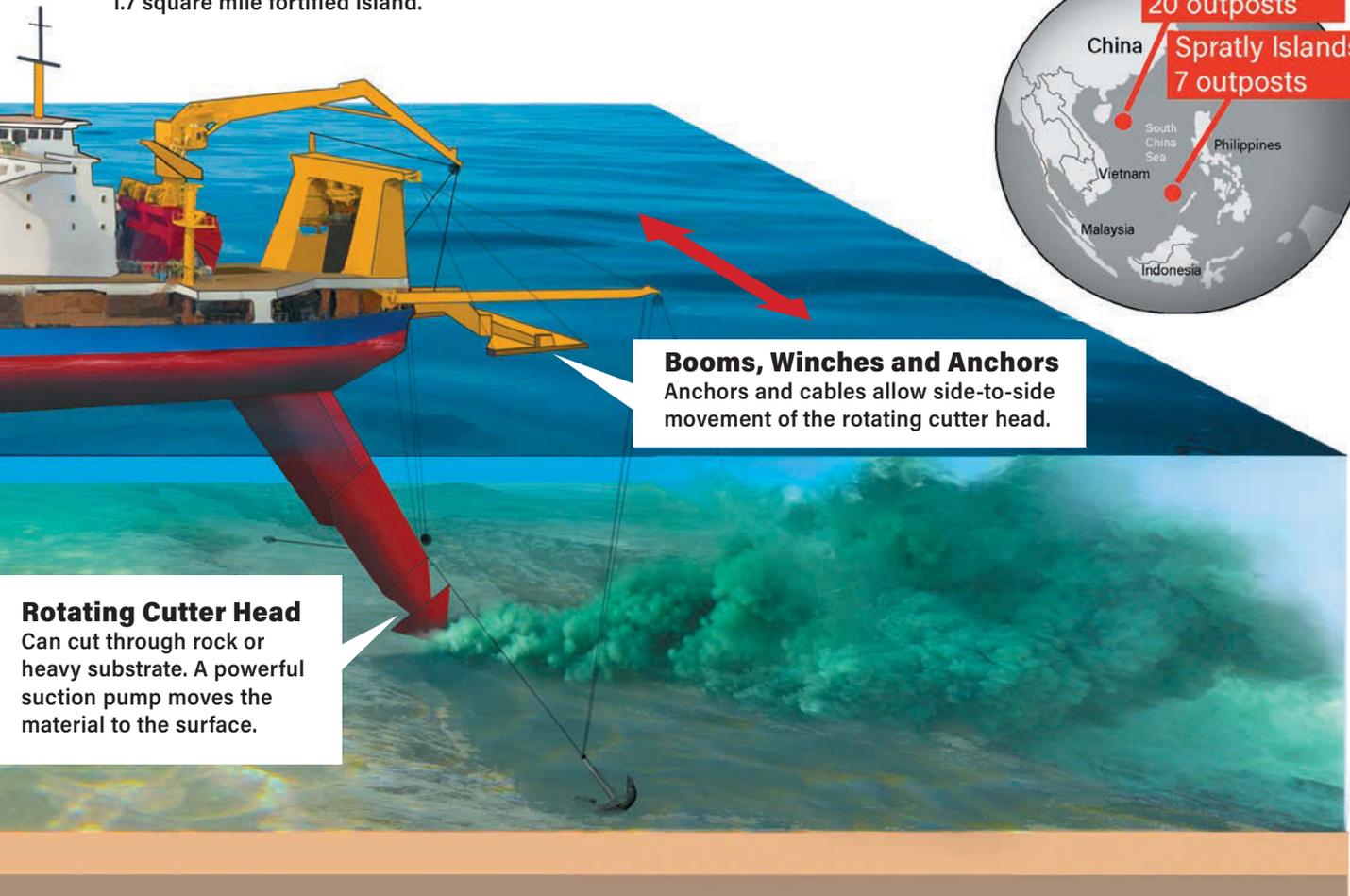


Bucket Chain Dredge



Fiery Cross Reef now has a 10,000-foot runway capable of operating H-6K strategic bombers. For more on China's advancing airpower, see "The Chinese Air Force's Great Leap Forward," p. 44.

In a 2018 photo, what was once a submerged reef is now a 1.7 square mile fortified island.



Booms, Winches and Anchors
Anchors and cables allow side-to-side movement of the rotating cutter head.

Rotating Cutter Head
Can cut through rock or heavy substrate. A powerful suction pump moves the material to the surface.

CHINA'S TERRITORY GRAB

China has occupied territory in the Paracel Islands since 1974 and began claiming reefs and tiny islands in the Spratly Islands in the 1980s. In early 2014, China began its massive dredging operations. Its island-building operations are highly controver-

sial and are generally considered illegal territorial grabs. The tiny island chains are economically vital to all nations bordering the South China Sea, featuring rich fishing grounds, oil, natural gas, minerals, and major shipping and air routes.

Photos: Center for Strategic and International Studies/Asia Maritime Transparency Initiative; Google Earth



A guided munition (red circle) is moments from impact on a Taliban narcotics production facility in Farah province, Afghanistan. The munition explodes (middle). After the munition explodes, the facility is strafed and destroyed (right).

AIRPOWER IN THE CENTCOM AOR

The latest shift flows air assets from anti-ISIS operations back to Afghanistan.

An Afghan commando during a nighttime raid of a Taliban narcotics production facility in Helmand province, Afghanistan, in April.





By Jennifer Hlad

COMBINED AIR OPERATIONS CENTER, QATAR—

Since the end of 2017, with the fight against ISIS in Iraq and Syria winding down, the Air Force has been shifting airmen and aircraft to Afghanistan to support the changing, enduring mission there.

In October 2017, US aircraft conducted 653 strikes in Afghanistan, the highest number since November 2010—during the surge under President Barack Obama—and in November, the US and Afghan military began targeting Taliban drug labs in an ongoing operation called Jagged Knife.

By the beginning of February 2018, the Air Force had sent A-10 Warthogs, MQ-9 Reapers, and HH-60G Pave Hawks to Kandahar Airfield, as Afghanistan became US Central Command's main effort. It was just the beginning.

"It's definitely a refocus. A lot of effort [is] going into making sure we get the weight of effort switched over to Afghanistan," Maj. Gen. David S. Nahom, deputy head of US Air Forces Central Command and deputy combined force air component commander, told *Air Force Magazine* in an interview at Al Udeid Air Base, Qatar.

The new fight in Afghanistan is not the same as the previous campaign, Nahom



A-10s at Al Udeid AB, Qatar, en route to Kandahar Airfield, Afghanistan.

pointed out. It's much more of a strategic air campaign and will include support to the Afghan army through the US Army's Security Force Assistance Brigades.

"We're not going to just go after terrorists, we're going to go after networks ... financing ... drugs; going after the things that give them the fuel. That's going to be a big part of getting after these networks in our strategic air campaign." At the same time, "we're going to have soldiers and others outside the wire in support of the Afghan army, and we as an air component are going to be overhead protecting them, because that's what we do," Nahom explained.

The mission and the fight are "much more intricate" than in the past, he said.

"It's going to be much more complex now, as the size and breadth of this campaign is just going to grow. We're not going to be waiting for fighting seasons. We're getting after it now, and that's just going to continue," he said.

The most obvious example of the change from previous years is Operation Jagged Knife. Though the US in 2015 began systematically targeting oil refineries and other sources of ISIS revenue in Iraq and Syria in an operation called Tidal Wave II, Jagged Knife is the first time in recent history the US has gone after Taliban drug networks in Afghanistan.

Jagged Knife, like Tidal Wave II, was designed to disrupt the enemy's ability

Photos: USAF; 7th SOK; MSgt. Phil Speck/ANG



USAF civil engineers build airfield matting at Kandahar Airfield in December 2017.

to fund its operations. Between November 2017 and April 7, 2018, the coalition conducted 75 strikes against drug facilities in Afghanistan, according to a NATO Resolute Support press statement. Drug production and taxation generates about \$200 million in revenue for the Taliban, according to the release.

In February alone, the campaign destroyed about 25 Taliban “narcotics facilities and financial nodes,” according to AFCENT’s Feb. 28 airpower summary.

It is worth noting, Nahom said, that the Afghan Air Force took on the initial strikes in Operation Jagged Knife. Some of the shift to Afghanistan has been a ramping up in support to the Afghan Air Force, Nahom said, but “they’ve really come along,” conducting their first laser-guided weapon drops in January.

The “realignment” to Afghanistan, as

Nahom calls it, involves shifting assets from Operation Inherent Resolve. A-10 Warthogs belonging to the 303rd Expeditionary Fighter Squadron out of Whiteman Air Force Base in Missouri were originally scheduled to replace the A-10s operating out of Incirlik AB, Turkey, but instead went to Kandahar, where the Warthogs flew their first mission within 24 hours of arriving on Jan. 19.

Nahom said the decision to send the A-10s to Afghanistan wasn’t random. The country is “the perfect place for the A-10 to go,” he said, noting that they were originally thinking of moving Marine Corps F/A-18s to Afghanistan, but decided it would be better to keep them in the Iraq and Syria theater, where their air-to-air capabilities are occasionally needed.

“There were several compelling reasons

to move the A-10,” he added. Air Forces Central moved them “out of Turkey thinking Syria may be kind of wrapping up by now, (although) somebody needs to tell ISIS.”

The low collateral damage weapons the A-10 carries are also useful in Afghanistan, Nahom explained.

“Every asset we have has got an advantage and a disadvantage,” he said. The B-52 offers “versatility, the amount it can carry, and how long it can stay airborne.” The F-15E “can do air-to-air and air-to-ground,” as can the F-16 and the Navy’s F/A-18, and that’s “what I need in OIR right now, because there still is a threat from Syrian, Russian, and Iranian aircraft.”

Having aircraft with multirole capabilities in Iraq and Syria—“just in case we need it”—is very valuable. The A-10



Walking The Planks

It was just a few days before Christmas when TSgt. Frederick Horne's name was called at Al Udeid Air Base. He was told to bring his supervisor, so he thought he might be in trouble. Instead, he was told he was going to Kandahar.

Horne and SSgt. Zachary Hohenstein were on a plane on Dec. 24 and landed in Afghanistan on Christmas morning. Once the airmen and the materials arrived, it was "go, go, go," Horne said: Out at 6 a.m. and working until dark everyday.

The airmen worked with the sun, "probably 10-, 12-hour workdays," Hohenstein said, and it was hard, heavy labor, though some days they got a break as they waited for a plane to land with more materials.

"Everybody had the same mindset: Just [tough] it out and

go home," said Hohenstein, who, like Horne, was scheduled to return to the US at the end of January.

Ten days in, they had three weeks' worth of work done, Lt. Col. Jerry Milliman, the engineering group's operations director, said.

"We were well ahead of schedule, which enabled the other pieces to move ahead of schedule," he explained.

The airmen built four large area maintenance shelters at over 10,000 square feet apiece, as well as several medium shelter systems. The new construction of what Milliman described as "big tents" with aluminum plank flooring allowed the Army to move out of existing hangars the Air Force needed for the A-10s.

and the B-52 are not those airplanes," Nahom said.

In addition to the A-10s, AFCENT also sent MQ-9s and HH-60Gs from OIR to Kandahar in January. The Reapers were flown to Kandahar, rather than being boxed up and shipped—a first for CENTCOM, although this has been done in other theaters, Nahom said.

"Normally, we take the wings off, box

them up, put them in a C-17, ship them over, put them back together. And that takes time," he explained.

Flying the Reapers directly to Afghanistan took less than 10 percent of the time it would have taken to airlift them, so they were available for missions more quickly, he noted.

In another first, a Reaper in February performed a multirole (strike, armed over-

watch, and ISR) mission by employing four 500-pound precision guided munitions against a Taliban drug facility in Helmand province.

Still, moving all of the aircraft to Kandahar wasn't as easy as firing them up and flying them over. Significant planning and construction was necessary to get the airfield ready for the new arrivals in a matter of weeks.



Airmen unload an HH-60 Pave Hawk helicopter from a C-17 at Kandahar Airfield in January.

The 1st Expeditionary Civil Engineering Group did much of the heavy lifting—literally—to get Kandahar prepared. Col. Brian M. Stumpe, director of civil engineering, contracting, and installations, said the accomplishment was “an incredible display” of the joint force’s ability to bed down multiple airframes in a new location.

“The ability of the Air Force to have the stuff we needed in reserve, the ability to get the stuff on airlift and get it to where it needs to be, and have our engineers there ready to go to set this up was just incredible. The coordination and synchronization that occurred, it’s mind-boggling,” Stumpe said.

Lt. Col. Jerry Milliman, director of operations for the 1st ECEG, said the unit knew in the fall that there was going to be “an inflection point” from OIR to Afghanistan, so he went to Kandahar to see what would be needed and to start planning. He was glad he did, he said, because the execution order “came much sooner than we expected.”

With a plan already in place, the group had airmen out the door within 48 hours, and they put up nearly 50,000 square feet of covered space in the span of just two weeks.

The shift northeast also required

significant mobility support. Lt. Col. Andrew Frasch, deputy director of the Air Mobility Division, explained that air mobility is focused on productivity and effectiveness, and in the shift from OIR to Afghanistan they tried to be as efficient as possible with the limited resources they had, but frequently had to focus more on being effective.

Planning and communication were critical, noted Canadian Air Force Col. Scott Murphy, also a deputy director.

The mobility forces were authorized by the Combined Deployment and Distribution Operations Center to make decisions that would normally have had to go through the center, giving the airmen more flexibility, Frasch said.

“If we hadn’t been able to get ahead of the game, we’d be in a world of hurt right now,” he said.

Mobility assets moved more than 17,500 tons of cargo between Jan. 1 and Feb. 28, assisted by the Qatar Emiri Air Force, which flew seven C-17 sorties and moved 212,000 pounds of cargo between Jan. 26 and Feb. 28, according to an AFCENT airpower summary.

Even as the strategic focus and majority of effort shifts back to Afghanistan, however, Operation Inherent Resolve continues.

Nahom emphasized that even though there was talk of “pivoting,” no one seemed to have told ISIS or the other elements in Iraq and Syria.

“They haven’t seemed to stop fighting, so we’re still really busy in OIR,” he said. “There’s a lot of ISIS left.”

Even though “we’ve done some incredible work, freed a lot of territory and set a lot of people free,” and the would-be caliphate has been decimated, “there’s still a lot of work to be done.”

Some of that work was visible on the CAOC’s screens, as Air Commodore Harvey Smyth, an RAF pilot serving as the CAOC director, walked *Air Force Magazine* through the CAOC’s operations.

The shift back to Afghanistan is particularly interesting to Smyth because he spent a lot of time there and was one of the last British officers to leave Kandahar in 2014.

He was also the UK Tornado strike aircraft commander during the Mount Sinjar aid drops that marked the beginning of OIR as allied forces worked to rescue trapped Iraqis from ISIS.

On the day of the walk-through, the CAOC’s screens showed a lot of effort focused on the Middle Euphrates River Valley, where the coalition was “trying to finish off ISIS,” Smyth said. But it was



A B-1B from the 34th Expeditionary Bomb Squadron is prepared for a strike on Syria.

APRIL 13, 2018

Airpower Blasts Syrian Chem Facilities

A large combination of US, United Kingdom, and French aircraft and ships fired 105 total weapons aimed at crippling the chemical weapons infrastructure of Syrian President Bashar al-Assad almost a week after the regime allegedly used chemical weapons on a suburb of the country's capital.

The strike marked the first use of the AGM-158 Joint Air-to-Surface Standoff Missile in combat. Two USAF B-1B Lancers from the 34th Expeditionary Bomb Squadron launched a total of 19 JASSMs. The bombers, deployed from Al Udeid AB, Qatar, entered Syrian airspace from the south and were escorted by a USMC E/A-6B Prowler.

President Trump ordered the strike to demonstrate “international resolve to prevent chemical weapons from being used on anyone, under any circumstances, in contravention of international law,” Defense Secretary Jim Mattis said during an after-action briefing.

F-22s were also flying in the area, ready to strike Syrian

or Russian air defense systems and other assets if they threatened either coalition aircraft or US ground forces in the region.

“US Air Force F-22 Raptors played an integral role in protecting ground forces during and after the multinational strikes against Syrian chemical weapons production facilities on the morning of April 14,” AFCENT spokesman Capt. Mark Graff said. “Thanks to its unique fifth generation capabilities, the F-22 was the only airframe suited to operate inside the Syrian integrated air defense systems, offering an option with which to neutralize [Integrated Air Defense System] threats to our forces and installations in the region, and provide protective air support for US, coalition and partners on the ground in Syria.”

Russia has deployed S-400 air defense systems in Syria. More than simply a system to shoot down missiles or aircraft, it can also serve as a guided tactical ballistic missile system, with the ability to shoot ground targets.

clear that there's activity across all the regional maps.

The AFCENT airpower summary for January noted that “continued progress in Operation Inherent Resolve and the fight to defeat ISIS” allowed the command to move airmen, aircraft, and assets to Kandahar. The number of weapons released that month in OIR and Afghanistan also tell a story: Just

448 weapons were dropped in Iraq and Syria, compared to 3,600 a year earlier, while in Afghanistan, 321 weapons were released, compared to 54 in January 2017.

The shift in airpower had already produced “tangible results” against the Taliban by mid-February, AFCENT Commander Lt. Gen. Jeffrey L. Harrigan told reporters at the time.

“That's the beauty of airpower, to be able to flexibly and in a very agile fashion switch” from one theater to another, he said.

Still, Nahom noted that the US has not forgotten about OIR, noting that there is still “a lot of firepower” in the region, including a US Navy aircraft carrier, F-22s, and F-15Es, with F-16s expected to arrive in the spring. ✪

Photos: SSgt. Sean Martin; MSgt. Phil Speck

★ SCREENSHOT





05.05.2018

Raindrops soften the view as two F-15 Eagles deploy flares after fueling up from a KC-135 tanker during a mission for Operation Inherent Resolve.



THERE IS NO

There is

COLORADO SPRINGS COLO.—

The increasing military importance of space permeated the 34th Space Symposium in April. Speakers from Vice President Michael R. Pence down through a range of military and Air Force officials underscoring the need to focus on space as a warfighting domain, as the Trump administration has declared it to be.

The emphasis on the national security space enterprise has been an increasing focus in Washington in recent months. It has been prominent in, for example, the administration's December National Security Strategy and in continuing calls from some in Congress for establishment of a space force or space corps as a military service separate from the Air Force.

Pence's remarks, at the start of the event went far beyond the national security aspects of space. He did, however, describe the newly re-established National Space Council's proposal to shift basic space situational awareness to the Commerce Department as a step being taken "so that our military leaders can focus on protecting and defending our national security assets in space."

Moreover, he pointed to Trump's statements that "space is a warfighting domain, just like the land, air, and sea" and calls for the Pentagon to strengthen the resilience of US space systems in the face of Russian and Chinese pursuit of anti-satellite capabilities.

It was Defense Department officials at the conference, though, who really hammered the point home. In speeches and remarks to reporters, DOD leaders reminded listeners of the National

By Steve Hirsch, Senior Editor

Security Strategy declaration that the US "considers unfettered access to and freedom to operate in space to be a vital interest." Similarly, they emphasized how the National Defense Strategy designated space as a warfighting domain.

Gen. John W. Raymond, commander of Air Force Space Command headquartered at Peterson Air Force Base and the Joint Force Space Component under US Strategic Command, pointedly predicted that future historians will look back on 2017 and 2018 as "one of the most critical times in our national security space history."

It will be seen, he suggested, "as a strategic inflection point for national security space and a bold shift toward warfighting and space superiority."

The sense of being at a critical juncture—a key moment in the history of the US national security space enterprise—

"WAR IN SPACE"

just war.

was a common thread throughout the presentations that Raymond and his colleagues made during the symposium. Also high on the agenda was the recurring theme that the defense and security elements of the US government are increasingly focused on dealing with national security issues raised by the changing space environment.

Gen. John E. Hyten, commander of US Strategic Command and former commander of Air Force Space Command, told reporters there was "no doubt in my mind we're going to have to deploy defensive counterspace systems because our adversaries are building offensive counterspace systems."

"The nation's going to have to make a decision on what we do in order to challenge somebody else's space capabilities. I think we're going to go down that path. I think we *have* to go down that path," Hyten said.



SBIRS-4 is ready for encapsulation in January 2018 at Cape Canaveral AFS, Fla. The SBIRS payloads are classified.

He said understanding of the threat in space has grown in Washington policy circles in recent years.

"I think five years ago there was very little understanding," Hyten said. "Today, there's a broad understanding that continues to expand."

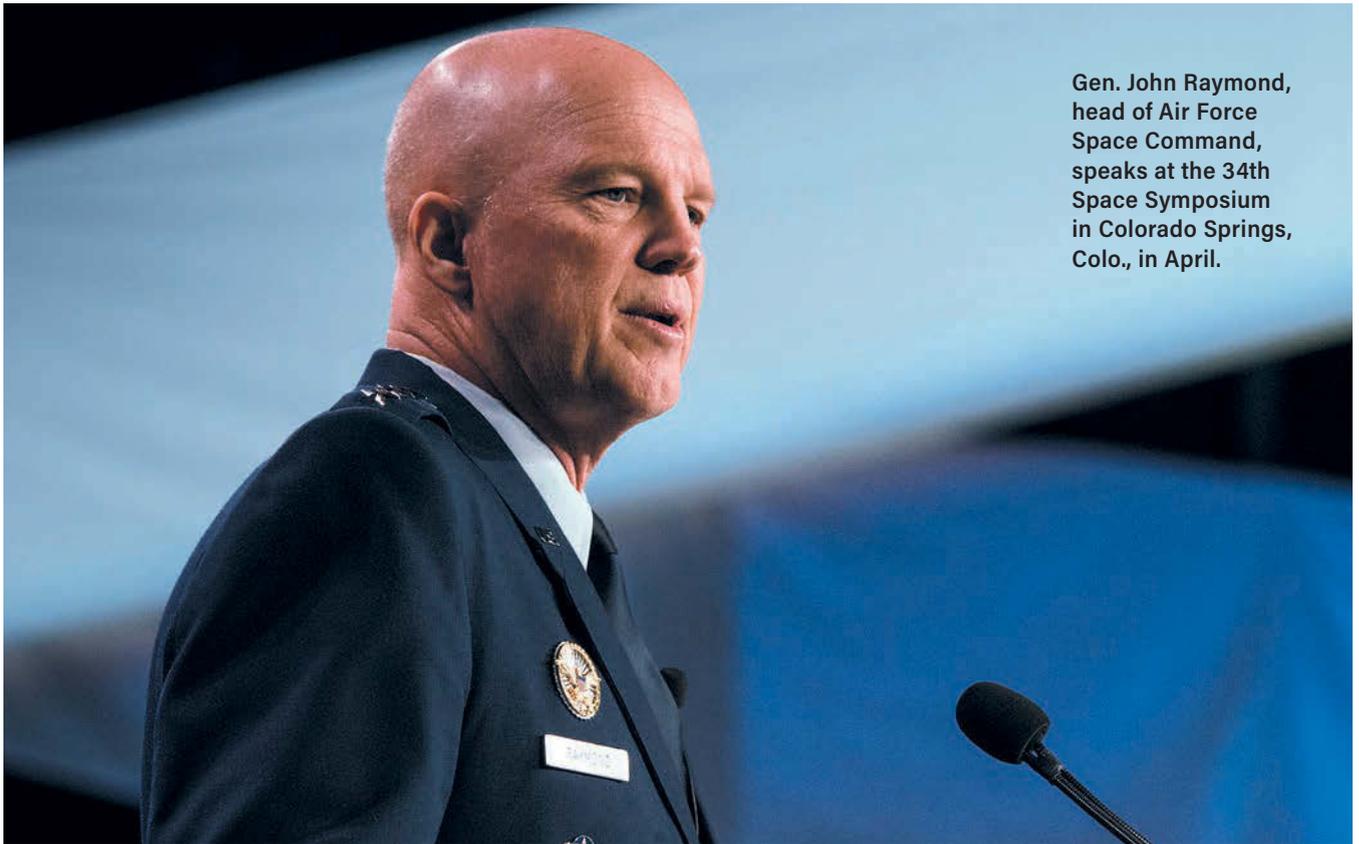
He praised the House Armed Services Committee's Strategic Forces Subcommittee for defining in legislation—including the National Defense Authorization Act—what needs to be done in space.

"They talked about the threat exactly right. They talked about the need to respond to that threat exactly right," Hyten said.

There were "significant discussions" in the press and publicly about space as a warfighting domain or the idea of a space corps or force, he said.

"But the real benefit, the real strength of that law was the identification of

Photos: Arek Socha/Qimono; Jim Dowdall/Lockheed Martin



Gen. John Raymond, head of Air Force Space Command, speaks at the 34th Space Symposium in Colorado Springs, Colo., in April.

the problem. That will allow us now to engage with the broader members of Congress to further educate them on what the threat is. And we've also shared a very detailed tabletop exercise with the members of the Senate and House Armed Services committees so they can see the full implication of all the things that we're worried about," he said.

"We're still on the education path," Hyten said, "but it's far more mature than it was just five years ago."

As a consequence, the administration has increasingly focused on national security space, speakers said, with Raymond telling reporters it is clear "our nation's senior leaders are laser-focused on the space domain."

He pointed to a number of steps already taken, including the administration's 2019 budget request that includes almost \$7 billion more for space, growing partnerships with the National Reconnaissance Office and with industry, establishment of a four-star Space Component Command in US Strategic Command, and the planned conversion of the Joint Space Operations Center into a Combined Space Operations Center.

However, even as the government has already taken steps to focus more on national security space, "it is time to go further," Air Force Secretary Heather

A. Wilson said, and she announced a series of steps at the symposium to do just that.

INTERNATIONAL SPACE

Addressing a dinner audience, Wilson said now is the time to expand national security space relations with allies and partners because the US faces "a more competitive and dangerous international security environment than we have seen in decades."

As America's great power rivals, "Russia and China are developing capabilities to disable our satellites," she added.

She announced the Air Force would, starting next year, increase the availability of Air Force space training for allies and partners by adding two more courses to the National Security Space Institute, including one on space situational awareness. USAF would also open more of the existing advanced national security space courses to members of allied nation militaries, including those of France, Germany, Japan, New Zealand, and possibly others—Australia, Canada, and the United Kingdom were already in. "Countries with allies thrive and those without allies" do not, she told reporters before her speech.

"We will strengthen our alliances and attract new partners," Wilson said, "Not just by sharing data from monitoring,

but by training and working closely with each other in space operations."

She said an increasing number of countries are establishing space interests or launching satellites, adding, "there are more countries that are allies of ours that we probably want to train together."

"One of the key lines of effort in the National Defense Strategy is to deepen our alliances and partnerships. This is just one of the ways we're going to be doing this in the space domain," she said.

Raymond also pointed to the importance of international partnerships.

"We're increasing our training with an international coalition of allies and partners," he said, for example, having added France, Germany, and now Japan to the Air Force Space Command Schriever Wargame series.

One reason alliances are important is because not all responses to space threats will necessarily be in the space domain itself.

The National Security Strategy includes a statement, which Raymond pointed to in his speech, that any harmful interference with, or attack on, critical components of the US space architecture that directly affects unfettered US access to, and freedom to operate in, space will be met with a deliberate response "at a time, place, manner, and domain of our choosing."

Gen. John Hyten,
commander of US
Strategic Command,
moderates a panel
on "Recapturing Our
Ability to Go Fast" at
the symposium.



Hyten returned to that phrase during his press conference to talk about the likely US response to a space attack.

The reference to the US responding in a domain of its choosing, Hyten said, "is a huge change in our overall strategy."

The passage, he said, focuses on something STRATCOM has been looking at for a while, which is how to fight a war that goes into space.

"My answer is, the first thing I'm going to do is I'm going to call the geographic combatant commander that's actually fighting whoever the opponent is on the Earth and find out what the heck is going on in that world. And, oh, by the way, the response that we work out to recommend if warfare does extend into space may not be in space. It may be in cyberspace, it may be in the air, it may be some other place," he said.

"What I don't want," he said, is "war to effectively go kinetic and big in space because that is where the United States loses," because the kinetic effects created in space last a long time, and the nation with more space capability has more to lose because of the danger to space assets from debris.

So, the addition of language referring to a domain chosen by the US opens new possibilities, he said.

"No. 1, when we train and exercise, instead of just going 'Okay, now you

have a space problem. STRATCOM, what are you going to do?' It's 'what domain are you going to respond to?' And we have to now develop broad-based plans, broad-based structures, then we have to figure out how to exercise those broad-based plans across multiple combatant commands. That's going to drive multicombatant exercises that we really have to do. You talk about space, it's always a global problem."

That means that "if we're doing something in the Pacific, European Command actually has to play, because everything we do impacts the entire world," Hyten said.

The point, he told reporters, is that the US will respond to actions in space by its adversaries "as part of the broader conflict." Therefore, "you have to look at war from the perspective of the adversary and you, not from domain to domain."

Adversaries must know the US response "can be significant, and it will be something that would hurt them, [and] that's why they should not ever want to go down that path," said Hyten.

HURRY UP DON'T WAIT

The US still has serious vulnerabilities in space it must address, but schedules can be slow and ponderous. The Air Force is working to address this as well.

Wilson said US satellites are to become more resilient and defensible and must be developed more quickly. She said the time for replacing the canceled seventh and eighth Space-Based Infrared System missile warning satellites would be cut from nine to five years for the new satellites.

As part of moves to speed up acquisition, Wilson said USAF would set up an office reporting to the assistant Air Force secretary for acquisition, whose job "is not to buy things, but to change the Pentagon rules on how we buy things so that speed is possible."

"I'm not sure what we're going to call it. Perhaps AQ Delta—the fourth letter in the Greek alphabet—which in mathematics is the symbol for change. Or perhaps we'll find a name slightly less geeky and obscure," she said.

Finally, she said, Los Angeles Air Force Base's Space and Missile Systems Center—in charge of space systems procurement—would be revamped to eliminate stovepipes and to streamline its operations.

Altogether, the Air Force is working to make its space capabilities more flexible so it can respond faster, winning wars in ways enemies can't predict.

"It's not space for space's sake," Hyten noted, because "there's no such thing as war in space, there's just war." ★

The Air Force struggles to make the case for a new nuclear cruise missile because it can't say much about it.



THE LRSO

The Long-Range Standoff weapon, or LRSO, is arguably the most controversial element of the Air Force's strategic modernization plan. While there's general—though frequently grudging—bipartisan congressional support for replacing most of the geriatric nuclear deterrence enterprise, there's rather less enthusiasm for LRSO, a stealthy cruise missile that would be launched from B-52 bombers far outside enemy defenses or from B-21 stealth bombers that have penetrated enemy airspace.

The criticisms revolve around the weapon's cost, whether it's needed, and its potential to be "destabilizing."

The Air Force has said relatively

little about LRSO, explaining that it wants to keep adversaries guessing about its capabilities and technologies. Last summer, Lockheed Martin and Raytheon each received \$900 million contracts to develop competing designs for the weapon, which will succeed the AGM-86 Air Launched Cruise Missile (ALCM) and, indirectly, the AGM-129 Advanced Cruise Missile (ACM).

AND THE WINNER IS ...

A winning design will be chosen in 2022, and after a development program, operational service is expected in 2030. Gen. Robin Rand, commander of Air Force Global Strike Command, told the Senate Armed Services Committee in June 2017 that the service had

By John A. Tirpak, Editorial Director

"dedicated \$2.7 billion" to the program between Fiscal 2018 and 2022.

What is known about LRSO is that it will be extremely stealthy and presumably more accurate than the missiles it replaces. Industry and Air Force sources say it won't be a hypersonic weapon, as that technology won't be ready for operational use in time. An Air Force document circulated last summer referred to LRSO as having the designation "AGM-180/181," a likely reference to the two competing designs, although it could refer to a possible nuclear/conventional split of production.

The Air Force is planning to build about 1,000 LRSOs, a portion would be for routine tests, but the bulk of which would be kept ready for combat

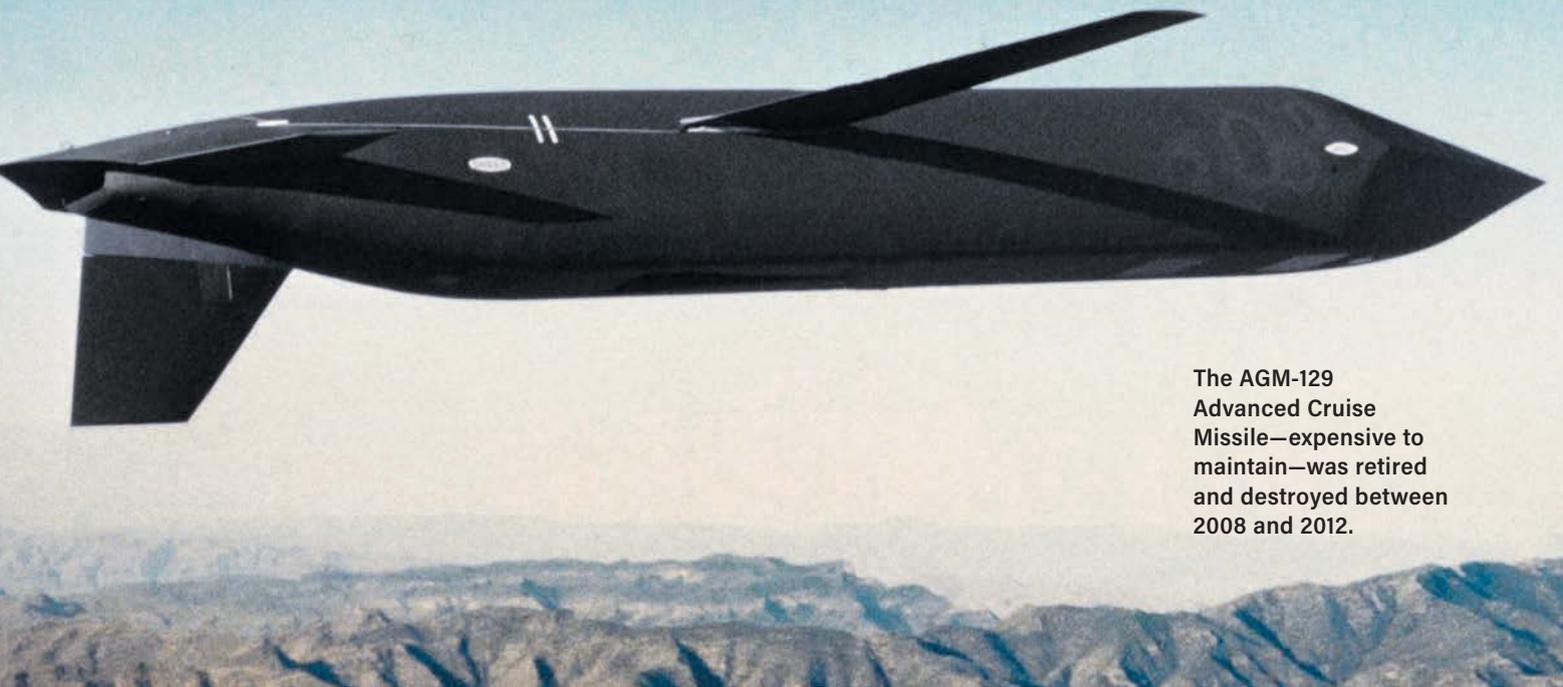
Airmen attach AGM-86B cruise missiles to a B-52H at Minot AFB, N.D., during a Global Thunder exercise in 2016. The proposed Long-Range Standoff weapon will enable the B-52H to remain an effective part of USAF's nuclear bomber force.

ARGUMENTS

Airmen at Dyess AFB, Texas, load a JASSM cruise missile. USAF launched 19 JASSM during a recent air strike on Syria.



Photos: A1C J.T. Armstrong; SrA. Kedesha Pennant



The AGM-129 Advanced Cruise Missile—expensive to maintain—was retired and destroyed between 2008 and 2012.

use. The LRSO is expected to carry an upgraded version of the W80-4 nuclear warhead and be capable of operating in “a GPS-denied environment,” meaning it can navigate even if Global Positioning System signals are jammed. Rand said LRSO will “retain penetrating cruise missile capabilities through 2060,” suggesting it will be designed for a 30-year service life.

Service and industry officials have said LRSO will have a mission to destroy densely overlapped air defense systems, clearing a path for stealth bombers to penetrate enemy airspace.

The Congressional Budget Office, in a wide-ranging assessment of the cost to modernize the nation’s nuclear deterrence enterprise, released last fall, said that \$28 billion in development, acquisition, and sustainment cost could be avoided over the next 30 years by terminating the LRSO program. The CBO noted, however, that this would only shave two percent off the overall nuclear modernization bill of more than \$1.3 trillion over that same period. The actual acquisition cost for development and procurement of 1,000 missiles is estimated at about \$10 billion.

LRSO DETRACTORS

The LRSO has some heavy-hitter critics. Former Defense Secretary William J. Perry—considered the “godfather” of stealth and precision-guided weapons at the Pentagon when he was its technology chief—co-penned an op-ed in the *Washington Post* in 2015, saying LRSO would be “destabilizing” to deterrence. He and co-author Andy



Soviet inspectors check a BGM-109G cruise missile before it is destroyed at Davis-Monthan AFB, Ariz., in 1988 as the US complied with the Intermediate-Range Nuclear Forces Treaty.

Weber based this assertion on the fact that LRSO could be launched without warning, and an enemy would not know if it was a conventional or nuclear-armed weapon, compelling that enemy to treat the situation as “worst case” and respond with his own nuclear weapons.

Perry and Weber further argued that LRSO is redundant if the B-21 can penetrate enemy defenses and reach its intended targets through its stealth. They also said that if LRSO is meant to offer a President “flexibility” to use

a low-yield weapon, such a purpose would be “dangerous” and “a grave mistake,” by lowering the threshold for use of nuclear weapons and greatly increasing the risk of escalation to all-out nuclear war.

Last year, nine Democratic senators introduced a bill that would cap LRSO funding until its need could be explained by the Trump administration’s Nuclear Posture Review. They echoed Perry’s arguments that LRSO is either unnecessary or destabilizing, or both. One of the senators, Dianne Feinstein (D-Calif.), had previously called for hearings on the need for the weapon.

Defense Secretary Jim Mattis, in answers prepared for his confirmation hearings in January 2017, voiced his support for modernizing the nuclear triad, but was—at that time—ambiguous about his support for LRSO. He promised he would “examine the utility and advisability of this ... program within existing nuclear doctrine” and deliver firmer answers with the Nuclear Posture Review, promised within a year. The NPR was to be a DOD-driven holistic look at the nuclear deterrent enterprise, ranging from the scientific infrastructure of building and testing nuclear weapons to the viability of delivery systems across the services and the command and control architecture governing them.

“I’ve not yet completed my own review,” Mattis said at the time, adding, however, that LRSO as a weapon to eliminate air defenses helps deterrence strategy. “We have got to make certain the bombers can get through,” he asserted, “if they’re to be a valid

deterrent.” Mattis further said he’d consult with Perry on the issue and was well aware of the “destabilizing” argument. Feinstein, in that same hearing, said LRSO has “features which concern me greatly,” but didn’t elaborate. However, “I’m not sure, for the cost, that we’ll end up with a practical deterrent,” she added.

Rand, in his testimony, said, “I cannot overemphasize this point: B-21 and B-52, without LRSO, greatly reduces our ability to hold adversaries at risk, increases risk to our aircraft and aircrew members, and negatively impacts our ability to execute the mission.”

Requirements for LRSO are set by US Strategic Command—not the Air Force—because it is a nuclear weapon. STRATCOM chief Gen. John E. Hyten, in a speech to the Hudson Institute in September 2017, said there are “a million reasons” for LRSO, most of which are classified and would be discussed in the Nuclear Posture Review. But he argued that the need to keep the B-52 in the nuclear game, coupled with the antiquity of the ALCM, means a new missile is necessary.

The ALCM, Hyten said, is “40-plus years old, ... difficult to maintain, almost impossible to fly. We won’t be able to fly it much longer.” Without it, he said, “you don’t have the B-52 as a viable platform.”

Moreover, it’s a numbers game, Hyten said. A B-21 on a nuclear mission “only goes after one target. We need the ability to attack multiple targets with the air leg of our triad. That’s why you need a cruise missile.” Those arguments alone are “powerful enough” to make the case for LRSO,

Hyten said, adding that “there’s a dozen other very powerful classified reasons that I’ve talked about with Congress.”

Gen. Stephen W. Wilson, the Air Force vice chief of staff and former Global Strike commander, calls LRSO a must-have capability. In an interview with *Air Force Magazine*, Wilson said “we’ve determined ... all three legs of the triad make sense, that all three legs need to be modernized,” and the LRSO preserves part of that deterrent, given that ALCM was “designed to last for 10 years” and is “on its fifth life extension program.”

Asked if LRSO is needed to keep the new B-21 bomber relevant in 15 to 20 years, when air defenses may have developed the ability to detect it, Wilson answered indirectly.

“We need to make sure we’ve got the capability to do both standoff and stand-in,” and prosecute both the nuclear and conventional mission, he said. As to the perishability of stealth, he said, “Yeah, disruptive technologies are out there. We’re constantly exploring what that means to us, what the threat’s doing, as well as what are we doing that’s changing the game, too.” However, “stealth is going to continue to be part of our programs going forward.”

WE NEED IT

The Nuclear Posture Review, released in February, was unequivocal about the need for LRSO. The missile will “maintain into the future our bomber capability to deliver stand-off weapons that can penetrate and survive advanced integrated air defense systems, thus holding targets at risk anywhere on the Earth.” It specifically noted that Russia has developed new cruise missiles that expand its options for attack,

and these steps need to be countered. The LRSO will preserve the efficacy of the bomber leg of the triad even if the B-21’s stealthiness is eventually overcome by adversary countermeasures, the NPR said. Also, LRSO “will enable the B-52H to remain an effective part of the nuclear-capable bomber force and preserve upload potential as a key hedge against unforeseen technical and geopolitical challenges.”

The NPR also noted that the US will develop a low-yield weapon to provide “more options” to the President, but said it will likely be delivered by a new missile, the Sea-Launched Cruise Missile, or SLCM, as well as a low-yield warhead that could be carried by the next Sea-Launched Ballistic Missile, or SLBM. A low-yield weapon, the NPR explained, “cannot substitute for [the LRSO] because LRSO is required to sustain an effective air leg of the Triad.”

The Nuclear Posture Review also said the US might forego developing SLCM if Russia agrees to “return to compliance” with its nuclear treaty obligations, reduces its “nonstrategic nuclear arsenal, and corrects its other destabilizing behaviors.”

In an April paper, “Sustaining the US Nuclear Deterrent: The LRSO and the GBSD,” authors from the Center for Security and Budgetary Assessments argued that LRSO is an essential element of nuclear modernization, and the cost, redundancy, and “destabilizing” arguments against it don’t hold water.

“There is little evidence that ALCMs were destabilizing during the Cold War,” CSBA authors Mark Gunzinger, Carl Rehberg, and Gillian Evans wrote. “In fact, bombers equipped with nuclear cruise missiles and gravity bombs may have been and remain the *most* [CSBA emphasis] stabilizing element of the US triad. Due to their visibility, ability to be recalled after launch, and



AFGSC Commander Gen. Robin Rand



The Air Force has only fielded a few nuclear cruise missiles. One of them was the AGM-28 Hound Dog.

Photos: USAF; MSgt. Jose Lopez Jr. via National Archives; SrA. Malcolm Mayfield; North American Aviation/AFA Library

AGM-86 Air Launched Cruise Missiles on a wing pylon of a B-52.



longer flight times relative to ballistic missiles, bombers are considered particularly effective means for stabilizing crises.” Russia has pursued “dual-capable” conventional/nuclear missiles and does not seem “concerned with their potential to destabilize the nuclear balance.”

The LRSO would “complement” the penetrating bomber and not be redundant to it, the CSBA authors asserted, because the B-21 and B-2’s stealth capability “will eventually erode over their operational lives,” even if they are updated with fresher stealth technology. The ability to launch from outside enemy air defenses will preserve the bomber’s capability to deter, the authors maintained.

The Navy’s nuclear-armed Tomahawk Land Attack Missile, or TLAM-N, was retired in 2013 without a comparable replacement in hand, although conventionally armed Tomahawks remain in service and were used as recently as this April’s strikes against Syrian chemical weapons sites. The absence of a nuclear Tomahawk, however, has “reduced options available” for the US to “communicate its intent and resolve to its allies and potential adversaries in a crisis,” according to CSBA. The LRSO would “provide another extended deterrence option” for the US.

In addition to maintaining a retaliatory or first-strike capability in the bomber force, LRSO is a “cost-imposing” weapon, both Wilson and the CSBA authors have argued, compelling nuclear adversaries to beef up their defenses against it. Resources expended on air defense would therefore not be available for other offensive capabilities, either conventional or nuclear. A cost-imposing strategy has worked before: The Soviet Union dissolved soon after its military concluded that hundreds of billions of dollars’ worth of investment in air defenses had been rendered largely useless by the US Air Force’s stealth technology.

Wilson, in a May 2017 Air Force Association event, noted that a US bomber could carry 21 LRSOs,—“a very daunting challenge for any adversary,”—and would also be less costly as a deterrent than trying to develop a system to defend against comparable Russian weapons.

THE COST

The CSBA authors also noted the cost of LRSO is “a small fraction of the \$94 billion the Pentagon has projected it will spend on the triad between FY 2016 and FY 2020.” The CSBA report pointed out that if LRSO is not pursued, and the ALCM retires without a

replacement in hand, the US will “lose its ability to launch nuclear strike from standoff ranges” and hand Russia and China “the opportunity to gain significant advantages in the salvo competition,” potentially providing those countries a coercive advantage against the US.

The two LRSO competitors, Lockheed Martin and Raytheon, both worked on the AGM-129. Lockheed designed and built that missile—a stealthy successor to the ALCM. Only some 460 were ever produced, and the Air Force retired those between 2008 and 2012, saying they were too costly to maintain. The ACMs were physically destroyed, not converted into conventional weapons. The ALCMs they were initially intended to replace remain in service and are today over 30 years old.

The ACM retirement decision took place at a time of relative calm in US-Russian relations; Russia did not invade Ukraine until six years later.

While USAF has said in recent months that it wants to drastically shorten the development time lines of new projects, it’s not clear if the LRSO could benefit from program streamlining or whether the schedule has been hard-set. Wilson said USAF can’t afford any more 20-year development programs, due to the speed at which adversaries



Three AGM-69 Short-Range Attack Missiles in the bomb bay of a B-52H at Ellsworth AFB, S.D., in 1984. Two Mark 28 thermonuclear bombs are mounted in front of the SRAMs.

are fielding new capabilities. He said USAF is shooting to compress weapon development cycles to under five years, with a goal of three.

The matching \$900 million LRSO contracts were for technology maturation and risk reduction, or “TMRR.” The Air Force’s top uniformed acquisition officer, Lt. Gen. Arnold W. Bunch Jr., acknowledged in October 2017 that LRSO funding in the TMRR phase would be somewhat higher than that for USAF’s new silo-based ICBM, the Ground Based Strategic Deterrent missile, or GBSDB. The reason, he said, was to gain better reliability in the final product.

The Air Force wants to “ensure that we have a design that we can produce that will be reliable and available once it gets out into the field,” Bunch said. Experience with cruise missiles, he explained, showed that their reliability and availability “is not exactly what we need, so we took a different approach, put a lot more money into the [TMRR] phase, farther than we have before on these kinds of programs,” in the goal of obtaining better day-to-day performance.

“We’re calling it, ‘Design for Reliability and Manufacturing,’” he added. Although combat performance is “critical,” the weapon isn’t worth much “if you can’t utilize it.”

The service later told *Air Force Magazine* through a spokeswoman that Bunch had based his comments on “a

benchmark study ... using historical data from two nuclear cruise missile programs and two conventional cruise missile programs.”

PERFORMANCE, RELIABILITY

The goal for LRSO, she continued, is to have “the first missile produced from the production line to meet all reliability and operational requirements.” The Air Force wants to minimize design changes after the TMRR phase to lower “the risk of a future unaffordable reliability improvement program” and stick fast to the planned IOC date.

The spokeswoman would not identify the missiles in the study, but USAF has only ever fielded a few nuclear cruise missiles. They include the ALCM and ACM, the BGM-109G Ground-Launched Cruise Missile, or GLCM, the AGM-28 Hound Dog, the SM-62 Snark, and the AGM-69 Short-Range Attack Missile, or SRAM.

As for conventional cruise missiles, one likely to have been scrutinized in the study was the stealthy Northrop AGM-137 Tri-Service Standoff Attack Missile, or TSSAM. The highly secret TSSAM was beset by rapid schedule and cost growth, driven by launching the program before requirements were fully established and by frequent changes to requirements during development. Funding and management by committee among the services, who wanted air-, ship-, and ground-launched versions,

further exacerbated its problems. It was terminated in 1994.

The following year, a replacement program, the Joint Air-to-Surface Stand-off Missile (JASSM) program began. Lockheed Martin won the contract, and subsequently more than 3,000 AGM-158 JASSMs or JASSM-ERs (Extended Range) have been produced or are under contract. JASSM was used in combat in this spring’s strike against Syria. A variant, the Long-Range Anti-Ship Missile (LRASM) is in development for the Air Force and Navy.

In March of last year, Gen. Paul J. Selva, vice chairman of the Joint Chiefs of Staff, argued that LRSO is an “integral part” of the strategy for modernizing the strategic nuclear deterrent, noting particularly the “cost imposing” concept. Selva further argued that if there are members of Congress who are serious about getting rid of nuclear cruise missiles, the only way to negotiate them away is, paradoxically, to have one in the first place.

Where the US has had “success in negotiating types and classes of weapons out of adversary nuclear arsenals,” it’s been because “we possess a similar capability” that poses a severe defense problem for that adversary, Selva argued. To get rid of nuclear cruise missiles, “we should take that to the table” and “negotiate it in a bilateral, verifiable way so that we don’t give up the options and strategic leverage we have,” he said. ♣

THE CHINESE AIR FORCE'S GREAT LEAP FORWARD

Flush with cash, the PLAAF is coming on strong.



The People's Liberation Army Air Force is rapidly modernizing and growing its combat forces to counter the US Air Force. Here, airmen of an H-6K bomber unit march in formation before the start of a long-range training exercise.

By John A. Tirpak, Editorial Director

Of the three world superpowers, two have operational squadrons of stealth fighters. One is the US. The other is not Russia, but China.

In fact, the National Defense Strategy, released in February, suggests that China's conventional power is growing more rapidly than that of Russia. Flush with cash, China has the resources to maintain a brisk pace of technology advancement for all its military services, but especially the People's Liberation Army Air Force (PLAAF). Top USAF leaders have dropped the "near" from the sobriquet "near-peer adversary" when referring to China.

The PLAAF has made a "great leap forward" in the last 20 years, continuing to shift from a fleet of mostly obsolescent license-built second and third generation Soviet combat aircraft to a mostly modern, fourth generation force featuring counterparts to almost every type of US Air Force system. In fact, if imitation is the sincerest form of flattery, USAF should feel extremely flattered, indeed: China has fielded clones of USAF aircraft ranging from the Global Hawk and Reaper remotely piloted drones to the C-17 transport and F-35 fighter, and air-to-air missiles that look remarkably like the US AMRAAM.

Chinese defense white papers in recent years tout that, even as the nation seeks to asymmetrically counter US strengths, it will build up its conventional airpower, fundamentally copying the US Air Force. It now fields up-to-date airborne warning and control aircraft,



Photos: Yang Ruikang, Ministry of National Defense



aerial tankers, bombers, fighters, electronic warfare, and intelligence, surveillance, and reconnaissance assets all largely organized to mirror USAF. (Where the counterparts differ is that the PLAAF has responsibility for the helicopters that transport and tactically support the People's Liberation Army ground forces, as well as ground-based air defenses.)

The J-20 fighter—around which PLAAF's first stealth squadron, at Dingxin, is organized—has no real USAF analog. The J-20 has features that echo the F-22 and F-35 (its chin-mounted electro-optical system is externally identical to that on the F-35), and US intelligence has no doubt it is based on stolen US technology. However, USAF and industry watchers deduce that it is not necessarily built for agility, but for speed and stealth in the forward quarter; capabilities that would make it useful for surprise attacks on land units or, more likely, critical airborne assets such as tankers and intelligence, surveillance, and reconnaissance platforms. In some circles, it's described as the "AWACS killer."

The J-20 is also not the only stealth aircraft China is working on. The J-31 fighter in development is a ringer for the American F-35 and differs mainly by having two smaller engines instead of one big one. The J-31 seems to be making slower progress than the J-20, and there are rumors it may be intended as an export aircraft.

Though based largely on US technology, both the J-20 and J-31 are indigenous designs, China having largely broken off deals with Russia to collaborate on fifth generation platforms. Engines, however, continue to be China's weakness, and in this category it is still forced to rely on Russian designs. China's government has made improving its engine capability a priority, and the J-20 may soon trade its Russian-designed AL-31FN engines for the domestically built WS-10B.

As its military built up a head of steam in the late 1990s and early 2000s, China at first imported, then license-built, variants of Russia's top fighter, the Su-27 Flanker, and later versions in the Su-30 and Su-35. Known as the J-11 in China, the basic Flanker has been modified and improved, and China now also builds the J-16 variant domestically, including versions optimized for ground attack and electronic warfare. The J-15—a carrier-capable version that operates off the Chinese carrier *Liaoning*—is adapted from the Russian SU-33, another Flanker variant. It has folding wings and canards and uses a ski-jump to get airborne quickly. China airpower observers have said the J-15 seems to have limited range and weaponry compared to western carrier aircraft counterparts. It's operated





1/ A PLAAF J-20 stealth fighter. The fifth generation Chinese jet looks strikingly similar to USAF's F-22 Raptor (photo No. 2) but might not be as agile. 3/ Another Chinese stealth fighter, the new J-31 is a ringer for USAF's F-35 (photo No. 4) but features two smaller engines instead of a single big one. Most experts believe the J-31 and J-20 were developed with the aid of stolen US technology. 5/ An H-6K strategic bomber, a license-built version of the Russian Tu-16, receives a pre-flight inspection on March 27 before beginning a long-range exercise to the remote Shaanxi Plain. The H-6K is designed for long-range standoff attack and can carry up to six air-launched cruise missiles. 6/ An instructor, left, and maintainer help a pilot through preflight procedures before his first flight in a third generation J-11 multirole fighter in the PLAAF's Eastern Theater Command. The aircraft is a license-built copy of the Russian Su-27 and features a glass cockpit and digital flight control systems.

Photos: Sunson Guo; AIC George Goslin; Danny Yu; AIC Mercedes Schwartz; Lu Bingguang, Ministry of National Defense; Fu Gan and Wei Bin, Ministry of National Defense



by the People's Liberation Army Navy. All told, China has about 300 Flanker-derived fighters.

The Flanker variants are generally considered on a par with the US F-15.

The J-10 is one of the PLAAF's proudest achievements. Designed with Israel's assistance and based somewhat on that country's canceled Lavi fighter, the J-10 is China's answer to the F-16.

The PLAAF is already fielding the third iteration of the J-10, each with more sensor capabilities, processing power and improved aerodynamic performance, as evidenced externally by its evolving chin intake. The J-10 is intended to be the "backbone" of the PLAAF combat forces; a multirole fighter able to swing between dogfighting and ground attack.

US intelligence pegs the J-10 as roughly comparable to the F-16 Block 42 in capability, and the latest versions, equipped with active electronically scanned array radars, may give it an edge over the F-16 Block 50-52. China has more than 250 J-10s in service.

The J-10 is rapidly supplanting older Chinese fighters based on or derived from the MiG-21. In the attack role, the J-10 complements the JH-7 and JH-8, which are optimized for precision ground attack. Older types like the J-7, based on the Russian MiG-21, have been modernized but are being phased out.

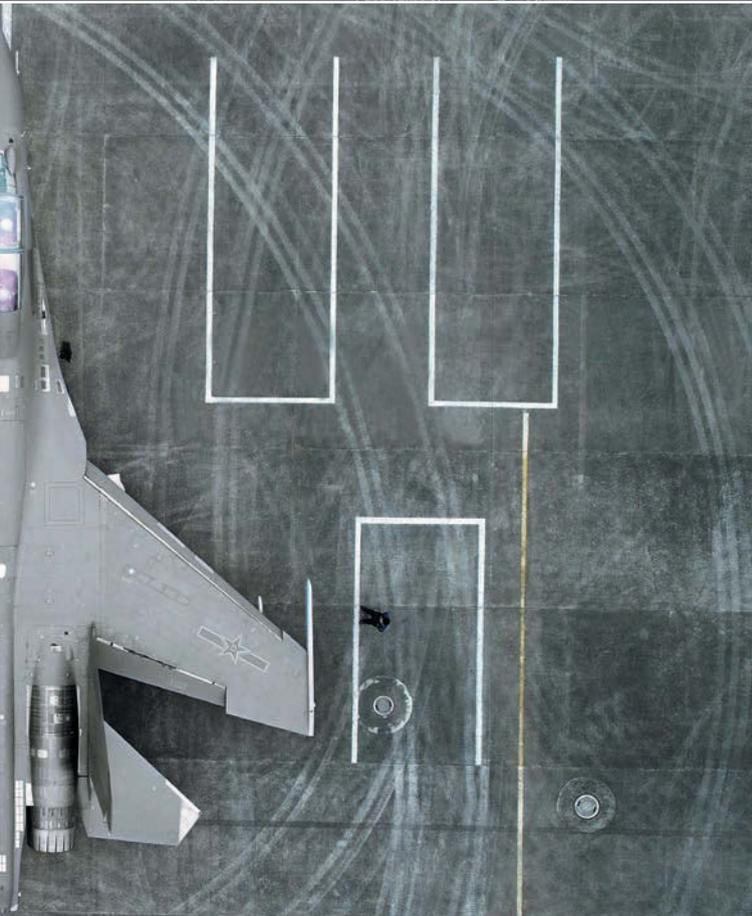
China's bomber force comprises about 120 H-6 aircraft, which are of roughly the same vintage as USAF's B-52s and are based on the Russian Tu-16. According to a 2017 Pentagon report on Chinese military capabilities, the H-6 has been adapted to launch cruise missiles, extending its power projection capabilities well beyond the "first island chain" of Chinese strategy.

The Pentagon has said China could unveil a new, low-observable bomber in the next few years, called the H-20, but reports differ as to whether this will be a "flying





Photos: Xi Bobo, Ministry of National Defense; Liu Chang and Liu Yinghua, Ministry of National Defense (2,3); Sunson Guo



4

1/ A maintainer with the PLAAF's Western Theater Command loads ammunition into a J-7 fighter before a live-fire exercise. The J-7 is a Chinese-built version of the Russian MiG-21. 2/ A Western Theater Command pilot inverts his J-16 all-weather multirole strike fighter during a training flight in southwestern China. The J-16 carries two crew members and can deploy anti-ship missiles, precision munitions, air-to-air missiles and cruise missiles. 3/ A J-16 fighter is inspected before a training exercise. 4/ A PLAAF J-20 fifth generation stealth fighter. Similar to a USAF F-22, the J-20 could be used against AWACS aircraft.

wing” design like the B-2, or a scaled-up version of the J-20.

China’s newest airlifter is the Y-20—still in flight test—which should become operational in the next few years. Strongly resembling the C-17, the Y-20’s development is said to have been accelerated by the C-17’s ability to deliver aid to Chinese provinces after the massive 2008 earthquake, when China’s own IL-76s could not use the short and damaged airfields available, thus causing some embarrassment for the PLAAF.

Airborne warning and control assets include the KJ-2000—similar to the Swedish “Erieye”—and the KJ-2000, which, with its rotating saucer-shaped radome, resembles the US AWACS. The KJ-2000, hosted on an Il-76 transport, can track more than 100 targets simultaneously.

China also seems likely to press ahead with building more aerial refueling IL-76-based tankers to extend the range of its land- and sea-based aircraft alike.

Innovation and improvement of China’s air force is likely to continue unabated, as the nation seeks to become the hegemon in the South Asia region and an equal challenger to the US in the Pacific. It has become, as the National Defense Strategy states, the “pacing threat” for the US military. 🌐



1/ An Xian Y-20 heavy-lift transport flies over Jinwan Airport during Airshow China 2016. It is similar in size and performance to USAF’s C-17 Globemaster III. 2/ The KJ-2000 is one of the PLAAF’s airborne early warning and control aircraft. It can detect low-flying enemy aircraft at long range with its nonrotating active electronically scanned array on top of its fuselage. 3/ A J-10 multirole fighter sits on the runway in 2017. The J-10 is intended for air superiority missions or surface attack, carrying an array of air-to-air missiles or bombs and rocket pods. 4/ A J-10C zooms through a valley during a training exercise. The J-10C entered service in April, is equipped with an advanced avionics system, and is capable of precision strikes on land or maritime targets.





4



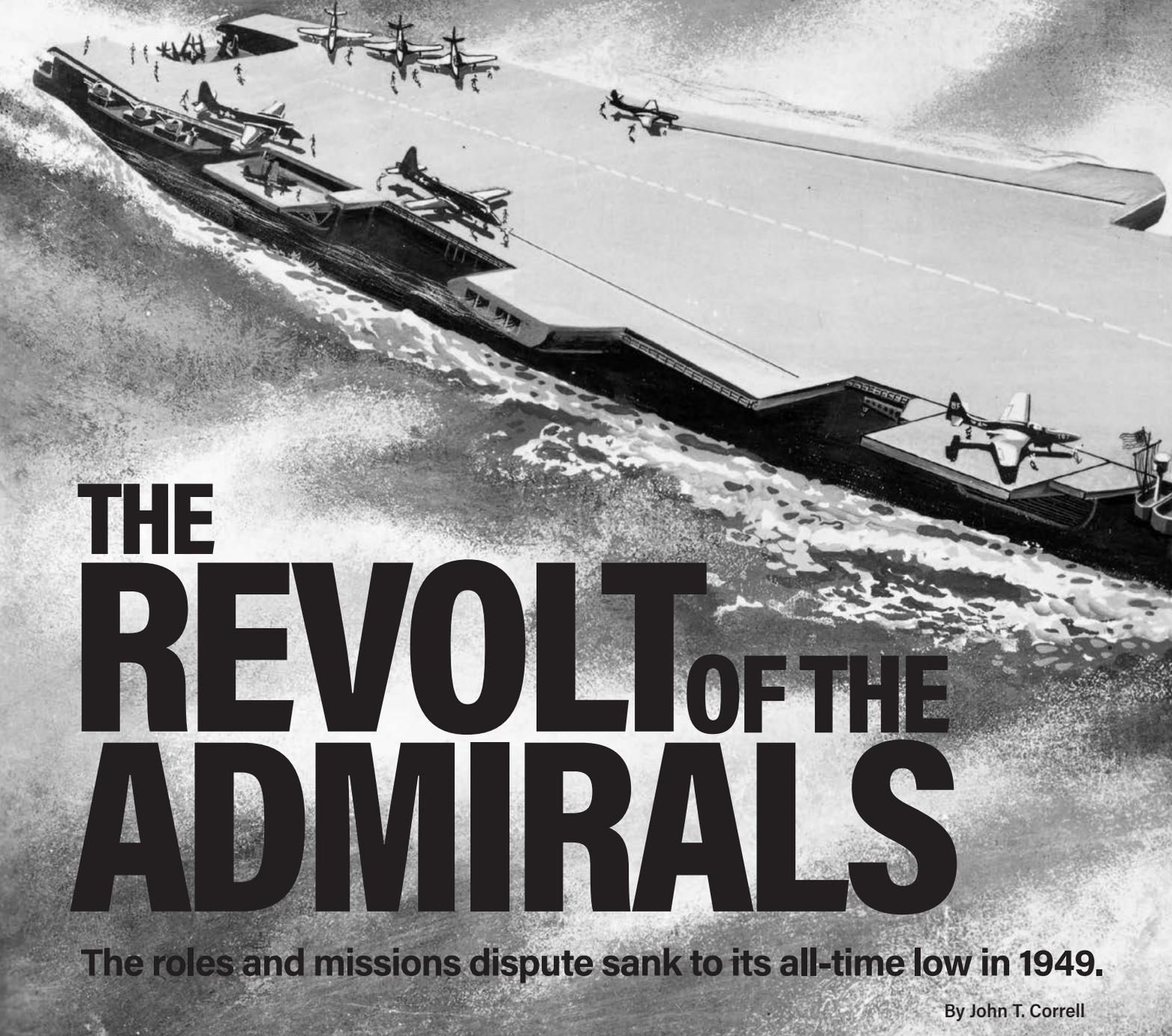
Photos: Jim Woodward; ShinoDeJance; Sunson Guo; Xi Bobo, Ministry of National Defense





1/ Chinese maintainers load rockets onto a J-7 fighter before a live-fire training exercise in March. 2/ A J-11 flies through a valley at low altitude during a flight training exercise. 3/ A PLAAF JH-7 fighter/bomber on the line in 2017. 4/ A J-10A fighter fires at ground targets during an assault competition—Golden Dart—in northeastern China. 5/ A pilot cadet waits in the cockpit of a JJ-7 fighter-trainer in northwestern China's Gansu province.

Photos: Xi Bobo; Chen Qingshun; Sunson Guo; Yang Fan; Cui Baoliang, Ministry of National Defense



THE REVOLT OF THE ADMIRALS

The roles and missions dispute sank to its all-time low in 1949.

By John T. Correll

The spark that set off the Revolt of the Admirals in 1949 was the cancellation of the Navy's supercarrier, the CVA-58 *United States*, within a few days of the laying of the keel.

The situation was already primed to ignite. The Navy in the postwar period had become apprehensive, then alarmed, about the impending unification of the services under a single Department of Defense. The rise of the Air Force was a challenge to naval aviation.

No foreign nation posed a threat to the United States at sea. With its traditional role thus diminished in importance, the Navy feared that it might be relegated to minor functions.

The nation's strategic focus was on atomic weapons, which were in the domain of the Air Force. At the Key West conference in 1948, the mission of strategic air warfare had been assigned to the Air Force. The Navy was determined to roll back that decision and gain at least part of the atomic mission.

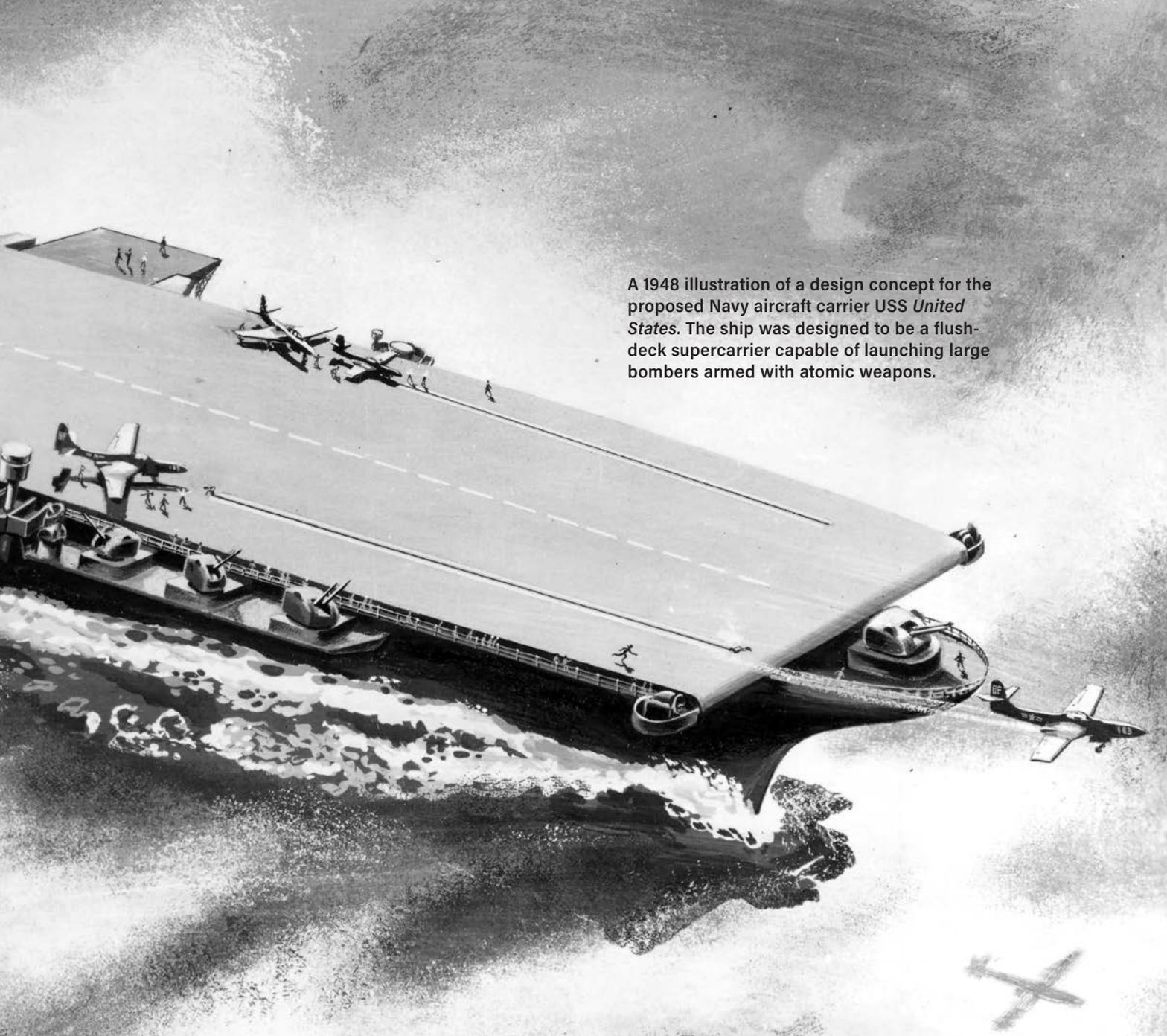
To do so, it needed a "supercarrier" that could launch large bombers. It also had to discredit the Air Force's B-36 bomber, which was performing the mission the Navy wanted. Cancellation of the CVA-58 in April 1949 sent the Navy to battle stations.

The Revolt of the Admirals unfolded in stages over the next six months and revolved around a sweeping investigation by the House Armed Services

Committee, whose chairman, Rep. Carl Vinson (D-Ga.), was the great patron and protector of the Navy.

The congressional inquiry was instigated by Rep. James Van Zandt (R-Pa.), a member of the HASC and a captain in the Navy Reserve. Van Zandt brandished an anonymous paper that supposedly exposed malfeasance in the B-36 procurement, including allegations of political and financial gain by Secretary of Defense Louis A. Johnson and Secretary of the Air Force Stuart Symington Jr.

It was not revealed until August that Van Zandt's "unimpeachable evidence" consisted of a memo written by Cedric Worth, a civilian assistant to the Undersecretary of the Navy,



A 1948 illustration of a design concept for the proposed Navy aircraft carrier USS *United States*. The ship was designed to be a flush-deck supercarrier capable of launching large bombers armed with atomic weapons.

and based purely on gossip and rumor. Worth had help in writing the memo from the deputy chief of Op-23, a special propaganda cell that had been set up by the Navy to work the strategic airpower issue.

Vinson soon acknowledged that the B-36 program was “clean as a hound’s tooth” but he allowed the investigation to continue. The Navy sent one admiral after another to testify. Their main message was that the Air Force had sold the nation a bill of goods on the B-36, and that the current strategy—which had been agreed upon by all



James Van Zandt

of the service chiefs—was wrong.

Finally, Gen. Omar Bradley, the highly respected, even-handed Chairman of the Joint Chiefs of Staff, had heard as much as he could tolerate. In what the *Washington Post* called a “hide-searing statement” to the HASC, Bradley lambasted the dissident admirals as “fancy Dans who

won’t hit the line with all they have on every play unless they call the signals.”

That effectively blew the Revolt of the Admirals out of the water. The chief of naval operations, Adm. Louis

E. Denfeld, was relieved and replaced. Op-23 was shut down. Cedric Worth resigned.

Seventy years later, the Revolt of the Admirals lives on in naval tradition as a courageous lost cause, imperfect in some respects, but waged in a noble and justified purpose. The story from the historical record is at considerable variance with that.

THE “ATOMIC CARRIER”

In February 1948, the Navy announced plans to build a “flush-deck” supercarrier. It would be 1,090 feet long, more than a tenth again larger than the *Midway* class carriers. An elevator would lower the bridge below the flight deck to allow easier operation



of airplanes with a wide wingspan.

The manifest purpose was to establish a claim to the strategic bombing mission. The Navy regularly referred to the project as the “atomic carrier.”

In May 1948, the House Armed Services Committee gave unanimous backing for the Navy to “lay down” the supercarrier. Secretary of Defense James V. Forrestal and the Navy assured the HASC the project had been approved by all of the service chiefs. The Army and the Air Force said that this exaggerated the extent of their agreement.

Also in May, President Harry S. Truman announced his intention to hold the FY 1950 budget to \$15 billion. The requirements calculated by the individual services came to \$29 billion, almost twice the size of Truman’s limit.

The estimated cost of CVA-58 was \$188 million, but the additional ships required to complete a supercarrier task force would raise it to \$1.27 billion, an amount equal to more than eight percent of Truman’s total defense budget.

Bomber aircraft for the supercarrier—not yet developed and not available for another five years—would add \$500 million to the cost. These aircraft would have the capability to deliver an atomic bomb but they would not match the range of Air Force bombers.

A contract for the CVA-58 was let in

August 1948. Although not much was said about it, the Navy hoped eventually to have four carriers of that design.

The Air Force canceled six aircraft programs, 240 total aircraft in all, to help fund the B-36 program. Forrestal forwarded to the Bureau of the Budget a request for additional B-36s that would be equipped with four jet engines to augment the six piston engines and add to its capability.

Forrestal left office in March 1949 and was replaced by Louis A. Johnson, who asked the Joint Chiefs in April for a fresh appraisal of the supercarrier. The Navy was for it, but the Army and the Air Force were opposed. The majority opinion was that the supercarrier was too expensive for a limited strategic capability not part of a primary function assigned to the Navy.

The keel for the CVA-58 was formally laid April 18, but on April 23, Johnson issued orders for the program to be stopped “at once and at the least possible cost to the government.” The Secretary of the Navy, John L. Sullivan, who had not been consulted, resigned in protest and was replaced by Francis P. Matthews, whose main qualification was his willingness to cooperate with Johnson.

THE NAVY STRIKES BACK

The Navy struck back on several fronts, making use of material pro-

duced by Op-23, a secretive “research and policy” unit created on the CNO’s staff the previous December and led by Capt. Arleigh A. Burke, a distinguished combat veteran of World War II.

Naval aviators clamored for a mock battle in which their F2H-1 Banshee fighter would attempt to intercept and attack a B-36. Van Zandt took the proposal to Vinson. The Joint Chiefs said the ability of the B-36 to evade interception and complete its mission depended on an entire process of factors and that a stand-alone set piece fighter demonstration was not a valid test. Vinson agreed with them and did not press the issue.

A recurring theme of the campaign was that an “atomic blitz” strategy gambled the future on the Air Force and the B-36. In fact, no such strategy existed and had never been proposed. In July, the Joint Chiefs issued a ringing endorsement of the current war plan. “The Joint Chiefs of Staff separately and jointly are of the firm opinion that the concept of strategic bombing and the extent of its employment as now planned are sound,” they said.

Both the effectiveness and the morality of strategic nuclear bombing role were regularly questioned. The most extreme claim was by Navy Cmdr. Eugene Tatom, head of research and development for aviation ordnance, who said, “you could stand in the



An Air Force Convair B-36 Peacemaker strategic bomber. It was performing the atomic mission the Navy wanted.

open at one end of the north-south runway at the Washington National Airport with no more protection than the clothes you have on, and have an atom bomb explode at the other end of the runway without serious injury to you.”

Putting this into perspective, Bradley said that, “it has been the Navy’s continuous argument that they should be permitted to use the atomic bomb, both strategically and tactically. If it is really so ineffective as some would have you believe, I wonder why the Navy is so anxious to use it.”

VAN ZANDT’S ALLEGATIONS

In the early summer of 1949, though, the main headlines were created by Van Zandt and his showy activities on Capitol Hill. He called for a congressional investigation into “ugly, disturbing reports” of wrongdoing in the B-36 program.

Van Zandt said he had “no personal knowledge” of the truth of these reports. However, he characterized various allegations as “well-founded” and based on “unimpeachable authority.” He also repeated them over and over on the floor of the House, where he could do so with immunity from a lawsuit.

Among the more spectacular accusations—and the actuality of the alleged events, soon verified by the

Committee staff—were these:

- Floyd Odlum, the head of Consolidated Vultee, which produced the B-36 was supposedly a “heavy contributor” to President Truman’s election campaign in 1948, for which Secretary Johnson had been finance chairman. Odlum’s contribution was \$3,000.

- Van Zandt said Forrestal had refused to approve the request for additional B-36s but that “a very short time” after he was sworn in to replace Forrestal, Johnson issued the order “in great haste.” In fact, Forrestal signed the approval two weeks before he left office. The order was in place when Johnson got there.

- According to Van Zandt, Symington was “a frequent weekend visitor at the Palm Springs, Calif., home of Mr. Odlum.” Symington had been there twice, once when his airplane diverted to land there because of weather—Odlum not being home at the time—and again for less than a full day in conjunction with a business meeting.

- A wartime defense contract with Emerson Electric Co., formerly headed by Symington, was said to have been renegotiated in Emerson’s favor in 1948 by Col. Frank Wolfe of Wright Field. Wolfe, then retired, supposedly lived in a luxurious Beverly Hills home. In fact, Symington had not been affiliated with Emerson since 1945. Wolfe had retired from the Air Force in 1944. In 1949, he

lived in a rental apartment.

- Van Zandt said there was “a plan underway” for Symington to resign as Air Force Secretary as soon as the budget with more funds for the B-36 was approved and head a “huge aircraft combine” established by Odlum. In fact, there were no such plans, no such combine.

Symington challenged Van Zandt to repeat what he had said somewhere away from Capitol Hill where he would not be shielded by congressional immunity. Van Zandt declined.

CONFESSION

When the hearings opened in August, it did not take long to dismiss the accusations. Vinson announced that there was “not one iota, not one scintilla, of evidence” of “collusion, fraud, corruption, influence, or favoritism” in the B-36 procurement.

Van Zandt’s sole source for his inflammatory statements was the paper, referred to in the press and elsewhere as the “anonymous memo.”

The Air Force knew where the paper came from—the Air Force Office of Special Investigations working with the FBI had tracked down the typewriter on which it was created—and told Vinson, who called Cedric Worth to the stand.

Worth, a former scriptwriter for the movies (“The Corpse That Knew Everybody” and “The Trail of the Serpent”)



Rep. Carl Vinson (D-Ga.), (left), Secretary of the Navy Francis Matthews, Adm. Louis Denfeld, and Pacific Fleet Commander Arthur Radford in Washington, D.C., on Oct. 6, 1949.

was an assistant to Undersecretary of the Navy Dan A. Kimball. Worth promptly admitted to Vinson that he had written the paper. "I made a great error and I regret it deeply," he said.

A Navy court of inquiry subsequently established that the Op-23 deputy, Cmdr. Thomas M. Davies—noted for setting an aviation distance record in 1946—had helped Worth write the paper, drawing on "rank gossip" he had heard.

Davies said he had no idea Worth intended to circulate the paper, which according to one congressman was "peddled all over Capitol Hill" by an Active Duty naval officer.

"I made no charges or accusations," Van Zandt said. "I simply repeated to the House the rumors that were all over Washington and were affecting service morale."

Vinson rejected suggestions to terminate the inquiry, having been persuaded by the Navy that more needed to be heard on the underlying strategic issues.

Concurrently in August, Congress passed the National Security Act Amendment of 1949, completing the unification of the armed forces. The National Military Establishment was replaced by a much stronger Depart-

ment of Defense. The individual service departments lost their Cabinet status. The position of Chairman of the Joint Chiefs of Staff, which had existed informally up to then, was created in law. The Army's Omar Bradley was appointed the first CJCS.

THE ADMIRALS RALLY

Navy Secretary Matthews implored the service to stick to its own issues in the hearing and not attack the Air Force. Matthews, however, had no credibility with the disgruntled admirals. "They kept the pot boiling with leaks or rebellious public statements, attacking Johnson's budget cuts, the Air Force, the B-36, and the nuclear retaliatory strategy," Bradley said.

The principal Navy spokesman was the colorful Adm. Arthur W. Radford, a naval aviator and commander of the US Pacific Fleet. He called the B-36 "a billion-dollar blunder," a symbol of the "atomic blitz," and "cheap and easy victory" through mass destruction of populations.

A parade of admirals, Active Duty and retired, took the stand to testify, but the headlines were grabbed by Capt.



Arleigh Burke

John G. Crommelin Jr., a naval aviator serving on the Joint Staff, who called a press conference to say the Navy was being systematically and intentionally destroyed.

Crommelin, who became a hero to many in the Navy, praised Cedric Worth for "the highest motives of patriotism and selflessness." The legendary retired Adm. William F. Halsey Jr. said Crommelin

"deserves the help and respect of all naval officers."

CNO Denfeld, who through the summer had left it to others to carry the propaganda campaign, took the stand Oct. 13 to say, "There is a steady campaign to relegate the Navy to a convoy and anti-submarine service" and that "I do not believe that high-level strategic bombing will attain for us the objectives of a war."

A week later, Bradley unloaded on the Navy and on the "fancy Dans who won't hit the line" unless they could call the signals. "I believe that the public hearing of the grievances of a few officers who will not accept the decisions of the authorities established by law. . . have done infinite harm to our national



Air Force Secretary Stuart Symington, (left), speaks with Army Secretary Kenneth Royall Sr., Secretary of Defense Louis Johnson, and Secretary of the Navy John Sullivan in 1949.

defense, our position of leadership in world affairs, the position of our national policy, and the confidence of the people in their government.”

Coming as it did from Bradley, that was a fatal blow to the Revolt of the Admirals. Truman, acting on the advice of Secretary Matthews, relieved Denfeld as CNO on Oct. 27 and named Adm. Forrest Sherman, who had not taken part in the revolt, to replace him.

Tracing a news leak, a team from the Navy Inspector General’s office was dispatched for a no-notice inspection of the Op-23 files. Tipped off by an informant in the CNO’s office, Op-23 was able to pull the most sensitive papers out of the files and hide them in an office down the hall before the IG got there. On Nov. 3, Sherman disbanded Op-23 and reassigned Burke, Davies, and their colleagues to other duties.

OFF THEY GO . . .

Van Zandt was re-elected to Congress and served until 1963. He was an unsuccessful candidate for the Senate in 1962. He had retired as a rear admiral in the Navy Reserve in 1959.

Worth resigned and went back to writing movie scripts. In 1957, he produced a documentary, “Naked Africa.”

Crommelin continued to criticize Defense officials publicly, received a reprimand, and took early retirement when he was placed on indefinite furlough. He went home to Alabama where he ran for the US Senate and lost.

Radford followed Bradley as Chair-



Workmen lay the keel plate and initial shell plate for USS *United States* at Newport News Va., in 1949. The carrier was canceled days later.

man of the Joint Chiefs of Staff. He was a strong supporter of President Eisenhower’s New Look/Massive Retaliation strategy that increased the emphasis on nuclear weapons.

Burke, who had been redlined from the promotion list in December 1949, was reinstated and advanced to rear admiral by President Truman. With Radford as his sponsor, Burke became Chief of Naval Operations in 1955.

Davies retired as a rear admiral in 1973 after 40 years in the Navy.

The B-36 continued in effective service with Strategic Air Command until 1958.

The Navy went on to build big-deck carriers. The CVA-59 *Forrestal* in 1955 is regarded as the first supercarrier, but a

“flush-deck” plan to lower the bridge with an elevator was scrapped. Instead, *Forrestal* had an angled flight deck with the “island” off to the side.

The carrier’s enduring claim to fame turned out to be its value in theater and tactical operations, not in launching long-range bombers. The Navy eventually gained a share of the nuclear mission when submarine-launched ballistic missiles took their place in the strategic triad alongside Air Force bombers and ICBMs. ★

John T. Correll was the editor-in-chief of *Air Force Magazine* for 18 years and is now a contributor. His most recent article, “Intercepting the Bear,” appeared in the April / May issue.

Mr. Putin Regrets

"I'm of the opinion that, unless [Russian President Vladimir] Putin is made to regret his decision [to use cyberwar in the US], he will return to the scene of the crime again and again. To make Putin deeply regret his assault on the foundation of our democracy—free and fair elections—we should seriously consider retaliating with the kinds of weapons he used. We have cyber capabilities, too. They should be used to expose the epic scale of his regime's corruption."—**Sen. John McCain (R-Ariz.)**, excerpt from his memoir, "The Restless Wave," out May 22.

And Now, a Sixth?

"You will be part of the five proud branches of the United States Armed Forces—Army, Navy, Marines, Air Force, and the Coast Guard. And we're actually thinking of a sixth, and that would be the Space Force. ... Because we're getting very big in space, both militarily and for other reasons, and we are seriously thinking of the Space Force."—**President Donald J. Trump**, remarks to West Point cadets at the White House, May 1.

It Won't be Easy

"[When] you renovate a house, you don't realize there's asbestos behind the wall. We've been talking about re-engineering the B-52 for a long time. Am I going to sit here and say we're not going to have a problem with the re-engineering? I'm not going to say that. I will tell you an awful lot of work has gone into evaluating how to re-engine, what is the best way to do it. ... It's going to take ... constant oversight."—**Air Force Lt. Gen. Jack Weinstein**, deputy chief of staff for strategic deterrence, Air Force Association event, May 1.

New and Dangerous Phase

"This should be seen as China crossing an important threshold. Missile platforms present a clear offensive threat. It is a pretty clear threat to the other claimants and furthers China's goal of establishing complete control over the water and airspace of the South China Sea. ... Now every ship or plane moving near the Spratly [Islands] is operating within Chinese missile range."—**Gregory B. Poling**, Center for Strategic and International

Studies, on China placing cruise missiles and surface-to-air missiles on man-made islands in South China Sea, CNBC broadcast, May 5.

Revenge of the Nerds

"We believe that Google should not be in the business of war. ... Google is implementing Project Maven, a customized AI surveillance engine. ... This contract puts Google's reputation at risk and stands in direct opposition to our core values. Building this technology to assist the US government in military surveillance—and potentially lethal outcomes—is not acceptable."—**Open letter from some 3,000 Google employees to CEO Sundar Pichai**, quoted in *The New York Times*, May 2.

Knowledge is Destabilizing

"Even if AI [artificial intelligence] capability only modestly improves the ability to integrate data about the disposition of enemy missiles, it might substantially undermine a state's sense of security and undermine crisis stability. It is extremely technically challenging for a state to develop the ability to locate and target all enemy nuclear-weapon launchers, but such an ability also yields an immense strategic advantage. The tracking and targeting system needs only to be perceived as capable to be destabilizing. A capability that is nearly as effective might be even more dangerous than one that already works."—**RAND Corp. report**, released April 24.

As If 1989 Never Happened

"Two centuries on, despite huge and profound changes in human society, the name of Karl Marx is still respected all over the world, and his theory still shines with the brilliant light of truth. ... The greatest thinker of modern times."—**Chinese President Xi Jinping**, speech commemorating the bicentennial of the 1818 birth of the German communist theorizer, May 3.

Sacred Duty

"Our space specialists must be world-class experts in their domain, but every airman, beyond the space specialty, must understand the business of space superiority. And, we must also have a working knowledge of ground maneuver and maritime operations if we are to integrate

air, space, and cyber operations in a truly seamless joint campaign. Let there be no doubt, as the service responsible for 90 percent of the Department of Defense's space architecture and the professional force with the sacred duty to defend it, we must and will embrace space superiority with the same passion and sense of ownership as we apply to air superiority today."—**Gen. David L. Goldfein**, USAF Chief of Staff, 34th Space Symposium in Colorado Springs, April 17.

Nobody Said You Were

"I don't know what war is going to look like in the future. I think things that fly in the sky, the great majority of them, ... there will not be human beings at the controls. There will be a human somewhere directing that thing. We aren't androids. There is a human part of this."—**Gen. Robert B. Neller**, Commandant of the Marine Corps, remarks at Brookings Institution, April 26.

Getting a Pulse

"The short burst of vastly powerful electrical and magnetic shocks involved in an EMP [electromagnetic pulse] could potentially devastate everything from your iPhone to the entire US power grid. Imagine thousands of lightning strikes hitting every home and business in America. Bursts from a high-altitude nuclear weapon ... could start by producing a so-called E1 shock, a brief pulse that is particularly devastating to what are known as supervisory control and data acquisition systems. ... Immediately after the E1 would follow an E2 burst, which is of lesser magnitude and may last as little as a microsecond. ... Finally, a longer E3 pulse could last several minutes and attack long-line systems such as the electric power grid. Together, they could deprive large parts of the country of electricity for weeks, months, or even a year or two."—**Editorial in Bloomberg Quint.com**, April 25.

Thorfinn Karlsefni, I Presume?

"I grant your accommodation. ... In observance of your Heathen Norse Pagan faith, you may wear a beard, in accordance with Army uniform and grooming standards for soldiers with approved religious accommodations."—**Army Col. Curtis Shroeder**, commander of 795th Military Police Battalion, to an unknown (evidently Viking) soldier, armytimes.com, April 25.



Airmen Taking Care of Airmen



*"This program doesn't just change lives,
it saves them as well."*

Jimmy, Air Force Wounded Warrior



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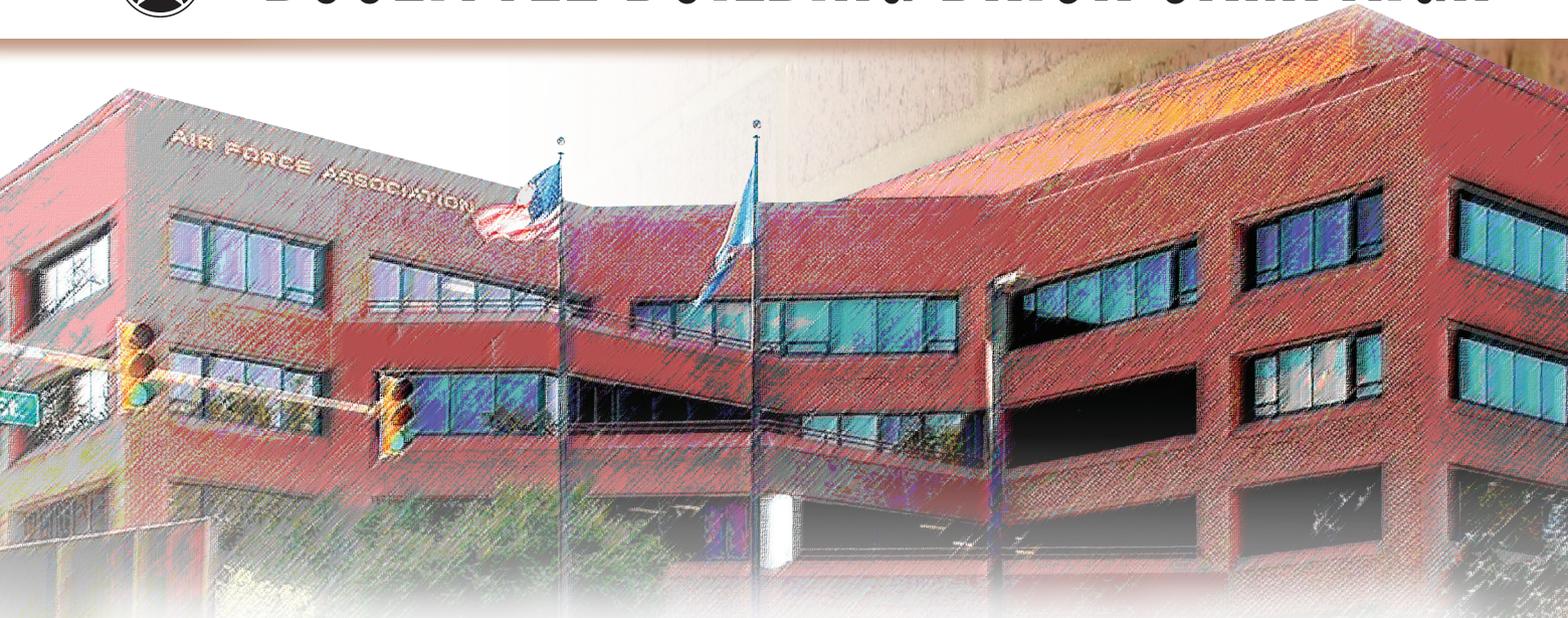


**Aerospace
Education
Programs**

K-12 Educator Grants | Teacher of the Year | Scholarships | Civil Air Patrol | CyberPatriot | StellarXplorers



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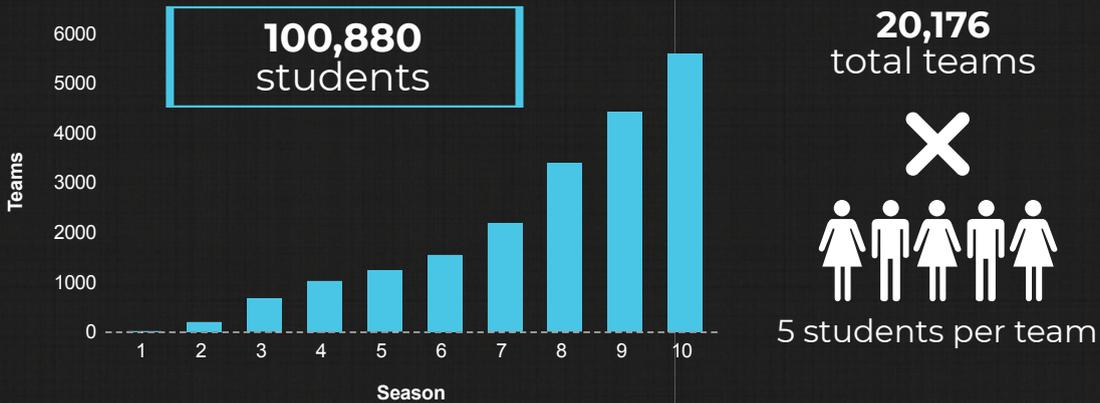
Begun as a modest pilot program in 2009, AFA's CyberPatriot National Youth Cyber Education Program has grown into a comprehensive family of programs motivating students in grades K-12 to pursue education and careers in cyber-security and other STEM disciplines. As of April 2018, the program's competition, cybercamps, elementary school cyber education initiative (ESCEI), and its recently published children's book, "Sarah the Cyber Hero," have in the aggregate reached an estimated 175,000 students nationwide.

CYBERPATRIOT

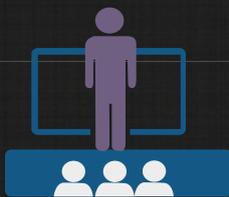
student reach



NATIONAL YOUTH CYBER DEFENSE COMPETITION



CYBERCAMPS



313 camps
 ×
 25 students per camp

7,825 students

ESCEI



6,651 kits distributed
 ×
 10 students per class

66,510 students

CHILDREN'S BOOK



322 copies sold
 ×
 2 students per copy

644 students

TOTAL REACH: 175,859 STUDENTS



That's enough students to fill two NFL stadiums!



MOFFETT

The Architect

Decades ago, the Army Air Corps briefly owned a base in what we now call Silicon Valley. It was built by the Navy, handed off to the Army in 1935, and given back to the Navy in 1942.

The Army reign—though a mere seven years—was unique in at least one way: It marked the only time the Army named a base for an admiral. The place was Moffett Field Army Air Corps Base, Calif.

Who was Moffett?

William Adger Moffett was an American born and reared in Charleston, S.C., during Reconstruction. He graduated from the US Naval Academy in 1890 and embarked on an illustrious 43-year military career.

In 1898, Moffett was an officer on USS *Charleston* when she crossed the Pacific and captured Guam. He took part in the shelling of shore targets in the Battle of Manila Bay. Moffett, commanding USS *Chester* in 1914, led a dangerous nighttime entry of Veracruz, Mexico, harbor to land marines. For this, he received the Medal of Honor.

Aviation came to dominate his career. Moffett, commanding Great Lakes Naval Training Center in World War I, built an aviator training program. He later put scout planes on US warships.

When the Navy created a Bureau of Aeronautics in 1921, it chose Moffett to lead it. From this post he oversaw development of naval air tactics and successfully pushed for aircraft carriers. Moffett also did polit-



1/ Rear Adm. William Adger Moffett. 2/A 129th Rescue Wing HC-130J Combat King II. 3/The airship *Akron*. Its crash caused Moffett's death. 4/ Aerial view of Moffett Field in 1938.

ical combat with Army Col. William "Billy" Mitchell, warding off Mitchell's push to combine Army and Navy aircraft.

For these and other achievements, Moffett has been termed "the architect of US naval aviation."

Moffett was a strong proponent of airships, or "dirigibles," for military purposes. He died when one of them, USS *Akron*, crashed in a storm off the New Jersey coast on April 4, 1933.

Eight days after Moffett's death, the Navy opened NAS Sunnyvale at the south end of San Francisco Bay ("Silicon Valley"). Thirty days after that, the Navy bestowed the admiral's name on the NAS's landing field, naming it "Moffett Field."

Significantly, the Navy did not rename the entire base for the admiral. There was only "Moffett Field at NAS Sunnyvale."

The Army took over in 1935. Because of Moffett's heroic biography, the Army kept the name "Moffett Field." However, Army tradition was to use the name of an individual for an entire base. Thus was "Moffett Field Army Air Corps Base" created. Among its many pilot alumni was then-2nd Lt. James "Jimmy" Stewart of Hollywood fame.

The Army name lasted until 1942, when the Navy regained control and imposed the name NAS Moffett Field. The Navy held onto the base for 52 more years. It left in 1994, turning the base over to NASA, which calls it "Moffett Federal Airfield."

It is the site of the NASA-Ames Research Center. The Air Force also maintains a presence. Moffett hosts the California Air

WILLIAM ADGER MOFFETT ah, Ga.

Born: Oct. 31, 1869, Charleston, S. C.

Died: April 4, 1933 (KIF) off New Jersey coast

College: US Naval Academy, Annapolis, Md.

Service: US Navy

Occupation: US naval officer

Main Era: Early 20th century, Interwar Period

Years Active: 1890-1933

Combat: Spanish-American War, Mexican Revolution

Final Grade: Rear Admiral

Honors: Medal of Honor, Distinguished Service Medal

Famous Friend: Franklin D. Roosevelt

Interred: Arlington National Cemetery, Arlington, Va.

MOFFETT FIELD ARMY AIR CORPS BASE

State: California

Nearest City: Mountain View

Area of Main Base: 3.5 sq mi./2,263 acres

Status: Civilian, mixed use

Opened (by USN) NAS Sunnyvale: April 12, 1933

Airstrip named Moffett Field: May 18, 1933

Commissioned (by USAAC) Moffett Field AAC

Base: Oct. 25, 1935

Recommissioned (USN) NAS Sunnyvale: April 16, 1942

Renamed (USN) NAS Moffett Field: April 20, 1942

Decommissioned (by Navy): July 1, 1994

Re-opened (NASA) Moffett Federal Airfield: July 1, 1994

Current Owner: NASA Ames Research Center

Former Owners: US Navy, US Army Air Corps

Main USAF Unit: 129th RQW, California ANG

National Guard's 129th Rescue Wing. The old Onizuka Air Force Station, now closed, was situated east of Moffett, just outside the base perimeter.



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