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AIR FORCE

MAGAZINE

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The F-22 & F-35 fight the same battles but speak different languages.



Published by the
Air Force Association

March 2018

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See "5th Generation Comms," p. 34. Photo by SSgt. Daryn Murphy.

In Case You Missed it: Airpower Killed ISIS

In 2014, ISIS emerged with a roar. It captured vast swathes of Syria and Iraq with stunning speed, and shocked the world with its brutality. It took Raqqa and was on the outskirts of Damascus. In Iraq, it overran Mosul, a city of 2 million people. Abu Bakr al-Baghdadi declared himself the leader of all Muslims and announced the creation of a caliphate.

At its peak, ISIS had 7.7 million people under its sadistic control. Enemies, “infidels,” and those who broke ISIS’ rules were beheaded or stoned. Some were burned alive. Much of this was proudly photographed and videotaped in public. The group destroyed priceless artworks and antiquities deemed inconsistent with ISIS’ view of Islam.

For a brief time, the organization looked unstoppable in Iraq as defense forces fled before ISIS fighters. For Americans, this seemed a disturbing echo of Vietnam.

ISIS as we know it is dead, defeated by USAF-led airpower.

Iraqi and Syrian defenders were in disarray, and the US response was tepid and ineffective. “Intelligence on ISIS was almost entirely lacking,” Ashton B. Carter, Defense Secretary under President Obama, wrote in *The Atlantic* last year. ISIS’ capture of Ramadi, Iraq, in May 2015, “with zero warning, three months after I took over the Pentagon, epitomized the problem.”

In July 2015, Carter acknowledged, despite spending millions of dollars, the US “had trained and deployed only about 60 dependable anti-ISIS fighters in Syria.”

And then, stalemate. ISIS was stopped 30 miles from Baghdad. Despite inflows of foreign fighters attracted by its ideology and seeming power, ISIS’ gains quickly ended.

The US began building a plan for success. In December 2015, “after months of defensiveness in Washington—about the failed train and equip program, or the pace of the campaign, or our perceived lack of strategy—it was time to go on the offensive,” Carter wrote. Airstrikes ramped up, intelligence platforms were constantly overhead, and US special operators and air controllers embedded with Iraqis and Syrians on the ground. Mosul and Raqqa—ISIS’ capitals and headquarters—were the prime targets, Carter said.

Combined offensives, reliant upon airpower, gradually pushed ISIS back. The battle for Mosul began in October 2016 and lasted nine months, spanning two Presidential administrations. Under Trump, the rules of engagement were loosened, military commanders were given greater autonomy, and the pace of operations further accelerated.

“Every inch of ground the Iraqi Security Forces [ISF] pried from ISIS is testament to their courage in the face of desperate enemy forces who employed suicide bombers, routinely shielded themselves with civilians, and rigged schools and homes with explosives,” wrote Lt. Gen. Jeffrey L. Harrigian, commander of Air Forces Central Command, in December.

When the ISF was “pinned down by fire, coalition air controllers embedded with them called in precision airstrikes to



silence the enemy,” wrote Harrigian, who is CENTCOM’s air component commander. “When suicide vehicle bombers raced toward exposed [Iraqis], airpower delivered precision weapons to stop the enemy forces from completing their grisly mission.”

Indigenous forces led on the ground, but success required airpower. As Harrigian noted, “Iraqi allies advanced when our aircraft were overhead, and paused to rest when they were not.”

Beginning with the airdrop in August 2014 that broke the siege of Mount Sinjar, freeing thousands of desperate trapped civilians, the Air Force continually adapted to ISIS’ unique challenges.

In last fall’s battle for Raqqa, A-10 attack jets and remotely piloted aircraft flew in dense urban war zones reminiscent of World War II. Lt. Col. Craig Morash, a deployed A-10 squadron commander, said Warthog pilots “had to get creative to figure out ways to strike targets at the bottom of these five-story buildings.”

MQ-1 and MQ-9 airmen performed “close air support, tactical reconnaissance, and overwatch,” as allies “fought to take back [Raqqa] block by block,” said an unnamed squadron commander in a USAF news release. Raqqa was liberated in October.

In December the Iraqi government declared ISIS defeated. ISIS’ downfall did not generate nearly the attention its rise did, and even Harrigian’s essay was released on a Friday, three days before Christmas—seemingly timed to avoid notice.

ISIS will continue to be a dispersed terrorist threat and an inspiration to some seeking a radical purpose in their lives. Clean-up operations against ISIS must continue and al-Baghdadi brought to justice.

The entity has lost 98 percent of its territory and has perhaps 1,000 fighters left in Iraq and Syria. But ISIS is dead as a large-scale threat, and airpower killed it. This should not be forgotten.

Illustration: Mike Tsukamoto/AFA

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GO BEYOND

There I Was ... in Cambodia

While reading "The Shadow War In Cambodia," which referred to March 18, 1969, I realized that I was there [January, p. 54]. As a FAC billeted with the Army in An Loc, our AOR included Loc Ninh, Tay Ninh, and that stretch of the Cambodian border. That morning, I had the dawn patrol in my trusty O-1 pattering along at 70 knots near the border. We knew the NVA had camps just over the border, so we stayed a few clicks away. In 1968, one of our FACs had wandered over into Cambodia and was shot down and killed by Sihanouk's son flying a T-28. One flew the O-1 just with the rudder pedals while using binoculars for signs of the enemy. And there it was in my binocs! Not the NVA but clear tracks of an Arc Light starting in Vietnam, crossing a narrow tributary of the Mekong, and marching into Cambodia!

WOW! Some poor BUFF crew had screwed up royally and was in deep kimchi. Upon returning to An Loc I briefed the ALO. Since we didn't know this was all hushed up, the word soon got out. Shortly thereafter I volunteered for a super hushed assignment with the Ravens in Laos, but that's another story.

Lt. Col. Bill Angliss,
USAF (Ret.)
Redlands, Calif.

I read this article with interest as I was a participant in part of this bombing of Cambodia. I cannot address the behind-the-scenes politics of the situation, but the aircrew level description is not completely accurate. I was a copilot on a crew that was briefed for what we

were told was the first bombing mission against Cambodia. It was not in March 1969, but rather between April 19-24. I do not have the specific date in my paper flight records as we aborted on takeoff roll and a spare aircraft took our place. (The B-52D used water injection on takeoff. At max weight out of Guam, you could usually take off if one engine—occasionally two—did not take water. Our right wing did not take water. We would have run out of both runway and island before reaching flying speed.)

The briefings I attended that spring and summer were not the hush-hush, "change targets inflight" described in the article. The entire crew attended the briefing and were briefed on actual targets in Cambodia. The briefing normally included a code word to be broadcast by GCI [ground control intercept] if they detected anyone about to penetrate Cambodian airspace. We were dutifully briefed on the code word and told to ignore it.

For the first mission, there was one political impact on routing. The targets were just inside Cambodia. The bomb runs were made perpendicular to the border. As soon as the last bomb departed, each aircraft turned as sharply as a B-52 could turn. The aircraft did not penetrate Cambodian airspace—the bombs did. That mattered to someone.

At that time, 60 B-52 sorties were being flown each day. While I was there that spring and summer, we had periodic "compression" missions. A token half-dozen two-ship strikes were flown during the day to maintain some normal B-52 activity. The rest of the sorties for the day were targeted against one base area listed in the article. Spacing between each three-ship formation was based on how quickly combat skypot controllers could handle the traffic. For supposedly unoccupied jungle, eastern Cambodia burned very brightly that summer.

Maj. Raymond Milberg,
USAF (Ret.)
Colorado Springs, Colo.

Bismarck Not So Tough

John Correll's article, "In Pursuit of the *Bismarck*" [February, p. 56], starts

off with oft-repeated statement that *Bismarck* was "the most powerful warship in the world." This is far from the truth, a mere propaganda statement. One must compare *Bismarck* to her contemporary battleships, the British *King George V* class, British *Nelson* class, French *Richelieu*, Italian *Littorio*, and the USN's potent USS *South Dakota*.

First, the *Bismarck* did not have 16-inch naval rifles for armament. She was equipped with eight 15-inch guns in four turrets. Compare this to the *KGV* with 10 14-inch guns, *Nelson* with nine 16-inch, *Richelieu* with eight 15-inch, *Littorio* with nine 15-inch, and *South Dakota* with nine 16-inch. All had more "throw weight" in terms of firepower. Of course, the Japanese *Yamato*, launched but not yet commissioned, outclassed them all with nine 18.1-inch guns.

Displacement, construction quality, speed, and armor did not favor *Bismarck* either, with *South Dakota* the best and *Richelieu* close behind. Only *Yamato* and later US *Iowa* class would be better.

Correll misstates the actions of British Admiral Holland, commanding the old battlecruiser *Hood* and the not quite completed *KGV* battleship *Prince of Wales*. Holland could not have "waited across the path of the Germans." Holland was aware of the shortcoming of *Hood's* light armor. At long range, plunging shells could and did make short work of her. He tried to close the range quickly to utilize his gunfire superiority, on paper at least, with 18 heavy guns to the German's eight.

After the battle, the critical factor in finding *Bismarck* again was when she was spotted by a US Navy officer, Ensign Leonard Smith, piloting a British Catalina, on May 26. His report enabled HMS *Ark Royal* to launch her Swordfish for the crippling torpedo attack.

All this overlooks the fact that the most powerful warships in the world were not battleships. These were obsolescent as the British air attack in November 1940 on the Italian fleet at Taranto would prove. The same old and slow Swordfish would sink four

WRITE TO US

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—The Editors



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Air Force ANG units flying the venerable "old" F-84F also faced probable one-way missions that were not nuclear but just old "dumb" iron bomb missions. We, the ANG units, were assigned nonnuclear targets in Soviet-controlled countries that were in good probability going to be "one way" due to the very likelihood of us being shot down either by anti-aircraft weapons in the target areas or [by] enemy aircraft such as the MiG 15s-17s. This was with the rumors of Communists having developed SAMs and having built hundreds of SAM sites in the communist zone. We in the F-84F would be hauling six to eight 750-pound dumb bombs and using the Hi-Lo fly at 420-500 knots—high profile to our targets—and back to our launch base in France, and then pulling up to 60,000-70,000 feet, where our airspeed would be down to the 180-200 knot range at most as we rolled in to dive bomb our targets, which were railroad and highway bridges, railyards, etc., all the while still being tasked to keep our 450-gallon drop tanks due to a critical shortage of those tanks in-theater and worldwide in the Air Force.

Now remember, F-84Fs used 450-gallon drop tanks for long-range missions. Those tanks were 16-18 feet long and about two-and-a-half feet wide and were a huge drag in the air. We later learned that the probable loss rate for those missions would be 60 percent or greater.

We were, for the most part, going to be on a "one-way mission."

I really enjoy every issue of your magazine, thank you.

Maj. Robert V. Thompson,
 USAF/NJANG (Ret.)
 Punta Gorda, Fla.

A Widow Goes Down

My hometown of Adams, Mass., sits in the shadow of Mount Greylock, the highest point in the state. One day as I was walking down my street, I heard an airplane coming from east to west toward the mountain. It was a P-61 Black Widow ["They Owned the Night," December 2017, p. 52]. It must have been around an altitude of 4,000 feet. It flew overhead and headed toward the mountain. As it got closer to the mountain, its engine(s) started to sputter. As it flew over the mountain, there was silence and shortly after it disappeared from sight over the mountain, a thin stream of smoke rose up from behind the mountain. I do not remember if a report was published in the newspaper and if it was, what it said. I do know it was a sad day for anyone associated with the crew, but an awesome

experience for me, a young boy of 10 or 11 years old. The memory of this event has been with me ever since, and it seems like just yesterday that it happened.

Col. William C. Koch Jr.,
 USAF (Ret.)
 Raleigh, N.C.

Hit and Miss

The AETC's commander's comments concerning the USAF pilot shortage in the January ["Verbatim: Outside the Lines," p. 52] column comprise both a hit and a miss. He suggests a "national pilot training academy that is partially funded by airlines and industry and the military." That is a miss. The much-publicized airline pilot shortage is a myth; there are far more civilian pilots with FAA airline pilot certificates than airline pilot jobs. What that industry has lacked is the willingness to reasonably compensate pilots, especially at the regional airline level. That sort of problem tends to be self-correcting, and that is what is presently happening. Lieutenant General Roberson also states that producing sufficient military pilots "is outside the resource capacity of the United States Air Force," and that is the hit. Williams Air Force Base, Reese Air Force Base (where I began my flying career), and others are gone forever along with the infrastructure that made them work. That sort of problem does not self-correct; only proper resources within DOD for an adequate pilot training system will heal our self-inflicted injury.

David Himes
 Honolulu

A Phoenix Rises

MSgt. [Israel] Del Toro has become a national symbol ["Like a Phoenix," December, p. 26]. Stripped of physical clues to his racial or other identity because of a cruel wartime incident, he is, to all appearances, left only with his name. That suggests a Hispanic factor. His given name of Israel could be some clue to his religion or national connection. But all that we do know by looking at him is that he is a male human being named Israel Del Toro. No doubt he is proud of his ancestral predecessors, but that is not apparent to our eyes.

But when we hear about him and what he has done with his life, he becomes a symbol of all that is good about America. He is an American who, regardless of race, color, religion, or other ethnic typing, is very brave, determined, and devoted to serving his family and his country. No identification politics needed. No saying



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"he's representative of his _____." He is him. After all adjectives are removed, he stands there all by himself as the best America has to offer. Not a representative of the best, but the best. Despite cruel fate, he wants to go back and serve. He refuses to be a victim but chooses participation in American life. As such, he has conquered the bad "isms" existing in our country and stands alone as an American hero who represents all that we can be.

Lt. Col. Charles L.Harrington,
USAFR, MSC (Ret.)
Walnut Creek, Calif.

Murders in Texas

I was disappointed by *Air Force Magazine's* January editorial on the massacre in Sutherland Springs, Texas, which resulted in the horrendous death of 26 people praying in church ["A Simple Lesson From 26 Murders in Texas," p. 2]. I am glad that the editorial attempted to deal with this terrible event, but feel that the approach that registering would-be murderers will contribute meaningfully to reducing the routine mass murders that occur in our country. Registering people but allowing guns to be legally transferred to them anywhere outside of stores is an expensive and worthless approach. While I fully endorse the Second Amendment right of states to have militias, we should be able to do so without making guns easily available to murderers. Until we do, registering potential murderers will have zero effect.

Steven E. Zalesch
New Haven, Conn.

Dueling Engine

On p. 38 of the December issue, the author states that the B-2 uses an engine similar to the GE F404, as used in the T-50A trainer aircraft ["Heading To a T-X," p. 34].

The B-2s engine, the GE F118, is based on the F110, not the F404. The F110 in turn was based on the F101, the turbofan equipping the B-1.

Note that an enhanced version of the F404 is available, with up to 19,000-lbs. thrust in afterburner, which could be fitted to the T-50A.

Also note that the T-X winner will likely end up in a decade or so being the selected mount of the Thunderbirds, since the F-35 will obviously not be suitable.

TSgt. Chris Dierkes
Stratford, Conn.

Umm, Oops

Thank you for publishing my letter ["Letters: Namesake: Dyess," February, p. 5].

However, since this occurred during WWII, presumably the president was Franklin Roosevelt, not Theodore Roosevelt. I'm sure readers will figure that out.

Lt. Col. Robert Rogers,
USAF (Ret.)
Sudbury, Mass.

They did. Our bad.—THE EDITORS

Missile Replacement

I have read your magazine as a lifetime member of the Air Force Association for over 40 years. This month, I was particularly pleased to see Wilson Brissett's article "Replacing Minuteman" [February, p. 27].

As a former career Minuteman III missile operator and flight tester I think we should look at strengthening the ground-based nuclear deterrent as Brissett indicates. In the article, I immediately recognized the picture of two Minuteman III missiles in flight from Vandenberg AFB on p. 28. It brought back many fond memories. However, the picture itself is printed backward. As the 1st Strategic Air Division Test and Evaluation test conductor, I trained the SAC launch crews for that Global Shield mission. From what we called "the point," where the launch countdown team was located (about a mile from Launch Facility (LF) 08), I counted down those crew members for their launch-initiating keyturn.

As I recall, Glory Trip 40GM was the first to launch. It should be on the right-hand side of the photo, pitching over from right to left. It roared out of LF-09, followed by Glory Trip 68GM from LF-08 only 12 seconds later. We intentionally delayed the launch of the second missile so that we could stop it if the first did not go well. The second missile had a one-of-a-kind telemetry collar on it, and stopping it from launching would save us the capability to attempt a "dual launch" later. Range safety split up their safety sensors to provide the minimum allowable safety coverage on each of the two missiles in flight at the same time. Thus, the risk of something going wrong was much higher than that for a normal flight test. The stress was palpable until the second missile was well downrange. As far as I know, there has not been a "dual launch" since.

Lt. Col. Brian Willis,
USAF (Ret.)
Manhattan, Kan.

The important discussion of the triad brought to mind that in the 1970s I had the privilege of working with and spend-

ing considerable time traveling with Rear Adm. George H. Miller, at the time the Navy's leading strategist. We often discussed the triad as the Ohio-class ballistic missile submarines were being designed at that time.

The cost and effectiveness of maintaining the triad components was a frequent topic. Ballistic missile submarines unquestionably provided the most survivable and hence most flexible component of US strategic striking forces. The bomber component was the most vulnerable, on the ground and in the air, especially in the face of ever-advancing Soviet air defense systems (fighters and surface-to-air missiles). And it was the least flexible because—depending upon specific Soviet targets—the bombers would be over Soviet territory or in their air defense zone for one to two hours before striking their targets. Thus, during those one or two hours they could not be effectively recalled and the United States would be at war. Submarine missiles and ICBMs could be recalled up to some 30 minutes before striking their targets—i.e., their flight time to targets in the Soviet Union.

With respect to costs, developing new bombers and tanker aircraft, periodically upgrading them, their crew costs, and other factors probably made the bomber component the most expensive part of the triad.

In Miller's opinion, the ICBM force was vital. While the United States might lose one or two or even more ballistic missile submarines, for several reasons there might not be a nuclear exchange between the United States and the Soviet Union. However, to destroy the ICBM force the enemy would have to impact many nuclear warheads on the United States. That would undoubtedly lead to an all-out nuclear conflict. Thus, in many respects, ICBMs on US territory were the ultimate deterrent force.

Norman Polmar
Alexandria, Va.

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January 11, 2018

AMERICA FIRST

The United States' new National Security Strategy (NSS) marks a departure from that of previous administrations. It is unapologetically about promoting American wealth and prosperity, with less attention paid to whether its friends and allies benefit or not. President Donald J. Trump has dubbed this strategy "principled realism."

The new strategy seeks to build up US military forces—including a modernization of the US strategic nuclear enterprise. It also promises the administration will work to get Congress to repeal the Budget Control Act of 2011, which has been suppressing military budgets, and bolster US military strength by building up economic strength and therefore, influence.

In unveiling the strategy, Trump, in a Dec. 18 speech at the Ronald Reagan building in Washington, D.C., made no mention of promoting democracy around the world, as his predecessors have since WWII, nor did he echo the strategies of Presidents George W. Bush and Barack Obama, which sought to advance global prosperity along with that of the US. Rather, Trump said the world is filled with competitors large and small, vying among themselves both economically and militarily, and, "we are declaring that America is in the game, and America is going to win."

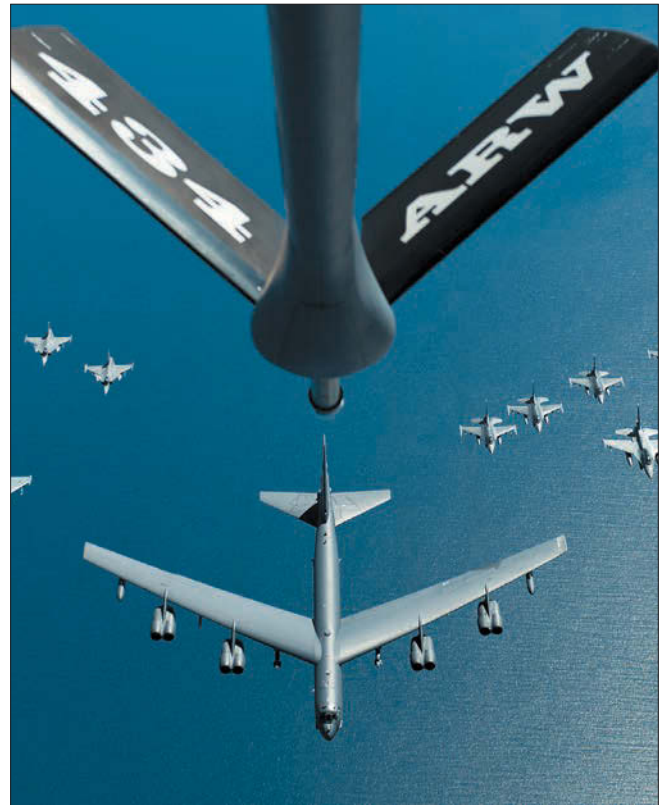
The full document states flatly that efforts to bring other countries into the fold of liberal, capitalist democracies were overly optimistic but ultimately unsuccessful.

The US must "rethink the policies of the last two decades—policies based on the assumption that engagement with rivals and their inclusion in international institutions and global commerce would turn them into benign actors and trustworthy partners. For the most part, this premise turned out to be false," according to the NSS text.

The document acknowledges Russia's efforts to interfere with US democratic institutions and bluntly charges that China, as the US tried to promote what China calls its "peaceful rise," stole its way to advanced weaponry and technological parity. China has succeeded in building a military "second only to our own." The US will aggressively counter cyber threats and challenge military aggression, the NSS asserted, correcting what the administration sees as too long a period when the US did not "lead," allowing "malign actors [to] fill the void."

Although the new NSS acknowledges that allies and partners "magnify our power," it quickly adds that "we expect them to shoulder a fair share of the burden of responsibility to protect against common threats."

US defense leaders in recent years have uniformly promoted alliances, all echoing some version of the sentiment that these relationships are America's asymmetric advantage versus China and Russia. Defense Secretary Jim Mattis, addressing AFA's Air, Space & Cyber conference last September, said he's never fought in "an all-American formation. I've always fought alongside coalition partners." He added that the US needs to listen more to its allies and "be willing to ... be persuaded by them." He joked that "not all good ideas come from the country with the most aircraft carriers."



A USAF B-52 and KC-135 fly with multinational aircraft during an exercise over the Baltic Sea.

Nevertheless, Trump, in his December speech, declared that there must be reciprocity with allies, especially those who are wealthy, and the US protective umbrella will come with a monetary price.

Last September, addressing the United Nations for the first time, Trump said the US would always be a friend to its allies, but "we can no longer be taken advantage of or enter into a one-sided deal where the United States gets nothing in return." At a Florida rally in December, Trump was more direct: "You gotta pay. You gotta pay. ... You don't pay, we're out of there, right?" In other speeches, Trump has, through comment or omission, demonstrated discomfort with the NATO Article 5 provisions that say all signatories will come to the aid of any member who is attacked. At the Florida rally, he lamented that an ally who gets "frisky with whoever—Russia," could drag the US into "World War III for somebody that doesn't even pay."

The NSS document—which is different from the National Military Strategy—posits four "pillars" of the new approach to American security. They are:

1. **Protect the American People, the Homeland, and the American Way of Life**
2. **Promote American Prosperity**
3. **Preserve Peace Through Strength**
4. **Advance American Influence**

Each pillar was accompanied by "priority actions" the US will take to ensure it is successful.



A Chinese J-20 stealth fighter. China wants to displace the US in the Indo-Pacific region.

HOMELAND

For homeland defense, the NSS promises a more robust and layered missile defense system focused on North Korea and Iran, and claims the right of preemption. Missile defense "will include the ability to defeat missile threats prior to launch." Other priority actions include stepping up the ability to detect and neutralize weapons of mass destruction both abroad and at the US border, while working with other countries to stop proliferation overseas.

The administration also promises a more forceful involvement in the world health system to quickly spot and neutralize outbreaks of potential pandemic diseases like Ebola.

Many of the priority actions associated with homeland defense will center on building a southern border wall, changing the immigration system, and "enhancing intelligence" to detect and stop terrorist threats worldwide.

The NSS also devotes a long section to the cyber threat, promising to work with industry to create more capability in "prevention, protection, and resiliency" against cyber crime and attack. It will do so "in a way that respects free markets, private competition, and the limited but important role of government in enforcing the rule of law."

Under homeland security, the NSS also warns that the American people need to be encouraged and trained to do more to defend themselves and develop the means to ride out cyber attacks, possible nuclear attacks, and the effects of natural disasters. In the same section, the NSS said the American public and private sectors must recognize the attempts of "Russia and other actors" to "undermine the legitimacy of democracies" through their attacks on "media, political processes, financial networks, and personal data" and take steps against them.

PROSPERITY

In the pillar of promoting American prosperity, the NSS pledged to advance fair-trade deals, and not turn a "blind eye" to "cheating or economic aggression." The administration said big government is an enemy and pledged deregulation and budget-cutting to reduce its size and influence. Recently enacted tax cuts will be paid for with commensurate economic growth, it claimed. It also put a priority on infrastructure improvement in which government at all levels will "work with private industry" to improve air and seaports,

rail, transit, and telecommunications. The government will work to create new markets for American goods overseas.

In research and development, the NSS said it will attempt to "attract and retain inventors and innovators" both from other countries and into government, while making it easier for those talented in science and technology to move more easily in and out of government. It promised more streamlined approval of security clearances and to offer "competitive salaries." The administration also pledges to "rapidly field inventions and innovations" to "regain the element of surprise" both economically and militarily, while doing more to protect intellectual property and safeguard national security secrets.

The NSS pledges the US will become an "energy-dominant" power and do whatever is necessary to assure access to energy markets and promote cheap energy as a means of stimulating the American economy.

PEACE THROUGH STRENGTH

Under the third pillar, peace through strength, the administration flatly assesses China as seeking to "displace the United States in the Indo-Pacific region ... and reorder the region in its favor." Meanwhile, Russia aims to "restore its great power status and establish spheres of influence near its borders." Russia views the European Union and NATO as threats. The US will try to cooperate with its competitors "across areas of mutual interest."

"Rogue regimes" like Iran and North Korea are the "scourge of the world today," threatening to use ballistic missiles and weapons of mass destruction to extort their ends, the NSS said.

The administration pledges an all-of-government approach to competing with foreign powers and terror groups in order to shape the geopolitical landscape favorably for the US and world markets. Only a perception of the US as a strong nation willing to flex its military muscle will make those efforts credible, the NSS said.

Toward these ends, the NSS pledges to grow the US military while modernizing and ensuring readiness." It pledges a clear "military overmatch" of any other power in capabilities and action to "eliminate bureaucratic impediments to innovation" and speed up deployment of new capabilities. The military will be sized to be capable of "operating in sufficient scale and for ample duration" to defeat enemies and achieve "sustainable outcomes."

Still, the administration said it will develop "new operational capabilities and concepts" in order to "win without assured dominance in air, maritime, land, space, and cyberspace domains." It also promised to plan irregular warfare campaigns for the long-term, not on an ad-hoc basis.

The NSS promises to modernize the entire US nuclear triad, the nuclear development and testing element, and command and control system that underpins it. At the same time, "to avoid miscalculation," it will negotiate with other countries to "build predictable relationships and reduce nuclear risks." New arms control deals will only be considered if they add to stability and are verifiable, however. The administration said it would not be coerced by adversaries using "threats of nuclear escalation."

The NSS pledges a vital space enterprise and maintaining a lead in space technology and exploration.

INFLUENCE

Finally, under advancing American influence, the NSS said the US will "lead by example" but will not "impose our values on others." Partnerships will be of mutual benefit, wherein the US is enabled to "achieve our goals while our partners achieve theirs."

Ground crew work on an Su-25 ground attack aircraft at an air base in Syria. Russia has been using the ongoing war in Syria as a proving ground for weaponry and for airmen to gain combat experience.



The US will encourage countries that want to join alliances with the US to "improve the condition of their peoples."

The NSS acknowledges that China and Russia are buying influence with cash grants, but the US will provide "an alternative to state-directed investments," offering instead market ties and friendship. The US will extend friendship to anyone basing their relationships on "free-market principles, fair and reciprocal trade, private sector activity, and rule of law."

The US will "emphasize reforms that unlock the economic potential of citizens, such as the promotion of formal proper rights, entrepreneurial reforms, and infrastructure improvements— projects that help people earn their livelihood and have the added benefit of helping US businesses."

BORIS AND NATASHA'S FIRST 'AWAY' GAME

Russia has been using the anti-ISIS/pro-regime fight in Syria as a proving ground for its weaponry, to gain combat experience for its airmen, and to learn about how the US operates in an air campaign, Air Force deputy chief of staff for intelligence, surveillance and reconnaissance Lt. Gen. VeraLinn Jamieson said in early January.

Speaking at an AFA Mitchell Institute event on Capitol Hill, Jamieson offered some glimpses into what USAF intelligence has observed about the way Russia has operated in Syria, and how that compares to what is being seen in Chinese exercises and the development of that country's own air forces.

Russian air units in Syria "have employed precision guided munitions for the first time in a combat role in their history," Jamieson said. Russian air forces "do not use the same mindset nor do they have the same employment concept, but they are using PGMs at a much greater rate" than at the outset of Russia's involvement in the conflict, "by their own account," she said.

She further noted that Russia has "cycled nearly 85 percent of all line-unit aircrew from across the air force into combat operations," and have learned that there's a big difference between training and "to be in combat and face an adversary and a threat." A goal of Russia's involvement is to "test the mettle, not just of a specific few, but of the majority of their line aircraft and pilots."

Besides precision-guided bombs and missiles, Jamieson said Russia has used new cruise missiles, air-to-air missiles, and long-range bombers flying "18-24 hours long" missions to and from Syria, in "what I would characterize as their first 'away game.'"

China, too, has been flying long bomber missions "six to eight-

plus hours, where they used to only fly in their little world." Both countries have been taking a building-block approach of adding and integrating ISR capabilities, advanced command and control, and aerial refueling.

"They are learning from us," too, Jamieson allowed, describing the opportunity for Russia to view US operations at close range as "a treasure trove for them," while China's first out-of-area base, at Djiboiti, is going to "provide them a unique opportunity to actually ... monitor our operations in the region."

Broadly, US intelligence has observed Russia integrate "some of what we would call their advanced fourth generation fighters, but we do not assess them to be fifth generation fighters." Troubling, Jamieson said, is the fact that technology advances have allowed both Russia and China to "use a little more flexibility" in air operations. "There is a little more fusion of data in the aircraft, and so they're able to be a little more flexible" in their tactics, techniques, and procedures, with reduced reliance on ground controllers.

"I think that's an important distinction they have learned," and Russia especially has "gained confidence in a combat setting," she pointed out. Although the Air Force has in recent months been sounding the alarm about the advancement of Russian combat aviation, Jamieson said, "We are really not as far ahead of our adversaries as we are used to being." She also said, "I don't want to make the threat 10 feet tall."

Russia, having observed the US for many years, is attempting—with some success—to emulate the American model of jointness. "While it is not as integrated as we operate, it is a change for them," she noted.

China, too, has studied the American jointness model and is imitating it with greater success, Jamieson reported.

"China's exercises are truly of a joint nature," she said. "They exercise all of their components together because they see the value of joint interoperability."

She said Russia and China gauge themselves differently in comparison to the US. Russian defense white papers released recently reveal that they view themselves as a full-on "competitor in air and air defense," while China takes a humbler approach. China views itself as "about a decade behind us. ... They are the underdog but they are trying, in the next 10 years or so ... to be a competitor in the air and air defense arena."

Jamieson reported that she is readying an "ISR Flight Plan," a summary of which will be released in the spring, which will lay out how USAF's ISR force will "transform," and it will answer "where does our next generation really need to be." ❖

BIG DOINGS IN RAQQA

Before he deployed to Incirlik AB, Turkey, last summer, Capt. Brendan Lanphear's longest sortie in the A-10 was four hours with one tanker refueling.

His first combat sortie, in support of the liberation of Raqqa, Syria, was more than seven hours long, involved fuel from four tankers, and marked the first time he employed weapons.

Every part of the 447th Air Expeditionary Group played a significant role in the battle, from the A-10s to the KC-135s to the maintainers, who made sure the aircraft stayed in the air and didn't miss a single air tasking order sortie, said the unit's commander, Col. Scott Hoffman.

Lanphear, a wingman deployed out of Moody AFB, Ga., with the 74th Expeditionary Fighter Squadron, wasn't the only one facing a new situation in Raqqa.

In a recent phone interview with several representatives of the 447th AEG, Lt. Col. Craig Morash, commander of the 74th EFS, told *Air Force Magazine* that 20 pilots—a little more than half the squadron—were deploying for the first time. Even those with combat experience had never seen a battle like that.

"As A-10 guys, we train [for] nonlinear battles as well as linear battles, but urban conflict, at least in this form, [Raqqa] was kind of the first time anybody had ever seen it before," Morash said.

He added that A-10 pilots generally train for two-hour sorties, but the sortie length when the squadron first arrived in-theater averaged 7.4 hours. Keeping the A-10s up in the air for so long required quite a lot of refueling, and the KC-135s of the 22nd Expeditionary Air Refueling Squadron (EARS), also part of the 447th AEG, did about a third of all the aerial refueling in support of Operation Inherent Resolve, Hoffman said.

The Warthogs dropped about 44 percent of the weapons in the Raqqa area for the first two-and-a-half months of the battle and more than half of those were danger close, Morash said—some as close as eight meters.

"Really, what I don't think you can ever prepare for was the rate of expenditures that we were dropping or the dense urban conflict that Raqqa presented," he said.

The Warthogs carried an extraordinarily diverse set of weapons, from 2,000-pound bunker busters, "which we dropped for the first time off an A-10 in Raqqa, to GPS weapons, laser-guided weapons, and precise low-collateral-damage weapons as well, to include laser rockets, the laser Maverick, and the versatile 30 mm," he explained.

During a typical day of the fight for Raqqa, the KC-135s of the 22nd EARS, flew 13 to 15 sorties per day, averaging nearly six hours per mission and off-loading 60,000 pounds of fuel, said Lt. Col. Kelly Kimsey, director of operations for the 22nd.

In October 2017, the unit flew 296 missions and off-loaded 19.2 million pounds of fuel.

"The mission out here, the dynamic nature of it, is different than what we train for in the states," Kimsey noted. "For a lot of our young crews that come out here, it's the first time that they've seen, when they cross from Turkish airspace into the combat zone, how often the plan changes: the locations that they're refueling, amounts of off-load, times, where they have to be. And it can be a little overwhelming for them ... but they



An A-10 with the 74th Expeditionary Fighter Squadron banks after refueling from a 22nd Expeditionary Air Refueling Squadron KC-135 during the fight for Raqqa, Syria.

pick it up pretty quick, and by the time they've flown a sortie or two, it's second nature."

Kimsey said the crews stayed very focused on where the receivers wanted to be picked up and dropped off, to keep them as close to the fight as possible.

Morash added that the mission required the A-10s to "seek efficiency in everything that we did," and they worked with both the tankers and the maintainers "to see how we could shave five minutes off refueling and get the jets turned that much faster, so that we could actually execute that length of mission that many times a day."

Unlike the aircrews, the job for the airmen of the 447th Expeditionary Aircraft Maintenance Squadron (EAMXS) was not significantly different on deployment than at home station. Still, the deployment offered the opportunity to work on every aspect of the maintenance job, rather than focusing only on launching, fixing, or servicing, said Capt. Brett Gudim, 74th Aircraft Maintenance Unit officer in charge.

And, noted Lt. Col. Yoggi Lebby, commander of the 447th EAMXS, maintainers had the "opportunity to see jets come back without bombs loaded, the airplanes come back without bullets in the gun. ... You're actually getting to see all the things you've put in and effort come full circle."

"It's just astounding to me how rapidly over the course of this six months the work they have done has helped liberate so many people," Hoffman said. "Even though I know my group here is small, we really ... punched above our weight."

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



CMSgt. Michael West (r) is awarded the Silver Star for his actions in Afghanistan.

■ Air Commando Earns Silver Star for Afghanistan Valor

CMSgt. Michael R. West was presented the Silver Star—the nation’s third highest award for valor in combat—on Dec. 15, 2017. In September 2006, West was a joint terminal attack controller embedded with a US Army Special Forces Team that came under attack while serving as a “blockade for a NATO ground operation” that was clearing an insurgent safe haven.

With “complete disregard for his own safety,” West repeatedly “exposed himself to direct and accurate enemy fire” while coordinating 88 fixed and rotary wing aircraft, intelligence, surveillance, and reconnaissance platforms, and medical evacuation assets. He called in 24,000 pounds of precision ordnance against “waves of enemy attacks,” resulting in the death of more than 500 enemy killed in action, according to the citation.

The Special Tactics operator with the 24th Special Operations Wing at Hurlburt Field, Fla., was originally awarded the Bronze Star Medal for his actions between Sept. 3-9, 2006, in Panjwai Village, Afghanistan. However, his package was resubmitted for an upgrade as part of a Defense Department-wide review of medals earned in Afghanistan and Iraq. West is credited with “turning the tide of the battle” and saving the lives of 51 Special Forces soldiers and 33 coalition partner troops.

■ Raymond Assumes Command of New Joint Space Component

Air Force Space Command boss Gen. John W. “Jay” Raymond took command of all DOD space forces on Dec. 1, as part of a restructuring of US Strategic Command to streamline its structure. Raymond is now “dual hatted” as commander of the Joint Force Space Component. In addition to overseeing the organization and training of USAF space forces, he will execute “operational command and control

of joint space forces,” according to AFSPC.

The organization “will help change the collective mindset of space forces from providers of space capabilities to war-fighters,” Raymond said. The move does not create or eliminate any positions.

At the same ceremony, Maj. Gen. Stephen N. Whiting took command of 14th Air Force and became Raymond’s deputy commander of the Joint Force Space Component.



Secretary Heather Wilson

■ “Systemic Problems” Found in USAF’s Criminal Reporting

The Air Force’s failure to report the domestic violence conviction of the former airman who killed 26 people in a November 2017 shooting in Texas was not an isolated incident. In fact, USAF has uncovered “systemic problems” in its criminal reporting procedures, service Secretary Heather Wilson told Congress on Dec. 6.

As a result, the Air Force is building new safeguards into its recording and transmission system and is updating its training requirements. It’s expected to take “between four and five months to complete the database review,” Wilson said.

Also on Dec. 6, family members of four victims of the Texas shooting filed a claim against the Air Force. The family of five-year-old Ryland Ward, who was injured in the shooting, is filing the claim on his behalf as well as that of his two sisters and stepmother, who were killed in the shooting, according to a News 4 San Antonio report. Another wrongful death claim was previously filed by Joe and Claryce Holcombe, who lost children, grandchildren, great-grandchildren, and a future great-grandchild in the mass shooting.



JFSC Commander Gen. John Raymond

Fifth gen F-35s will replace old Guard Vipers.



■ Air Force Selects Alabama and Wisconsin for Guard F-35s

The Air Force on Dec. 21 picked the Alabama Air National Guard's 187th Fighter Wing and the Wisconsin Air National Guard's 115th Fighter Wing to transition to the F-35 from their current F-16 fleets.

The aircraft are expected to begin arriving in Alabama and Wisconsin in 2023. Each location will get 18 primary aircraft, said Brig. Gen. Randal Efferson, chief of staff of the Alabama Air National Guard, during a press conference announcing the decision.

■ Vance T-6s Resume Flying Operations

The 71st Flying Training Wing at Vance AFB, Okla., resumed T-6A flying operations on Dec. 5 following a 20-day grounding after pilots reported four "physiological events" in November.

However, Air Force inspectors still have not found a root cause for the physiological events, according to a Vance release. A team of aviation, medical, functional, and industry experts investigated but were unable to identify a specific problem. The investigation will continue as flights resume.

■ The War on Terrorism

US Central Command Operations: Freedom's Sentinel and Inherent Resolve
Casualties

As of Jan 25, a total of 49 Americans had died in Operation Freedom's Sentinel in Afghanistan, and 52 Americans had died in Operation Inherent Resolve in Iraq and Syria.

The total includes 97 troops and four Department of Defense civilians. Of these deaths, 46 were killed in action with the enemy while 55 died in noncombat incidents.

There have been 239 troops wounded in action during OFS and 58 troops in OIR.



The B-52 needs major engine rehauling to remain in service long-term.

■ Will the B-52 Finally Get New Engines?

The Air Force has "initial seed funding" in the 2018 budget to begin re-engining the B-52, after numerous false starts at such an effort over the last 40 years, the service announced.

The project is aimed at making the bomber more fuel efficient, maintainable at a lower cost, quicker to get to cruising altitude, and able to fly longer or farther. An industry day was held at Barksdale AFB, La., in December to discuss replacing the B-52's eight JT3D (TF33) engines

with eight new power plants providing better thrust, fuel burn, availability of parts, and longer on-wing time between engine overhauls. Representatives from 15 companies attended the event.

The current engine is "costly and manpower intensive to maintain," and parts are becoming difficult to get. The "bottom line," according to briefing slides, is that the current engine is "not sustainable past 2030," but the Air Force expects the B-52 to remain operational through at least 2050.

■ Hackers Infiltrate DOD Networks, Earn Record Bounty

Hackers Brett Buerhaus and Mathias Karlsson earned \$10,650 for infiltrating the Department of Defense's unclassified network through a vulnerability in a USAF website Dec. 9 at a live-hacking event in New York City. Known as pivoting, Buerhaus and Mathias' maneuver demonstrated a flaw likely impossible to find without outside help, according to a Defense Media Activity official.

"We wouldn't have found this without you," James Garrett, DMA's web chief of operations told the hackers during the event, which was run by bug bounty organizer HackerOne. The two hackers split that one bounty, reportedly the biggest single reward in a government bug bounty program to date.

The event kicked off HackerOne's larger bug bounty program "Hack the Air Force 2.0." During the launch, seven USAF airmen and 25 civilians—comprising people from the US, Canada, the UK, Sweden, Netherlands, Belgium, and Latvia—hacked USAF networks for nine hours nonstop. They found 55 vulnerabilities, and USAF shelled out \$26,883 total in bounties. During this live event, members of the DMA and US Defense Digital Services were onsite to fix issues as they were reported.

■ Predators, Reapers Kept Consistent Watch in Battle for Raqqa

Air Force MQ-1 Predators and MQ-9 Reapers flew more than 44,000 hours and were responsible for one-fifth of all coalition air strikes as part of the US-backed Syrian Democratic Forces in the liberation of Raqqa, Syria, from ISIS.

The RPA operations over the city, which ISIS once touted as the capital of its caliphate, included close air support, tactical reconnaissance, overwatch, and "buddy lasing"—the guidance of munitions fired from other aircraft, according to a 432nd Wing roundup of remotely piloted aircraft operations in the offensive.



MQ-9 Reaper

Flying together for 70 years



Photo: U.S. Air Force

For seven decades, U.S. Air Force pilots have taken to the skies, and Rolls-Royce has proudly supplied thousands of engines to keep them aloft. From the early V-1710 engines powering P-51 Mustangs, to the current fleet of C-130Js, CV-22s and Global Hawks powered by Rolls-Royce AE engines, our facility in Indianapolis has kept those aircraft soaring.

Congratulations for 70 years full of aerospace innovation. We've been happy to be along for the ride into the wild blue yonder.



Rolls-Royce

COMING TO “TERMS WITH” FORE

MANNING AND MONEY ARE NEEDED TO MAINTAIN WHAT HAS BECOME USAF'S PERMANENT WAR FOOTING.

By John A. Tirpak, Editorial Director

The Air Force's 27 years of standing as the world's unrivaled airpower are officially over. “Peer” competitors—the term “near-peer” has recently been dropped from official language—now challenge America's ability to control the skies in any conflict.

The upshot is that the considerable capital investment the United States made in air superiority 30 years ago must be made again, or the US may no longer hold significant advantages in a future conflict.

This frank assessment came from Air Combat Command chief Gen. James “Mike” Holmes. He called this a “blinding flash of the obvious.”



VER WAR”

A steady parade of impressive new systems and investments by China, Russia, and other aspiring great powers means the US will have to push harder and faster to keep ahead—and maybe just to keep up.

“Smart, tough, capable peer adversaries have watched us” since 1990, “and they took notes,” he observed. Now, they’ve “developed ... smart asymmetric tools that are designed to counter our strengths ... and exploit our weaknesses.” The US simply can’t posture itself and operate in ways it has gotten used to, or there will be ugly surprises ahead, he warned in a speech to AFA’s Mitchell Institute for Aerospace Studies in November.

The response must be to “bring the future faster,” Holmes

explained, with a streamlined acquisition system that allows the US to field new systems “in a short number of years,” not at the plodding pace it has settled into.

“The world is changing, and if the Air Force and Air Combat Command don’t change with it, we’ll be disadvantaged, and that’ll have an impact on the entire joint force,” he asserted. “We’re back in a world with peer adversaries where they’re fielding something new every day, and we have to be able either to modernize the tools that we bring or bring new tools and field them much faster.”

As an example of a new reality that demands new action, Holmes pointed out that with high-resolution, fast-revisit commercial imagery satellites and social media, there’s

USAF F-16s and South Korean F-15s on the line at Daegu AB, South Korea, participating in Buddy Wing exercises to improve fighter interoperability.



Photo: SrA. Divine Cox

Air Force Special Operations Command troops meet with leaders from the Afghan Air Force to discuss plans to increase airpower in Faryab province, Afghanistan.



Gen. Mike Holmes, ACC commander, uses the High Frequency Global Communication System radio at Grand Forks AFB, N. D., to speak to troops across the globe.

“The world is changing, and if the Air Force and Air Combat Command don’t change with it, we’ll be disadvantaged.”

“nowhere to hide” anymore. The US can’t secretively marshal forces, move them to ships or planes, and deploy them without an enemy being able to “figure out what you’re doing” almost immediately, he said.

Moreover, the rapid proliferation of “precision long-range fires” in the form of highly accurate, long-range missiles available even to low-rent militaries, coupled with widely available high-quality “cyber and information tools” means there are no sanctuaries anymore.

ACC will train its junior officers in how to quickly deploy small groups of aircraft to austere fields, quickly move them again in order to avoid being hit, and make those calls on their own initiative, Holmes said. It will mean driving decision-making authority to lower and lower levels and expecting young leaders to use their wits to carry out “commander’s intent.”

ACC has gotten too reliant on spelling out what units should do in excruciating detail, Holmes said, and if it is to win a future fight, leaders at all levels must be practiced in thinking for themselves.

The new information reality will also mean “the focus will shift from trying to find out everything you can” with intelligence, surveillance, and reconnaissance assets to “trying to safeguard your data and maintain trust in what you know,” Holmes noted. Operators must trust the information before them even as they try to “create doubt in the enemy’s analysis and knowledge.” It will then be of prime importance to seize the initiative “through high-tempo operations, to force the enemy to react,” and maintain this advantage so the enemy can’t keep up.

One obvious response to the new reality, Holmes insisted, is to put an end to the fiction that the US is on a peacetime footing.

No longer can the acquisition system, the organization of the Active, Guard and Reserve forces, and the state of readiness be postured as if the US is at peace, Holmes said. It isn’t.

The Air Force has not seen a year since 1990 when it did not regularly employ forces in combat, and even 1990 saw the massive Desert Shield buildup of forces in Saudi Arabia in response to Iraq's invasion of Kuwait.

Forces are strained in part because "we continue to try to work primarily with our Active component, without mobilizing our Reserve component ... when we've moved half our capability into our Reserve components."

Holmes said bluntly that the 1980s investment in air superiority must be made again or control of the air will be lost.

"The investment made 30 years ago is being overcome by adversary efforts," Holmes said. Every aspect of the US military depends on having control of the air, and it underpins everything the US military does. The goal, he said, is to have such mastery of the air domain that not only can the US operate inside enemy air defenses at will, but "you want the enemy to worry about whether they can take off from their own airfields, instead of how they're going to get out of their airspace and into yours."

He estimated that the equipment advantage the US has lived off since the end of the Cold War initially required about \$8 billion per year—over and above the normal tactical aviation portfolio budget—to put into place. To keep air superiority, "we're going to have to find money ... like that. I don't see a shortcut," said Holmes.

Whether the next generation is a new fighter, or family of systems including fighters and drones and new kinds of munitions, "it's going to cost about the same as it did 30 years ago to be able to do it," Holmes asserted.

While he wouldn't say just what the preferred route in air superiority will be—"I want to preserve the ... decision space" of the Secretaries of the Air Force and Defense—Holmes said the themes will be familiar: counterair, suppression of enemy air defenses, electronic warfare, and a faster production rate on F-35s, as well as the capabilities that the "F-35s we buy five years from now" will require.

The centerpiece is also likely to be the still-undefined Penetrating Counter-Air (PCA) platform. Part of the decisions being made are also about "what we cannot afford," Holmes noted. He wants to avoid "flying F-35s six hours back and forth from a major base in the Middle East, to drop a \$20,000 bomb," at a cost of up to \$40,000 per flying hour to do it.

30-30-30

The fighter force today averages 30 years, he said. At the current rate of replacement, it will still be 30 years old 30 years from now. To get the buy rate of new aircraft up, he said, work will continue on driving down acquisition costs, but the big prize will be in pushing down sustainment costs "so we can afford them."

Without some major departure from the plans now in place, Holmes said the F-22 will have to undergo extensive modernization to stay relevant, and "we're going to be flying legacy, fourth generation airplanes for quite a while. ... We're going to have to continue to put money into their modernization."

To go with those fighters and other combat aircraft is going to have to be a vast improvement in command and control to maximize every step in the "kill chain."

Artificial intelligence and automation will play an increasing role. These areas have been identified by top Pentagon leaders as the key technologies for getting far more out of forces already in use, and Holmes said they already



SSgt. Timothy Kennedy marshals an Mi-8 helicopter during sling-load operations for the exercise Saber Strike at Lielvarde AB, Latvia. Airmen are not only busy performing nonstop combat and security operations, but participating in a full calendar of multilateral training exercises.

play a considerable role in how the Air Force operates.

"We have moved aggressively into remotely piloted aircraft," he said, but in cockpits, computers already prioritize targets, select appropriate uses of electronic warfare, and warn the pilot of threats to the point where "the pilot, in some cases, is kind of 'voting' with the airplane as to what to do."

A Russian tank formation mobilized for an unannounced combat readiness inspection in 2016. Holmes says adversaries such as Russia are also using new media to divide Western democratic alliances.



Cruise missile technology is also advancing rapidly, and Holmes reported “what’s holding us up” in this area is not the hardware but “the kind of moral and ethical parts of having the human in the loop, and then the details of how do you be as successful without a person.” He noted that computers can now beat humans at Chess or Go, but a human “chess master” paired with a computer can defeat the computer, and that’s how the Air Force sees the human-machine partnership—“the right mix”—shaping up in the near future.

The Air Force has to be cost-conscious, Holmes said, arguing that he must look for cheaper alternatives if it costs him “\$60,000 per flying hour” to put a big ISR airplane in the air over a relatively unimportant target. That’s why he’s looking at light attack aircraft and “thinking about” light ISR aircraft.

Less costly to buy and operate, light ISR aircraft could free up higher-end aircraft for missions that actually deter or engage high-end adversaries. Light aircraft are “relatively inexpensive, but they’re not free,” and he expressed appreciation that Congress is funding the Air Force to experiment with these concepts.

Joint organizations must change, too, he said. Given the perpetually higher demand for intelligence, surveillance, and reconnaissance products than there are ways to generate them, there has developed a “joint ISR board” and a “joint targeting board” that plans what the ISR world will be doing three days out, with redundant capabilities.

“I just don’t think that will work,” anymore, Holmes argued. Because of the speed of modern warfare, “I don’t think you can think that far ahead, I don’t think the targets will still be there, I don’t think the forces you were going to use to bring those fires against those targets will still be there, and so we’re going to have to change the way we look at that.” It’s going to mean “lashing up” service capabilities at lower and lower levels, Holmes asserted, not just at the top echelons.

The services will have to “trust each other” because they can’t afford to have redundant space, cyber or joint-fires capabilities, Holmes said. Expect some reorganization efforts stemming from USAF’s recent Multi-Domain Command and Control study “over the next year,” he predicted.

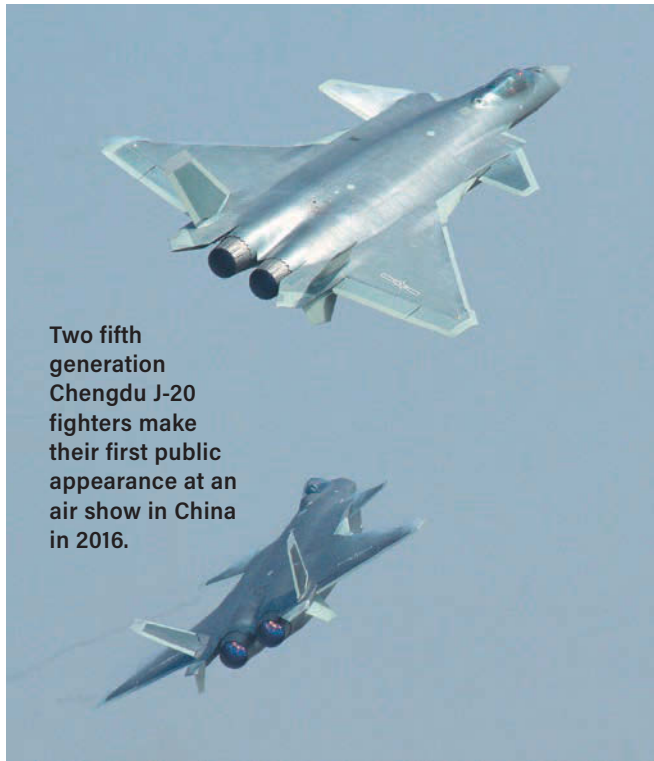
ACC is building new joint doctrine with the Army’s Training and Doctrine Command (TRADOC), benefitting from years of effort with the Navy on what was called “Air-Sea Battle” on “how we’ll inject ourselves into contested environments and how we’ll fight together once we’re there,” Holmes reported. Parallel efforts are underway among the services’ special operations organizations.

Referring to the “training” part of his “man, train, and equip” function, Holmes said he’s done almost everything possible to put “white space” into the ACC airmen’s calendar, because even when they are nominally at home from deployment, airmen are too often still not at home. They tend to be “on the road” even when Stateside, going to training exercises, and not “home” with their families.

Three Russian fighters—a Sukhoi T-50, an Su-35BM, and an Su-34 (l-r)—fly in formation at Ramenskoye, Russia.



Two fifth generation Chengdu J-20 fighters make their first public appearance at an air show in China in 2016.



Defining “ready for what?” is also part of this effort, he said. ACC’s airmen have explained to him that the definitions that have grown up in recent years—such as what a “permissive environment” is—don’t work.

“A permissive environment for F-22s might be highly contested” for other kinds of fighters, he noted. Now, he gives more specific instruction. “I want you to train for this regional adversary, and this is how we define your capabilities, and I want you to dedicate your training efforts toward that.”

Units can measure whether they can, indeed, execute their missions with what they have and know how to do, and if not, can ask for specific assets or training to make sure they can. This specificity will help ACC answer the

“ready for what?” question, Holmes said. A lot of training is going to have to move into the world of simulation, he allowed. For example, “we will not be able to build a live-threat emitter complex of the breadth and depth that some of our adversaries can put in the field.” The Air Force can build ranges large enough “that we can have confidence in the way we work together and integrate to defeat it,” and which thoroughly exercise crews’ “tackling and blocking skills,” but “I think we’ll move that highest-end training into a simulated environment,” he said. It’s not just that live ranges are costly, but simulation is necessary to represent the “density” of the threats US aircrews will face. Also, “because we don’t want people to watch ... exactly what we’re doing and how we’re doing it.”


Holmes said flatly that he’d like to “unify the Active component and the Reserve component.” Increasingly, he said, the two function in Associate organizations, and they must function more seamlessly if they are to be successful in what some call “infinite war: longtime competition against peer adversaries.”

Retention problems are “a symptom” of the fact that the US is essentially already in this infinite war, with endless deployments over the last two-and-a-half decades.

“If we’re faced with a forever war, then let’s admit it and resource ourselves to be able to take it on, and ... deter those peer adversaries,” he said.

Such a condition of constant competition is preferable to having a real, shooting war—although this too has already been going on for 27 years. The price is to “keep the game going and stay in it and maintain our values and the things we care about.”

America’s adversaries are “employing whole-of-government efforts at the strategic level that are designed to divide the Western democratic alliance that I’ve spent my whole life as a part of,” Holmes asserted. “They’re trying to use our differences to divide us as an alliance ... to use our differences in the nation to divide us on our goals.”

This situation is thrust upon the US by nations such as China, Iran, North Korea, and Russia, whether the country likes it or not. The US must accept and build to the reality, Holmes said. 



STRAINED RELATIONS



Leaders at the Pentagon (top) and the US Capitol (above) are debating plans to create a new Space Corps.

By Megan Scully

THE AIR FORCE HAS LONG STRUGGLED TO FIND ITS WAY ON CAPITOL HILL.

For quite some time, the Air Force has had, at best, a strained relationship with Congress. Lawmakers complain that USAF frequently surprises them with major changes—system retirements, mission or organizational swaps, programmatic cost jumps, and altered relationships with the Guard and Reserve, to name a few—while USAF leaders in turn express frustration that Congress won't give them a reliable budget or let them manage a resource-strapped force in the most efficient way available.

Things appear to be getting a bit better, but there's still a long way to go in improving the relationship.

The strain was on full display in the recent back-and-forth over some lawmakers' plans to create a new Space Corps; an organization patterned after the Marine Corps, but part of the Air Force, with space as its sole focus. Members complained that this new organization was needed because the Air Force just wasn't paying enough attention to space, the US was falling behind Russia and China in this domain, and military space needs were losing out in the resource competition with more traditional USAF missions.

The Air Force only got wind of this idea in a low-key press release from the House Armed Services subcommittee. The service got to work trying to



Defense Secretary Jim Mattis says now is the time for another BRAC round. Top DOD officials are united in their desire to shed excess infrastructure.

dissuade lawmakers from going ahead with the plan.

USAF leaders argued that creating a separate organization would only hinder efforts to integrate space into the joint combat enterprise. It would do more harm than good, they said, and it would create a new and expensive bureaucracy. In any event, USAF had just created a new deputy chief of staff for space operations, and this was evidence that the service was already making space a top priority.

House lawmakers remained skeptical. With staggering speed, the proposed change—which never had a public hearing or study—reached the highest levels of the powerful Armed Services Committee.

Within the House, there was little opposition, and even less debate, about what would amount to a radical shift in the structure of the Air Force.

Committee leaders shepherded the provision through the panel's marathon consideration of the massive Pentagon policy bill in June. Later, on the House floor, the Space Corps idea got barely a few minutes' mention.

As the Senate's version of the bill took shape, the notional Space Corps became a lightning rod during consideration of the defense authorization bill. Air Force Secretary Heather Wilson, a former Republican congresswoman from New Mexico, was thrust into a bruising battle with her former colleagues on the Armed Services panel.

Within the Senate, Space Corps was always dead on arrival. The typically more circumspect committee had no

HASC chairman Rep. Mac Thornberry (R-Texas), like most members of Congress, isn't sold on another round of BRAC.



appetite for creating a new military service—much less a new position on the Joint Chiefs—without ample study and review. But even with strong Senate opposition to the House language, the Air Force didn't walk away from the debate unscathed.

During House-Senate negotiations on the final defense authorization measure, lawmakers agreed to kill the newly created deputy chief of staff for space position, sending a strong message to Air Force leadership that their planned internal changes weren't sufficient. They also kept the prospect of a new space organization alive by adding language mandating a review by the Deputy Secretary of Defense.

The House-Senate conferees wanted to know if an all-new military space service—not just a Corps within the Air Force—is needed to deal with space.

The episode drew the contentious Hill-Air Force relationship into high relief. It represents the latest test of service leaders' ability to maneuver dicey political and policy issues in what's proving to be, as the Air Force might say, a "contested environment."

CULTURE WARS

The tension between the executive and legislative branches is healthy and natural. Congress has the power of the purse, and military leaders are charged with providing lawmakers with



An F-35 performs cold-weather testing in harsh conditions out of Alaska's Eielson Air Force Base near Fairbanks.



Eielson, once targeted for near-closure, has become a world-class test and training environment. It is home to F-16s (above) and in the future will also have F-35s.

their best military advice. The two don't always align.

"This is not something that should necessarily frustrate people in the leadership of our Air Force, and I know that it doesn't," said former USAF Chief of Staff, retired Gen. Norton A. Schwartz. "There is a recognition that this is the arrangement, this is the architecture we work with. It's embedded in our Constitution. That is the reality."

The relationship between the military services and lawmakers is complicated by the fact that those in uniform are not allowed to lobby Capitol Hill. Ultimately, executive branch decisions on policy and spending are far above the pay grade of the service chiefs and secretaries and come directly from the White House.

Even so, USAF's relationship with the Hill has often seemed more fraught than that of the other services. In an

effort to remedy that, USAF leaders have sought to be more forthcoming with key lawmakers.

Robert Winkler, who recently left the Air Force's legislative liaison office, said there was a conscious decision in the last two years to get Congress involved in decision-making before the release of the annual budget request.

USAF officers, Winkler said, are still giving Congress their best military advice, but doing so with better knowledge of the dynamics on Capitol Hill and better appreciation for potential pitfalls along the way.

In its Hill strategy, the Air Force is also talking to Congress less about dollars and more about combat requirements. That means less time spent talking about a particular budget decision and more on what the service needs to execute worldwide operational demands.

"We have a requirement for a certain force structure, so let's explain that force structure to the Hill and why we need that requirement, as opposed to those decisions baked in" to the budget request, Winkler said.

Such an approach mollifies hawkish lawmakers, who have long been frustrated with military leaders couching needs in vague discussions of "acceptable levels of risk." Some decisions derived from that thinking—such as efforts to retire the A-10 and U-2—have been extremely unpopular with Congress, which rejected them.

The new approach "would give Congress pretty much exactly what they've been asking for, not just the Air Force but DOD writ large," said Mark Gunzinger of the Center for Strategic and Budgetary Assessments.

All too often, he noted, the Air Force tells Congress what it can afford,



Air Force Chief of Staff Gen. David Goldfein says breaking off military space into a new space corps would do more harm than good.



The A-10 has starred in many back-and-forth debates between USAF and Congress.

not what it needs to fully implement the national defense strategy, from ongoing operations to deterring potential adversaries such as Russia and China.

The Navy, by comparison, is better at articulating the strategic need for a 355-ship fleet, even if funding for a fleet of that size is unlikely.

“Congress deserves to know what the data points are,” says Gunzinger, a retired Air Force colonel and a former Defense Department official. “Here’s a force we can afford to build given a budget we’ve authorized and appropriated.”

That, in turn, could give Congress the information it needs to make better strategic choices on the size, shape, and nature of the force, he added.

Schwartz, who now leads the Washington-based Business Executives for National Security, rates the Air Force-congressional relationship as “okay” right now. While the Space Corps issue was clearly contentious, there has generally been consensus on other recent issues, such as the need to grow the Air Force and invest more heavily in modernization.

Schwartz took on the top uniformed USAF job at a particularly challenging time for the service, coming in right after the previous Chief and Secretary were fired. He acknowledges that the Air Force is not the favored service among members of Congress. That distinction has typically gone to the Marine Corps.

“I think there’s a consensus that

the Marine Corps has the best overall stock on Capitol Hill,” Schwartz said. “They are very skillful in cultivating their brand, and ... they are quite good with their congressional relations.”

ALWAYS FAITHFUL

Working in its favor is the Marine Corps’ smaller size and less diverse portfolio versus the Air Force. That means there’s plenty of opportunity for USAF to make political mistakes that could hurt the service’s brand and its footing inside the Beltway.

“The jobs of the Chiefs and the Secretary in the Washington setting are a lot like a checkbook,” Schwartz said, crediting former Air Force Secretary Michael B. Donley with the analogy. “You make deposits and you make withdrawals, and ideally your deposits exceed your withdrawals. When the latter happens, the other way around, there’s a lot more tension.”

The Marine Corps commandant, meanwhile, tends to have more personal power within his own service than the Army or Air Force Chiefs, Schwartz said.

The Marines also have an alumni network that is “beyond compare,” Schwartz says, and a culture that is more cohesive than in one of the larger services, where “tribal dynamics” sometimes present a political challenge.

Those tribal dynamics were on display when the Air Force sent Congress a proposal five years ago making significant cuts to the Air National Guard. The proposal was rejected by lawmakers, who in turn created a commission on the size and structure of the Air Force, including its reserve components.

Todd Harrison of the Center for Strategic and International Studies said the Air Force analysis supporting its decisions on the Air Guard—as well as its analysis on other matters—is viewed as suspect by congressional committees.

“In many cases, the Air Force will make a decision and then come up with analysis that supports the decision,” he said. “It makes one question the validity of the analysis.”

Harrison also pointed to a culture of risk aversion within the Air Force senior leadership. As a result, Harrison said, they stick firmly to talking points, making them look disingenuous or even uncooperative when testifying or speaking to members.

Former Chief of Staff Norton Schwartz, now head of Business Executives for National Security, advises Air Force leaders to never surprise a lawmaker.



“They don’t do as good a job [at] being just candid, both in public settings and in private settings,” added Harrison, a former Air Force reservist.

By comparison, the Marine Corps is akin to a religion, and there is an innate sense of enthusiasm that goes along with that

“They view themselves as Marines, first and foremost,” Harrison insisted, “and so from that kind of culture, it’s more natural ... to just speak off the cuff. They don’t have to stick to talking points because it’s ingrained in them.”

LESSONS LEARNED

After four years in the chief’s chair, Schwartz said his advice to Air Force leaders on congressional relations is to never surprise a lawmaker. Inform Congress whenever possible, even if that conversation is off the record, he said.

But the communication is a two-way street. The service’s leaders should also have a sense of what the momentum is on Capitol Hill. If the service’s proposals run counter to that momentum, it’s imperative to have a good argument and a good reason for them.

“If you do it right, no one gets surprised,” Schwartz said. “You understand what the boundaries are, you get a sense of what people’s bottom lines are, and you do your best to govern.”

Having those discussions—and including Congress in the analysis before the budget drop—doesn’t necessarily mean the Air Force will get its way. In the end, though, it could make it easier for the Air Force to convince Congress to authorize

unpopular proposals such as retiring the A-10 fleet, something the service tried and failed to do for several years.

“You’re in a much better position to fight that fight if you know that you’re fighting the good fight,” Harrison said.

Lawmakers are motivated by different interests than the services. They have constituencies to represent and local interests to protect. That makes policy issues like base closures or aircraft retirements a difficult sell among lawmakers whose states and districts could stand to lose from the decision.

Winkler, however, said he was “pleasantly surprised” that lawmakers—particularly those on the defense committees—could usually see beyond the parochial on proposals affecting national security.

“I found that, for the most part, when faced with the decision of what was best for America, specifically inside the committees, ... everybody understood what the big picture was and there wasn’t a big uproar about local politics,” he noted.

Checks and balances in government is a good thing, Schwartz said, allowing that the Air Force may not always be right.

“You come up with a solution set. It is examined every which way by the professional staff and the members, as it should be,” he said. “And the scrutiny is healthy.”

If lawmakers are operating purely on parochial interests, Schwartz said, that’s usually very evident. “But in most cases, it’s not just that. It’s a genuine concern,” he added.

The retired four-star readily acknowledged that his successors handled the politically fraught Air Guard issue better

than he did during his tenure as chief. Schwartz also said that the 2012 proposal to move F-16 fighters out of Eielson Air Force Base in Fairbanks to JB Elmendorf-Richardson in Anchorage—a move that provoked strong local opposition in Fairbanks and spurred Alaska’s senators to work to block the move—would have been the wrong move for the Air Force.

Three years after USAF made the initial proposal, Schwartz’s successors decided to keep the F-16 squadron in Fairbanks, pointing to the base’s strategic location. The following year, the Air Force announced that Eielson would also become home to two F-35A squadrons, calling it both a strategically important location and a “world-class training environment.”

“The approach we were taking was flawed, to some degree,” Schwartz recalled of the F-16 proposal.

The Air Force will, no doubt, relearn many of these lessons when it defends its Fiscal 2018 budget proposal before the congressional defense committees in the coming months. Lawmakers will, as always, pick apart the budget request, questioning plans to change force structure or reduce planned equipment purchases.

Issues such as base closures and readiness will also likely continue to dominate the debate on defense spending, and the Air Force will definitely not get everything it wants.

“One always has to have a bit of humility,” Schwartz said. ❖

Megan Scully is a reporter for *CQ Roll Call* and a longtime *Air Force Magazine* contributor.

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STRATEGIC DETERRANCE IN 2018

NUKES IN A COMPLEX AND EVOLVING THREAT ENVIRONMENT



By Wilson Brissett

For nearly 70 years, strategic deterrence has meant threatening an adversary with the possibility of near-total destruction—likely with nuclear weapons—to dissuade him from aggression. That definition held during the Cold War between the US and Soviet Union, and served as a foundational element throughout US military strategy.

Now, however, strategic deterrence is becoming more complex and nuanced. Some world actors who threaten the US don't have a nation to threaten; some adversaries can't credibly be threatened with nuclear weapons; many state and nonstate actors can inflict strategic destruction through cyber attack rather than by nuclear, chemical, or biological weapons. How can they be deterred?



Gen. John Hyten, head of US Strategic Command, looks to reorganize STRATCOM to meet 2018's requirements.



Secretary of the Air Force Heather Wilson (left) and USAF Chief of Staff Gen. David Goldfein answer questions at the Pentagon Nov. 9, 2017.



Defense Secretary Jim Mattis (right) and Marine Corps Gen. Joseph Dunford (to his right), Chairman of the Joint Chiefs of Staff, in Seoul, South Korea, in October 2017.



B-2 bombers at Andersen AFB, Guam.

Homeland defense today “starts with the nuclear enterprise,” Air Force Chief of Staff Gen. David L. Goldfein affirmed at AFA’s Air, Space & Cyber Conference (ASC) last September. The service had announced technology maturation and risk reduction contracts for two legs of the nuclear triad, the Ground-Based Strategic Deterrent cruise missile and the Long-Range Standoff weapon ICBM.

While 21st century deterrence is multidomain, it has also become multipolar. Defense Secretary Jim Mattis drove this point home at ASC when he said, “I believe the problem we face today is how [to] maintain a nuclear deterrent and a decisive conventional force while maintaining irregular warfare as a core competency.”

In other words, the US strategy of preparing for the four-plus-one threat landscape—where key US adversaries are

Russia, China, Iran, North Korea, and militant extremism—should guide deterrence thinking as well.

Gen. John E. Hyten, head of US Strategic Command, agrees. While counterterrorism is not one of STRATCOM’s direct mission sets, he includes the “violent extremism threat” in the US strategic portfolio. North Korea is moving fast in its nuclear weapons program, while Iran is “building ballistic missiles all over the place,” he said at ASC.

Meanwhile, Hyten said, Russia is modernizing its strategic forces with alacrity, in a way not seen since the Cold War, and China is thinking about deterrence in sophisticated new ways. The strategic threat has proliferated, both in terms of capabilities and competitors.

In an interview with *Air Force Magazine*, Hyten said one of his top goals is to reorganize his command from top to

Photos: SRA Jovan Banks; SSgt. Adam Fischman/ANG; SSgt. Rusty Frank; Navy Petty Officer 1st Class Dominique A. Pineiro/DOD

bottom in search of a new 21st century approach to deterrence.

“Now I’m trying to focus on that integrated, multidomain, multipolar environment,” he said. In one sense, the problem stems from an embarrassment of military riches. Because the US military has “the most dominant conventional force in the history of the planet,” Hyten said, US adversaries have been forced to try to “counter it strategically.”

In the fall of 2016, Russia held a “civil defense exercise involving 40 million Russian citizens,” Hyten said last September. The war game marked “the largest strategic force deployment and exercise that they have done since the Cold War.” Russia is also reorganizing its strategic forces.

“They integrate nukes, space, cyber, and conventional to achieve an overall strategic effect,” he noted. In thinking through the new multidomain, multipolar strategic environment, “Who puts all of the pieces together and talks about what deterrence is in the 21st century?” Hyten asked. “The best stuff I’ve read is Chinese, not American,” he said in the interview.

PREPARE IN EVERY DIRECTION

Goldfein emphasized that the strategic threat is not just nuclear. Wars of the near future will be “wars of cognition,” he said. They will be “multidomain” and will require a response structured by “simultaneous activity from multiple domains that act together.” This means that—in addition to air, land, and sea—deterrence today must consider domains like cyberspace and space, and “while not a separate domain, you’ve almost got to start adding social media” to deterrence thinking, he observed.

Perhaps the most important emerging strategic domain is space, which Goldfein called “the ultimate high ground.” The ability of US forces to respond to strategic threats in all domains relies on space capabilities, from “early warning to protected communications to the GPS signal.”

US adversaries have been keenly aware of American dependence on space since at least the first Gulf War. China’s successful test of an anti-satellite missile in 2007 (against one of its own satellites) “served as a wake-up call” to US military leaders, according to *Escalation and Deterrence in the Second Space Age*, a report by the Center for Strategic and



Richard Mullee, 90th Missile Wing Safety Office missile safety superintendent, checks the midsection of a Minuteman III booster at F.E. Warren AFB, Wyo.

International Studies, released in October 2017. The lesson of the Chinese ASAT test was clear, the report said: The US “could no longer continue acting as if space was the sanctuary it had been throughout much of the Cold War.”

Air Force Secretary Heather Wilson, also speaking at ASC, drove home how crucial space is for deterrence today. “We must seek to deter attacks on our satellites,” she asserted, “and if deterrence fails, our space systems must be resilient so we can take a punch and fight back.” Goldfein further emphasized the point: “The business of warfighting in space,” especially as it relates to nuclear detection and command and control, “has got to be central to our development in the learning curriculum going forward,” he said.

Hyten has been assembling “an academic alliance in STRATCOM” to inspire a renaissance in deterrence thinking. This “alliance” involves 44 universities to date. While these participants sent representatives to a July 2017 STRATCOM symposium in Omaha, Neb., “we’re going to go to them” as well, he said.

While he’s encouraged by the “emerging discussion” among academics, Hyten sees a lot of remaining work to translate that thinking into military strategy.

“What I don’t see coming up in any large way yet,” he said, “are the

traditional think-tank publications” on 21st century strategic deterrence.

That means for STRATCOM itself, there is still work to do. “We have a good, clear problem statement. I think we have a definition of the framework,” he allowed, but “we don’t understand the details fully, and that’s what we’re looking for.”

He’s encouraged by a rising strategic awareness on the part of US personnel. “Ten years ago,” Hyten said, knowledge of nuclear deterrence among US military forces in-theater was very low. But “I think we’re climbing out of that trough,” today. “We’re in a much, much better place,” he said.

An exchange between Mattis and a Navy petty officer at STRATCOM headquarters last September impressed Hyten. The Defense Secretary, fielding questions, took one from the petty officer, who said he’d just read a book “on Libya, Iraq, and the Ukraine and the role of nuclear weapons” in those parts of the world.

Mattis said he’d read the same book. “I was watching the Secretary of Defense talk with a petty officer in the Navy about the most strategic issues. And the petty officer is holding his own right [along] with the Secretary of all Defense. That’s when you know that people are getting it,” Hyten added.

Hyten is interested in more than thinking, however. He calls STRAT-



An E-4B serves as the National Airborne Operations Center. It provides highly survivable command, control, and communications in case of a national emergency such as a threatened nuclear strike.

COM “the ultimate warfighting command.” When he assumed leadership of STRATCOM in November 2016, he asked himself, “How come I don’t have a warfighting structure?”

NEEDING STRUCTURE

STRATCOM’s sprawling organizational chart features six nuclear task forces, three centers, three joint component commands, five service components, and a subunified command for cyber. In collaborating with STRATCOM, “one of the biggest challenges for other combatant commands ... is who do you call?” Hyten said in the interview.

Hyten began a major reorganization of the command last June. The new structure will create just four major joint components for air, maritime, space, and missile defense. Cyber forces are likely to receive their own unified combatant command and no longer report to STRATCOM through US Cyber Command.

The changes make it “much easier” to connect STRATCOM with geographic combatant commanders, Hyten said. “It’s a warfighting structure that everybody recognizes, which means they know exactly where to plug in.”

When there were 18 elements, some with significant overlap in mission profile, combatant commands had difficulty working smoothly with such a behemoth organization. After the change, STRATCOM will look more familiar. “Every combatant command has a JFAC, every combatant command has a maritime component,” Hyten said. “So now their J-3 can call my J-3. Their J-5 can talk to my J-5.”

The changes will take time to implement; Hyten said. They will be complete later this year.

For all the talk of changes at STRATCOM and in 21st century deterrence theory, Hyten remains tightly focused on modernizing the US nuclear deterrent, which he sees as a very broad task.

“People, when they talk about nuclear modernization tend to go to the big four: submarine, bomber, and two missiles,” the Long-Range Stand Off and Ground-Based Strategic Deterrent (GBSD), Hyten explained. “But it’s actually six. It’s those four, plus nuclear weapons (warheads), plus nuclear command and control.” Those six nuclear elements are all reaching the end of their service lives all at once, presenting a formidable recapitalization task.

Hyten said his hope is that the Defense Department will find a way “to move all of those to the left so we don’t have any just-in-time” deliveries of nuclear capabilities. A further challenge will be to refresh all these nuclear technologies “in an environment where we don’t want to initiate testing anymore,” he said.

The STRATCOM boss lamented that “our nation has lost the ability to go fast,” when developing new weapons. Throughout US history, “we’ve always been able to leverage the industrial base and go faster than anyone else in the world.” But today, “we have adversaries going faster than we are.”

Hyten’s favorite example is Minuteman I, which the Air Force developed in five years at a cost of \$17 billion in today’s dollars. By way of contrast, the Minuteman III replacement program, GBSD, is projected to cost \$84 billion and is still 17 years away from full operating capability.

He believes GBSD could still turn a corner and not get bogged down with typical Pentagon procurement time

lines. “It’s not anywhere close to too late,” Hyten said in the interview. He said he has confidence in Col. Heath Collins, GBSD program director, but says the service needs to give Collins “the authority and responsibility” to carry out the program as he sees fit.

“The metric for success will be when our program directors spend more time in the factories ... than they do in the Pentagon,” according to Hyten. Right now, “they have to spend more time in the Pentagon.”

Learning to trust the people who work in the strategic force is perhaps the most important lesson for 21st century deterrence. Gen. Samuel C. Phillips, who led the Minuteman I program and later the Apollo lunar landing effort, was successful because “he knew how to take smart risks,” Hyten told the audience at ASC. The red tape, not the people, are the problem. “It has been reported ... that I have trashed the acquisition community,” Hyten said, adding, “I’m criticizing the entire process.”

In the interview he clarified that. “I think the major barrier is the nature of the bureaucracy.” Programs don’t receive regular funding from Congress, requirements grow overly complex in the Pentagon, and “we’re having a tough time keeping colonels in the business because we don’t give them the authority and responsibility” to execute their programs efficiently, Hyten said.

He’s not so worried about 2018. “We are fully ready today to respond to any threat we have,” Hyten asserted. His concern is that the successor to his own successor will not have the same capabilities. He wants to make sure that future STRATCOM commanders “can respond like I can to any threat that’s out there.”



01.18.2018

F-15C fighters from California ANG's 144th Fighter Wing before a morning mission at JB Pearl Harbor-Hickam, Hawaii, during Sentry Aloha, an ongoing series of exercises hosted by the Hawaii ANG.



5TH GENERATION COMMS

**What's being
done to ensure
the F-22 and
F-35 can talk to
each other ... and
the rest of the
Air Force?**

By Brian W. Everstine, Pentagon Editor

The F-22 Raptor, the Air Force's fifth generation air superiority fighter, has been described as a "game-changer" in current Middle East operations, using its advanced sensors to see huge swaths of territory and steer coalition aircraft around threats. As a de facto "quarterback" in the contested zone, it makes all other aircraft in the fight more effective.

That communication, though, is largely limited to radio calls. The F-22 can't transmit the most sensitive data it collects to any aircraft besides oth-

er F-22s. While it can receive Link 16 data from other aircraft, it can't pass along its "God's-eye view" to other players in the force. Even the other fifth generation fighter, the F-35, can't communicate with the F-22 except at the voice level.

The situation wasn't brought about by negligence. In developing the F-22—and later, the F-35—designers needed to preserve the jets' stealth against rapidly evolving adversaries. Standard radio emissions would reveal their locations, which meant devising ways the low-observable fighters could

talk to each other without giving away their position. Both jets have what are called "low probability of detection/intercept" communications gear to stay hidden. The F-35's system—because it was developed 10 years after the F-22's—takes a different approach.

As a result, Air Force combat communications can become a kind of Tower of Babel. While Raptors can receive over the Link 16 network—the standard across US and NATO aircraft—it can't transmit over the system. Instead, it uses the F-22-only Intra-Flight Data Link (IFDL). F-35s



An F-22 conducts air strikes and patrols in Iraqi and Syrian airspace for Operation Inherent Resolve in November 2017. The F-22s benefit to the rest of the force could be multiplied by new, data-sharing capabilities.

can transmit on Link 16 to fourth gen jets and talk among themselves using the stealthy Multifunction Advanced Data Link (MADL), a capability the Air Force had planned to install on the F-22 but canceled because of cost about five years ago.

The Air Force's goal is to harmonize all these systems so that everyone can talk among themselves—both by voice and machine-to-machine—without an enemy listening in or figuring out where those stealth jets are.

Fixing the situation is “part of the larger effort to figure out how we’re going to move away from having a bunch of Rube Goldberg gateways trying to connect things, to having a jump to the next generation of networks and radios and how they talk to each other,” Air Combat Command head Gen. James M. Holmes told *Air Force Magazine* in November.

The Air Force is looking at this problem with “two lines of effort” for the near-term and long-term.

For the near-term, the Air Force has multiple “small-scale experimentation campaigns” aimed at reducing risk and quickly fielding advanced data links, along with enhancing the current data links, reported Lt. Gen. Jerry D. Harris Jr., the deputy chief of staff for strategic plans and requirements, in written answers to questions from the House Armed Services Tactical Air and Land Forces Subcommittee in June.

“These experiments are demonstrating correlation/fusion of data from multiple sources, including intelligence sources and fifth generation fighters,” Harris wrote.

The first stage of this effort focuses on the F-22 being able to transmit on Link 16. The service has a funded program on the books to address this, called TACLink 16. The program, which had \$41.7 million budgeted for Fiscal 2017, is scheduled to begin fielding in Fiscal 2021, Harris said. Service officials have said they hope to go even faster.

Link 16 transmit is crucial. If the fighter isn’t transmitting over this network, other aircraft in the fight can’t “employ weapons on enemy forces without first identifying F-22 position by means of multiple radio calls,” Air National Guard Director Lt. Gen. L. Scott Rice said in his modernization priorities outline for 2017. The Guard flies 11 percent of the F-22 fleet and has deployed multiple times for combat. This issue is “compounded” because fourth generation fighters can’t track Raptors with their own sensors.

The ability for the F-22 to transmit its “most advanced sensor,” Rice wrote, will permit it to “share high-fidelity data of air and surface tracks,” which in turn will significantly increase “the combat capability of every asset that is Link-16 capable.”

While USAF presses on with TAC-Link 16, it’s looking for industry to supply a quick means to bridge fourth and fifth generation aircraft. In October, the service released a request



An F-35, an F-15C, and an F-22 on the ramp at Gwangju AB, South Korea, during exercise Vigilant Ace-18. Including both fourth and fifth generation aircraft in exercises enhances interoperability.

for information to industry calling for systems that could be a “gateway” between fourth and fifth generation aircraft. The request came with the proviso, however, that the system could be ready within 12 months.

This document was “market research” by the Air Force, looking at what industry has ready to address this problem, according to the Air Force Life Cycle Management Center.

The Link 16 system, which dates back to the development of the Joint Tactical Information Distribution System starting in the mid-1970s, broadcasts on a frequency that can easily be picked up by enemy signals intelligence. New systems transmit data in a more stealthy manner.

Boeing’s secretive Phantom Works division is testing a program allowing the F-22 to communicate securely with its fourth generation air superiority counterpart, the F-15C Eagle.

The US Air Force Tactical Exploitation of National Capabilities (TENCAP) office in Air Combat Command worked alongside Boeing’s Phantom Works to develop Talon HATE: a communications translator pod carried on the F-15C. The 17-foot, 1,844-pound pod includes an adaptive sensor, multi-domain information processor, and a network communications gateway that allows the Eagle to communicate with the F-22 securely over a common data link, according to Boeing.

In September 2017, Boeing delivered four of these systems and finished modifications to F-15Cs, Boeing Phantom Works spokeswoman Cheryl Sampson told *Air Force Magazine*.

“They offer a giant leap forward in tactical fighter capability with real-time connectivity and expanded information sharing,” Sampson said.



Airmen complete postflight checks on an RQ-4 Global Hawk in Southwest Asia. Specially equipped Global Hawks are proposed as a solution to communications hurdles between F-22 and F-35 aircraft.

“Boeing demonstrated secure data link connections between F-15Cs and F-22s in a way that integrates information for the pilot in a common operating picture.”

Northrop Grumman has pitched a different way to help F-22s and F-35s securely talk in flight, by adding another aircraft—Northrop suggests its own RQ-4 Global Hawk—to fly in the area with its “Freedom 550” radio. This “production-ready ... software-defined” radio is built using avionics Northrop developed for both the F-35 and F-22. That means the system can translate among IFDL, MADL, and Link 16.

Northrop tested the radio through more than 400 flight hours in 2014 as part of an Air Force-sponsored experiment called the Jetpack Joint Capability Technology Demonstration.

In February 2017, the company conducted a trial with the United Kingdom

Royal Air Force, integrating the radio with the F-35B and Typhoon FGR4 aircraft. During the UK Ministry of Defense-funded trial, called Babel Fish III, Northrop’s system translated F-35B messages to Link 16, which was received by the Typhoon.

The demonstration was the first time non-US fifth and fourth generation aircraft have shared stealthy data, according to Northrop.

“Being able to network sensor data between fifth generation and fourth generation fast-jets and other battlespace assets in a stealthy matter is critically important to enabling the full capability offered by fifth generation aircraft,” said Andrew Tyler, the chief executive of Northrop Grumman Europe, in a statement announcing the demonstration.

Lockheed Martin has offered an effort to let F-22s communicate with fourth generation aircraft, through



Two F-15s take off at JB Elmendorf-Richardson, Alaska. One carries a Talon HATE pod—a communications translator device.

its Project Missouri program. Using a Rockwell Collins radio for Link 16 and L-3 Communications devices for encrypted communications, the Raptors were able to transmit to ground stations and an F-35 avionics test bed in late 2013. The capability has flown in exercises since the initial demonstration, as recently as the Northern Edge exercise in May 2017.

The F-22's inability to share data has been an issue afflicting USAF operations since the fleet became operational. Some have speculated that the lack of stealth data sharing kept the Raptor from participating in the 2011 air campaign in Libya.

The Air Force acknowledges the communications restrictions, and both F-22 and F-35 pilot training includes workarounds to allow the stealth jets to communicate with their nonstealthy stablemates.

In July 2017, all types of USAF stealth aircraft—F-22s, F-35As, and B-2 bombers—participated in a Red Flag exercise at Nellis AFB, Nev. Marine Corps F-35Bs participated, as well. Pilots needed to talk with each other over “secure voice” systems as the jets flew “strategic attack scenarios” against an integrated air defense system, said Capt. Neil M. Fournie, the advanced warfighting chief of the 414th Combat Training Squadron.

Because the F-35 does have the ability to share over Link 16, it was a more capable “quarterback” in that fight, when the battle was taking place in a “permissive” environment. During Red Flag 17-1, five months

earlier, F-35As from Hill AFB, Utah, flew with British Typhoons to take out a “high-value target” in a training exercise. The F-35 pilots used Link 16 data to communicate with the Typhoons, while also using MADL to share a greater level of data, stealthily, with other F-35s.

“The thing that’s great about having Link 16 and MADL onboard and the sensor fusion is the amount of situational awareness the pilot has,” said Lt. Col. George Watkins, commander of the 34th Fighter Squadron at Hill, in a release about the mission. “I’m able to directly communicate with specific formations, and I can see the whole war and where all the players are from a God’s-eye view. That makes me more effective because I know who to talk with and at what times, over the secure voice.”

While the legacy Link 16 system lets F-35 pilots speak with older aircraft, the advanced system is the preferred method.

“It’s the data link that we use to communicate just between F-35s,” he said. “It’s a solid architecture and from my experience it’s been very stable. The pilots rely on it for fighting, and at night we fly what we call sensor formations and we use MADL to keep our situational awareness.”

Speaking last March, shortly after that Red Flag exercise, USAF Chief of Staff Gen. David L. Goldfein detailed this capability as he highlighted the need for next generation, multidomain command and control. F-35s, he said, were not only fusing information from

other aircraft, but also from cyber and space assets that were participating in the exercise. The exercise included a combat search and rescue scenario, all while facing the threats of air defenses.

The F-35’s situation, as displayed on the pilot’s visor, was also “replicated in other command-and-control agencies,” which allowed the F-35 pilot to “perform as the quarterback of the joint team, as they went in to accomplish all of these simultaneous missions,” Goldfein said. “So when I talk to you about situational awareness, this was an example at the tactical level to produce operational effects.”

Outside of Red Flag, F-22s have participated in several high-profile exercises that sought to knit USAF and international crews together when performing air superiority and other missions.

JB Langley-Eustis, Va., as one of the service’s major Raptor bases, has hosted premiere fighters of close allied air forces in training missions meant to ensure they can cooperate on “Night One” of a major operation. The first of two Atlantic Trident exercises in 2015 brought together United Kingdom Eurofighter Typhoons, French Dassault Rafales, and USAF F-22s in an attempt to “get back into high-end training,” Royal Air Force Chief of Staff Air Chief Marshal Sir Andrew Pulford said at the outset of the exercise. The war game focused on logistics and getting the aircrews acquainted in operating together, including addressing issues of communication in the air.

In April 2017, the three types of

Capt. Michael Slotten, an F-35 student pilot, prepares to taxi onto the runway at Luke AFB, Ariz. Chief of Staff Gen. David Goldfein wants all of USAF's platforms to talk to each other, but admits "I've got all kinds of priorities."



advanced jets came back together at Langley for the second iteration of the exercise and to build on the initial progress. For the second round, the Air Force also sent F-35As. The pilots needed to refine their communication and tactics, so they would be ready for "Night One interoperability," then-1st Fighter Wing Commander Col. Peter M. Fesler told *Air Force Magazine*. The aircraft flew 510 sorties together over three weeks.

"All these aircraft have tremendous capabilities, but if we don't plan them and integrate them and understand each other's capabilities and limitations—and use them to their full potential—then we could lose in any combat scenario," said Lt. Col. Brad Bashore, commander of the 58th Fighter Squadron.

The possibilities for improved secure communication and data sharing will touch the Air Force's mobility community, as well.

Air Mobility Command chief Gen. Carlton D. Everhart II floated an idea at AFA's Air, Space & Cyber Conference last September that USAF's 11,000-plus mobility aircraft, including KC-135s, KC-10s, and soon KC-46s, could link F-22s and F-35s during combat operations. "Why not use them as relay platforms?" Everhart asked.

Tankers could automatically offload data collected by F-35 and F-22 sensors, freeing up the fighters' onboard cache, while also getting intelligence and surveillance data to analysts in a timely manner.

All of these programs, tests, and evaluations are aimed at near-term solutions, addressing as well prob-

lems being faced in ongoing combat operations, but, as Holmes said, they amount to a "bunch of Rube Goldberg gateways." For the longer-term, the Air Force wants holistic communication and data sharing.

The Air Force's Air Superiority 2030 Flight Plan, completed in the spring of 2016, outlined current and future threats to readiness. As directed under the plan, USAF is conducting an Advanced Battle Management System analysis of alternatives due to be completed in 2018. It will include the next generation of networks and radios. In addition, the plan calls for a development effort focused on agile communications, including adaptable networks for operations in "highly contested" environments.

"The agile communication capabilities-based assessment is defining communication gaps that the Air Force must mitigate in (anti-access/area-denial) environments in the 2030-plus time frame," Harris told lawmakers. "The outcome of each of these efforts will inform the path forward for communications capabilities that enable interoperability across the A2/AD environment."

The focus ultimately can't be on communications between specific planes or on an endless litany of demonstrations, Holmes said.

"The issue to me is not when we're going to make the F-22 and F-35 talk to each other, it's when we'll have everything talk to each other," he said. It is a priority, "but I've got all kinds of priorities."

Goldfein feels strongly enough about "multidomain command and

control" that he's made it one of his three main focus areas during his tenure as Chief, and he's directed a one-star general to research it.

"This evolution in our command-and-control capabilities requires new thinking, new training, and perhaps new technologies or ways to use older technology," Goldfein said in a March 2017 letter to airmen. "We will need to integrate real-time information from a variety of sources—some nontraditional—and evaluate that information as fast as systems can process it. If an enemy blocks actions in one domain, we quickly 'call an audible' to change the play and attack or defend from another. Future multidomain operations will be high velocity, agile, and joint by their very nature."

Goldfein tapped the Air Force's director of current operations, Brig. Gen. Chance Saltzman, for the study, with a charter to look at common mission systems, common data, and common architecture. Machine-to-machine teaming is seen as the major part of the solution to help the Air Force process massive volumes of intelligence, surveillance, and reconnaissance, from cyber and space assets, which can be disseminated to an airborne fleet.

"We're operating in all these domains," Goldfein said in announcing this effort in September 2016. "Gaining information and clarity on issues that are sensing in ways we have not sensed before. We're achieving decisions at a speed that we've not seen before. So we're going to have to ensure that we're ready for the speed of conflict." ★

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Grand Sky's Gatehouse opens up to a 217-acre facility and provides secure access for tenants.

By Jenn Rowell

Although there is general agreement that the US military has far more bases than it actually needs—by a recent Pentagon count, the Air Force has 22 percent excess base capacity—for more than a decade Congress has refused to even consider closing any more defense facilities. The Air Force says it wastes billions in overhead costs by not consolidating at fewer locations.

Members of Congress fear a loss of jobs, economic activity, and property values in their districts, and have compelled the services to keep open installations that just don't have enough people, equipment, or missions to make them militarily effective.

Grand Forks, N.D., has proved this fear doesn't have to come true. Its commercial aircraft center, which makes use of former Air Force facilities in partnership with the service, has been hailed by many as a model for the base of the future.

The concept was born after the

2005 iteration of the Base Realignment and Closure (BRAC) process. Under BRAC, the Pentagon submits a list of realignments and closures to Congress, which can either vote the whole package up or down—without tweaking—thus providing members with political cover. Many communities have put together local task forces looking for ways to make their bases “BRAC-proof.”

In the 2005 BRAC, Grand Forks Air Force Base lost a tanker mission. The base didn't close, but there was a large reduction in the number of airmen stationed there. This delivered a hit to the economy of Grand Forks County, with a population of about 100,000 people, county government relations manager Tom Ford explained.

That's when local officials got together and asked, “What can we do to offset that negative impact, and how do we make our community less dependent on the base if we were to ever lose the base?” Ford said.

Around the same time, the RQ-4

Global Hawk intelligence, surveillance, and reconnaissance mission came to Grand Forks Air Force Base, which is also home to the John D. Odegard School of Aerospace Sciences. The local team thought that coming up with a plan to support the emerging drone business might be a good idea for Grand Forks, Ford said.

The thinking was, “what if we use some of the excess capacity on base, since we lost tankers, to make a flight center?” for unmanned aerial systems (UAS), he explained.

The county hired Jeff Donohoe as a consultant. Donohoe brought on Tom Swoyer, who now leads the development of Grand Sky, a business park and flight center for commercial unmanned aerial systems on 217 acres of Air Force land. A feasibility study showed an enhanced-use lease (EUL) could work, and a deal was signed in 2015, Swoyer said.

The Air Force has used EULs at other bases, but few have been as successful as Grand Forks in developing

AT GRAND FORKS



A FIRST-OF-ITS-KIND UAS PARTNERSHIP EMERGED AFTER BRAC TOOK THE BASE'S TANKERS.

synergies with an Air Force mission while spurring industry, education, and economic development in the local community.

The anchor tenants at Grand Sky are Northrop Grumman and General Atomics. Both hold various military contracts, but their work at Grand Sky is focused on commercial UAS development. They use a separate security entrance from the base, but can launch and recover aircraft from the base's runway. There's schedule availability that's attractive to tenants and compatible with the base's Global Hawk mission.

Like many northern-tier bases, Grand Forks is cold in the winter and can be quite windy, but Swoyer said it averages 320 flying days annually. The private entities can also use Air Force radar, under a new agreement, and have their own dedicated access to the feed, which allows them to eliminate use of chase planes. These are ways the Air Force brings value to the partnership by creating training opportunities and reduced costs, Swoyer said.

Since the EUL was signed in 2015,

Grand Sky has expanded quickly, but there's plenty of room for growth. Only about 20 acres are under contract out of the 217 acres available.

"We offer schedule certainty and the ability to use an Air Force runway. We provide a lot of value to companies that are in the DOD space," Swoyer said.

He said the organization touts Grand Forks as the "base of the future. There's a lot of value-added in terms of employment, engagement, and the raw exchange of support to each other."

While economic development was a desired by-product of the effort, the initial focus was how can the community and the base forge a tighter bond, Swoyer said. The relationship between the base and the community was always good, but has strengthened in recent years because both sides are really getting something from it, he said.

"They're the epicenter of commercial UAS," Swoyer said. "This is the only place where you can set up shop and start flying and working. Right now, the UAS focus is small unmanned aircraft, but the clear migration is toward

larger, more capable aircraft like the military uses. It's happening, so we're positioning ourselves to support that activity."

Grand Forks is a unique case, but the key players agree that there are lessons to be learned from it that can be applied in other Air Force communities.

"It always works better when there's an idea," Swoyer said. "You can't really just put a piece of land out there and say 'oh, come develop this for us.' There has to be a reason to develop it."

Retired Lt. Gen. William J. Rew was the vice commander at Air Combat Command from 2009 to 2013 and got involved in the Grand Forks team around that time. Grand Forks had been an Air Force Materiel Command base until it transferred to ACC this year.

Rew grew up as the son of a bomber airman on old Strategic Air Command bases, many now closed. He said the northern-tier bases such as Grand Forks need to be looked at now from a strategic perspective, considering the global interest in the Arctic region.

"If we look at the Arctic, wouldn't



General Atomics, an anchor tenant at Grand Sky, displays an MQ-1 and an MQ-9 outside its Flight Test and Training Center.

it be nice to have Active Duty bases that we can do missions from, being closer to the challenge, closer to the threat?" Rew said. "That has always been beneficial. How do we look at these northern-tier bases ... differently than we have in the past?" The base now has a leading role in unmanned systems, and in pioneer programs creating associations with "the National Guard, Customs and Border Protection, UND [the University of North Dakota], and now Grand Sky." Although "it does get cold in the winter," the low-population region offers "unique opportunities" in available airspace.

"When you put that all together, it makes a very compelling case for retaining a base like Grand Forks in the future and keeping our strategic options open," he asserted.

Terry A. Yonkers was the assistant secretary of the Air Force for installations, environment, and logistics when the Grand Forks EUL was being developed.

"Grand Forks is really turning into a model—if not *the* model—for the enhanced-use lease approach," he said. "What's unique about Grand Forks is the EUL is oriented toward the mission."

A number of enhanced-use leases have been used over the last decade, but aren't militarily connected, leading to businesses such as hotels, strip malls, or other retail space.

Grand Forks was the model for an EUL that was recently approved at Kirtland AFB, N.M., where about 107 acres of nonexcess property on the base perimeter was made available. Thunderbird Kirtland Development Ltd., Co. proposed a research park with office, industrial, laboratory, retail, and

hospitality facilities targeting Defense Department business and contractors wanting to relocate operations close to DOD, Air Force, and other federal partners.

"The research park will revitalize the area while remaining compatible with the missions, plans, and programs at Kirtland," according to a USAF press release. "The close proximity of public and private sector partners is expected to increase communications and potentially compress research and development life-cycle times," it said.

During his first visit to Grand Forks, Yonkers said, civic leaders said they were nervous about being on the BRAC candidate list again and wanted to see if there was anything they could do to secure the base's future in their community.

One of the ideas that came out of the trip was the EUL and in Grand Forks, local leaders ran with it.

"These things are not easy, or everybody would be doing them," Yonkers observed. "There probably is opportunity on almost every installation. I do think there's mission synergy to be had at almost every installation."

Some of the key elements, Yonkers said, are retail and an element of financial return, since developers won't be able to generate enough revenue to sustain the lease without it.

Grand Sky was fortunate to get to major tenant anchors early on, so they haven't needed to rely on retail, but many others have needed retail to make the finances work, Yonkers noted.



Northrop Grumman, also an anchor tenant at Grand Sky, offers the first commercial UAS flight testing range in the US.



Col. Benjamin Spencer, commander of the 319th Air Base Wing, says the partnership is a win for the Air Force.

Mission synergy is beneficial for the Air Force when it can be found, he said, but it's also beneficial in generating revenue from property that is otherwise not being used.

Leases like Grand Forks can generate \$2 million to \$3 million worth of value for the Air Force. If similar scenarios play out at other bases nationwide, that could generate billions for the service, relieving strain on its budget.

Collectively, "That's not inconsequential," he pointed out.

Wing commanders keep about 50 percent of the lease revenue for base initiatives. At Grand Forks, the base was able to reopen the bowling alley and improve its theater. The first movie shown was "Star Wars."

"In a place like Grand Forks, it's particularly a benefit to quality of life and airmen morale because they're so far out in the country," Yonkers said.

The prospect of extra revenue also encourages wing commanders to take an active role in finding possibilities for EULs with the local community, he said, though the Air Force can realistically only handle four or five EULs at a time.

"These things are not easy and they're time consuming," Yonkers asserted, but "they're good all the way around. Grand Forks is at the top of the heap in terms of community partnerships and the EUL is part of that. I think there's a tremendous amount of benefit for everybody ... involved."

In Grand Forks, the community initially wanted to support the Distributed Common Ground System, but recognized the military's shift toward remotely piloted systems.

"This is the future of military aviation. If you want to make your Air Force base relevant, let's invest in that," was the



Sen. Heidi Heitkamp (D-N.D.) helped organize the perfect storm of UAS synergies that led to Grand Sky.

community's thinking, Swoyer said.

Grand Forks County holds the 50-year lease with the Air Force and Ford said they bid the lease like any other county project. Grand Sky won the bid, which signed a sublease with the county, putting all of the Air Force's requirements on Grand Sky.

The county remains responsible for making payments—handled through an escrow account—ensuring compliance with the lease and submitting documents and reports.

"As for the fiscal impacts, the project is still in its infancy, so it hasn't reached its full potential yet, but ... the impact on the community has been huge," Ford said. "It brought a wave of excitement to the community and state, as well as a national spotlight to the community. Grand Forks and North Dakota has become the center for all things UAS."

North Dakota investment in unmanned aerial systems goes back to 2007, Swoyer said, when then-governor (now senator) John Hoeven supported efforts for the state to get one of the UAS test sites approved by the Federal Aviation Administration.

The state won the Northern Plains UAS Test Site. Executive Director Nick Flom said one of the goals is to create jobs within the state.

"If they're going to do testing, wouldn't it be great if they stayed and set up shop here?" Flom asked.

The test site supports commercial UAS efforts and Flom noted the open airspace offered at Grand Sky is appealing to the industry.

"It's a layered approach," he said. "There's a lot of people bringing different specialties and levels of support to this."

North Dakota's Sen. Heidi Heitkamp

(D) helped set the stage for the perfect storm of UAS synergies that led to the Grand Sky lease.

"The agreement will allow the Air Force and private sector to collaborate on critical research and training that will support 21st century Air Force missions," said Heitkamp. "Public-private partnerships like the one in Grand Forks set an example for the rest of the nation of how infrastructure can be leveraged for the mutual benefit of the Air Force, defense communities, and private industry. Grand Forks' growing expertise in remotely piloted aircraft will generate a new kind of air base in Grand Forks ... one that's vital for the long-term future of the Air Force."

Grand Forks Air Force Base commander Col. Benjamin Spencer said that in addition to the financial benefit to the base from the rent payment, the EUL challenges the Air Force to be creative and to innovate.

"With a shared flight line and airspace and our air traffic controllers providing airfield management, Grand Sky operations consistently drive us to find better ways to do business, in some cases crafting pioneering processes. At the end of the day, if the innovation being generated at Grand Sky finds its way into products and services that enhance Air Force combat capability, then the EUL is a win for the Air Force at-large as well. Bottom line ... the EUL makes us better," said Spencer. All of those involved at Grand Forks said there are lessons other communities can learn from their success and apply to their own EUL efforts.

"Communities can look at what their base does and then figure out what they can do to support that mission. This isn't pure real estate, it's about mission effectiveness and mission synergy," Swoyer said.

Most communities hosting a base probably worry about whether it will always be there, adding to the local prosperity, he said.

"There's no foolproof strategy that would keep a base from closing and this certainly is not one," he observed, but the Grand Sky arrangement "is an investment in an industry that has commercial viability" for which there is a proven market. "The goal is not specifically to BRAC-proof, the goal is to improve efficiency." ★

Jenn Rowell is a military-local government reporter based in Great Falls, Mont.

Photos: General Atomics Aeronautical Systems Inc.; Grand Sky Development Co., Inc.; USAF; Office of Sen. Heidi Heitkamp

THE "X" FILES

Bell Aircraft test pilot Jean Ziegler in the cockpit of rocket-powered X-2 No. 2 after a hard landing. The X-plane business has yielded groundbreaking information with nearly every new aircraft, but the price has sometimes been quite high: Ziegler was killed when this aircraft exploded during a later captive flight. EB-50 crew member Frank Wolko was also killed in the accident.



"X" airplanes and missiles—flown by various combinations of military and civil organizations—have pushed the art of the possible in aerospace.

By John A. Tirpak, Editorial Director

The term "X-plane" has been practically synonymous with cutting-edge aeronautical research since 1945. In that year, the Army teamed up with the National Advisory Committee for Aeronautics (NACA) to award Bell Aircraft Co. a contract to fabricate three aircraft. They were not to be prototypes of combat airplanes, but pure research craft, specifically designed to investigate flight faster than the speed of sound.

Designated XS-1 (for experimental, supersonic, and later simply X-1), these rocket-powered aircraft were the first to fly beyond Mach 1. Then-Capt. Chuck Yeager made the first supersonic flight on Oct. 14, 1947, just a couple of weeks after the Air Force became an independent military service.





The X-1 was closely followed by a wide variety of research craft that have become known as the X-planes. Not all of them were airplanes; some were missiles, some were hybrid air vehicles meant to fly both in air and space, some have been rotorcraft, and some uninhabited air vehicles. Sometimes a particular military service pursued these vehicles; sometimes in partnership with other services, or with NASA (the successor to NACA), and various incarnations of the Defense Advanced Research Projects Agency (DARPA).

While the initial aircraft in the X series focused on flying higher and faster, there soon followed craft that explored particular refinements of flight. These included airplanes with swept, forward-swept, and variable-sweep wings; airplanes with different-shaped wings or unusual control surfaces; new geometry for air inlets, aircraft with wings of different camber, or to explore laminar flow, shifting shock waves, or computer-aided flight controls. The purpose of these programs was to develop basic technologies that could make US aircraft—mainly military, some civil—more efficient, maneuverable, or otherwise more capable. A number explored a variety of approaches to vertical flight, and there were also gliders and craft that investigated technologies applicable to potential future spacecraft. One was to be nuclear powered. Some were secret, and many never even reached the hardware stage.

While some X-planes that explored rather esoteric technologies are practically unknown even to aviation fans, others have become part of the national consciousness.

■ Yeager's X-1 flight made magazine covers months after the fact and was immortalized in the 1980 film, "The Right Stuff."





1/ Bell Aircraft president Larry Bell, left, discusses a record-breaking flight with then-Maj. Chuck Yeager, who had just surpassed Mach 2 in the Bell X-1A. 2/ Here, Yeager tops Mach 2.44 in the X-1A in December 1953. 3/ The Douglas X-3 Stiletto, for all its rakish looks, was designed not for speed but to test its slender fuselage and small trapezoidal wings, sustained high-speed flight, and use of titanium in major structural components. It flew in 1954. 4/ The Bell X-5 tested variable-geometry ("swing") wings in the mid-1950s. The knowledge gained was applied to the F-111, F-14, and B-1 bomber. 5/ Carried aboard the NB-52B mother ship, an X-15 is lofted to altitude before release. Captive carry was employed with a number of X-planes to save the fuel needed for ascent and extend flight time in the regimes being explored. A T-38 chase plane flies alongside. The "white stripes" beneath the X-15 are actually frozen condensation from liquid oxygen within.

Photos: AFA, NASA (1,3,4,5), San Diego Air & Space Museum



■ The North American X-15 rocket plane competed with NASA's Mercury program and made astronauts of a number of test pilots who flew to the edge of space, broke speed and altitude records for winged flight, and returned to a controlled landing on a runway.

■ The Boeing X-20 "Dyna-Soar" was the first attempt to develop a space shuttle-like capability (it was never flown, eclipsed by the Mercury program).

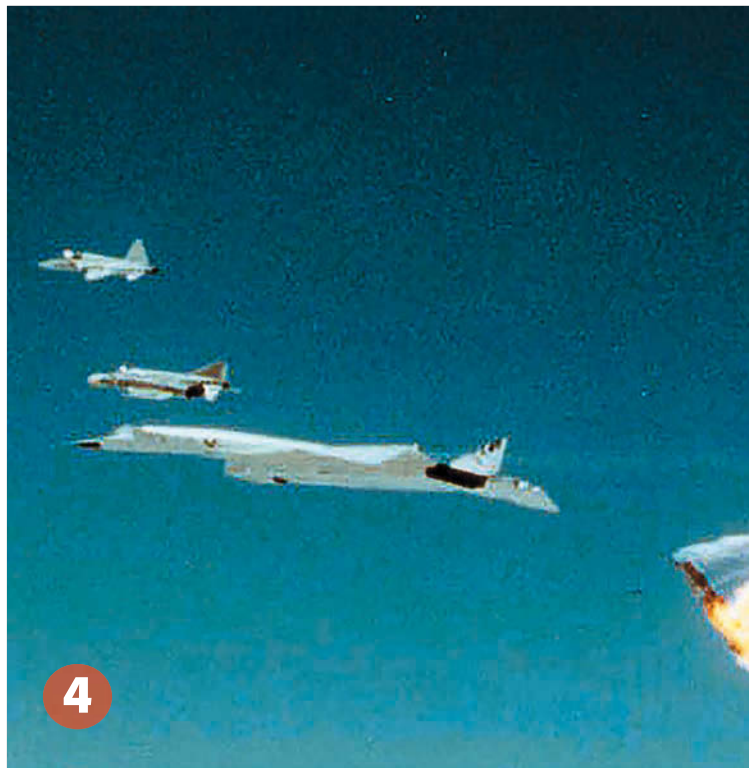
■ President Ronald Reagan featured the Rockwell X-30 National Aero-Space Plane program in his 1986 State of the Union address. The mention was meant to reassure America that US leadership in space would continue, coming only a week after the Challenger space shuttle disaster. Unfortunately, the planned single-stage-to-orbit craft, which Reagan dubbed the "Orient Express," struggled because of immature technologies. It was canceled before flight hardware was built.

■ Boeing and Lockheed Martin, with the X-32 and X-35, respectively, vied to build the Joint Strike Fighter. Though fighter prototypes usually receive a YF nomenclature, the two airplanes earned their X designations by virtue of being the first jet-powered aircraft to take off conventionally, fly supersonic, and land vertically. Lockheed Martin won the competition, and its F-35 fighters are now equipping the US Air Force, Navy, Marine Corps, and other countries' militaries.

■ The Northrop Grumman X-47B made headlines by being the first unmanned autonomous aircraft to launch from an aircraft carrier via catapult and recover on the same ship using the arrestor cable system. The Northrop Grumman X-47B made headlines by being the first unmanned aircraft to launch from an aircraft carrier via catapult and recover on the same ship using the arrestor cable system.

■ The X-51 Waverider—a small unmanned vehicle that achieved 200 seconds of hypersonic speed—proved scramjet technologies were viable and paved the way for future US hypersonic efforts.

Not all experimental aircraft were labeled X-planes. The Air Force flew a large number of secret aircraft designed to test breakthrough military technologies. The Have Blue stealth demonstrator, for example, led to the F-117 Night-



hawk attack aircraft. Other platforms that broke speed or altitude records bore different nomenclature, such as the Lockheed NF-104, adapted from surplus F-104Cs in the 1960s to train pilots for the presumed coming age of flight in both air and space.

The X-plane program has had its ups and downs, sometimes going years between new experiments, while at other times many were underway at once. The latest potential X-plane is being pursued by Lockheed Martin, with its Quiet Supersonic Technology aircraft. The aircraft is designed to muffle the hard sonic booms that accompany supersonic flight, often breaking windows and frightening animals. The new jet could make it feasible to develop supersonic aircraft that could fly over inhabited areas, potentially ushering in a whole new era of high-speed commercial flight. It has not yet been awarded an X designation.



1/ Lockheed's X-33—a subscale demonstrator of a proposed Space Shuttle replacement—ended due to technical challenges and cost. 2/ Civilian pilot Jack McKay survived this wreck of an X-15 in 1962, after its landing gear collapsed. 3/ The X-24A, M2-F2,3, and HL-10, respectively, were used to evaluate “lifting body” technologies that could pave the way for winged re-entry of aerospace vehicles. Film of the spectacular 1967 crash of the M2-F2, rebuilt as M2-F3, was seen on TV every week from 1974-1978, as part of the opening of the hit show, “The Six Million Dollar Man.” 4/ This fiery 1966 midair collision between an F-104 chase plane and the XB-70 Valkyrie supersonic bomber prototype destroyed both aircraft and killed two pilots. 5/ A Boeing X-32, left, and Lockheed Martin X-35 sit nose-to-nose during the concept demonstration phase of the Joint Strike Fighter Program. The X-35 won the competition.



Photos: Tom Tischida; NASA (2,3); USAF; Joint Strike Fighter Program





1/ The Martin Marietta X-24B was rebuilt from the "A" model to better define glide performance. 2/ The McDonnell Douglas X-36 tailless technology demonstrator was a subscale, remotely piloted (the canopy is just painted on) aircraft to test out computer flight controls—necessary for an agile design with no vertical tail—and a two-dimensional exhaust. 3/ Grumman's X-29 was a Northrop F-5 rebuilt with forward-swept wings and a canard to assess the agility enhancements possible with this configuration. Though highly unstable and utterly dependent on computers, both X-29s completed their program without mishap. 4/ The X-31 Enhanced Fighter Maneuverability aircraft was a partnership of the US and Germany, and explored both thrust-vectoring and tailless flight in pursuit of greater agility. 5/ The Scaled Composites X-38 Crew Return Vehicle was intended as a miniature space shuttle that would serve as a "lifeboat" for astronauts aboard the International Space Station (ISS), and potentially a space taxi to ferry astronauts to space. Budget cuts killed it in 2002, requiring ISS crews to be limited to the number who could return on Russian Soyuz capsules docked with the station.



Photos: NASA (1-3); Carla Thomas/NASA; Jim Ross/NASA; Bill Isbell/NASA



1/ The Orbital X-34A was explored as a potential quick-response capability to carry small satellites to space. 2/ The Boeing X-45A Unmanned Combat Air Vehicle program proved the concept of a full-scale combat aircraft with no onboard crew. This aircraft now hangs in the Smithsonian's National Air & Space Museum. 3/ Boeing's X-48B, shown in a 2007 test flight, is a subscale demonstrator of a potential future airlifter-passenger jet (painted to look like a full-size airplane) with great range and capacity thanks to its blended wing body design. 4/ An X-51 Waverider at Edwards AFB, Calif. In 2010 this flight test vehicle successfully made the longest supersonic combustion ramjet-powered hypersonic flight. 5/ The Boeing X-37B Orbital Test Vehicle is an experimental spaceplane. The two X-37Bs have made five flights to space over the last seven years, performing secret operations, returning for refurbishment and reuse. Here technicians make safe an X-37B after its May 2017 landing at Kennedy Space Center, Fla.



The Brando Solution

"We [the US Air Force] have to stop thinking like the champion and start thinking like the contender. Our competitors are not only imitating us; they are improving upon what we've done."—**USAF Lt. Gen. Mark C. Nowland, deputy chief of staff for operations, remarks at a Mitchell Institute for Aerospace Studies event, Jan. 4.**

The Arc of AI

"It's pretty simple. By 2020, they [China] will have caught up [in artificial intelligence]. By 2025, they will be better than us. By 2030, they will dominate the industries of AI. They have announced their strategy, so you're crazy to treat them as somehow second-class citizens."—**Eric Schmidt, then-CEO of Alphabet, Inc., and the chairman of DOD's Defense Innovation Board, quoted in defenseneews.com, Jan. 4.**

Double Gamesters

"The administration is withholding \$255 million in assistance to Pakistan. There are clear reasons for this. Pakistan has played a double game for years. They work with us at times, and they also harbor the terrorists that attack our troops in Afghanistan. That game is not acceptable."—**Amb. Nikki Haley, US envoy to the UN, news conference, Jan. 2.**

Waiting for the A Team

"As of 2017, the Russian military is in its seventh year of true joint force command and is gaining operational experience through recent joint operations abroad. Russia is working toward the ultimate goal of a unified 'information space.' The trial by combat of these capabilities has taken place in Ukraine and Syria. They reflect substantial improvements in combat capability compared with what they demonstrated in the 2008 war with Georgia, [but] they have not yet been tested against a capable military or in large-scale operations."—**From *The Russian Way of Warfare: A Primer*, published by Rand Corp., Dec. 7.**

"Something Could Happen"

"In my opinion, if this was a court of law, we have reached the point of 'beyond reasonable doubt.' I hate to use the

term 'UFO,' but that's what we're looking at. I think it's pretty clear this is not us, and it's not anyone else [on Earth], so one has to ask the question, 'Where are they from?' ... Extreme maneuverability, hypersonic velocity without a sonic boom, speeds of 7,000 mph to 8,000 mph, no flight surfaces on the objects. A lot of this is backed with radar signal data, gun camera footage from aircraft, multiple witnesses. There was never any display of hostility, but, ... you have to be conscious something could happen."—**Luis Elizondo, former head of DOD's Advanced Aerospace Threat Identification Program, on possible visits by alien spacecraft, *Daily Telegraph*, Dec. 25.**

Where ISIS Excels

"We sit here today at the end of 2017, the [Islamic State] caliphate is on the run, we're breaking them. We are in the process of crushing the life out of the caliphate there while trying to keep the innocent people safe, which is very hard with this group. We need to drive this down to the point where it can be handled by local authorities—police—but right now, it is still very much a military intelligence type of operation. ... Am I worried about it? Not in the least. These guys have not proven they can stand against [trained military troops]. They are best against unarmed men, women, and children."—**Secretary of Defense Jim Mattis, Pentagon news conference, Dec. 29.**

Is It the End?

"Together with our allies, we came here to Afghanistan to liberate its people and prevent the terrorists from ever threatening our homeland again, and we are staying in that fight and we will see it through to the end."—**Vice President Michael Pence, remarks to US troops in Afghanistan, Dec. 21.**

Our "Dubious Privilege"

"The United States is by far the single largest contributor to the United Nations. ... When we make generous contributions to the UN, we also have a legitimate expectation that our goodwill is recognized and respected. When a nation is singled out for attack in this organization, that

nation is disrespected. What's more, that nation is asked to pay for the 'privilege' of being disrespected. In the case of the United States, we are asked to pay more than anyone else for that dubious privilege. ... The United States will remember this day in which it was singled out for attack in the General Assembly. ... And this vote will be remembered."—**Amb. Nikki Haley, after General Assembly vote to condemn the US for moving its embassy to Jerusalem, Dec. 21.**

Future Death Spiral?

"The Navy wants to grow to 355 ships, that puts the Navy roughly at the level it was in Fiscal 1997. The question is: Is that affordable? Even once we acquire all the platforms, can we afford to operate and sustain them? ... The operations and support costs are going to eat the budget alive. ... [It] can get you into a death spiral."—**Defense budget expert Todd Harrison, Center for Strategic and International Studies, news roundtable, Dec. 7.**

They Just Really Like to Ski

"I wouldn't read too much into it, because we don't know if it is a genuine olive branch or not. Obviously, we have to be open to anything that would implement a diplomatic solution. Those talks clearly are the result of the amount of international pressure, and they are a way, I think, for North Korea to start talking while keeping it contained for a benign issue. It is difficult for me to disassociate [the fact that Pyongyang] is now willing to negotiate on any issue [from] the months and months of United Nations Security Council effort."—**Secretary of Defense Jim Mattis, remarks on why North Korea opened talks with South Korea, news conference, Jan. 4.**

So Immature

"Pre-emption is becoming more likely as their technology matures. I think we're really running out of time. The Chinese are trying, but ineffectively. If there's an underground nuclear test, then you need to get ready for a very serious response by the United States."—**Sen. Lindsey Graham (R-S.C.), Senate Armed Services Committee, CBS's "Face the Nation," Dec. 2.**

INTRUDER ALERT

The Air Force keeps electronic eyes peeled for sniffers, phishers, spoofers, and hackers.

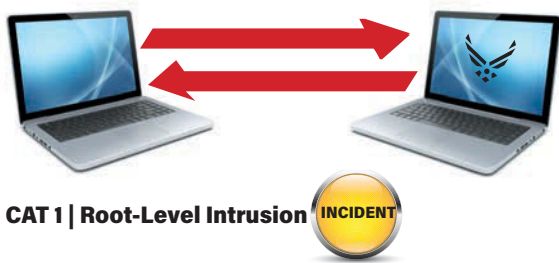
By Gideon Grudo, Digital Platforms Editor

To defend the full Air Force Network (AFNET)—which the service uses for daily business such as emails and file sharing—the 33rd Network Warfare Squadron operates and relies on a special sidekick: the Air Force Cyberspace Defense (ACD) weapon system.

The custom-built suite of devices and programs is deployed throughout the AFNET ecosystem, always watching it, ever reactive to suspicious activity.

Capt. Anthony Rodriguez, 33rd NWS director of operations at JBSA-Lackland, Texas, recently explained to *Air Force Magazine* exactly what each of the nine threat categories mean and what happens when ACD triggers them. The Air Force Cyberspace Defense system may resolve issues itself or it may alert a cyber warrior. When an airman gets involved, he or she will investigate to get a better understanding of what's happened (these are called events) or get up and react to an ongoing and potentially dangerous situation (these are called incidents).

The squadron opens more than 1,000 such investigations each year.



CAT 1 | Root-Level Intrusion INCIDENT

Official Definition

Unauthorized, privileged access to an Air Force system. Privileged access—often referred to as administrative or root access—provides unrestricted access to the system.

What That Means

This is the absolute worst-case scenario. The adversary has acquired privileged authority (like administrator access) into a server or computer connected to AFNET. The Adversary is able to transmit sensitive data outward, to keep creeping around the network, or even launch additional attacks against critical mission systems, all from inside AFNET.



CAT 2 | User-Level Intrusion INCIDENT

Official Definition

Unauthorized nonprivileged access to an Air Force system. Nonprivileged access—often referred to as user-level access—provides restricted access to the system based on the privileges granted to the user.

What That Means

This is the second worst-case scenario. This time, the adversary has gotten access into a computer connected to AFNET, but without privileged authority (like user access). Adversary can't do much to this computer, the network, or infrastructure. However, the skill necessary to get this far means the adversary is likely trying to escalate access to the privileged kind.



CAT 3 | Unsuccessful Activity Attempt EVENT

Official Definition

Deliberate, unsuccessful attempts to gain unauthorized access to an Air Force system that are defeated by normal defensive mechanisms, and the activity cannot be characterized as exploratory.

What That Means

The adversary tried to penetrate AFNET, faced ACD and/or a cyber warrior, and was defeated. Despite the victory, the event must be investigated to figure out what went wrong that allowed a battle in the first place.



CAT 4 | Denial of Service

Official Definition

Activity that impairs, impedes, or halts normal functionality of a system or network.

What That Means

USAF considers denial of service attacks grave incidents. The adversary may program a botnet to send so much traffic into a mission-critical network system that the system fails under its weight.



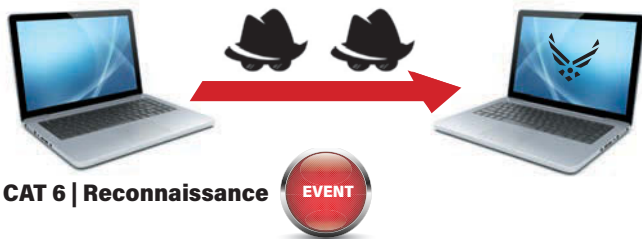
CAT 5 | Noncompliance Activity

Official Definition

Activity that potentially exposes Air Force systems to increased risk as a result of the action or inaction of authorized users.

What That Means

AFNET-authorized airmen can also be a vulnerability. They may open and click around phishing emails or download infected software into AFNET. Damaging or insecure activity by airmen is extremely common.



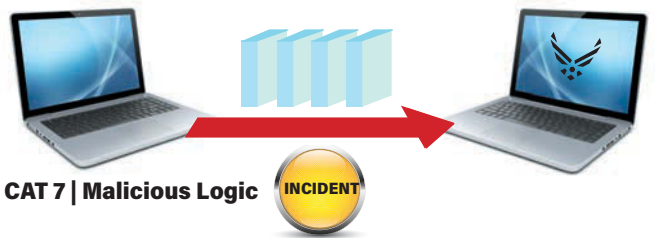
CAT 6 | Reconnaissance

Official Definition

Activity that seeks to gather information used to characterize Air Force systems, applications, networks, and users that may be useful in formulating an attack.

What That Means

Someone's trying to figure out what AFNET looks like from the inside, mapping it out or tracking it in some way. That someone isn't necessarily an adversary, and the activity may or may not be malicious. But such knowledge could potentially lead or aid an attack on AFNET.



CAT 7 | Malicious Logic

Official Definition

Installation of software designed and-or deployed by adversaries with malicious intentions for the purpose of gaining access to resources or information without consent or knowledge of the end user. This category can be further broken down to moderate and severe.

What That Means

A program or piece of software has made its way into AFNET through a computer or server and is now installed. Whether the logic in the program is designed to carry out an attack on the network or not doesn't matter—it needs to be dealt with. These usually get into the network without the consent or knowledge of the user who allowed them in, perhaps by opening and clicking around a phishing email.



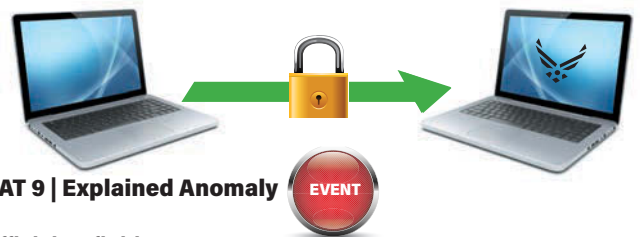
CAT 8 | Investigating

Official Definition

Events that are potentially malicious or anomalous activity deemed suspicious and warrants or is undergoing further review. No event will be closed as a Category 8. Instead, they will be re-categorized to the appropriate CAT 1-7 or CAT 9 prior to closure.

What That Means

Without further research, it's hard for ACD to know what this event signifies, forcing further review. It may fall to the Category 9 realm of little significance or threat, or it may be determined malicious, requiring a more critical categorization.



CAT 9 | Explained Anomaly

Official Definition

Suspicious events that, after further investigation, are determined to be nonmalicious activity and do not fit the criteria for any other categories.

What That Means

This is benign activity ACD or cyber warriors determine to be nonthreatening. Usually, ACD will be tweaked to recognize this the next time so to not trigger a category description, and maybe even deal with the issue automatically.

To learn more about the ACD, read "Meet USAF's Most Widely Spread Cyber Weapon System" in the Dec. 1 Daily Report at airforcemag.com.

TARGETING TH

When Spaatz and Doolittle changed the fighter strategy, it was the beginning of the end for German airpower in western Europe.

By John T. Correll

In January 1944, the new commander of Eighth Air Force, Maj. Gen. James H. Doolittle, was visiting his subordinate commander, Maj. Gen. William A. Kepner, at VIII Fighter Command, when he noticed a slogan on the wall.

It read: "The first duty of Eighth Air Force fighters is to bring the bombers back alive." Kepner said the sign was there when he got there. Doolittle told him to take it down, that it was wrong.

A new sign went up: "The first duty of Eighth Air Force fighters is to destroy German fighters."

This was considerably more than a moment of fighter pilot bravado. It marked a key change in strategy in the air war in Europe.

"As far as I'm concerned, this was the most important and far-reaching military decision I made during the



Lt. Gen. James Doolittle sent USAAF's fighters after the Luftwaffe.

war." Doolittle said. "It was also the most controversial."

The fighters were no longer constrained to holding close formation with bombers. Instead, they would fly ahead, look for German fighters, and attack them where they found them.

Bomber crews were dismayed at first, but the results were dramatic. Within a few months, the Allies had seized air superiority from the Germans and held

it for the rest of the war. The average monthly loss rate for Eighth Air Force heavy bombers fell from 5.1 percent in 1943 to 1.9 percent in 1944.

It was part of a broader plan by Lt. Gen. Carl A. "Tooey" Spaatz, commander of US Strategic Air Forces in Europe (USSTAF) to destroy the Luftwaffe. Spaatz deliberately used the bombers as bait. By attacking the German oil supplies, they would lure the Luftwaffe up into direct combat, where US fighters waited for them. German airpower would be destroyed by attrition.

The Luftwaffe managed a recovery of sorts later in the year, but its losses in the spring of 1944 were of critical importance. On D-Day, June 6, the Allied invasion force was strung out for miles along the Normandy coast, presenting the greatest target of the war for German airpower. The Luftwaffe

THE LUFTWAFFE



Fighters leave curving contrails while escorting a B-17 bomber on a mission over Germany in 1943.



Lt. Gen. Carl Spaatz steps out of a B-17 in England in 1944. Spaatz joined Doolittle in reimagining the role of fighters and bombers in World War II.

was unable to mount opposition of any significance.

The Spaatz-Doolittle strategy also demonstrated the error of pre-war theories—strongly held by Air Corps leaders, including Henry H. “Hap” Arnold and Spaatz—about the relative

roles of bombers and fighters and how they could best operate together.

THE BOMBER ASSUMPTION

Between the world wars, “the task of formulating doctrine fell largely to the faculty of the old Air Corps Tactical

School,” said military historian I. B. Holley Jr. “In the early years, when the memory of World War I was still fresh in everyone’s mind, the boys in the bomber branch displayed considerable realism in their thinking. When they projected long-range strategic bombardment missions, they visualized fighter escorts going along to fend off enemy attacks. This view persisted at least down to 1930, but thereafter the picture changed radically.”

The new Martin B-10 bomber could outfly the older fighters. The B-17 and the B-24 were even faster and flew at altitudes too high for most pursuit aircraft to catch them. The revised doctrine from the Tactical School was that bombers could penetrate air defenses with acceptable losses so that fighter escorts were not necessary.

“Gradually, it became an article of faith with the enthusiasts that the

THE FIGHTERS

Within a few months, the Eighth Air Force fighter force rose from

274
to
882.

Long-range P-51 fighters and larger fuel tanks enabled the fighters, including P-38s and P-47s, to go as far as Berlin.

bomber was invulnerable," Holley said.

In tests at March Field, California, in 1933, Lt. Col. Arnold demonstrated that P-26 fighters were seldom able to intercept B-10 and B-12 bombers. In his view, fighters of the future would rarely be a threat to bombers. In any role, pursuit aircraft would be of limited value.

Among those challenging Arnold's conclusions was Capt. Claire L. Chennault, an instructor in fighter tactics at the Tactical School. Arnold responded to Chennault's rebuttal with a note asking, "Who is this damned fellow Chennault?"

Arnold was the foremost advocate of the bomber. By 1938, he was a two-star general and Chief of the Air Corps. His principal disciples were Spaatz and Ira C. Eaker. Chennault left the Air Corps and went to China, where he led the fighters of the American Volunteer Group—the Flying Tigers—for Chiang Kai-shek.

Fighters were a secondary consideration in pre-war research and development. In 1940, the standard Air Corps fighter was the P-40, outclassed by the best German, British, and Japanese fighters. In 1939 and again in 1941, the Air Corps rejected proposals for auxiliary fuel tanks to give tactical aircraft, including escort fighters, greater range. Drop tanks, it was held, would add weight for no good purpose.

In any case, escort fighters were not supposed to be off chasing enemy aircraft. Army Air Forces Field Manual 1-15, *Tactics and Technique of Air Fighting*, said in April 1942 the mission

of close escorts "precludes their seeking to impose combat on other forces except as necessary to carry out their defensive role."

THE CONCEPT GOES TO WAR

When the United States entered World War II, Lt. Gen. Arnold was chief of the Army Air Forces. In 1942, Maj. Gen. Spaatz went to Britain as commander of Eighth Air Force, with Brig. Gen. Eaker as commander of VIII Bomber Command under Spaatz.

The B-17s flew their first mission from England in August 1942 with limited escort from the Royal Air Force. American pilots from VIII Fighter Command took over the job in October, flying short-range British Spitfires that

could go no further than Antwerp in Belgium.

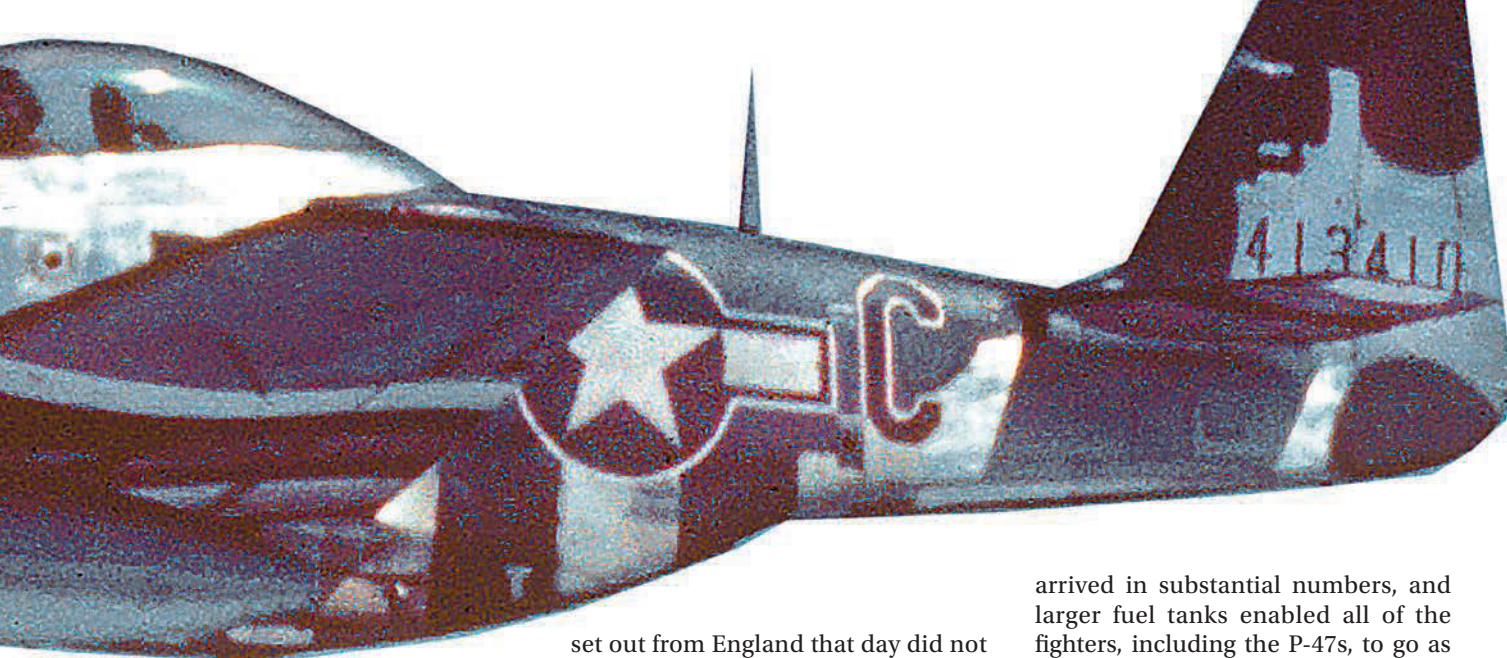
Eaker was not particularly worried about that. "Our bombing experience to date indicates that the B-17 with its 12 .50-caliber guns can cope with the German day fighter, if flown in close formation," he said in October. "I think it is safe to say that a large force of day bombers can operate without fighter cover against material objectives anywhere in Germany, without excessive losses."

Operations against occupied Europe had barely begun when the Allied strategic focus shifted—at British insistence—to North Africa. The key commanders went there, including Spaatz.

Eaker was promoted to major gen-



Three B-17s are attacked by a German fighter (top, center) during a 1944 mission.



eral and took over Eighth Air Force in December 1942 when Spaatz was put in command of US air units in North Africa. Aircraft and pilots were transferred from Eighth Air Force to form Twelfth Air Force in Africa.

As bomber missions into western Europe increased, losses rose at an alarming rate. "In the late spring of 1943, Arnold's staff had determined that the 'self-defending' bomber was incapable of defending itself against German attacks," said historian Steven L. McFarland. The AAF School of Applied Tactics, successor to the Tactical School, "was teaching its students that escort was essential to successful bombardment as early as March 1943."

The first P-47 fighters arrived in Britain in April to escort the B-17s. In July, they were outfitted with drop tanks, giving them enough fuel to reach the German border. Bombers were seven times more likely to be shot down if they were not accompanied by fighters.

By summer, close escort was the standard practice. Initially, the fighters flew as top cover but then moved down into closer formation beside and in front of the bombers to better meet the Luftwaffe attack. The P-47s had to weave and limit their speed to keep pace with the slower bombers.

Whatever fragment of credibility that remained for the Tactical School bomber concept was swept away by stunning losses over Schweinfurt and Regensburg that fall. For the Schweinfurt mission Oct. 14, the P-47 escorts turned back just inside the German border, whereupon the Luftwaffe attacked in large numbers from all directions. One of every five B-17s that

set out from England that day did not return.

For the rest of the year, Eighth Air Force struck only targets that were within range of the escort fighters. "The fact was that the Eighth Air Force had, for the time being, lost air superiority over Germany," the official AAF history said. In October, Eaker declared the primary role of fighters to be support for the heavy bombers.

When bomber crews completed 25 missions, they got credit for a combat tour and went home, but in late 1943, the odds were against their doing so. Before reaching that mark, 57 percent of them would be dead or missing.

The terrible losses were not the only problem. In December, Arnold warned that unless the German Air Force was destroyed, Operation Overlord—the D-Day invasion coming up in June 1944—would not be possible.

PRESSING THE ATTACK

Preparations for Overlord brought wholesale changes. Spaatz returned to England as commander of US Strategic Air Forces in Europe. Doolittle came with him as the new commander of Eighth Air Force, replacing Eaker who was promoted to lieutenant general and sent to command the Mediterranean Allied Air Forces.

Eaker never had enough bombers to achieve the results asked of him, nor did he have enough fighters—or the right kind of fighters—to provide real protection for the bombers. By contrast, with Overlord on the horizon, Doolittle was flooded with resources.

Within a few months and despite attrition, operational bombers in Eighth Air Force increased from 461 to 1,655 and the fighter force rose from 274 to 882. Long-range P-38 and P-51 fighters

arrived in substantial numbers, and larger fuel tanks enabled all of the fighters, including the P-47s, to go as far as Berlin.

That—and Arnold's mandate to destroy the Luftwaffe—set the stage for Doolittle's order to Kepner in January 1944 to go after the German fighters. By the end of January, the escorts had spread out into formations 25 miles wide with a squadron out front, sweeping the route for enemy aircraft. Soon entire groups of fighters were ranging 50 miles ahead to catch the German interceptors on the ground or as they were forming up to attack the bombers.

At the same time, the Spaatz strategy focused the bomber attacks on two critical elements of the German war industry: aircraft factories and synthetic oil plants. This compelled the Luftwaffe to stay closer to home in a defensive mode rather than venturing afield to intercept the bombers. It also required them to come up and fight the P-38s and P-51s, which were tough opponents.

British Air Chief Marshal Trafford Leigh-Mallory, the Allied air chief for Overlord, disagreed vigorously. He wanted to hold back the fighters for training and the big air battle he anticipated on D-Day. He thought the primary target for the bombers should be German rail centers and marshaling yards.

The supreme Allied commander, US Gen. Dwight D. Eisenhower, settled the priorities with consideration for British sensitivities. Spaatz got most, but not all, of what he wanted. However, it was enough.

The ensuing operations, especially the concentrated attacks during "Big Week" in February, dealt the Luftwaffe a blow from which it never fully recovered. The Luftwaffe in western Europe wrote off 34 percent of its fighter strength in January, another 56 percent in February. Production of Bf 109 and Fw 190 fighters contin-

A German Me 262 fighter being shot down by an Eighth Air Force P-51—as seen from the P-51's gun camera—in January 1945.



ued but did not make up for the attrition. Supplies of aviation fuel dropped from 180,000 tons in April to 50,000 tons in July and 10,000 tons in August.

Thanks to the genius of Hitler's armaments minister, Albert Speer, the Germans would eventually replenish most of their aircraft losses. They would not be able to replace the veteran pilots lost, though, and the new fighters would sit idle on the ramp for lack of fuel.

ON FROM OVERLORD

The Allies had absolute air supremacy on D-Day. The battle over the beaches predicted by Leigh-Mallory did not happen. The Luftwaffe in France could launch only 70 fighter sorties on the first day of the Normandy invasion and another 175 that night with no significant effect. Allied forces moved inland, establishing forward air bases as they went and rolling back the perimeter of the war in the west.

The Eighth Air Force loss rate improved sufficiently in July for Doolittle and Spaatz to raise the level for completion of a combat tour from 25 bomber missions to 35.

The Luftwaffe was still able to inflict casualties, but the Allies—especially the United States—could replace their losses. The Germans could not. Already short of pilots, the Luftwaffe had to shut down its training schools for want of fuel.

New pilots went into combat with barely 50 hours of flying time.

The ground support role virtually ended as bomb racks were taken off fighters so they could concentrate on air defense. "By late September the Luftwaffe had almost abandoned the Wehrmacht to devote such fighting power as it had left to the Allied bomber fleets," the official AAF history of the war said. "Practically all pretense of maintaining a bomber force was gone, and bomber pilots now flew fighters."

Even so, the damage during the Big Week attacks to machinery and equipment at the German aircraft plants had not been as extensive as believed at first, and the armaments ministry was resourceful.

"For months the Allies had been looking on the GAF [German air force] as a beaten arm, capable only of rare and ineffective retaliation," the AAF history said. However, "Speer's ministry had worked its usual magic. Skillfully mobilizing materiel and manpower, it concentrated on the [Bf 109 and Fw 190] types and effectively dispersed aircraft production from 27 main plants to 729 smaller ones, some of which were located in quarries, caves, mines, forests, or just in villages. In doing this, the Germans abandoned mass production methods and greatly increased their costs, but they also concealed most of their production centers from both the

bombardiers and intelligence officers of the enemy."

In September, the Germans produced 4,103 fighters, their highest total for any month of the war. The Luftwaffe appeared to be poised for a resurgence, although the shortage of fuel and pilots did not allow the operation of nearly as many airplanes as Speer's factories were turning out.

THE LAST OF THE LUFTWAFFE

Germany's last real stand in the west was the Battle of the Bulge in December 1944, during which more of its aircraft and pilots were lost. That, combined with a massive transfer of aircraft to the Eastern front in January to meet the Soviet winter offensive "relegated the Western front to the status of a secondary air theater for the Luftwaffe," said historian Richard G. Davis.

The Messerschmitt Me 262, the world's first operational jet fighter, first appeared in July 1944, and its numbers increased in the opening months of 1945. It was very effective against the B-17s and B-24s, but the Germans had delayed Me 262 production—a bad decision by Luftwaffe chief Herman Goering—and at Hitler's insistence, modified the design to make it a fighter-bomber instead of a pure air superiority fighter. For the Luftwaffe, it was too little, too late.

The Allied armies advanced without any serious threat from German airpower. Eighth Air Force flew its last bomber mission April 8. There were no worthwhile strategic targets left.

The Luftwaffe was never completely destroyed. When the Germans surrendered in May, they had about 3,000 front-line combat aircraft remaining—with no means to operate them.

"It is generally conceded that the air war against Germany was won during the phase of our operations between the beginning of February 1944 and D-Day," Doolittle said years later. "The rate of attrition of the Luftwaffe's pilots exceeded Germany's rate of replacement. Also, the several months of reduced aircraft production during a crucial period created a shortage of reserve aircraft that was difficult to overcome. Thus, Germany was low in two essentials at a critical point: aircraft and pilots." ✪

John T. Correll was the editor-in-chief of *Air Force Magazine* for 18 years and is now a contributor. His most recent article, "In Pursuit of the Bismarck," appeared in the February issue.

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OFFUTT

Airman From the Heartland

1/ Jarvis Offutt. 2/ A security guard at the entrance to Offutt AFB, Neb., then-home to Strategic Air Command. 3/ As part of the Airborne Launch Control System, the EC-135 "Looking Glass" aircraft remained on continuous alert.

In today's Air Force, Offutt is a famous name, indelibly linked to Strategic Air Command. Offutt Air Force Base, near Omaha, was the home of SAC headquarters for 44 years.

Offutt was a name of distinction long before there was a SAC—or even airplanes—but that's getting ahead of the story.

It begins with Army Maj. Gen. George Crook, the famed 19th century Indian fighter. Based in Omaha in 1875-82, he helped subdue the Plains Indians and in time became the namesake of Ft. George Crook, an outpost built near Omaha in the early 1890s.

For the base's first three decades, Crook's name prevailed. Then Jarvis Jenness Offutt came on the US military scene.

Jarvis, born in 1894, was scion of a prominent family in Nebraska. His father was a well-known and influential attorney in Omaha. His mother was herself wealthy and well-connected in business and social circles.

Jarvis at first took the predictable course in life. He attended the elite Lawrenceville School in New Jersey and Chateau de Lancy, a Swiss prep school. In 1913, he entered Yale, where he became a member of the Varsity Club and was a top hurdler on the track team. He was inducted into Phi Beta Kappa.

Less predictably, however, the young Offutt also took a keen interest in military af-

airs. He began an Army career in 1916 while still at Yale, serving in Company B of the Army's Yale Batteries.

Within days of his 1917 graduation, Offutt entered officer training in Minnesota. In another unexpected move, he requested and received a transfer into the fledgling Air Service, which was then in the throes of preparing for World War I.

Offutt was one of 300 US pilot candidates assigned to the Royal Canadian Flying Corps in Ontario for training. That training completed, he joined the 22nd Aero Squadron in Texas, received a commission, and left for England. In early 1918, he was detailed to the Royal Flying Corps (soon, Royal Air Force) as a ferry pilot.

Offutt, however, pushed hard for combat and was assigned to RAF No. 56 Squadron, a fighter unit in France. He arrived Aug. 12, 1918. The next day, he was dead, killed in an airplane crash. The Army could never determine whether his SE5 biplane was brought down by enemy fire or through mechanical failure.

In 1924, the Army honored him by naming the Ft. Crook airstrip "Offutt Field." Twenty-two years later, the entire base was renamed "Offutt Field," and the name "Crook" vanished.

Today, Offutt AFB, Neb., is home to US Strategic Command and the intel-heavy 55th Wing, the largest and most diverse

JARVIS JENNESS OFFUTT

Born: Oct. 26, 1894, Omaha, Neb.
Died: Aug. 13, 1918, Valheureaux, France
College: Yale University
Services: US Army (Artillery and Air Service)
Assigned: Royal Canadian Flying Corps; Royal Flying Corps; Royal Air Force
Main Era: World War I
Years Active: 1916-1918
Combat: Western Europe
Final Grade: First Lieutenant
Honor: Phi Beta Kappa

OFFUTT AIR FORCE BASE

State: Nebraska
Nearest City: Omaha
Area of Main Base: 4.3 sq mi/2,752 acres
Status: Open, operational
Opened as Ft. Crook (Army): March 3, 1891
Airstrip Offutt Field: May 10, 1924
Ft. Crook Renamed Offutt Field: June 1946
Home of: US Strategic Command, 55th Wing
Renamed Offutt AFB (USAF): Jan. 13, 1948
Current Owner: Air Combat Command
Former Owner: Strategic Air Command

wing in Air Combat Command. SAC's famous "Looking Glass" aircraft made its final operational flight from Offutt in 1990. SAC itself was disestablished in 1992. The 55th today operates AC-, OC-, and WC-135 aircraft and E-4B command posts, among others.

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