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AIR FORCE

June 2019. Vol. 102, No. 5

Photo: TSgt. Chris Hibben

A C-130J supporting Combined Joint Task Force-Horn of Africa operations in early May.

DEPARTMENTS

FEATURES

ON THE COVER

A photo illustration created by Eric Lee, who combined an eagle photo taken by Felix Broennimann with 324 photos from past issues of *Air Force Magazine*.

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By Tobias Naegele

A Space Force for the Future

President Trump has spent nearly a year pressing for the creation of an independent Space Force. Over the next few months, Congress must decide how—and whether—to act.

Advocates for a separate Space Force argue that Russia and China already see space as a warfighting domain. "They view space as important to modern warfare and view counter-space capabilities as a means to reduce US and allied military effectiveness," said the Defense Intelligence Agency in a January report titled *Challenges to Security in Space.* Both rivals reorganized their militaries in 2015, emphasizing space operations and both have developed space weapons.

Anyone who has watched US military operations over the past 25 years knows how much the American way of war depends on space for situational awareness, communicating, navigating, and precisely putting weapons on target. Today, China and Russia view those largely undefended military space assets as the soft underbelly of our technologically superior force. Iran and North Korea do, too.

Opponents of an independent Space Force counter that splitting out space from the Air Force will disrupt existing synergy, fuel inter-service rivalry, and divert funding and attention from adding capability in favor of building bureaucracy. They note correctly that the administration's Space Force proposal does nothing to address a US government space enterprise that's fragmented across 60 civilian and defense agencies, and that the plan does little more than repackage Air Force personnel into a new headquarters with virtually no new people or assets from other organizations.

"More than ever before, the world is trans-regional. It's also all-domain."—Lt. Gen. David Allvin

To see the way forward, it is helpful to look back in history. Airpower had already won a war when the decision to create a single Department of Defense with an independent Navy, Army, and Air Force came about in 1947. In World War I, airmen harnessed nascent aviation technology in the combat arena; in the interwar years, they developed strategies, operational concepts, tactics, and new capabilities. World War II tested those ideas under fire, fueling rapid innovation in both the conceptual and technological realms. Allied forces landed in Normandy on June 6, 1944, and brought an end to the war just 11 months later, fighting through the very same territory that had stalemated rivals in a bloody war of attrition from 1914 through 1918. The difference was airpower. The nuclear strikes against Hiroshima and Nagasaki were even more game-changing.

In other words, having been nurtured and developed since its first tentative uses in WWI, airpower and its role in the American way of war had evolved. By 1947, there was little question that the Air Force did not just deserve to become an independent force—it had to.

By contrast, however, the US today possesses no weapons in space, nor does it have a defined strategy or doctrine for when or how to fight in space. America's space assets make us more aware and more precise, but they are not the stuff of an independent armed force. Not yet.

In the joint world, Air Force Lt. Gen. David W. Allvin, director of strategy, plans, and policy for the Joint Staff, is leading a critical effort to develop a more integrated way of war for US forces, one that leverages US capabilities in space and cyberspace—and could help define future capabilities not yet in place.

"More than ever before, the world is trans-regional. It's also all-domain," Allvin told a Mitchell Institute for Aerospace gathering at AFA headquarters in May. "Anything we contemplate is going to have to be in all domains. We have to integrate that better. It's critical to have cyber and space integrated into our way of war."

Yet, today our ability to generate effects in space is less mature than our ability to generate cyber effects—even though we've been operating in space for far longer. The United States has been so far ahead in space for so long that it hasn't had to worry about defending those advantages until recently.

"Now that space is recognized as a warfighting domain," Allvin said, critical questions must be answered: "What do we protect, what do we want to attack? That's what I mean by integrating the planning: It's not just that you have an annex out there, but rather that it becomes part of the planning options to do things that you can't do in the other domains that might be able to broaden the decision space."

This will take time. Rather than split space off on its own today and expect a new force to develop all that from scratch while simultaneously maturing as a full-fledged member of the armed services, Congress should think back to the interwar years when airpower was developing inside the Army Air Corps. It is wiser to set the conditions for nurturing today's capabilities within a cohesive and established ecosystem, so that it can develop the strength and infrastructure to stand on its own in the future.

By redesignating Air Force Space Command as the Air Force Space Corps (reflecting the early history of the Army Air Corps) or the Air Force Space Force (in order to more firmly set the tone for future intent), Congress can establish the groundwork for a future Space Force with the tools and doctrine needed to be successful. Over time, space assets and personnel from the Army, Navy, and National Reconnaissance Office can be integrated into that force, building capacity and capability at the same time as space becomes better integrated into national security plans, policy, and strategy.

The nonpartisan Congressional Budget Office analyzed the costs of creating different kinds of space organizations in a report published in May. Focusing on the incremental management and overhead costs of several different kinds of space organizations, CBO estimated that a new military service would increase DOD's costs by $820 million to $1.3 billion a year, plus one-time costs of $1.1 billion to $3 billion.

Taking the more incremental approach outlined here would help hold down costs, enabling more rapid investment in military capability as the Joint Staff and others develop the plans and strategy for future military action in space. This is a common-sense, solution that would nurture success—and avoid the kind of bureaucratic traps that inevitably result from growing too fast.

The administration launched this important and essential debate. Now Congress gets a vote. It should choose a prudent route that poses less risk today and leaves open all options in the future. ✪

Whither Weather?

As a USAF facility engineer, I was reading with interest about the plans for Tyndall's reconstruction ["Tyndall's New Rebuild Plan: The Base of the Future," April, p. 18]. Little did I know that the author and the *Air Force Magazine* editorial staff decided to devote a quarter of the (otherwise fine) article to the "what if" game of a Washington lobbyist.

Sure, *if* there is another Category 5 hurricane that makes US landfall, and *if* it heads toward a USAF base, and *if* it scores a freaking direct hit, *then* USAF might have a problem with that base—maybe. In the last 50 years, a direct smack-dab hit on a USAF base has happened twice—Homestead and Tyndall. Twice. However, everyone needs to go back and spend billions of dollars to retrofit our facilities (oh, and thank you for the nice retainer).

But, climate change is coming and that means that number and intensity of storms are going to increase.

Really? What do the statistics say?

The number of hurricanes by either year or decade has been stagnant since the US started tracking them in 1850 (note, this includes the last 40 years when the climate change experts have said the world is smack-dab in the middle of it). And, if you throw the outlying years (both high and low), as is typical for statistical analysis, the numbers have been even more steady. Conversely, in 1990 and 2000, there were *zero* hurricane landfalls in the US (uh oh, that doesn't fit our model …).

Sure, there have been multiple Category 5 hits in 2005, 2007, and 2017, which implies—to the shortsighted—that larger storms are becoming more frequent. However, 1932 and 1933 had multiple Category 5s each year, and then there was a 28-year lull until 1961 and then a 44-year lull until 2005. So, what does this tell us? Nothing, other than we are probably due for another several-decade lull. So how about we slow our roll a little, and devote less article space to lobbyists with clear agendas.

Chris Kruschke
Beavercreek, Ohio

The article on the DOD climate change report in the *Aperture* section of the March issue [p. 12] was interesting—but misleading. It is true that there is flooding at JB Langley-Eustis and Hampton Roads in Virginia, but it has nothing to do with recent climate change. Approximately two-thirds of the apparent sea level rise is, actually, the result of subsidence of the land. That is a common phenomenon all along the Atlantic Coast. The remainder is the result of the rise that has been nearly constant for more than 100 years.

The DOD report appears to show acceleration of the sea level rise after 1993. But, 1993 is the year when sea level measurements were first done by satellite. Before that, the level was measured by tide gauges. The tide gauges show a rise of 1.4 mm per year for the past century. The satellite measurements indicate 3.3 mm per year after 1993. If you tack the curves together in a single graph, your eye will detect an acceleration at 1993. But, there is no reason for the satellites to be more accurate than the tide gauges, and if you just continue the tide-gauge measurements past 1993, there is no

WRITE TO US

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—The Editors

acceleration. I do not know whether this was intentional in an attempt to support a climate change argument, or if it were just an error. In any case, I recommend ignoring that section of the report, consulting the government data on line, and drawing your own conclusions. Some of the other sections have problems, too, when the conclusions are compared to data.

Aligning plans for the defense of the nation with such a flawed report is likely to be costly, and the results are likely to be disappointing.

Gene McCall
Los Alamos, N.M.

Pedro History

I enjoyed reading and reliving some of the adventures of a Pedro pilot ["Bring 'Em Back Alive," April, p. 56].

At Pleiku RVN in 1966-67, we had over 80 recoveries from March to October 1966. [We] lost one Pedro, copilot (Lt. Spike Bonnell), crew chief (Airman Rice), and four who had been recovered during a night operation. The PJs were invaluable to our operations and one, Al Stanek, went on to be the No. 2 PJ in the ARRS (Aerospace Rescue and Recovery Squadron) before he retired. The last Pedros operated out of Udorn AB, Thailand, made their last pickup of an F-4 crew in August 1975, and flew for the last time on Sept. 20, 1975. A long and storied career from the first deployment to Nakhon Phanom in June 1964.

"These things we do so that others may live."

Lt. Col. Fred Bergold,
USAF (Ret.)
Fruit Heights, Utah

INDEX TO ADVERTISERS

I flew HH-43s out of northern Thailand in the early (1965) part of the war. The B model had a short [one hour and 45-minute] flying time so we fashioned a range extension system from 2-inch x 12-inch cradles that would support three 55-gallon drums of fuel, gravity fed into the in-cabin fuel bladder opening, which when empty, could be jettisoned out the rear clamshell doors. NO SMOKING ALLOWED!

Later, I flew the HH-43F model that had its own in-cabin 150-gallon fuel tank *with* armored pilot seats and protection for an in-belly fuel tank—quite an improvement.

Col. Jay M. Strayer,
USAF (Ret.)
Xenia, Ohio

Thunderstreak Jackson

The very nice tribute to Medal of Honor recipient Col. Joe M. Jackson written by John A. Tirpak in the March 2019 edition of the magazine ["World: Joe M. Jackson, 1923-2019"] asserts that Jackson flew 107 combat missions in the F-84 Thunderstreak during the Korean War with the 524th Fighter Squadron. This is not correct. The 524th Fighter-Escort Squadron flew combat in Korea between Dec. 7, 1950, and Aug. 1, 1951, before it returned to the United States. During that time, the unit flew the F-84D and E versions of the straight wing Thunderjet. The F-84F was the swept-wing Thunderstreak version of the aircraft, and it was never assigned to the 524th or available for combat during the Korean War since it was not operational in the USAF until 1954.

John Terino
Montgomery, Ala

Battle Dress Blues

On p. 12 of the April edition of *Air Force Magazine,* Vice Chief of Staff [Gen. Stephen W.] Wilson is pictured wearing BDUs, speaking at the AFA Air Warfare Symposium this past March, speaking to Air Force and industry leaders ["Q&A: The Vice Chief's Challenge"]. Was this a combat zone that he needed to wear BDUs?

It used to be fatigues (now BDUs) were worn in the field or as a work uniform, certainly not in public or at events. From pictures I've seen, other Air Force personnel were wearing various traditional blue uniforms. I believe

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- **Support** the Total Air Force family and promote aerospace education.

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wearing BDUs at such an event shows a lack of professionalism and respect for the audience.

Col. Don Hengesh,
USAF (Ret.)
Petoskey, Mich.

Pilot Training Inertia

How unfortunate that Secretary of the Air Force [Heather] Wilson is leaving the Air Force before fixing one of its main problems today—an ineffective initial pilot training program ["World: Secretary Wilson Will Resign, Lead University of Texas at El Paso," April, p. 28]. She could have teamed up with USAF Chief of Staff Gen. David L. Goldfein to streamline and simplify USAF pilot training. Looking back to the classic Undergraduate Pilot Training (UPT) and comparing it with todays Specialized Undergraduate Pilot Training (SUPT) could have provided their senior staff with some easy alternatives to the current training process. Why does SUPT take 15 months to complete? UPT, the course that General Goldfein took in 1984, only [lasted] 11 months. So the training process has morphed into a longer training footprint with built-in periods of non-flight activity. In UPT, student pilots used to fly Monday through Friday, once they were on the flight line. In SUPT, there are several week-long periods during the flying phase where students don't fly a single mission. Perhaps this is what causes many students to drop out—an obvious lack of the repetition that is sorely needed during this early learning process.

By reading "The Future of Pilot Training" article (Jan/Feb 2019 issue), I can see the obvious hint that future pilot training could be relegated to civilian contractors. Perhaps that is exactly what the Air Force needs today—an outside entity to take over an essential training function that has strayed off course over the years. However, I still think that the Air Force could simply bring back UPT, shave off six weeks or so due to improved computer-based training, and end up with top-notch pilots who have experienced 180 to 200 hours in training aircraft when graduating from a 10-month-long program.

Good luck to Heather Wilson as she returns to academia.

Lt. Col. Karl Blackmun,
USAF (Ret.)
Temecula, Calif.

First, Look in the Mirror

In the October/November 2018 issue of *Air Force Magazine,* I read with interest, "The Chappie James Way" [p. 70]. It brought a memory to mind of my first "dining-in" as a USAFA Cadet Squadron-01 doolie (4th classman) in the fall/winter of 1971-72 at the Dublin Dinner Playhouse, Colorado Springs, Colo.

Our guest of honor was someone I had never heard of, much less had had the chance to meet, Maj. Gen. Chappie James. The one thing I have remembered for the rest of my military/civilian careers and voluntary efforts was the essence of his speech (paraphrasing): "... When things go wrong around you, start the search to find out what went wrong by beginning with your own desk and then expanding the search in ever-increasing circles until you've identified the culprit(s), whatever or whoever it/they may be. Then work to fix it so it does not repeat." That's the "Chappie Way" I remembered and tried to make a part of my life. Good advice to a then-18 year old, now a 65 year old, and all the intervening years.

Lt. Col. Scott M. Smith,
USAF (Ret.)
Dumfries, Va.

Roles For Both

Obviously, the Air Force is planning to never use the F-35 as a weapons carrying platform [lest] we become "visible" to enemy defenses ["Aperture: F-15EX: Be Careful What You Don't Ask For," April, p. 13]. Yet, the Air Force is planning to re-engine the almost 70-year-old B-52 design, while planning to retire the newest B-2 bomber? My guess is that what is stealth today will be reasonably visible by new technology in the pipeline in only a few years; that leaves us with UAVs and cruise missiles to fight in complex air defense environments. However, none of our needless wars like Iraq, Afghanistan, and Syria [really] needed fighters flying in their stealth mode, but rather fighters able to carry weapons to deliver on targets.

I fully support technology development, but DOD is missing the mark by not improving and buying more F-22s, A-10 type aircraft, and fighters with proven capability to deliver weapons. The F-35 can carry a large payload if you fly it as a conventional fighter, but is compromised except in a BVR (beyond-visual-range) environment, since the 50-year-old F-16 is clearly a better close-in fighter. I question the survivability of the F-35 versus the F-15X when both are loaded to deliver

weapons on target. I would suggest that any new F-15s probably should be more focused on adding to the F-15E mission area, letting the F-35s become more air defense oriented, augmenting the F-15Cs. Just thinking.

Lt. Col. George E. Boyd,
USAF (Ret.)
Stillwater, Okla.

Lemon Law

In regard to the KC-46 tanker ["Pegasus Takes Flight," April, p. 48]: The next new car I get, I guess I should be willing to pay for it even if everything isn't functioning correctly.

The dealer will let me fix these things myself, at my expense. What a farce this whole purchase of a new airplane is.

MSgt. Denis Neal,
USAF (Ret.)
Mesa, Neb.

Brian Everstine's article states, "..did not anticipate the need to continue to refuel the A-10 Warthogs that date back to the Vietnam Era." The first A-10 was accepted by TAC on March 30, 1976, according to Wikipedia. The Vietnam War ended with the fall of Saigon on April 30, 1975—one year earlier. So, obviously, the A-10 was a post-Vietnam War aircraft.

Lt. Col. Karl Blackmun,
USAF (Ret.)
Temecula, Calif.

Big 'Uns Knock Down Small 'Uns

Maybe there is a cheaper way to knock down a swarm of drones than with a laser ["Swarms: Why They're the Future of Warfare," April, p. 35]. Just use a bigger drone with a strengthened nose/wing and put the propeller in the back. Then just use the bigger dumb drone to ram the smaller swarm of drones, one by one. One rugged drone could knock down an unlimited number of smaller drones.

William Thayer
San Diego

Keeping the Peace (Keeper)

The subject of your article in your March magazine by John Correll was an accurate portrayal of the tortuous process to select the basing concept for the deployment of the Peacekeeper weapons system ["Peacekeeper by Fits and Starts," p. 55]. Mr. Correll has a fine grasp of history and the ability to tell a complex story well. I note two omissions regarding the Peacekeeper story that I believe are of major import.

While the dates of first test flight, production decision, and IOC are given; he makes no mention of the fact that all were accomplished in less than four years in a remarkable acquisition performance not seen since the original Polaris and Minuteman I Systems.

In addition, he fails to note the (MX) Peacekeeper with the floated Ball inertial guidance provided revolutionary accuracy for warhead delivery at operational ranges. At the time, neither the US nor the Soviet Union encrypted the telemetry used in flight test, thereby allowing each to understand approximately the accuracy of the adversary's system. I believe the Soviet estimation of the precision of Peacekeeper was a factor in the subsequent arms control agreement to take down the most powerful war fighting systems.

Lt. Gen. Aloysius G. Casey,
USAF (Ret)
Redlands, Calif.

It's a Gas

I offer no comment on the opinions William Sayers expressed in "Operation Allied Force: How Airpower Won the War for Kosovo" [May, p. 56], but I can't let the accompanying graphic on p. 59 stand without a very loud objection. Likely unintended, the graphic, titled "Air Force Bases During Operation Allied Force" is still a smack in the face to all of the tanker folks involved in that endeavor, absent which the operation wouldn't have been remotely possible.

As the airman who deployed from CONUS to the Combined Air Operations Center (CAOC) in Vicenza, Italy, as the Tanker Director, responsible to Lt. Gen. Michael C. Short for, as he put it, "every aspect of things tanker—from beddown locations to planning to maintenance to opstempo to whether or not the boom operator sprains his ankle climbing into the airplane, ... " I can tell you that tanker deployment and employment operations were massive—our assigned 200 NATO tankers flew over 8,800 sorties during the operation. These forces operated in a very challenging environment from 13 bases in 11 different countries and most undoubtedly deserve recognition by showing those locations on any map purporting to show "Air Force Bases During Operation Allied Force." There are other communities within the Air Force that have claim to supporting the operation from additional locations as well, but as this graphic implies aircraft basing, the absence of the bases from which the essential tanker forces operated can be described thusly (to borrow a famous line): "It's outrageous, egregious, preposterous."

Post-Kosovo and as a senior mentor, Lieutenant General Short was a very strong tanker force proponent, whole-heartedly embracing the fact that reliable air refueling is absolutely vital to almost any air operation. As it was certainly vital to Operation Allied Force, I felt compelled to comment and I appreciate the opportunity to stand up for the proud men and women of the tanker force.

NKAWTG!

Brig. Gen. Thomas E. Stickford,
USAF (Ret.)
Burke, Va.

Who You Gonna Call?

In the May *Air Force Magazine,* the leader of the Skunk Works opined (roughly) in five or 10 years "the threat's going to move and ... you need something to defeat an IR threat" ["Strategy & Policy: Growing Skunk Works, Without Losing Skunk Works Culture," p. 18]. I am sure he's right, but wow, about five years from now we will be less than halfway through our F-35 production and barely in to the fielding of the B-21 Raider. I hope we are thinking—right now—in the Skunk Works, DARPA, RCO, and everywhere else, on this problem. Somehow, I think the Chinese, Indians, Russians, and even the Israelis are noodling away at this in a serious way (I understand there is a Pirate system coming out on the Typhoon even now). Are we facing real vulnerability for the future of our fifth-generation combat aircraft fleet? I hope not, but I am sure we are suffering from an acquisition process causing us to take nearly 15 years to get operational rubber on the ramp. As the Ghostbusters song goes, (sort of), "There's sumthin' wrong, in the neighborhood!"

We need a Ghostbuster!

Steve Mosier
Marietta, Ga.

GO BEYOND

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1952
The U.S. Air Force's B-52 Stratofortress makes its maiden flight, powered by eight Pratt & Whitney J57 engines.

1961
The B-52H, the final variant of the aircraft built, enters service with Pratt & Whitney's TF33 engines.

1991
B-52s deliver approximately 40% of all ordnance dropped by coalition forces during Operation Desert Storm.

2000s
B-52H aircraft play a key role in the 9,000+ total airstrikes conducted on targets between mid-2014 and the end of 2016.

2050
The B-52H remains one of the most versatile aircraft in the Air Force fleet.

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Maj. Paul Lopez, commander of USAF's F-22 Demonstration Team, flies in formation with the Navy's Blue Angels over Beaufort, S.C., on April 25, during a Marine Corps air show. It was the first time the iconic blue-and-gold F/A-18s and USAF's fifth-gen premier fighter flew together.

Photo: 2nd Lt. Samuel Eckholm

D minus one, June 5, 1944: Brig. Gen. Anthony McAuliffe gives glider pilots last-minute instructions before take off for the Allied Invasion of Normandy. Operation Overlord—better known as D-Day—was the largest amphibious invasion in military history. This year is the 75th anniversary of the invasion.

Photo: US Army via National Archives

An A-20 from the 416th Bomb Group makes a bombing run on June 6, 1944, during the D-Day invasion. The 416th went on to play a critical role in trapping German forces in the Falaise Gap August 6-9, 1944, for which it was recognized with a Distinguished Unit Citation.

Photo: USAAF via National Archives

Military spouses hitch a ride on the ramp of an MC-130J Commando II over New Mexico during Spouse's Day April 27. Dependents of military members at Cannon AFB, N.M., got a glimpse of day-to-day operations at the Air Force Special Operations Command base.

Photo: A1C Vernon Walter III

US service members unload a USAF C-130J Hercules deployed in support of Combined Joint Task Force-Horn of Africa in early May. US Air Force Expeditionary Airlift Squadrons provide medical evacuation, disaster relief, humanitarian aid, and airdrop capabilities to the continent.

Photo: TSgt. Chris Hibben

By John A. Tirpak

A Czar for EW; China's Long View; Defending Taiwan

Photo: SSgt. Kristin High

An airman runs maintenance on an EC-130H Compass Call at Bagram Airfield, Afghanistan, in 2018. The Compass Call mission is transitioning to the new EC-37 airframe.

REBUILDING ELECTRONIC WARFARE

After long years of neglect, the Air Force plans to reorganize its chaotic electronic warfare enterprise, creating a new service EW czar to coordinate its efforts in the domain, and breathing new life into the career field specializing in warfare in the electromagnetic spectrum.

The action plan will create an electromagnetic spectrum (EMS) "champion" on the Air Staff, who will advocate for the mission and its practitioners and consolidate USAF's disparate EW tools and missions—everything from jamming pods and decoys to dedicated EW aircraft—into a coherent and rationalized enterprise.

The plan came out of a yearlong Enterprise Capabilities Collaboration Team (ECCT) review of USAF's electronic warfare tools and tradecraft, which was headed up by Brig. Gen. David M. Gaedecke, USAF's director of cyberspace operations and warfighting integration, and approved in April by Chief of Staff Gen. David L. Goldfein.

Electronic warfare is essential to each of USAF's core competencies, Gaedecke said in a press release. These moves will help USAF "maintain our competitive advantage in [the] EMS to achieve freedom of action while denying the adversary that same freedom of action."

The new EW czar, a general officer not yet named, will head the EMS Superiority Directorate, managing a portfolio of EMS priorities and investments such as the Eagle Passive/Active Warning Survivability System (EPAWSS) electronic warfare suite for the F-15 Eagle; the Miniature Air-Launched Decoy and its jamming variant; defensive EW pods for fighters, defensive and offensive electronic systems on bombers; and large systems such as the EC-130H Compass Call electronic warfare aircraft, which is transitioning to the new EC-37 airframe. It could also include advanced radar systems that have evolved beyond detection and tracking and that have an inherent ability to hop frequencies and pump focused electrons in many directions.

What's not clear is whether the new directorate will be in charge of things like Sniper and Litening pods, or the F-35's Electro-Optical Targeting System, given that those systems operate in the visual and infrared parts of the spectrum. Service officials say IR systems will increasingly be fused with radio frequency sensors as adversary aircraft become stealthier and multi-sensor search and tracking becomes standard.

LOST FOCUS

Gen. James M. Holmes, head of Air Combat Command, said, "15 years squared off against violent extremists" in Afghanistan and Iraq has had an impact on the Air Force's EW expertise. The service suffered, "a loss of focus on coordinating our electronic combat tools," he said in an interview. Now, that focus is back. "You'll see us with a renewed focus in dominating that electronic spectrum," he said. The refocus on EW practitioners will allow USAF to come up with new concepts and new presentations.

Because the ECCT review is classified, Holmes and others remain purposely vague about its findings. But the National Defense Strategy is clear about the threat, noting that Russia and China have leaped forward in the past two decades, and critics complain the ECCT did not go far enough and failed to codify a servicewide plan for electronic attack.

USAF also struggles with definitions in the electromagnetic field and with uncertainty about where cyber operations end and EW begins. That's one reason the 24th and 25th Air Forces will merge this summer into a new numbered Air Force, combining cyber with intelligence, surveillance, and reconnaissance activities.

Holmes said the new plan will focus on EW planning and "how to integrate it against a peer adversary."

Muddy Watters, president of the Association of Old Crows—an organization of past and present electronic warfare practitioners—said in a statement that the ECCT's recommended actions "should ignite a resurgence in the Air Force EW and EMS capabilities." Putting a general officer in charge of the new EMS directorate should help USAF regain the "high ground" after US capabilities atrophied in the wake of the Cold War.

The new directorate will help the Air Force identify gaps in its capabilities, field critical technologies more quickly, and "ultimately facilitate the equipping of tomorrow's warfighter," Watters said.

CHINA: THE 30 YEARS WAR

China plans to match the US as a world military and economic power within 30 years and is moving deliberately toward achieving that goal, the Pentagon said in its annual report on China's military capabilities. Noteworthy developments highlighted by this year's report include:

■ The nearing deployment of a Chinese nuclear deterrence triad, like that possessed by the US and Russia.

■ An aggressive program of building new military bases abroad.

■ The construction of China's third large aircraft carrier.

■ Chinese efforts to stake its claim as a "near-Arctic" nation with claims on that region's resources.

"China has a stated goal of becoming a world-class military by 2049," said Randall G. Schriver, assistant defense secretary for Indo-Pacific Security Affairs. Briefing reporters in early May on the annual report, "Military and Security Developments Involving the People's Republic of China 2019," Schriver said China aims to "erode US military advantages and seeks to gain and maintain influence. And it backs these ambitions with significant resourcing, which translates into real capabilities and capacity." China's defense budget continues to grow at "near double-digit" percentages, the report noted.

Schriver said China has "areas of excellence" in its capabilities to build ballistic and cruise missiles, and it is deploying increasingly sophisticated ballistic missile submarines. It is both expanding its fleet of older-style bombers and developing new ones, which the report said are likely to have some low-observable capability and become available in the mid-2020s. That is about the time the US expects to begin fielding its new B-21 bomber.

Will China soon have its own nuclear triad? Schriver might not use those words, he said, but the Chinese are "heading in that direction." Where China is still lacking is in doctrine and training, he said. The bulk of China's nuclear weapons are still mounted on intermediate-range missiles. It is unclear how quickly China could achieve a full triad capability.

Schriver said China is not an enemy, but a competitor, noting the US competes with China economically and in the battle for influence and does not see armed conflict with China as inevitable. The US National Defense Strategy requires that the US compete "from a position of strength," he said, "while encouraging China to cooperate with the United States on security issues where our interests align."

That contrasts with China's strategy and objective, which Schriver said is to "supplant the United States and become the pre-eminent power in the Indo-Pacific."

The report points out that China's third and newest aircraft carrier is of domestic design, unlike the previous two, which were of Russian design. Both of those vessels use the "ski jump" launch system, which limits the number of aircraft that can be carried. The new carrier, though, will be larger and use a catapult system like US carriers. That means more aircraft on deck and more rapid flight operations. The report anticipates it to be deployed around 2022.

Schriver said China has developed and deployed a new class of guided missile cruisers—the "Renhai" class, which will be its "premier carrier escort for blue-water operations, carrying an array of long-range, anti-ship missiles."

China's fifth-generation J-20 stealth fighter, which Schriver said will be operational this year, will join a mostly fourth-generation force. The report also notes that China has tested a hypersonic cruise missile.

To go with the new equipment, Schriver said China has put greater emphasis on "realistic and joint training across all warfare domains."

China is actively looking to set up military bases across the world, often tying access to economic development deals with the host country. New Chinese bases are spouting up—or soon will be—in the Middle East, Southeast Asia, and the Western Pacific, Schriver said. A number of these are associated with China's "One Belt, One Road" plan for connecting the Eurasian continent with a series of rail and highway connections and the "Made in China 2025" initiative to corner the market on certain industries.

TAIWAN ON

China continues to try to achieve its ends without conflict, using "persuasion and coercion," the report noted, and is attempting to isolate Taiwan with economic pressure on small nations to withdraw their recognition of Taiwan. China also continues to "undermine democracy in Taiwan by meddling in its elections," Schriver reported. He said the US is pledged to supply Taiwan with the means to defend itself, but he stopped short of saying the US would come to Taiwan's defense if attacked.

"Our law says that any threat to Taiwan—and it's a broad definition of a threat, to include economic threats, blockade, etc.—would be regarded with grave concern in the United States," Schriver said, adding that in such an event, the president would "consult with Congress on an appropriate response." In previous cases, the US has "responded in an appropriate manner to help support Taiwan."

The report also offers a special examination of China's plans and policies regarding the Arctic, given China's declaration that it is a "near-Arctic state." It already has one large icebreaker and is building others, Schriver noted, and has also "announced a polar silk road." China is looking for access to potential resources on the Arctic sea floor and shipping routes, according to the report, and may be eyeing the region as a place it would deploy ballistic missile submarines, Schriver said.

China's use of cyber for intelligence collection is a "persistent" challenge, he said, and the main change in this area is "our level of awareness and the steps we're taking to reduce our own vulnerabilities." ✪

VERBATIM

Photo: Sun Vega/DOD

The Times, They Are a-Changin'

"Some of us may have to be dragged kicking and screaming into the 21st century. How we do things in space has to change."

Fred Kennedy, Space Development Agency director, at the 35th annual Space Symposium in Colorado Springs, Colo. [April 8].

Space Travel

Photo: Roderick Eime/Virgin Galactic

"I've driven a Bugatti at 253 miles an hour, I've skied to the South Pole, swam at the North Pole. I've done a lot of stuff, and the thing I really want to do is fly in space."

Jim Clash, adventure journalist and passenger 610 on Virgin Galactic's roster of tourists waiting to fly in space. He's been on the list for 10 years.

Security Flaw

Screenshot: USAF

"The US technology-control system is designed for an era of US technological dominance that no longer exists. The export-control mechanisms, which were designed to maintain US technological dominance developed at the height of the Cold War and protect the advances of state-sponsored R&D, have lost their relevance in an era where global commercial R&D investment outstrips military R&D. The legacy export-control system not only impedes economic security, but also poses a threat to US national security."

William Greenwalt, former Pentagon official, in a report for Atlantic Council's Scowcroft Center for Strategy and Security [April 23].

Jugglers Needed

"After 25 years of primarily drawing down and sustaining the nuclear forces we built during the Cold War, repeated decisions to defer recapitalization of our nuclear forces have caught up to us. Now, we must concurrently acquire and field modern systems in each leg of the strategic nuclear triad."

Ellen M. Lord, undersecretary of defense for acquisition and sustainment, statement to the Senate Armed Services Committee [May 1] .

Photo: SSgt. Chad Trujillo

Staff illustration

WE CAN'T HEAR YOU

"Government officials need to know that they will have to face the media on a regular basis. That reality will cause them to be cautious and judicious in wielding the tremendous power they hold. Media engagement can be painful at times, and it will create some missteps and miscommunications. But the benefits outweigh the costs. We need to see our civilian Secretaries, Admirals, Generals and senior intelligence professionals at the podium again—now and often."

Retired Adm. **James G. Stavridis,** 16th Supreme Allied Commander at NATO and an Operating Executive at The Carlyle Group, remarks in *Time* magazine in April on the Pentagon not holding press briefings for more than 6 months.

Photo: USAF

FINAL SALUTE

"The Doolittle Raid exemplifies American defiance and ingenuity. ... They bet big, and it worked, because nobody thought such an attack was even possible. Nobody, except those who threw out the rulebook, customized the airframe, its hardware, its engine, and pioneered the training and operational tactics to do the unthinkable on an impossible timeline."

Secretary of the Air Force **Heather Wilson** remarks at the memorial for the last Doolittle Raider, Lt. Col. Richard Cole, at JBSA-Randolph, Texas [April 18].

Back to the Future

"The US withdrawal from the ABM Treaty, and now from the INF Treaty, paves a way to a large-scale arms race with unpredictable consequences."

Russian Foreign Minister **Sergey Lavrov,** March 20 statement to the Conference on Disarmament in Geneva.

Threat? What Threat?

"China is going to eat our lunch? Come on, man—they can't even figure out how to deal with the fact that they have this great division between the China Sea and the mountains in the West. They can't figure out how they're going to deal with the corruption that exists within the system. They're not bad folks, [but]. ... They're not competition for us."

Former Vice President and current presidential candidate Joe Biden [May 1].


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Preparing for Future Space Flights

Photo: SpaceX

A SpaceX Falcon 9 carrying a GPS III payload lifts off from Cape Canaveral AFS, Fla., Dec. 23, 2018. The GPS mission is overseen by Air Force Space Command at Schriever AFB, Colo.

By Rachel S. Cohen

SCHRIEVER AFB, Colo.

More than 1,600 miles separates the 2nd Space Operations Squadron's (SOPS) GPS team from the military space debates churning in Washington and while they don't get the final say over what happens next for Air Force Space Command's warfighters, they do control how they prepare.

GPS is just one of the missions run out of this base in the rolling hills near the Rocky Mountains, which also oversees operations for a range of communications satellites, surveillance, and weather systems, as well as the X-37B experimental space plane.

"The largest change we have seen to date is just a better understanding of how large space is, the competition in space, and how we need to be prepared for operating in what [may] no longer be a benign environment," said Lt. Col. Stephen Toth, 2nd SOPS commander, in an interview. "We've started getting after training our operators in new and different ways … much more like the flying side of the Air Force."

That means the 10 GPS operators on each shift now have to think about potential threats, possible avenues for attack, and adversaries they may notice either in orbit or within the systems they run. Is the anomaly on their screen just a blip, or is it enemy interference?

Ten years ago, that wouldn't have crossed anyone's mind, Toth said. Getting people to think differently about who or what they might face is a first step in preparing for future combat.

"We've started to fuse intelligence more into the space environment to give us a better understanding of what is out there, what we could see, and how we need to operate in and through that to continue to provide our capability to the warfighters or the civilian users, wherever they may be," he said.

The pivot to a combat mindset began three years ago with the "Space Mission Force" initiative, which revamped training and started rotating staff through "ops floor deployments." By framing their time in the windowless, screen-lined room as a combat deployment, they aim to show airmen they're not just clicking buttons on a keyboard, but could find themselves in a fight.

"A lot of that training started with that intelligence fusion, by

Illustration: Lockheed Martin

An artist's concept of a GPS III on orbit. The next-generation satellite is said to be three times more accurate than the existing constellation and up to eight times more resistant to jamming.

Next-Generation GPS

The first next-generation GPS III satellite went into orbit in December, circling the Earth in medium orbit 12,550 miles up. Built by Lockheed Martin, the new satellites are touted as three times more accurate than the existing constellation and up to eight times more resistant to jamming.

Improved GPS will allow military and civilian users to act on information faster, Lt. Col. Stephen Toth, 2nd SOPS commander, said. New automated software will alert operators to problems, send better data to people on the ground, and begin self-healing procedures automatically, said Capt. Ryan Thompson, the 2nd SOPS engineering flight commander.

"We understand the space environment better nowadays," Toth said. "When you launched a [GPS] IIA into space 26 years ago, how well did you understand it? Now, with all the spacecraft going into space, we can build for robustness and really start to understand what it means to operate in space."

"Where we are today, it's way more exciting," said Toth. "Our people are excited about it, they want to join the Air Force to get into space—which they weren't doing 15, 20 years ago. They now see it as a future career option, and it shows in the people that we're getting to do this job." ✪

having intelligence personnel actually trained in space," Toth added. "We'd be asking that individual who provides intelligence to an aircraft before it goes into theater to also provide some flavor of space intelligence. Now we have intel folks that are trained solely in space. … We can then use their information and knowledge to build realistic training scenarios."

Qualification training today throws a range of threats at the GPS crew, forcing them to work through problems together. A recent report from the National Air and Space Intelligence Center pointed to anti-satellite missiles, lasers, jamming, cyber attacks, physical attacks on ground assets, and collisions with other objects in space as the most worrying issues.

So far, the 2nd SOPS hasn't seen any of those in real life.

"We're ready to execute the mission that we have right now," Toth said. "In GPS, I'm 100 percent confident in the fact that we will not have any issues continuing this mission moving forward."

He believes the Air Force will need to recruit more airmen for operational units as training evolves. The service will require more instructors, which would pull manpower from the ops floor, in turn growing the demand for personnel to fill in those spots while others are leading and attending training.

As US Space Command grows into a fully functional combatant command, Army, Navy, and Marine Corps space operations officers will naturally grow closer to the Air Force, Toth added. Bringing everyone together will help operators think outside their lanes and build a more holistic approach to space warfare.

"We are going to be bringing a lot of the best minds all together, kind of like how Strategic Command does it now, but with a sole focus on space and user capability on the ground," according to Toth. "That'll be a very good change. … The Army tends to deploy out into the field environment a lot and they really require a good use of space. Same with the Marines."

Other personnel changes are on the horizon. At a Senate Armed Services Committee hearing, Air Force Chief of Staff Gen. David L. Goldfein suggested there could be new career paths for enlisted airmen—piloting the RQ-4 Global Hawk and performing space operations.

Enlisted space personnel will also go to the Air Force Weapons School for the first time this summer to bring back more tactical planning experience and insight to their units. Though officers and enlisted will largely learn the same material, 1st Lt. Morgan Herman, a weapons and tactics assistant flight commander, said the biggest difference is that enlisted trainees will dive into more technical details while officers get into operational specifics.

At the Space Foundation's annual Space Symposium in Colorado Springs, Colo., Air Force Space Command chief Gen. John W. "Jay" Raymond said a new advanced instructor course for enlisted space warfighters will debut at Nellis AFB, Nev., this year. Six airmen will be in the first class.

"This new course will … provide advanced academic and tactical training for enlisted space professionals and is a stepping stone for incorporating our enlisted operators into the existing Air Force Weapons School," he said.

Enlisted airmen already serve as orbit analysts, engineering specialists, and more, and make up more than half of space operations crews.

"What we really want to do is get them to their full potential," Toth said. Enlisted airmen could eventually participate in navigation and bus payloads, orbital analysis, and nuclear detection.

About a dozen officers will soon graduate as the first class of "Schriever Scholars," a new joint space warfighting concentration at Air University, and the Air Force is opening educational courses and training opportunities such as Space Flag to international partners. ✪

Illustration: Alan Chinchar/NASA

An artist's 1991 concept of a future space station. Almost three decades later, scientists are still researching ways to manufacture and assemble platforms in space.

Chief Scientist Upbeat on Space Research

By Rachel S. Cohen

The Air Force wants to be able to do more in space and its science enterprise is lining up to help. Air Force Chief Scientist Richard J. Joseph said the military has much to learn about manufacturing and assembly in space, the materials that could both enable and be reaped during space operations, and new ways of harnessing energy.

"I'm really upbeat about what I see," Joseph said of recent developments in military-related space research. "I think they're really leaning forward on thinking far enough ahead that we're likely to be in good shape. And at the same time, we have people, of course, working today's issues."

Robotics could help assemble satellites in orbit, for example, potentially saving production and maintenance costs and reducing manpower needs.

"Rather than launching everything up whole, can we put things together?" Joseph asked. He speculated that the Air Force may want to deploy a manned assembly laboratory in space for that purpose.

Scientists are looking into potential improvements in the materials. Finding lighter materials may make it easier to fabricate parts on orbit, Joseph noted. The Air Force could also "cannibalize" existing US satellites for parts.

Air Force leadership is open to new approaches in space manufacturing, including possibly reusing old systems, Joseph said.

Eventually, materials could even be mined directly on the moon.

"We believe there are plenty of interesting materials, metals, and such," Joseph said. Without the burden of lifting all that weight off the Earth, it might be less costly to source materials in space. "What does a pound of titanium cost [to] put in [geosynchronous orbit], or in low Earth orbit, or in a [highly elliptical] orbit? What does that cost versus bringing it up from the ground?"

Where would the energy for moon mining come from? Or how would a directed-energy weapon get the power it needs? Air Force scientists are looking for answers.

"Our demand for power will go up, and up, and up, and we have all the same issues: How do we get rid of the heat? How do we transmit the power, and so on?" Joseph said. Power requirements will rise from tens of kilowatts or less, to hundreds of kilowatts, or even megawatts, he said. Scientists have been thinking about power in space for decades, but the research has not maintained its momentum.

"We stop and start, stop and start," he said. "Sometimes stopping is a good thing. Sometimes we wait for technology to come catch up a little bit with the idea, with the goal. … We've been rejecting things because they were more than a few years out, and space power is one of those."

Holmes: What ACC Expects from New "Century Series"

By John A. Tirpak

The Air Force will have more unique fighter programs in the coming years, but each will yield fewer airplanes than in the past, as the service moves toward a new "Century Series" of rapid development projects, Air Combat Command chief Gen. James M. Holmes said in an interview.

Instead of one big program numbering 1,500 aircraft that takes decades to field, Air Force acquisition chief Will Roper envisions a future where the Air Force develops and fields multiple different airplanes more quickly, but in lower volume.

"You'll see programs that deliver a better capability now," Holmes said. Then USAF will revisit them every couple of years to determine whether "we can we make that better."

Some upgrades will be blended into existing production aircraft, while others will be embodied in entirely new aircraft. If a new platform is ready and more effective, he said, then "let's stop producing what we were, and start producing these instead."

In this plan, "you have multiple things in development, and you see which ones are a little bit better, and you shift your investments," Holmes said. "You evaluate that routinely, instead of every 20 years."

The original "Century Series" was a string of second-generation fighters developed in the 1950s and 1960s with designations F-100 through F-111. The jets were rapidly developed and fielded, but not expected to serve more than seven to 10 years before being supplanted by third- and fourth-generation aircraft.

The Air Force is seeking more than $1 billion for its Next Generation Air Dominance program in the 2020 budget request, and Holmes said the "Century Series" concept is built into that request. The model is "part of how you're going to maintain an air advantage," he said. "That can't be static."

The NGAD funding would pay for studies, prototyping, and experimentation.

Previous ACC commanders have discussed a Penetrating Counter-Air platform that might supplement or succeed the F-22 and F-35, but Holmes said that platform is only "one part" of NGAD, which he envisions as "a family of systems to be able to control the air and space."

"It's too early to say what's going to show up," Holmes said. The Century Series approach doesn't require a plane be built to last 20,000 hours, opening up cost-saving options, he added. "You can build it in a different way."

USAF Outlines 12-Part Plan for Tyndall Rebuilld

Photo: A1C Monica Roybal

An F-22 readies for take off during Checkered Flag 19-1 at Tyndall AFB, Fla., in May. The F-22 fleet left Tyndall for other bases after Hurricane Michael, but F-35s are expected to arrive in 2020.

By Rachel S. Cohen

The Air Force laid out a 12-part plan to rebuild Tyndall AFB, Fla., saying they are ready to hire someone to coordinate the work—if and when Congress is ready to pay for it.

Brig. Gen. Patrice A. Melancon, executive director of the Tyndall Program Management Office, said in an interview the scope of the rebuilding effort is so vast the service wants to hire a single contractor to coordinate and integrate the work across 12 zones, each defined by location and mission.

"We are looking to get a professional services contract to have an integrator, basically someone who is looking at all the different pieces and making sure they are synchronizing and that we're not going to have a sidewalk that goes to nowhere, or we're going to have a waterline that doesn't connect up with a waterline from the other zone," Melancon said.

The Air Force won't issue any new contracts for the $5 billion restoration until Congress approves supplemental disaster-relief funding, which has been tied up in partisan disagreements. The House Appropriations military construction and veterans affairs subcommittee on May 9 approved fiscal 2020 legislation that would allocate $1.6 billion to Air Force military construction, including $736 million for projects related to last year's Hurricanes Florence and Michael.

The Air Force faces a multibillion-dollar shortfall to restore bases such as Tyndall and Offutt AFB, Neb., which were damaged by flooding in March. The service also recently proposed a pricey, long-term infrastructure improvement program.

The Air Force anticipates facility repairs at Tyndall will cost $1.4 billion, including about $550 million in fiscal 2019 and about $830 million in 2020.

Congress allowed the Pentagon to move $200 million to pay for those 2019 expenses, so a supplemental spending bill is needed to cover approximately $550 million in outstanding facility and non-facility expenses for Tyndall this year. Offutt also requires $420 million for recovery-related operations, maintenance, and construction, plus another $234 million for training devices.

The Air Force anticipates a long-term need for an additional $3.3 billion to completely restore Tyndall.

"If we initially only get enough money to do maybe two of the zones, that's not a whole heck of a lot of integration involved in that," Melancon said. "We are trying to figure out the right way to do sort of a base award for that design integrator, and then as we get more zones on, we will add capability to that design integrator because the more zones we have … the more effort it's going to be."

Another initial step will be finding a firm to start redesigning the base according to the new master plan and to help search for construction companies.

John W. Henderson, the Air Force's assistant secretary for installations, environment, and energy, told reporters the plan

shows a need to demolish more facilities than originally expected, but it also shows Tyndall can be laid out more efficiently.

"While ... I think we have well over 300 facilities now that are slated for demo or were destroyed in the storm, the build-back [plan] has significantly less than that because we were able to consolidate functions, we were able to make better use of the flight line, we were able to move non-flying functions off the flight line, and consolidate operations there," Henderson said.

Air Force Magazine previously reported rebuilding facilities that aren't tied to a particular flying mission, such as housing and child care, are a top priority. Melancon said that while the new master plan is in its final stages, officials are refining their requirements so they'll be sure of what they need when lawmakers approve additional funding.

But Rep. John Garamendi (D-Calif.), chairman of the House Armed Services readiness subcommittee, indicated concern about rebuilding Tyndall in the same location.

"Storm surge is going to happen," Garamendi told Air Force Vice Chief of Staff Gen Stephen W. Wilson during a hearing. "There are going to be Category 5 hurricanes in that area. ... If you go back and build where it was destroyed, you'd better be able to tell us there's absolutely no other place, and then you'd better build it for the worst possible case."

The target date for the work to be completed is Oct. 1, 2023, when the first F-35s are scheduled to arrive on base. Tyndall also may receive a new MQ-9 mission after that as well.

Work needed to house fighter jets at new locations will account for about one-third of total military construction spending in 2020, according to the report accompanying the House Appropriations subcommittee bill. Building F-35A facilities at Tyndall is expected to cost $350 million, and it will cost $150 million to bring new training and operational squadron facilities to existing F-22 bases, as the Raptors relocate from Tyndall.

After the first Industry Day in January, nearly 70 contractors and academics submitted about 100 white papers with ideas for a new Tyndall, which the Air Force decided were either worthwhile, possibly beneficial despite some risk, or not the right fit.

Submissions fell into six categories:

- Resiliency
- Smart basing
- Master planning concepts
- Contract acquisition
- Design and construction
- Project management.

The service is moving forward with about half of the suggestions it received, and one-third require more exploration, Melancon said. One standout idea involves developing a suite of sensors that could alert maintenance staff when a building has a problem or when parts need to be replaced. Using the sensors for more proactive maintenance would help address issues earlier and avoid higher repair costs as facilities deteriorate further.

"We might be able to get an alert that says, 'Hey, the motor in the No. 1 cooling tower, the vibrational pattern is off,' " Melancon said. "It might also be able to tell us, 'Hey, by the pattern that we're seeing, it's probably a bearing problem.' "

The Air Force plans a gathering this summer to discuss the types of sensors it might need and how to harness data about the base once it's collected. Plans to bring 5G wireless networks to the base also are underway, and officials are considering privately funded energy services, such as solar power arrays or microgrids. A third Industry Day is tentatively scheduled for August. ✪

Cost of Offutt Flood Recovery Will Top $650 Million

By Rachel S. Cohen

Twenty facilities at Offutt AFB, Neb., cannot be saved in the wake of flooding that covered one-third of the base in March. But 10 other buildings can still be repaired, the Air Force said.

Key facilities housing the 55th Wing, 55th Operations Group, and 595th Command and Control Group headquarters, and others that support nuclear command, control, and communications aircraft and simulators, must be torn down and rebuilt, spokesman Ryan Hansen said in a May 9 email.

Among the buildings that can be salvaged are the E-4B Nightwatch hangar, intel facilities, and maintenance areas.

The cost of the damage will total about $420 million—$120 million for operations, maintenance, and facilities sustainment and $300 million for military construction. Another $234 million will be needed to replace training systems.

"We have transitioned the [Recovery Operations Center] into what we're calling the NexGen Program Management Office," Hansen said. "It is comprised of folks that are organizing subject-matter experts into a working group who'll enable the wing to prioritize requirements. ... This team will synergize our efforts to ensure the redevelopment of Offutt is done as efficiently as possible."

Nearly 140 structures, including 44 occupied buildings, were flooded, Hansen said.

Facilities that must be rebuilt include:

- 55th Wing headquarters
- 55th Operations Group headquarters
- 595th Command and Control Group headquarters
- Satellite communications/MILSTAR Complex
- Aircrew alert campus for E-4B and E-6 aircraft
- 55th Intelligence Support Squadron facilities
- 343rd Reconnaissance Squadron facilities
- 625th Strategic Operations Squadron's simulator facility
- 55th Security Forces Squadron's combat arms training facility
- Veterinary clinic
- Petroleum operations facility
- Precision measurement laboratory
- Defense courier station
- Various electrical power substation utilities
- Tactical air navigation station
- Instrument landing system glide slope
- Recreation facilities
- Drug demand reduction facility
- Supply warehouses and equipment depots
- Hazardous waste storage facility

Facilities that can be repaired include:

- Bennie L. Davis Maintenance Facility
- E-6 ground equipment facility
- E-4B hangar
- 97th Intelligence Squadron facilities
- Recycling center
- Boundary fence
- Hydrant fueling facilities and utilities
- Munitions storage
- Vehicle fueling station
- Softball pavilion and storage

An F-35 is towed from a hangar at the Ogden Air Logistics Complex at Hill AFB, Utah. GAO says none of USAF's depots are rated "failing," but the average condition is "poor."

Photo: Alex Lloyd/USAF

GAO Finds Poor Conditions, Delayed Timelines at Depots

By Brian W. Everstine

Three Air Force depots are plagued with expired equipment and have shown steadily decreasing on-time performance, prompting two of them to be listed in overall "poor" condition, the Government Accountability Office states in a new report.

The GAO evaluated all of the military service depots, including the Air Force's Ogden Air Logistics Complex, Utah; Oklahoma City Air Logistics Complex, Okla.; and the Warner Robins Air Logistics Complex, Ga. The ratings largely focused on the age of equipment and overall health of the facilities.

Ogden, which performs depot maintenance on key fighter aircraft at a time when the service is working to increase readiness of these fleets, received the worst overall rating in the report. While no military depot was rated as "failing," the average condition of the depots is "poor."

The Air Force has said parts shortages at depots are a key reason for a drop in fighter readiness, but the GAO report also identifies the health of the depots themselves as an issue that needs to be addressed.

At Ogden, schedule performance has generally decreased over the past 11 years—down 20 percent from 2007 to 2017. While there was only data from fiscal 2018 to show the status of the complex's facilities, in general it was rated to be "poor" and average equipment exceeded its service life by 12 years, the report states. In addition, repair requests have increased since 2009. As of 2017, Ogden had a backlog of about $259 million in restoration and modernization projects.

At Oklahoma City, schedule performance has remained stable, though the 2018 data of the facilities show them to be in a "poor" state. The complex's equipment exceeds its useful life by an average of nine years, the report states. As of 2017, there was about $104 million in backlogged restoration projects.

The schedule performance at Warner Robins has decreased 30 percent over the past 11 years. The 2018 data of the facilities show them to be in a "fair" state, though equipment is exceeding its useful life by 13 years, the report states. As of 2017, there was a backlog of about $190 million in restoration and modernization projects.

While the Air Force, along with the other services, have begun to develop plans to improve the depots, the GAO states these plans lack analytically based goals, results-oriented metrics, identification of required resources, and adequate reporting on progress. The GAO recommended the Air Force address these shortfalls, and the Pentagon agreed to those recommendations. However, the Defense Department said it needs to wait until these plans are completed before it can develop an approach to manage and program future investments. ✪

Nominations Announced

President Donald J. Trump has nominated USAF **Maj. Gen. Eric T. Fick** for a third star and appointment as director of the F-35 Joint Strike Fighter Program. Fick currently serves as the office's deputy director, and if confirmed he will replace Vice Adm. Mat Winter, who led the JPO since May 2017.

Trump also nominated Air Force Special Operations Command boss **Lt. Gen. Marshall B. "Brad" Webb** to be commander of Air Education and Training Command. If confirmed, he will take over for **Lt. Gen. Steven L. Kwast**, who has led the command since November 2017. The Air Force has not announced Kwast's next position.

The Senate has confirmed **Lt. Gen. James C. Slife** to replace Webb at AFSOC. Slife previously served as the vice commander of US Special Operations Command.

Maj. Gen. David S. Nahom has been nominated for his third star and to be deputy chief of staff for strategic plans and programs. He is currently the director of programs for the deputy chief of staff of plans and programs. If confirmed, he will replace **Lt. Gen. Jerry D. Harris Jr**. The Air Force has not announced Harris's next position.

Lt. Gen. (sel.) Marc H. Sasseville was tapped for a third star and assignment as commander of US North American Aerospace Defense Command Region and 1st Air Force (Air Forces Northern). Sasseville currently serves as deputy director of the Air National Guard. ✪

The Strategic Implications of Hypersonic Weapons

By Rachel S. Cohen

As the Pentagon moves ahead in its pursuit of hypersonic weapons, the defense community has mixed opinions on whether the new missiles should be considered as strategic assets—because simply owning them should dissuade adversaries from using their own.

Adding hypersonic weapons to the inventory could affect the broader strategic deterrent as the nuclear triad is modernized in the coming decades.

USAF Gen. Paul J. Selva, Vice Chairman of the Joint Chiefs of Staff, said hypersonic weapons would be incredibly versatile in both conventional and nuclear conflicts.

"The best layman's description I've heard of hypersonics as a strategic threat goes something like this: If you're going Mach 13 at the very northern edge of Hudson Bay, you have enough residual velocity to hit all 48 of the continental United States," Selva said April 25. "You can choose … to make a right or a left turn and hit Maine or Alaska, or you can hit San Diego or Key West. That's a monstrous problem."

On the other hand, Pentagon research chief Mike Griffin told reporters last July he views hypersonic missiles more as tactical weapons, not strategic.

Hypersonic weapons could fly one mile per second and take 15 minutes or less to reach a target, compared to about half an hour for a ballistic missile. But James M. Acton, co-director of the Carnegie Endowment for International Peace's Nuclear Policy Program, says a hypersonic missile would move slower when approaching its target than a ballistic missile at the same range.

The Air Force aims to develop hypersonic weapon prototypes in the next few years under rapid development and acquisition partnerships with the Defense Advanced Research Projects Agency, its sister services, and Lockheed Martin. Some have speculated that development should run parallel to the Pentagon's broader nuclear modernization effort.

"Don't presume that what you modernize in this next five to seven, eight, 10 years stays the same for the rest of its deployed life," former 20th Air Force commander retired Maj. Gen. Roger W. Burg, who now runs O'Malley Burg Consulting, said at an AFA Mitchell Institute breakfast. "Hypersonics are going to have to be part of the nuclear deterrent of the future."

Hypersonics' role in projecting strategic power depends on how the military defines how they will be deployed. Possible missions include preemptively disabling rogue states' nuclear infrastructure or attacking anti-satellite weapons before they could be used, Acton said.

"I'm not sure we've got a clear concept of operations," Acton said in a May 6 interview. "A lot of this is developing technology for the sake of technology and trying to work out what to do with it later. To the best of my knowledge, we've never articulated precisely what mission need hypersonics are supposed to fill."

Hypersonics could pose tactical conundrums as well, according to Selva, such as in a "launch under attack" scenario like those considered during the Cold War. The US has to consider what it means to add weapons that would go undetected by current missile-warning systems, he said.

"We see a thousand missiles coming our way, we got a thousand missiles pointed their way, it's the end of the world as we know it. … Some modicum of the nation survives, we live to fly and fight another day," he said. "Hypersonics really complicate that problem in some really difficult tactical and operational settings. We have to figure out how to adjust to those."

Acton disputes that fielding American hypersonics will directly offset Russian or Chinese hypersonics, and that the US shouldn't pursue the capability simply because its rivals are.

He argues a conventional hypersonic missile strike would be 100 or 1,000 times less powerful than a nuclear one and that such comparisons of hypersonic and nuclear weapons are "totally misleading."

"Nevertheless, I would still class certain kinds of hypersonic weapons as strategic," he said. "In particular, we have a lot of military hardware deep in the US that we've never had to worry about being attacked with conventional weapons before. … If Russia or China had the ability to reach out over very long distances and threaten that kind of critical military infrastructure within the US, that's a pretty significant development."

Yet, while he said very long-range hypersonic missiles could be considered strategic, he added, putting a nuclear warhead on them wouldn't necessarily be a game-changer because the US is already vulnerable to a nuclear attack.

"I just don't see hypersonics displacing the kinds of things we would think about using nuclear weapons for," Acton said. "They're just completely different categories. … I don't think we can get rid of some nuclear weapons because we in some way substitute or replace them [with] hypersonics." ✪

Photo: A1C Pedro Tenorio

Undersecretary of the Air Force Matthew Donovan visits Sheppard AFB, Texas, in February.

Donovan to Become Acting SECAF June 1

Air Force Undersecretary Matthew P. Donovan will take over as Acting Secretary June 1 after Secretary Heather Wilson steps down, the Pentagon announced May 15. The announcement makes official—what has been expected—since Wilson announced her intent to become the next president of the University of Texas-El Paso.

Donovan took over as undersecretary of the Air Force in August 2017. He was previously the major policy director for the Senate Armed Services Committee, and he is a former command pilot with more than 2,900 flight hours in the F-5E and F-15C.

Undecided: How Many B-21s?

By John A. Tirpak

The head of Air Force Global Strike Command says it's too soon to decide how many B-21 Raiders to build.

Gen. Timothy M. Ray said AFGSC developed its Bomber Vector before the new National Defense Strategy was written, and development of the B-21 is still too premature to commit to a specific number.

"My job … is to keep as many options on the table as long as I possibly can," Ray said. The B-21 will not transition from development to production of the initial test aircraft until 2024. Committing to a number before that point would be "gambling," Ray said.

Still, Ray acknowledged buying more planes faster will ultimately be less costly than buying more slowly.

To build out the fleet faster is cheaper," he said. "But like anything, you pay more up-front" to get high-capacity production.

The Bomber Vector said the B-2 and B-1 would start phasing out around 2031, because the bulk of the B-21 fleet would be delivered by then. A fleet of 100 bombers delivered over seven years translates to production of fewer than 14 per year, since at least some early test versions are expected to be converted for operational use.

Ray said the Air Force learned from the B-2 and F-22 programs, where it invested in mass production capability only to buy fewer aircraft than expected, leaving high unit costs.

In addition to the National Defense Strategy, the Bomber Vector also predated a number of studies that concluded the service will need more bombers. Those include The Air Force We Need analysis released last fall and studies by the Center for Strategic and Budgetary Assessments, Mitre Corp., and AFA's Mitchell Institute for Aerospace Studies. "Every indication is that the bomber force needs to grow," Ray said.

Staff illustration by Mike Tsukamoto

An artist's concept of a B-21 Raider.

"Every indication is that the Air Force will be at the forefront of any conflict of any dimension, Ray said.

The bomber force is "under-invested" in hypersonics, counterspace, and counter-maritime capabilities, and Ray said he needs to "close some of these gaps."

The Air Force has said it needs "at least" 100 B-21s, but Ray said, "I shouldn't come to Congress, or the Secretary, or the American people and say the answer to this is to simply print me 250 B-21s. We need a minimum of 100, but the decision to make that move is in the outyears."

B-21 flight testing will get underway in 2021, Ray said, and USAF anticipates receiving a number of jets as a test fleet in that period.

"I'm confident [cost] numbers are going to be very favorable, because cost is a KPP [key performance parameter]," Ray said, adding that the critical design review was favorable for the B-21.

A CH-3 Jolly Green Giant flies over Vietnam.

Photo: USAF

Push to Upgrade Vet's Air Force Cross to Medal of Honor

By Brian W. Everstine

The heroic actions of a USAF special operations helicopter pilot who saved multiple Americans during a secret 1969 mission in Laos are getting a fresh look as a Congressman urges the Pentagon to upgrade an Air Force Cross to the Medal of Honor.

Retired Col. Philip J. Conran, then a pilot with the 21st Special Operations Squadron based in Thailand, received the Air Force Cross for a mission on Oct. 6, 1969. During a helicopter mission into Laos, the lead helicopter was shot down and a rescue helicopter, designated H-1, refused a request to reach the downed crew, saying it was too risky.

Photo: USAF

Col. Philip Conran

Conran, then a major, was ferrying troops in his CH-3 Jolly Green Giant and faced two choices: "Depart the area leaving his downed comrades or attempt a rescue and reinforce the friendly troops already on the ground," the Air Force Cross citation states.

Conran tried to rescue the crew, "since he felt his comrades would not survive the overwhelming enemy forces." As the Jolly Green Giant began its approach, the helicopter's servos were destroyed, but he made the landing, letting off the troops he was carrying and picking up the four Americans from the downed helicopter. Attempting to take off, enemy fire destroyed the helicopter's transmission, making flight impossible.

The team fled the helicopter, and Conran took command, exposing himself to enemy fire to set up a perimeter. He ran back to the CH-3 to pick up packaged parachutes to use as cover, and then ran 50 yards through enemy fire to get two M60 machine guns and ammunition from the downed helicopter. As the day went on, Conran called in air strikes, using a pocket compass to help direct the fires. Eventually he received a severe leg wound, but he remained a "source of energy" to the rest of his team. As night fell, the area "was completely sanitized with gas," and two HH-53 helicopters were able to land to rescue the downed crews.

Even though he was severely wounded, Conran got down on his hands and knees so another man could use his back as a stepping stone to get onto the aircraft.

"Major Conran's decision to come to the aid of his downed comrades, his heroic actions above and beyond the call of duty while under severe hostile fire, and his outstanding leadership throughout the many hours were instrumental in enabling them to withstand the superior enemy force," the citation states.

Rep. Salud Carbajal (D-Calif.) introduced a bill in April to authorize the president to award Conran the Medal of Honor.

"Conran served our nation with the utmost bravery during the Vietnam War when he risked his own life in combat to save his fellow soldiers," Carbajal said in a statement. "It has taken far too long for our country to honor his courage, and I will continue working to help secure this well-deserved recognition."

Carbajal also provided two eyewitness accounts from others on the mission to the Air Force Decorations Board to bolster the case for an upgrade.

In one of the statements, a gunner from the helicopter that was shot down said he owes his life to Conran. "Before he joined us on the ground, I didn't think we would survive the day," he said. The reinforcements from Conran's helicopter and his leadership helped them "withstand the onslaught" of enemy fighters, and Conran's decision to get on his hands and knees to help another soldier was a particularly "heroic act" "that still impresses me," said the gunner.

In the other statement, the mission commander of the helicopter that was shot down wrote that Conran deserves the Medal of Honor because he was willing to sacrifice his own life for his downed comrades. "I know I lived to see another day because Conran risked his life to save me and my crew," he said.

The aircraft commander wrote that at the time, politics prevented Conran from the recognition he deserved because the US did not admit publicly that US forces were operating there.

"We were in a place we should not have been, doing what our country asked us to do, yet we were treated different from those in open combat when it came to recognizing our accomplishments," he wrote. "In war, some secret missions can't be discussed until enough time has passed so as not to embarrass the nation. In this case, there is no excuse not to bestow this honor on a deserving warrior."

The military has in recent years upgraded several valor awards to the Medal of Honor, including to members serving in Laos. In 2010, former President Barack Obama awarded the Medal of Honor posthumously to CMSgt. Richard Etchberger, who originally received the Air Force Cross. Like Conran, Etchberger was deployed to Laos, where he was killed during the Battle of Lima Site 85.

Last year, MSgt. John Chapman's Air Force Cross was upgraded to the Medal of Honor, and a Navy Cross awarded to Marine Corps Sgt. Maj. John Canley was also upgraded to the Medal of Honor.

There is also precedent for Congress passing a law to upgrade an award. In 1999, then-Rep. John Boehner (R-Ohio) introduced a measure to upgrade the Air Force Cross awarded to A1C William Pitsenbarger to the Medal of Honor. The measure was approved as part of the next year's Defense Authorization Act, and the award was presented to Pitsenbarger's family in 2000. ✪

Photo: SrA. Rachel Yates

TSgt. Cam Kelsch receives a Silver Star Medal from Maj. Gen. Vincent Becklund during a ceremony at the Mighty Eighth Air Force Museum in Georgia April 9.

Two Valor Awards for TACP

By Brian W. Everstine

An Air Force tactical air control party airman received both the Silver Star and Bronze Star medals—both with Valor—for two separate missions during a single deployment to Afghanistan last year.

TSgt. Cam Kelsch, assigned to the 17th Special Tactics Squadron at Fort Benning, Ga., was deployed with the Army's 75th Ranger Regiment on April 25, 2018, when his team was tasked with tracking down a high-value target during a night raid in Afghanistan.

When the unit came under attack, Kelsch exposed himself to the fire and called in strikes from an AC-130 circling above, which used its 40 mm cannon to attack targets within 40 meters of the team's location.

"There's one thing that Cam had that day that we can't teach, instruct, or measure," said Maj. Gen. Vincent K. Becklund, deputy commander of Air Force Special Operations Command, during a ceremony at the National Museum of the Mighty Eighth Air Force in Pooler, Ga. "The reason we're here today is because Cam distinguished himself on the battlefield that night through his courage, his selflessness, and his devotion to his teammates."

Wounded as he dragged a fellow US service member to safety, saving his life, Kelsch continued to call in strikes on more targets about 70 meters away, according to the citation.

He then called on an unidentified ISR aircraft to coordinate simultaneous 500-pound bombs from an F-16 and 105 mm cannon blasts from the AC-130 to take out a final enemy location.

Kelsch also received the Bronze Star with Valor for an undated mission during which he placed himself between an enemy location and his team's wounded ground force commander.

With enemy in "immediate proximity," Kelsch eliminated that threat and helped his ground commander recover, according to the citation. ✪

F-35A Makes Combat Debut

By John A. Tirpak

The Air Force's F-35A Lightning II made its combat debut on April 30, releasing a Joint Direct Attack Munition against an ISIS tunnel network and weapons depot in Wadi Ashai, Iraq.

The target was located in the Hamrin Mountains and was in a position to "threaten friendly forces," according to AFCENT.

This is the first Middle East deployment for the Air Force's F-35A, and while the operation apparently involved two F-35As, only one released a weapon. The strike fighters deployed to Al Dhafra AB, United Arab Emirates, from the 4th Fighter Squadron at Hill AFB, Utah, just two weeks prior. The jets previously deployed to Europe and Japan. The F-35A was declared operational at Hill in the summer of 2016.

Lt. Col. Yosef Morris, 4th Fighter Squadron commander, said the F-35 is already making a significant contribution to USAF missions in the AOR.

"We have the ability to gather, fuse, and pass so much information, that we make every friendly aircraft more survivable and lethal," he said in a press release.

AFCENT released images of an F-35 being refueled above an undisclosed location on the day of the mission. The aircraft carried two AIM-9X air-to-air missiles on outboard stations, so if the jet in the image carried out the attack, it was not in "stealth mode," which would have contained all ordnance internally. No unit markings were visible in the images.

Morris, in the release, said the F-35 has "sensors everywhere, it has advanced radar, and it is gathering and fusing all this information from the battle space in real time." He said the jet can share that information with "other F-35s or even … fourth-generation aircraft in the same package that can also see the integrated picture."

A Marine Corps F-35B that was deployed to Afghanistan last September also released ordnance on a target. Previously, Israel had reported that an F-35A from its air force had released live ordnance against an enemy target. ✪

T-6 Crashes, Pilots Eject

By Brian W. Everstine

A T-6 training aircraft from Sheppard AFB, Texas, crashed May 1 in Oklahoma during a training flight. The pilot and co-pilot were able to safely eject.

Sheppard is the Air Force's largest training base and is the home to the 80th Flying Training Wing, which trains both Air Force and NATO pilots. The 89th and 459th Flying Training Squadrons fly T-6s.

The crash is the latest in a series of incidents involving the aging Texan II, including a Sept. 19 crash of a T-6 from JBSA-Randolph, Texas. The pilots in that incident also were able to eject and sustained minor injuries.

The fleet has been plagued by issues with its on-board oxygen system, leading to a stand-down in early 2018. The pause had a significant impact on the Air Force's ability to train pilots. The Air Force Physiological Episodes Action Team has recommended that USAF stand up new program offices to monitor and slash the number of hypoxia-like incidents in its trainer and fighter fleets, as it overhauls the On-Board Oxygen Generations Systems on the Texan IIs.

USAF is conducting an investigation to determine the cause of the most recent incident. ✪

Pilot Error Caused 2018 F-15C Crash

By Brian W. Everstine

An F-15C pilot's improper maneuvers during a June 2018 training flight near Kadena AB, Japan, caused the Eagle to enter into an uncontrollable spin and crash into the sea, according to a Pacific Air Forces accident investigation.

The pilot, who was assigned to the 44th Fighter Squadron at Kadena, sustained serious injuries after ejecting, and the aircraft was destroyed at a loss of $42.3 million.

While dogfighting with an F-22 from the 525th Fighter Squadron at JB Elmendorf-Richardson, Alaska, the pilot conducted a steep, sharp vertical maneuver and then experienced a significant nose drop, entering a dive, and turning right. This created a harsh G force change, snap roll, and started an inverted spin.

The pilot, whose name has not been released, attempted to eject, but initially failed because G forces had him pinned to the side of the cockpit. After a second attempt, the pilot was able to eject 15 seconds after losing control of the jet. The F-15 was at about 1,100 feet above sea level, well below its minimum ejection altitude of 6,000 feet.

Uncontrolled ejection altitudes are set based on the seat's capability and potential for the ejection to occur in extreme conditions. Because of the low altitude, and the fact the pilot ejected while in a spin, the pilot impacted the sea at a high speed and was injured.

The pilot's survival locator beacon failed and did not transmit his location. However, the F-22 was able to locate the crash site and transmit the location to Kadena's tower, and the pilot was rescued by a Japan Air Self-Defense Force UH-60J helicopter from Naha airport.

The PACAF investigation found the main cause of the crash was the pilot's improper application of forward stick with full right rudder, causing the negative G departure from controlled flight. Contributing factors included spatial disorientation, as well as a lack of emergency procedure training for negative G departures from controlled flight and a limited time to analyze the situation and recover.

Following the incident, Kadena's 18th Operations Group changed its training to give pilots more "decision time" in similar situations in the future. ✪

Photo: A1C Matthew Seefeldt

F-15Cs fly in formation over the East China Sea during a routine training exercise out of Kadena AB, Japan.

Photo: R. Nial Bradshaw/USAF

An F-35 takes off from Nellis AFB, Nev., in February.

F-35 Aggressors at Nellis

By Brian W. Everstine

The Air Force is bringing back the 65th Aggressor Squadron at Nellis AFB, Nev., and equipping it with F-35s to provide enhanced training for other fifth-generation aircraft. Nine non-combat capable F-35As from Eglin AFB, Fla., will move to Nellis once newly produced aircraft can backfill them, beginning in early 2022.

Two more F-35s will move from Edwards AFB, Calif., to Nellis to join the 24th Tactical Air Support Squadron, which now flies F-16s to conduct close air support training. The two new aircraft will allow for additional CAS training with F-35s.

The 65th Aggressor Squadron flew F-15s for nine years as mock adversaries for pilots in the US Air Force Weapons School and at exercises such as Red Flag, before it was inactivated in 2014 due to budget cuts. Since then, the 64th Aggressor Squadron has been the sole USAF provider of Red Air at Nellis, with the 18th Aggressor Squadron flying Red Air at Eielson AFB, Alaska. Draken International also has provided Red Air at the base since December 2015, and the Air Force is looking to significantly increase the amount of contractor-owned and operated aircraft that fly as aggressors. ✪

Fairchild to Receive KC-135s

The Air Force is restructuring its KC-135 fleet as it brings on more KC-46s, moving 12 of the legacy tankers from McConnell AFB, Kan., to Fairchild AFB, Wash.

The 92nd Air Refueling Wing at Fairchild will be the new home to the KC-135s beginning in fiscal 2020, a shift that will add 1,000 airmen and families to the base, according to a Fairchild release. The move will necessitate the reactivation of Fairchild's 97th Air Refueling Squadron—which was inactivated in 2004—and related maintenance unit.

McConnell will be the first main operating base for the KC-46. ✪

■ The War on Terrorism
Casualties:

As of May 15, 71 Americans had died in Operation Freedom's Sentinel in Afghanistan, and 79 Americans had died in Operation Inherent Resolve in Iraq, Syria, and other locations..

The total includes 145 troops and five Department of Defense civilians. Of these deaths, 69 were killed in action with the enemy while 81 died in noncombat incidents.

There have been 396 troops wounded in action during OFS and 81 troops in OIR.

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FACES OF THE FORCE

Courtesy photo

691st Intelligence, Surveillance, and Reconnaissance Group **TSgt. Matthew Staggs** (r) saved an Air Force spouse whose kidney made a transplant the difference between life and death. **Amy Lynn Samulenas** (l), the wife of 29th Intelligence Squadron **TSgt. Christopher Samulenas**, could not find a donor match until Staggs stepped up after learning about the situation from a public affairs newsletter. The transplant was performed in March.

Photo: SSgt. Laura Turner

SSgt. Christian Ramos, a Reserve airman with the 9th Combat Operations Squadron, was part of the team that helped shield the International Space Station and its astronauts from harm after an April Indian missile test took out a low-orbit satellite and launched debris toward the station. His civilian job as a coder with the NASA Johnson Space Flight Center helped him become the first and only enlisted airman to get his Reserve job.

Photo: University of St. Thomas

Air Force ROTC Detachment 410 **Cadet Savannah Johnson**, a junior mechanical engineering student at the University of St. Thomas, is being honored for her leadership, scholastic achievement, and more. In addition to being the inaugural cadet-category winner of the SECAF Leadership Award, she was chosen for a 2019 Air Force Association Outstanding Cadet of the Year Award and a Society of American Military Engineers Award of Merit.

Photo: MSgt. Amanda Currier

A JBSA-Lackland airman earned a Navy warfare device while deployed to Djibouti. On April 1, **SSgt. Brittany Eley (r)**, a Joint Network Control Center team lead attached to Combined Joint Task Force-Horn of Africa at Camp Lemonnier, was designated as a US Navy enlisted information warfare specialist. Eley is the first non-sailor to earn the distinction in the task force's history, though the program is open to all enlisted personnel assigned to the task force.

Photo: USAF

757th Airlift Squadron navigator **Lt. Col. Barry "J.R." Cupples** amassed 10,000 hours in a C-130H aircraft April 5. Cupples, a reservist who started his USAF career when he was still in high school, joined up as a loadmaster with dreams of becoming a pilot. But after learning that he couldn't get a waiver for his poor eyesight, he charted a new course and trained as a navigator, instead. "Anything's attainable if you work hard for it," he said of the milestone.

Photo: SSgt. Darby Arnold

A1C Gene Gunter of the 134th ARW Security Forces Squadron took second place in the Soldier of the Year category at the Tennessee Army National Guard's 2019 Best Warrior Competition. The contest, which tests participants physically and mentally, feeds a national competition. While Gunter didn't take the top prize, he was named runner-up in the Soldier of the Year category. Although airmen aren't allowed to move past the state level, Gunter said it was an honor to represent USAF and his wing.

Photo: USAFA

US Air Force Academy cadet **Kyle Haak** won the 2018-19 Senior CLASS Award for men's hockey. The awards, sponsored by Premiere Sports Management and deliberated by Division 1 coaches, the media, and fans, recognize the most stellar senior D-1 student-athletes in a variety of sports. "The Air Force coaching staff gave me a chance to play Division I hockey when no one else was willing to fully commit to a third-year, age-out, junior hockey player," the Falcons forward said.

Photo: SSgt. BreeAnn Sachs

When F-16 instructor pilot **Maj. David Abel (r)** graduated from Hill Air Force Base's 311st Fighter Squadron for a second time this April, he made history. "I'm the first B-Course graduate out of Holloman to come back as an instructor pilot and graduate out of the same unit," he explained. Abel, a former T-6 Texan II instructor pilot, first came to the 311th FS for his F-16 Basic Course. "It's not about me anymore," he said. "I get to help bring new pilots up and build on their experiences."

Photo: 2nd Lt. Anh Bui

A1C Josephino Cambosa (r) is the first non-prior service airman to complete the Cyber Warfare Operations Apprentice Course at Keesler AFB, Miss. Until this year, only cross-training airmen who had already completed their first enlistment were allowed to take the course and enter the cyber transport systems pipeline. "It is definitely more challenging than an average technical training I've been through," said Cambosa.

Photo: Maj. Darin Overstreet/CANG

Colorado ANG **MSgt. Gregory Elrod** retired from the Air Force in February, after over a quarter-century of service. He has been conditionally offered a spot in the US Foreign Service. The former security forces airman previously managed the Colorado National Guard's Air Active Guard and Reserve Program. He will pursue the management officer career track. "Part of the job is responding to challenging and unique situations. ... My military career has definitely prepared me for that," Elrod said.

Know of someone we should recognize? Send nominees to afmag@afa.org

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In Reserve

Lt. Gen. Richard W. Scobee has been head of Air Force Reserve Command since September 2018. In late April, Editorial Director John A. Tirpak sat down with him to discuss the effects on the command from the 2020 proposed budget, challenges facing the Reserve, and where it's headed in the coming years

Q. We didn't see a lot of growth in the Reserve in the budget request, ... only 100 people. Is more growth coming in the future?

A. Everything goes back to the National Defense Strategy. ... If the Air Force grows substantially—as the Secretary has said she would like it to—to 386 operational squadrons ... we will also grow ... commensurate with that.

Barring that, I'm not interested in growing. ... What I'm interested in doing is fixing what we have. Sequestration ... did significant damage to the Air Force Reserve. There's probably no component that is more susceptible to funding stream hiccups ... because of the way we do business with a part-time force. We pay people when they work. So when the budgets are uncertain, we can't pay people to work, and that's what damages us. So what I want to do, because of all that uncertainty, ... is fix the things we have, ... put in the right amount of maintainers, ... get end strength where it needs to be, ... recruit fantastic airmen, ...and retain that investment that we've made. ...

If we go back to sequestration levels of spending, the gains that I've made in the last three years will be wiped out. We will not survive it. We will go back to readiness the way it was after 2013, 2014. We have got to have stable budgets going forward.

The growth that you see is really me just fixing what we have ... because we're at the right size ... for what we need to do. We're in every mission set that the Air Force has. There used to be two places where we didn't have Reservists. Now there's none.

So how do I make sure we have the right force structure? My predecessors focused on growing in three areas: space, ISR [intelligence, surveillance, reconnaissance], and ... cyber. A while back we stood up our space wing; now we have an ISR and a cyber wing, which are doing fantastic. What I want to make sure of is, now that we've got all our structure in place, let's make sure that it's doing the job the Air Force needs done.

Q. Can you tell us more about the new wings?

A. In cyber and ISR, we bring unique capabilities that do two things. One, we capture talent when it leaves the component, and we want to make sure we retain that investment. And the other thing is, we can give people an ability to serve that they wouldn't get anywhere else. ... We can bring in some high-end cyber and intelligence specialists into the organization that may have other jobs that they don't necessarily want to leave. And that's the real value.

I thought when people got credentialed in cyber, that we would have an exodus of people, but actually, it's my highest retention area. ... We give people an ability to do things in the military that they can't do in the civilian sector. So it dovetails nicely. ...

Photo: Mike Tsukamoto/staff

Lt. Gen. Richard Scobee, head of AFRC, spoke to *Air Force Magazine* in late April.

In their civilian jobs [our people] ... focus on robust cyber networks. In the military they're able to do more than that.

A lot of people don't realize how robust and entrenched the Air Force Reserve is in everything the Air Force does. A perfect example is in space. The GPS constellation for the entire world, 48 percent of that is flown by Reservists on a day-to-day basis, but it's done with the Active component.

Q. How does the Reserve fit into the National Defense Strategy? How will things look different?

A. So, two things are going to change. One, our Air Force is actually going to start to get younger. We start bringing on the F-35 and we start retiring some of our old aircraft. We start incorporating the KC-46 and the B-21, some of these older airplanes will start to go away, so we'll start seeing a younger, more robust fleet. And two, we're going to be training folks to get ready for that high-end fight. But what is really going to change ... is going to be the focus on multi-domain operations. And it's going to be space effects, along with cyber effects, along with air effects, and then how we support our sister services ... regardless of whether Space Command ends up being a separate service.

We are postured to do that. We have between 1,600 and 1,800 people for agile combat support, we're well postured to support whatever Gen. [Jay] Raymond [commander of Air Force Space Command and nominee to lead US Space Command] needs as he goes forward with the space effort. So you're going to see a robust capability in space that is in the ARC, both the Guard and Reserve. And we've never seen that before. We used to look at the air domain in isolation. We can no longer do that.

Q. For many years now the Guard and Reserve have been very operational; a big part of the rotation force, part of everything the Air Force does day to day. Are you still a Strategic Reserve?

A. We are absolutely still that strategic depth. In my three main lines of effort in the Reserve Command to support the

Chief, the Secretary, and the National Defense Strategy, the first one is readiness and strategic depth. …

Surge capacity … is sacred to us, because … this is a best-value approach. We need surge capability because our budgets will no longer sustain the Air Force we need in order to protect America. The only way we can do it is having a … robust Reserve that can surge to the need. …

And that saves us money. For example, it costs … $10.9 million to train one F-22 pilot to be combat ready. … If I can keep her for 10 years in the Active component, great, but if I can keep her 28 years in the Reserve, that's even better. There are 850,000 people in the Air Force Reserve right now. … We have the Individual Ready Reserve; that is, folks who are not participating on a regular basis, but we keep track of them, and we can recall them when necessary.

For everybody else, different than the rest of the Department of Defense, our Reserve is always ready. On 72-hour notice in most cases—some are less than that—we can mobilize and get people out the door for that first tranche that has to go out.

We have 70,000 of those people, about to be 70,100.

Q. Are you affected by former Secretary Jim Mattis' directive to get systems to 80 percent mission capable rates?

A. Yes. We are over 80 percent MC rate with our F-16s. And that is great. What we struggle with, in MC rates, is making sure we have trained and ready maintenance personnel to take care of our equipment. The supply train and logistics are in place to take care of some of these aging platforms. …

The two things that have made me successful: Congress has given me a lot of ability to directly hire maintainers, which is alleviating a lot of my stress, … and they've actually required me to bring in additional full-time support.

Q. How are you doing with other platforms?

A. We're doing pretty well. Tankers—the KC-135s—are my most-stressed asset. … Gen. [Maryanne] Miller, the [Air Mobility Command] commander, is really focused on us taking care of that fleet.

The tanker fleet readiness has increased dramatically, and we'll make General Mattis' goal of MC 80 percent … in our tanker fleet as well. This month was our highest month, at 74 percent, and what I'm trying to do is keep that going in the right direction. …

Last year I was able to reprogram $90 million and put that directly on readiness.

The C-17 … is doing great. We have a few dozen B-52s, and [their mission capable rates] are coming up. We're in associations across the board with Global Strike, we also have a B-1 unit, but it is a pure association, I don't own any [B-1s], … although we fly them, … and A-10s. We also have a lot of C-130s, and we have a plan to upgrade the C-130s that we have. We also have a plan with the Air Force on how we're going to replace some of those older C-130H with J models.

Q. When are you getting F-35s?

A. My first ones will be in Op 7, which will be in Fort Worth, Texas; Carswell [Field] … in the 2022-2023 time frame.

Q. Will you have missions that only belong to the Reserve?

A. Yes. … One is aerial spray, which we do out at Youngstown [Ohio]. Which is a unique capability for combat, as well as domestic, operations.

It's a little unusual to have something that is only in the Reserve command because that doesn't play to all of our strengths, but in this one mission it does because of the amount of training it takes to fly low and spray. … You need continuity in that mission. … If you look at the aftermath of the hurricanes we had, like in Houston, being able to spray for mosquitoes and keep those infestations at bay is such a great capability for the American people. We have to maintain that. And the other is our hurricane hunters. … It is so important to have that capability to help predict what is going to happen with hurricanes. Over the last 20 years … the modeling has become so much better, and it's tied to what our hurricane hunters do.

Q. What do you struggle with?

A. My struggle is in the retention piece. We're really good at accessing people into the Air Force Reserve, and I'm accessing at the levels that I want, and I don't want to be any better at bringing new people off the street because of the best-value approach. We're at the right balance.

What I've got to do is focus on retention.

Q. Why is retention a problem? Do you know why people are not staying?

A. I know why. The reason is, our economy is so robust, … [it's] giving people so many alternatives.

These are high-skill folks; both our noncommissioned and our commissioned officers. They're very high-end, well-trained, and disciplined people, which every company is looking for. …

Service to your country is hard. And nobody will be compensated in the military better than they can get compensated in the civilian world. Our budgets won't support it. So what we have to do is create an organization such that people are willing to serve their country in some capacity.

… What we haven't been able to do is have all our policies and procedures in place that make it easy for our airmen to serve. So that's why we're going to focus on support to our airmen and their families. If I give them a place where they're valued for the contributions they bring, they'll keep showing up.

Q. What's making it hard? Long deployments? Unpredictability?

A. It is all of the above. Because of the operational Reserve, our reliance on the Reserve has been greater. People need a deployment rotation that is workable within the scope of their civilian job, … and they need stability. So we have to give them a long look at what that deployment outlook is going to be for them so they can prepare for it. If we spring deployments on a Reservist, … that makes it difficult to serve. So, compensation is part of the problem, and continuity is the other part of the problem.

We're trying to create deployments that do that, and the Air Force has been helping us out with that. Those are the reasons I'm struggling with end strength.

Q. Do you have any parting thoughts?

A. We have been successful on the backs of our airmen, They have shouldered the burden too long. What I need to do is give them the ability to get their job done with the least amount of friction as possible, so they can do their priorities. And their priority has to be taking care of their families. I've got to be a part of that solution. So even though I can't pay everybody as well as they could be [paid] in the outside world, they still want to show up because they want to serve their country. Service to your country is hard, and we need good people to do it. ✪

USAF ALMANAC 2019

This comprehensive look at the Air Force draws data and insights from a range of sources principally compiled by Amanda Miller and Arie Church with the assistance of Air Force Magazine *staff and invaluable help from the Secretary of the Air Force Office of Public Affairs, USAF Major Commands, and the Reserve Components. The photo illustration on this page and the cover was created by Eric Lee, who combined an eagle photo by Felix Broennimann with 324 photos from past issues of* Air Force Magazine.

STRUCTURE OF THE AIR FORCE

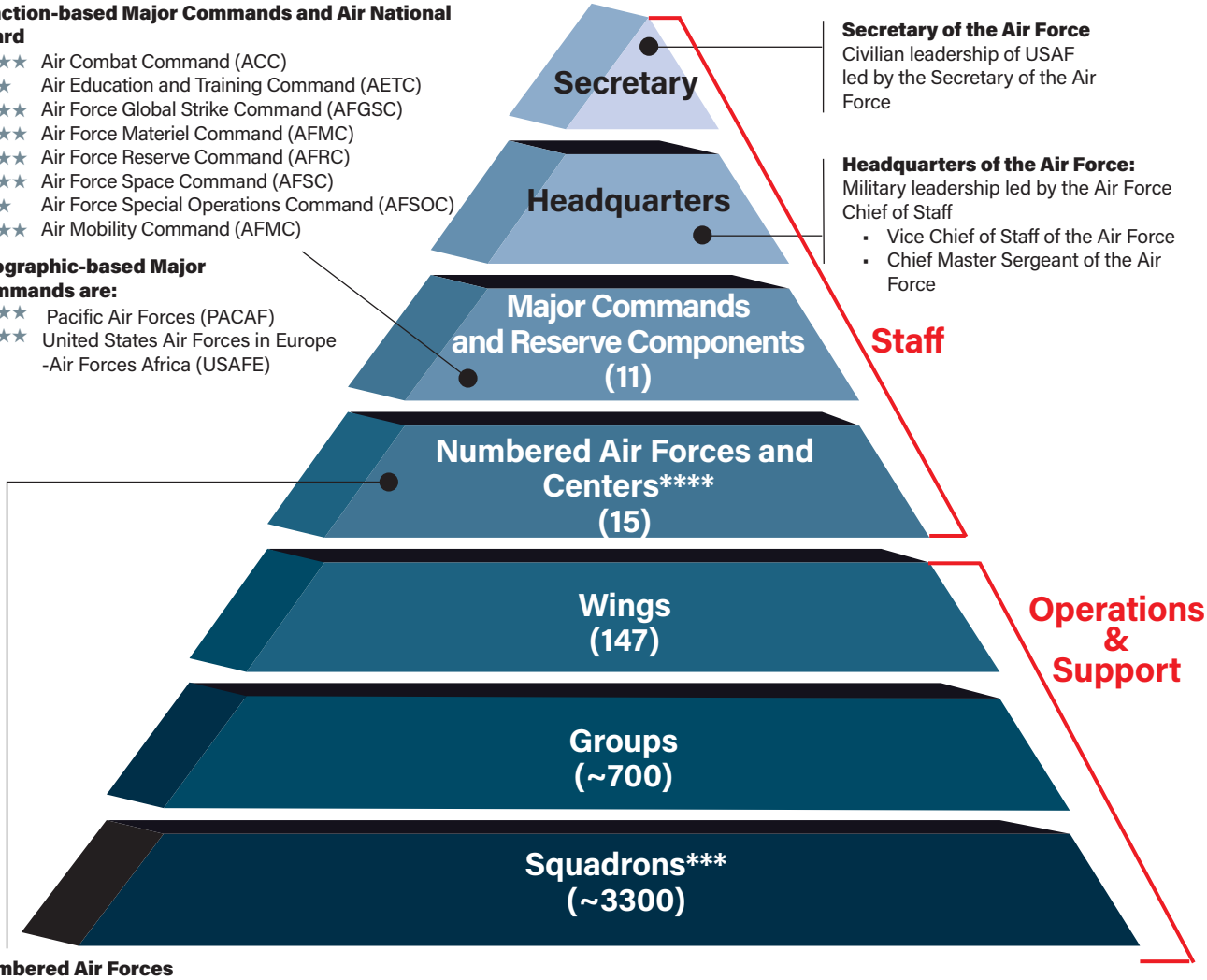
The Air Force is headed by a civilian Secretary and military Chief of Staff, who together are responsible for manning, training, and equipping the forces the service provides to Joint Combatant Commands around the globe. The Air Force itself can be seen as a pyramid, whose foundational units are squadrons—more than 3,000 of them, in all—which come in a variety of sizes. Squadrons wrap up into groups, and groups into wings. Wings, in turn, wrap up into numbered air forces (NAFs), which comprise the operational elements of the service's major commands. The number of stars indicate the general in command:

Function-based Major Commands and Air National Guard

- ★★★★ Air Combat Command (ACC)
- ★★★ Air Education and Training Command (AETC)
- ★★★★ Air Force Global Strike Command (AFGSC)
- ★★★★ Air Force Materiel Command (AFMC)
- ★★★★ Air Force Reserve Command (AFRC)
- ★★★★ Air Force Space Command (AFSC)
- ★★★ Air Force Special Operations Command (AFSOC)
- ★★★★ Air Mobility Command (AFMC)

Geographic-based Major Commands are:

- ★★★★ Pacific Air Forces (PACAF)
- ★★★★ United States Air Forces in Europe -Air Forces Africa (USAFE)



Secretary of the Air Force
Civilian leadership of USAF led by the Secretary of the Air Force

Headquarters of the Air Force:
Military leadership led by the Air Force Chief of Staff

- Vice Chief of Staff of the Air Force
- Chief Master Sergeant of the Air Force

Numbered Air Forces

Numbered Air Forces (NAFs) are subordinate to major commands. Those that support Unified Combatant Commands are designated Component Numbered Air Forces (C-NAFs).

CNAFs

- ★★★ **1st Air Force/AFNORTH**—Supports US Northern Command to ensure air defense of continental United States
- ★★ **2nd Air Force**—Part of AETC, responsible for all USAF non-flying technical training
- ★★ **3rd Air Force**—Supports US European Command/US Africa Command
- ★★★ **7th Air Force/Air Forces Korea**—Supports US Forces Korea
- ★★ **8th Air Force/Air Forces Strategic**—Supports US Strategic Command and responsible for all USAF bombers
- ★★ **12th Air Force/AFSOUTH**—Air component of US Southern Command
- ★★ **14th Air Force**—Air Force Space Component to US Strategic Command
- ★★★ **US Air Forces Central/AFCENT***—Supports US Central Command

NAFs

- ★★★ **5th Air Force**—Supports PACAF
- ★★★ **9th Air Force**—Designed to be a deployable, operational-level Joint Task Force
- ★★ **10th Air Force**—Support Air Force Reserve units nationwide
- ★★★ **11th Air Force**—Provides forces to PACAF
- ★★ **18th Air Force**—Operational component of Air Mobility Command
- ★★★ **19th Air Force**—Trains aircrews for manned and unmanned aircraft; air battle managers; and weapons directors
- ★★ **20th Air Force**—Responsible for ICBMs and nuclear operations support for Air Force Global Strike Command
- ★★ **22nd Air Force**—Responsible for AFRC C-130 and WC-130 units operated by Air Mobility Command
- ★★ **24th Air Force/Air Forces Cyber****—Responsible for protecting Air Force networks and supporting warfighters around the world
- ★★ **25th Air Force****—Provides multisource intelligence, surveillance, and reconnaissance to support US global interests

* AFCENT is officially a "named air force."

** USAF announced in April plans to combine the 24th and 25th Air Forces in 2019.

*** 312 operational and ~ 3,000 support squadrons

**** For a list of NAF-equivalent centers, see AFMC listing in the majcom section.

USAF TOTAL FORCE

(As of Sept. 30, 2018)

	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19 Estimate	FY20
Air Force Active Duty										
Officers	65,487	64,932	64,806	62,349	61,004	60,961	61,597	62,640	62,918	63,664
Enlisted	263,542	263,964	261,976	250,104	246,322	252,762	256,983	258,978	282,182	265,136
Cadets	4,341	4,022	3,912	3,879	4,031	4,160	4,207	4,262	4,000	4,000
Total Air Force Active Duty	**333,370**	**332,918**	**330,694**	**316,332**	**311,357**	**317,883**	**322,787**	**325,880**	**329,100**	**332,800**
Civilian Personnel										
Direct Hire (excluding technicians)	145,407	142,047	141,496	129,120	129,985	131,965	140,116	135,879	140,414	143,125
Air National Guard Technicians	22,139	22,859	22,568	22,225	23,448	23,044	22,542	21,705	19,133	13,343
Air Force Reserve Command Technicians	9,397	10,366	9,277	10,429	8,501	8,384	7,872	7,648	10,154	8,938
Total Direct Hire	**176,943**	**175,272**	**173,341**	**161,774**	**161,934**	**163,393**	**170,530**	**165,232**	**169,701**	**165,406**
Indirect Hire	6,776	6,714	6,501	4,823	4,090	3,704	4,570	4.202	4,529	598
Total Civilian Personnel	**183,719**	**181,986**	**179,842**	**166,597**	**166,024**	**167,097**	**175,100**	**169,434**	**174,230**	**166,002**
Air National Guard										
Selected Reserve Officers	14,418	14,598	14,731	15,024	15,084	14,593	15,257	15,401	14,817	14,986
Selected Reserve Enlisted	91,267	90,791	90,977	91,356	90,644	90,907	90,413	92,068	92,283	92,714
Total ANG	**105,685**	**105,389**	**105,708**	**106,380**	**105,728**	**105,500**	**105,670**	**107,469**	**107,100**	**107,700**
Air Force Reserve Command										
Selected Reserve Officers	14,535	14,303	14,060	13,817	13,937	14,896	13,672	13,716	14,744	14,783
Selected Reserve Enlisted	56,786	57,125	56,853	55,967	54,557	54,304	55,126	54,987	55,256	55,317
Total AFRC Selected Reserve	**71,321**	**71,428**	**70,913**	**69,784**	**68,494**	**69,200**	**68,798**	**68,703**	**70,000**	**70,100**
Individual Ready Reserve Officers	11,692	11,222	11,222	11,222	7,302	7,492	7,492	6,593	6,601	6,691
IRR Enlisted	28,863	24,271	24,271	24,271	29,449	29,359	29,359	21,801	21,471	19,033
Total AFRC IRR	**40,555**	**35,493**	**35,493**	**35,493**	**36,751**	**36,851**	**36,851**	**28,394**	**28,072**	**25,824**
Total AFRC	**111,876**	**106,921**	**106,406**	**105,277**	**105,245**	**106,051**	**105,649**	**97,097**	**98,072**	**95,824**
Total Ready Reserve	**217,561**	**212,310**	**212,114**	**211,657**	**210,973**	**211,551**	**211,319**	**204,566**	**205,172**	**203,524**

ARMED FORCES MANPOWER TRENDS, END STRENGTH (IN THOUSANDS)

(As of Sept. 30, 2018)

	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19
Active Duty Military										
Air Force	334	333	333	331	316	311	317	323	326	330
Army	566	566	550	532	508	491	475	476	476	478
Marine Corps	202	201	198	196	188	184	182	185	186	186
Navy	328	325	318	324	326	328	327	324	330	339
Total	**1,430**	**1,425**	**1,399**	**1,383**	**1,338**	**1,314**	**1,301**	**1,308**	**1,317**	**1,333**
Guard and Reserve (selected reserve)										
Air National Guard	108	107	105	106	106	106	106	106	107	107
Air Force Reserve	70	71	71	71	70	68	69	69	69	69
Army National Guard	362	358	358	358	354	350	342	344	335	335
Army Reserve	205	205	201	198	195	199	198	199	189	189
Marine Corps Reserve	39	40	40	40	40	39	39	39	38	38
Naval Reserve	65	66	65	62	59	57	57	58	58	59
Total	**849**	**847**	**840**	**835**	**824**	**819**	**811**	**802**	**797**	**799**
Direct-hire Civilian (full-time equivalents)										
Air Force	167	177	175	173	162	162	166	166	N/A	172
Army	260	269	250	242	195	194	190	185	N/A	185
Navy/Marine Corps	195	201	201	197	182	186	191	192	N/A	203
Defense Agencies	120	125	133	127	185	183	191	190	N/A	193
Total	**742**	**772**	**759**	**739**	**724**	**725**	**738**	**733**	N/A	**753**

ARMED FORCES ACTIVE DUTY WOMEN

(As of Sept. 30, 2018)

Total Active Duty	**215,787**	**17.0%**
Officer	41,468	18.0%
Enlisted	174,319	16.2%
Air Force	**65,076**	**20.2**
Officer	13,296	21.1%
Enlisted	51,780	20.0%
Army	**70,713**	**15.0%**
Officer	16,139	17.5%
Enlisted	54,574	14.4%
Marine Corps	**15,999**	**8.6%**
Officer	1,656	7.8%
Enlisted	14,343	8.7%
Navy	**63,999**	**19.7%**
Officer	10,377	19.0%
Enlisted	53,622	19.8%

ACTIVE DUTY AIRMEN BY RANK

(As of Sept. 30, 2018)

Officers	**Men**	**Women**	**Total**
General	12	1	13
Lieutenant General	39	5	44
Major General	85	5	90
Brigadier General	133	16	149
Colonel	2,782	459	3,241
Lieutenant Colonel	8,200	1,564	9,764
Major	10,824	2,769	13,593
Captain	15,857	4,994	20,851
First Lieutenant	5,296	1,699	6,995
Second Lieutenant	6,116	1,784	7,900
Total	**49,344**	**13,296**	**62,640**
Enlisted			
Chief Master Sergeant	2,205	435	2,640
Senior Master Sergeant	4,015	1,060	5,075
Master Sergeant	20,157	5,231	25,388
Technical Sergeant	32,456	7,239	39,695
Staff Sergeant	50,410	11,262	61,672
Senior Airman	41,457	10,088	51,545
Airman First Class	42,755	12,512	55,267
Airman First Class	5,608	1,584	7,192
Airman Basic	8,135	2,369	10,504
Total	**207,198**	**51,780**	**258,978**
Academy Cadets	**3,110**	**1,152**	**4,262**
Total Personnel	**259,652**	**66,228**	**325,880**

NUMBER AND PERCENTAGE OF ACTIVE DUTY AIRMEN BY GENDER

(As of Sept. 30, 2018)

	1960	1970	1980	1990	2000	2010	2017	2018
Officers								
Male	126,014	125,136	89,156	86,714	57,204	53,838	48,676	49,344
Percentage	97.2%	96.4%	91.3%	86.7%	82.9%	81.3%	79.0%	78.8%
Female	3,675	4,667	8,493	13,331	11,819	12,363	12,921	13,296
Percentage	2.8%	3.6%	8.7%	13.3%	17.1%	18.7%	21.0%	21.2%
Total Officers	**129,689**	**129,803**	**97,649**	**100,045**	**69,023**	**66,201**	**61,597**	**62,640**
Enlisted								
Male	679,412	652,559	399,517	374,385	231,620	212,491	206,896	207.198
Percentage	99.2%	98.6%	86.8%	86.0%	80.8%	80.7%	80.5%	80.0%
Female	5,651	8,987	60,803	60,803	55,011	50,946	50,087	51,780
Percentage	0.8%	1.4%	13.2%	14.0%	19.2%	19.3%	19.5%	20.0%
Total Enlisted	**685,063**	**661,546**	**460,320**	**435,188**	**286,631**	**263,437**	**256,983**	**258,978**
Cadets								
Male	1,949	4,144	3,907	3,817	3,617	3,592	3,103	3,110
Percentage	100.0%	100.0%	88.6%	87.3%	84.6%	78.8%	73.8%	73.0%
Female	0	0	504	553	658	966	1,104	1,155
Percentage	0.0%	0.0%	11.4%	12.7%	15.4%	21.2%	26.2%	27.0%
Total Cadets	**1,949**	**4,144**	**4,411**	**4,370**	**4,275**	**4,558**	**4,207**	**4,262**

ACTIVE DUTY AIRMEN BY REGION

(As of Sept. 30, 2018)

REGIONS	1960	1970	1980	1990	2000	2010	2017	2018
US and its Territories	633,327	565,098	445,886	418,027	291,260	277,123	253,741	270,503
Europe	104,899	72,937	76,788	69,296	32,901	30,963	27,073	27,085
East Asia, Pacific	50,679	139,666	32,263	33,558	22,030	12,649	19,748	20,372
Africa, Mideast, S. Asia	11,160	608	674	376	8,972	891	14,417	450
Western Hemisphere	14,106	5,348	2,211	2,356	345	339	337	2,119
Other	581	7,692	147	11,620	146	12,231	7,471	1,138
Total	**814,752**	**791,349**	**557,969**	**535,233**	**355,654**	**334,196**	**322,787**	**321,667**

These are permanently assigned airmen. Those deployed for operations in Afghanistan, Syria, and Iraq are included in US (transients) and Other totals.

Photo: TSgt. Gregory Brook

Capt. Susan Jennie, a C-17 Globemaster III pilot, delivers humanitarian aid from Homestead ARB, Fla., to Cucuta, Colombia.

PERSONNEL STRENGTH BY COMMANDS

(As of April 1, 2019)

	MILITARY	CIVILIAN	TOTAL
Active Duty Major Commands			
Air Combat Command	80,349	N/A	N/A
Air Education and Training Command	56,303	14,536	70,839
Air Force Global Strike Command	28,151	4,096	32,247
Air Force Materiel Command	16,487	65,686	82,173
Air Force Space Command	9,870	6,826	16,696
Air Force Special Operations Command	14,949	1,771	16,720
Air Mobility Command	40,843	7,875	48,718
Pacific Air Forces	28,468	N/A	N/A
US Air Forces in Europe	22,571	N/A	N/A

Photo: MSgt. Jason Robertson

USAF Special Tactics airmen jump from an MC-130H Combat Talon II above Eglin AFB, Fla., in December 2018.

ACTIVE DUTY PERSONNEL STRENGTH

(As of Sept. 30, 2018)

YEAR	NUMBER	YEAR	NUMBER
1907	3	1963	869,431
1908	13	1964	856,798
1909	27	1965	824,662
1910	11	1966	887,353
1911	23	1967	897,494
1912	51	1968	904,850
1913	114	1969	862,353
1914	122	1970	791,349
1915	208	1971	755,300
1916	311	1972	725,838
1917	1,218	1973	691,182
1918	195,023	1974	643,970
1919	25,603	1975	612,751
1920	9,050	1976	585,416
1921	11,649	1977	570,695
1922	9,642	1978	569,712
1923	9,441	1979	559,455
1924	10,547	1980	557,969
1925	9,670	1981	570,302
1926	9,674	1982	582,845
1927	10,078	1983	592,044
1928	10,549	1984	597,125
1929	12,131	1985	601,515
1930	13,531	1986	608,199
1931	14,780	1987	607,035
1932	15,028	1988	576,446
1933	15,099	1989	570,880
1934	15,861	1990	535,233
1935	16,247	1991	510,432
1936	17,233	1992	470,315
1937	19,147	1993	444,351
1938	21,089	1994	426,327
1939	23,455	1995	400,409
1940	51,165	1996	389,001
1941	152,125	1997	377,385
1942	764,415	1998	367,470
1943	2,197,114	1999	360,590
1944	2,372,292	2000	355,654
1945	2,282,259	2001	353,571
1946	455,515	2002	368,251
1947	305,827	2003	375,062
1948	387,730	2004	376,616
1949	419,347	2005	353,696
1950	411,277	2006	348,953
1951	788,381	2007	333,495
1952	983,261	2008	327,379
1953	977,593	2009	333,408
1954	947,918	2010	334,196
1955	959,946	2011	333,370
1956	909,958	2012	332,918
1957	919,835	2013	330,694
1958	871,156	2014	316,332
1959	840,435	2015	311,357
1960	814,752	2016	317,883
1961	821,151	2017	322,787
1962	884,025	2018	329,880
		*2019	329,100

2019 number is an estimate.

MONTHLY MILITARY BASIC PAY

(Effective Jan. 1, 2019)

	YEARS OF SERVICE													
	< 2	2	3	4	6	8	10	12	14	16	18	20	22	24	26
Pay Grade															
COMMISSIONED OFFICERS															
O-10												$15,800	$15,800	$15,800	$15,800
O-9												15,079	15,296	15,610	15,800
O-8	10,669	11,019	11,251	11,315	11,605	12,088	12,201	12,660	12,792	13,187	13,760	14,287	14,639	14,369	14,639
O-7	8,865	9,277	9,468	9,619	9,893	10,165	10,478	10,790	11,104	12,088	12,919	12,919	12,919	12,919	12,986
O-6	6,723	7,386	7,871	7,871	7,901	8,239	8,284	8,284	8,754	9,587	10,075	10,563	10,841	11,123	11,668
O-5	5,604	6,314	6,750	6,833	7,106	7,268	7,627	7,891	8,231	8,751	8,999	9,244	9,521	9,521	9,521
O-4	4,835	5,597	5,971	6,054	6,401	6,773	7,236	7,596	7,847	7,991	8,074	8,074	8,074	8,074	8,074
O-3	4,252	4,819	5,201	5,672	5,944	6,242	6,434	6,751	6,917	6,917	6,917	6,917	6,917	6,917	6,917
O-2	3,674	4,184	4,818	4,981	5,084	5,084	5,084	5,084	5,084	5,084	5,084	5,084	5,084	5,084	5,084
O-1	3,188	3,319	4,012	4,012	4,012	4,012	4,012	4,012	4,012	4,012	4,012	4,012	4,102	4,012	4,012
O-3E				5,672	5,944	6,242	6,434	6,751	7,019	7,173	7,382	7,382	7,382	7,382	7,319
O-2E				4,981	5,084	5,246	5,519	5,730	5,887	5,887	5,887	5,887	5,887	5,887	5,887
O-1E				4,012	4,284	4,442	4,604	4,763	4,981	4,981	4,981	4,981	4,981	4,981	4,981
ENLISTED MEMBERS															
E-9[a]							5,308	5,429	5,580	5,758	5,939	6,227	6,471	6,727	7,119
E-8						4,346	4,538	4,657	4,799	4,954	5,232	5,374	5,614	5,747	6,076
E-7	3,021	3,297	3,423	3,590	3,721	3,945	4,072	4,296	4,483	4,610	4,745	4,798	4,974	5,069	5,429
E-6	2,613	2,875	3,002	3,125	3,254	3,543	3,656	3,875	3,941	3,990	4,047	4,047	4,047	4,047	4,047
E-5	2,393	2,555	2,678	2,804	3,002	3,207	3,376	3,397	3,397	3,397	3,397	3,397	3,397	3,397	3,397
E-4	2,195	2,307	2,432	2,555	2,664	2,664	2,664	2,664	2,664	2,664	2,664	2,664	2,664	2,664	2,664
E-3	1,981	2,106	2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234
E-2	1,884	1,884	1,884	1,884	1,884	1,884	1,884	1,884	1,884	1,884	1,884	1,884	1,884	1,884	1,884
E-1	1,681	1,681	1,681	1,681	1,681	1,681	1,681	1,681	1,681	1,681	1,681	1,681	1,681	1,681	1,681

Amounts have been rounded to the nearest dollar.
Basic pay for pay grades O-7 through O-10 is limited to $15,800.10.
Basic pay for grades O-6 and below is limited to $12,816.60.
Grades O-1E to O-3E are commissioned officers with more than four years of Active Duty service as an enlisted member.
[a]Basic pay for the Chief Master Sergeant of the Air Force is $8,578.50.

AVIATION INCENTIVE PAY

(Effective Jan. 1, 2019)

Monthly Rate	Years of Service as an Aviation Officer
$ 150	Two or fewer
250	More than two
700	More than six
1,000	More than 10
700	More than 22
450	More than 24

Monthly Rate	Years of Service as an Enlisted Flyer
$225	Four or fewer
350	More than four
500	More than eight
600	More than 14

Provided to qualified rated officers. Continuous pay ends following the 25th year of service.

Photo: Yasuo Osakabe/USAF

SrA. Eric Poole, 374th Civil Engineer Squadron firefighter, battles a simulated aircraft fire during training at Yokota AB, Japan.

HAZARDOUS DUTY PAY

(Effective Jan. 1, 2019)

Pay Grade	Monthly Rate
O-10	$150
O-9	150
O-8	150
O-7	150
O-6	250
O-5	250
O-4	250
O-3	175
O-2	150
O-1	150
E-9	$240
E-8	240
E-7	240
E-6	215
E-5	190
E-4	165
E-3	150
E-2	150
E-1	150

HOUSING ALLOWANCE

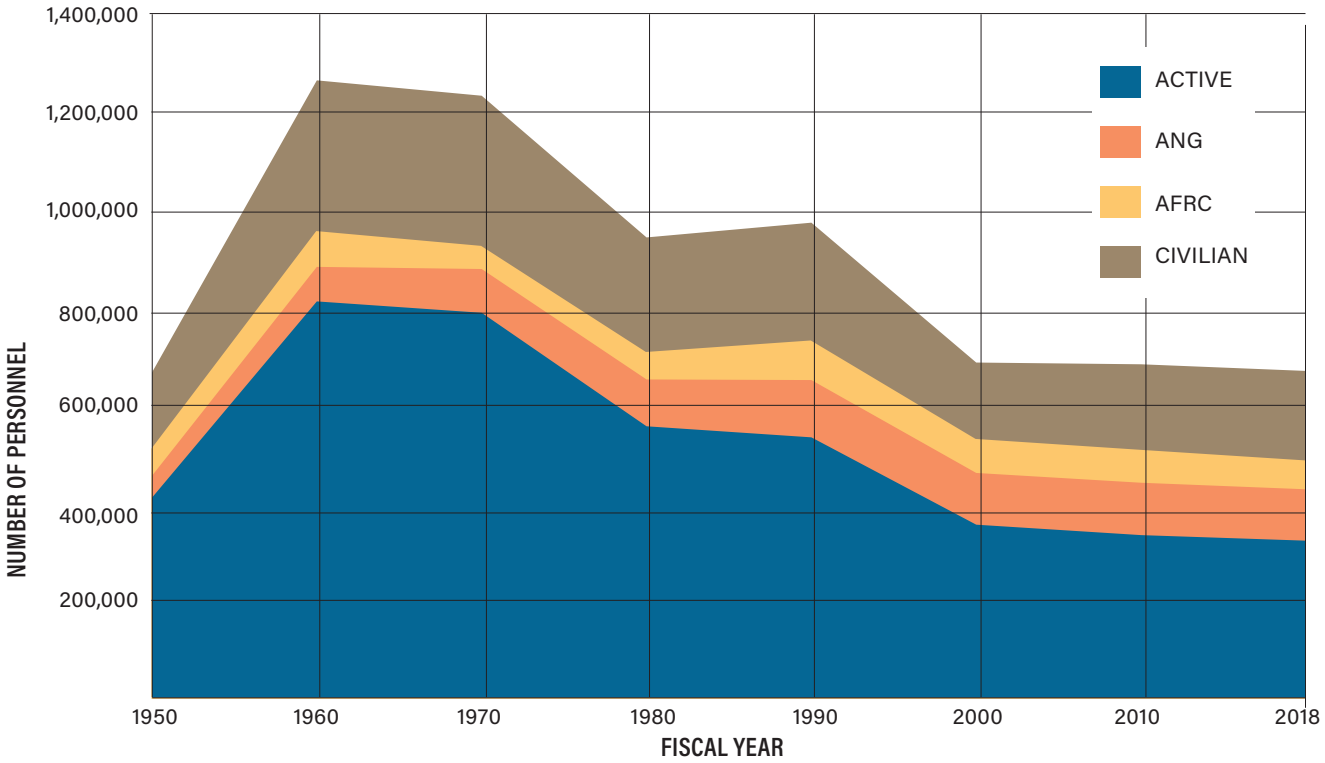
(Effective Jan. 1, 2019)

Pay Grade	Without Dependents	With Dependents
O-10	$1,708.80	$2,050.80
O-9	1,708.80	2,050.80
O-8	1,708.80	2,050.80
O-7	1,708.80	2,050.80
O-6	1,566.60	1,845.90
O-5	1,508.70	1,779.60
O-4	1,398.00	1,568.40
O-3	1,120.80	1,297.80
O-2	888.00	1,107.60
O-1	762.30	991.20
O-3E	1,209.60	1,395.00
O-2E	1,029.00	1,258.80
O-1E	894.90	1,163.40
E-9	$1,035.30	1,332.30
E-8	951.60	1,228.80
E-7	876.90	1,140.30
E-6	810.30	1,053.60
E-5	729.00	948.30
E-4	634.20	824.10
E-3	589.50	766.20
E-2	562.20	730.50
E-1	548.40	730.50

The Basic Allowance for Housing Reserve Component/Transit (BAH RC/T), given here, is a nonlocality housing allowance for members in particular circumstances, such as reservists on Active Duty for 30 or fewer days or an Active Duty member in transit from overseas.

TOTAL FORCE OVER TIME

(As of Sept. 30, 2018)



Source: Air Force Magazine's USAF Almanac; US Census Bureau; "Statistical Abstract of the United States", "Department of Defense Selected Manpower Statistics," various years.

ANNUAL PAY FOR FEDERAL CIVILIANS

(Effective Jan. 1, 2019)

GENERAL SCHEDULE										
Grade	**Step 1**	**Step 2**	**Step 3**	**Step 4**	**Step 5**	**Step 6**	**Step 7**	**Step 8**	**Step 9**	**Step 10**
GS-1	$18,785	$19,414	$20,039	$20,660	$21,285	$21,650	$22,267	$22,891	$22,915	$23,502
GS-2	21,121	21,624	22,323	22,915	23,175	23,857	24,539	25,221	25,903	26,585
GS-3	23,045	23,813	24,581	25,349	26,117	26,885	27,653	28,421	29,189	29,957
GS-4	25,871	26,733	27,595	28,457	29,319	30,181	31,043	31,905	32,767	33,629
GS-5	28,945	29,910	30,875	31,840	32,805	33,770	34,735	35,700	36,665	37,630
GS-6	32,264	33,339	34,414	35,489	36,564	37,639	38,714	39,789	40,864	41,939
GS-7	35,854	37,049	38,244	39,439	40,634	41,829	43,024	44,219	45,414	46,609
GS-8	39,707	41,031	42,355	43,679	45,003	46,327	47,651	48,975	50,299	51,623
GS-9	43,857	45,319	46,781	48,243	49,705	51,167	52,629	54,091	55,553	57,015
GS-10	48,297	49,970	51,517	53,127	54,737	56,347	57,957	59,567	61,177	62,787
GS-11	53,062	54,831	56,600	58,369	60,138	61,907	63,676	65,445	67,214	68,983
GS-12	63,600	65,720	67,840	69,960	72,080	74,200	76,320	78,440	80,560	82,680
GS-13	75,628	78,149	80,670	83,191	85,712	88,233	90,754	93,275	95,796	98,317
GS-14	89,370	92,349	95,328	98,307	101,286	104,265	107,244	110,223	113,202	116,181
GS-15	105,123	108,627	112,131	115,635	119,139	122,643	126,147	129,651	133,155	136,659

SENIOR EXECUTIVE SERVICE

(Effective Jan. 1, 2019)

SES Pay System Structure	Minimum	Maximum
Certified SES performance appraisal system	$126,148	$189,600
Noncertified SES performance appraisal system	$126,148	$174,500

The pay scale does not include locality pay.

SUBSISTENCE ALLOWANCE

(Effective Jan. 1, 2019)

Officers	Enlisted Members
$254/month	$369/month

RANK INSIGNIA OF THE ARMED FORCES

Officer

O-1	Second Lieutenant	O-6	Colonel
O-2	First Lieutenant	O-7	Brigadier General
O-3	Captain	O-8	Major General
O-4	Major	O-9	Lieutenant General
O-5	Lieutenant Colonel	O-10	General

Enlisted

E-1	Airman Basic No insignia	E-5	Staff Sergeant
E-2	Airman	E-6	Technical Sergeant
E-3	Airman First Class	E-7	Master Sergeant
E-4	Senior Airman	E-8	Senior Master Sergeant

E-9	Chief Master Sergeant
	First Sergeant The diamond device, shown here on chief master sergeant stripes, denotes an E-7 through E-9 who advises and assists a squadron commander in managing unit activities.
	Command Chief Master Sergeant The star device shown here denotes an E-9 who serves in a 9E000 position as a command's senior enlisted advisor.
	Chief Master Sergeant of the Air Force

Air Force

O-1	2nd Lieutenant	E-1	Airman Basic
O-2	1st Lieutenant	E-2	Airman
O-3	Captain	E-3	Airman First Class
O-4	Major	E-4	Senior Airman
O-5	Lieutenant Colonel	E-5	Staff Sergeant
O-6	Colonel	E-6	Technical Sergeant
O-7	Brigadier General	E-7	Master Sergeant
O-8	Major General	E-8	Senior Master Sergeant
O-9	Lieutenant General	E-9	Chief Master Sergeant
			First Sergeant
			Command Chief Master Sergeant
			Chief Master Sergeant of the Air Force
O-10	General		

Army

O-1	2nd Lieutenant	W-1	Warrant Officer 1	E-1	Private
O-2	1st Lieutenant	W-2	Warrant Officer 2	E-2	Private E-2
O-3	Captain	W-3	Warrant Officer 3	E-3	Private First Class
O-4	Major	W-4	Warrant Officer 4	E-4	Corporal / Specialist
O-5	Lieutenant Colonel	W-5	Warrant Officer 5	E-5	Sergeant
O-6	Colonel			E-6	Staff Sergeant
O-7	Brigadier General			E-7	Sergeant First Class
O-8	Major General			E-8	Master Sergeant / First Sergeant
O-9	Lieutenant General			E-9	Sergeant Major / Command Sergeant Major
O-10	General				Sergeant Major of the Army
	General of the Army (Reserved for wartime only)				

Navy and Coast Guard

O-1	Ensign	W-1	USN Warrant Officer 1	E-1	Seaman Recruit
O-2	Lieutenant Junior Grade	W-2	USN Chief Warrant Officer 2	E-2	Seaman Apprentice
O-3	Lieutenant	W-3	USN Chief Warrant Officer 3	E-3	Seaman
O-4	Lieutenant Commander	W-4	USN Chief Warrant Officer 4	E-4	Petty Officer Third Class
O-5	Commander	W-5	USN Chief Warrant Officer 5	E-5	Petty Officer Second Class
O-6	Captain			E-6	Petty Officer First Class
O-7	Rear Admiral Lower Half			E-7	Chief Petty Officer
O-8	Rear Admiral Upper Half			E-8	Senior Chief Petty Officer
O-9	Vice Admiral			E-9	Master Chief Petty Officer / Fleet/ Command Master Chief Petty Officer
O-10	Admiral				Master Chief Petty Officer of the Navy and Coast Guard
	Fleet Admiral (Reserved for wartime only)				

Marine Corps

O-1	2nd Lieutenant	W-1	Warrant Officer 1	E-1	Private
O-2	1st Lieutenant	W-2	Chief Warrant Officer 2	E-2	Private First Class
O-3	Captain	W-3	Chief Warrant Officer 3	E-3	Lance Corporal
O-4	Major	W-4	Chief Warrant Officer 4	E-4	Corporal
O-5	Lieutenant Colonel	W-5	Chief Warrant Officer 5	E-5	Sergeant
O-6	Colonel			E-6	Staff Sergeant
O-7	Brigadier General			E-7	Gunnery sergeant
O-8	Major General			E-8	Master Sergeant / First Sergeant
O-9	Lieutenant General			E-9	Master Gunnery Sergeant / Sergeant Major
O-10	General				Sergeant Major of the Marine Corps

AWARDS AND DECORATIONS

Shown in order of precedence.


Medal of Honor (AF)


Air Force Cross


Defense Distinguished Service Medal


Distinguished Service Medal (AF)


Silver Star


Defense Superior Service Medal


Legion of Merit


Distinguished Flying Cross


Airman's Medal


Bronze Star Medal


Purple Heart


Defense Meritorious Service Medal


Meritorious Service Medal (AF)


Air Medal


Aerial Achievement Medal


Joint Service Commendation Medal


Air Force Commendation Medal


Joint Service Achievement Medal


Air Force Achievement Medal


Air Force Combat Action Medal


Presidential Unit Citation (AF)


Joint Meritorious Unit Award


Gallant Unit Citation


Air Force Meritorious Unit Award


Air Force Outstanding Unit Award


Air Force Organizational Excellence Award


Prisoner of War Medal


Combat Readiness Medal


Air Force Good Conduct Medal


Good Conduct Medal


Air Reserve Forces Meritorious Service Medal


Outstanding Airman of the Year Ribbon


Air Force Recognition Ribbon


American Defense Service Medal


American Campaign Medal


Asiatic-Pacific Campaign Medal


European-African-Middle Eastern Campaign Medal


World War II Victory Medal


Army of Occupation Medal


Medal for Humane Action

National Defense Service Medal

Korean Service Medal

Antarctica Service Medal

Armed Forces Expeditionary Medal

Vietnam Service Medal

Southwest Asia Service Medal

Kosovo Campaign Medal

Afghanistan Campaign Medal

Iraq Campaign Medal

Inherent Resolve Campaign Medal

Global War on Terrorism Expeditionary Medal

Global War on Terrorism Service Medal

Korean Defense Service Medal

Armed Forces Service Medal

Humanitarian Service Medal

Military Outstanding Volunteer Service Medal

Air & Space Campaign Medal

Nuclear Deterrence Operations Service Medal

Air Force Overseas Ribbon-Short

Air Force Overseas Ribbon-Long

Air Force Expeditionary Service Ribbon

Air Force Longevity Service Award Ribbon

Air Force Special Duty Ribbon

USAF Basic Military Training Instructor Ribbon

Air Force Recruiter Ribbon

Armed Forces Reserve Medal

USAF NCO PME Graduate Ribbon

USAF Basic Military Training Honor Graduate Ribbon

Small Arms Expert Marksmanship Ribbon

Air Force Training Ribbon

Philippine Defense Ribbon

Philippine Liberation Ribbon

Philippine Independence Ribbon

Philippine Presidential Unit Citation

ROK Presidential Unit Citation

RVN Gallantry Cross with Palm

United Nations Service Medal

United Nations Medal

NATO Meritorious Service Medal

NATO Medal for Yugoslavia

NATO Medal for Kosovo

Article 5 NATO Medal-Eagle Assist

Article 5 NATO Medal-Active Endeavor

Non-Article 5 NATO Medal-Balkans

Non-Article 5 NATO Medal-ISAF

Republic of Vietnam Campaign Medal

Kuwait Liberation Medal, Kingdom of Saudi Arabia

Kuwait Liberation Medal, Government of Kuwait

Republic of Korea Korean War Service Medal

Devices

Bronze Star
For number of campaigns or operations, multiple qualifications, or an additional award of an authorized ribbon.

Silver Star
One silver star is worn in lieu of five bronze service stars.

Silver and Bronze Stars
When worn together on a single ribbon, silver stars are worn to wearer's right of a bronze star.

Bronze Oak Leaf Cluster
For second and subsequent awards.

Silver Oak Leaf Cluster
For sixth, 11th, etc., entitlements or in lieu of five bronze OLCs.

Silver and Bronze OLCs
Silver OLCs are worn to the wearer's right of the bronze OLCs on the same ribbon.

Valor Device
Denotes heroism above what is normally expected while engaged in direct combat with an enemy of the U.S., or an opposing foreign or armed force, with exposure to enemy hostilities and personal risk; not an additional award; only one per ribbon; worn to the wearer's right of OLCs on the same ribbon.

Arrowhead Device
Shows participation in assigned tactical combat parachute, glider, or amphibious assault landing; worn on campaign medals, Korean Service Medal, and Armed Forces and GWOT Expeditionary medals.

Combat Device
Denotes meritorious service or achievement performed under combat conditions.

Remote Device
Denotes hands-on employment of a weapons system, performed remotely without personal physical combat risk that had a direct and immediate effects on the outcome of an engagement or specific effects on a target.

Hourglass Device
Issued for the Armed Forces Reserve Medal in bronze for 10 years of service, silver for 20, and gold for 30.

Arctic Device
Worn on Air Force Overseas Ribbon-Short for service north of Arctic Circle; one per ribbon; worn to the wearer's right of OLCs.

Mobility Device
Worn with the Armed Forces Reserve Medal to denote Active Duty status for at least one day during a contingency; here with number of mobilizations.

Nuclear Device
Worn on the Nuclear Deterrence Operations Service Medal to indicate direct support.

Wintered Over Device
Worn on Antarctica Service Medal to denote staying on the Antarctic continent over the winter—bronze for one; gold, two; silver, three.

Plane Device
Worn on Army of Occupation Medal for 90 consecutive days in direct support of the Berlin Airlift, June 26, 1948, to Sept. 30, 1949.

USAF Specialty Berets

Airmen in seven USAF specialties are authorized to wear a colored beret along with the insignia of that particular field.

Combat Controller/ Special Tactics Officer

Pararescue/Combat Rescue Officer

Security Forces

Survival, Evasion, Resistance, and Escape

Tactical Air Command and Control
(Tactical Air Control Party crest)

Air Liaison Officer
(TACP flash and rank)

Weather Parachutist

SPENDING

Photo: Mike Killian/USAF

A KC-135R from Tinker AFB, Okla., on a refueling mission over Kansas.

Funding levels can be expressed in several ways. **Budget authority** is the value of new obligations the federal government is authorized to incur, including some obligations to be met in later years. Figures can also be expressed in **outlays** (actual expenditures, some of which are covered by amounts previously authorized).

Another difference concerns the value of money. When funding is in **current** or then-year dollars, it is not adjusted for inflation. This is the actual number of dollars that has been or is to be spent, budgeted, or forecast. When funding is expressed in **constant dollars,** or real dollars, the effect of inflation has been taken into account to make enable more direct historical comparisons between budget years possible. A specific year is chosen as a baseline for constant dollars.

Congress first authorizes payment, then appropriates it. **Authorization** establishes or continues a federal program or agency and sets forth guidelines to which it must adhere. **Appropriation** enables federal agencies to spend money for specific purposes.

Acronyms and Abbreviations

AEHF	Advanced Extremely High Frequency
AGS	Alliance Ground Surveillance
AMRAAM	Advanced Medium-Range Air-to-Air Missile
AWACS	Airborne Warning and Control System
BM	battle management
C3	command, control, and communications
DCGS	Distributed Common Ground System
DSRP	Defense Space Reconnaissance Program
EELV	Evolved Expendable Launch Vehicle
GPS	Global Positioning System
helo	helicopter
ICBM	intercontinental ballistic missile
ISR	intelligence, surveillance, and reconnaissance
JASSM	Joint Air-to-Surface Standoff Missile
JDAM	Joint Direct Attack Munition
JSTARS	Joint Surveillance Target Attack Radar System
MilSatCom	Military Satellite Communications
NAOC	National Airborne Operations Center
O&M	operation and maintenance
PAR	Presidential Aircraft Replacement
RDT&E	research, development, test, and evaluation
SATCOM	satellite communications
SBIRS	Space Based Infrared System
SDB	Small Diameter Bomb
Sigint	signals intelligence
SOF	Special operations forces
UAV	unmanned aerial vehicle

Budget Sources

Congressional Budget Office
cbo.gov
- Topics>>Budget

Defense Department Comptroller
comptroller.defense.gov
- Budget materials by fiscal year
- Links to budget pages for each service

Office of Management and Budget
whitehouse.gov/omb
- Budget
- Links to past budgets, including appendices and historical tables (via GPO)

AIR FORCE BUDGET—A 10-YEAR PERSPECTIVE

(Budget authority in millions of current FY20 dollars; excludes war funding)

CURRENT DOLLARS	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19 (requested)	FY20 (requested)
Military Personnel	$36,040	$36,624	$35,604	$35,888	$34,373	$34,803	$35,485	$36,495	$38,443	$40,325
O&M	59,357	57,602	52,072	55,992	55,131	55,786	58,784	61,142	60,629	65,026
Procurement	41,789	40,492	32.951	34,390	38,398	45,214	45,708	51,120	50,039	50,102
RDT&E	27,481	26,373	22,769	23,822	23,586	24,516	27.848	37,947	41,045	46,150
Military Construction	1,611	1,433	451	1,291	1,178	1,654	2,193	2,643	2,365	2,774
Family Housing	591	490	520	465	328	492	336	403	396	399
Revolving Funds	84	-46	-27	-597	106	521	-180	1,171	78	92
Trust, Receipts, and Other	-143	-175	-64	-142	69	196	-53	-328	-140	-140
Total	**$166,809**	**$162,793**	**$144,277**	**$151,108**	**$153,170**	**$163,183**	**$170,120**	**$190,593**	**$192,855**	**$204,728**

PERCENTAGE CHANGE	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19 (requested)	FY20 (requested)
Military Personnel	0.8%	-0.2%	-4.5%	-0.6%	-5.3%	-0.1%	0.0%	0.6%	2.8%	2.1%
O&M	2.9%	-4.3%	-12.3%	7.2%	-1.3%	2.5%	3.6%	1.2%	-3.7%	5.8%
Procurement	-1.7%	-4.6%	-19.8%	2.9%	10.1%	15.8%	-0.8%	9.6%	-4.0%	-1.8%
RDT&E	-3.5%	-5.6%	-14.9%	3.3%	-2.2%	2.4%	11.4%	33.4%	6.1%	10.4%
Military Construction	-50.4%	-12.3%	-69.0%	182.1%	-10.2%	37.8%	29.9%	18.2%	-12.3%	15.0%
Total	**-0.9%**	**-3.9%**	**-13.2%**	**3.7%**	**0.7%**	**6.0%**	**2.3%**	**9.4%**	**-1.2%**	**4.2%**

CONSTANT DOLLARS	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19 (requested)	FY20 (requested)
Military Personnel	$42,568	$42,492	$40,569	$40,341	$38,207	$38,171	$38,186	$38,417	$39,496	$40,325
O&M	66,909	64,003	56,146	60,191	59,438	60,895	63,066	63,837	61,449	65,026
Procurement	48,774	46,528	37.307	38,384	42,260	48,949	48,538	53,185	51,040	50,102
RDT&E	31,877	30,099	25,615	26,454	25,876	26,505	29,534	39,392	41,813	46,150
Military Construction	1,887	1,655	513	1,448	1,300	1,792	2,327	2,750	2,413	2,774
Family Housing	683	553	577	510	355	532	355	418	403	399
Revolving Funds	97	-54	-30	-661	116	563	-192	1,218	79	92
Trust, Receipts, and Other	-166	-199	-72	-158	75	212	-56	-341	-143	-140
Total	**$192,629**	**$185,076**	**$160,626**	**$166,511**	**$167,629**	**$177,619**	**$181,758**	**$198,878**	**$196,550**	**$204,728**

Numbers do not add due to rounding.

DOD BUDGET BY SERVICE COMPONENT

(INCLUDING NON-BLUE PASS-THROUGH SPENDING)

	2019 (Enacted)	2019 (% Enacted)	2020 (Requested)	2020 (% Requested)
Army	178,886	26.1%	191.397	26.6%
Navy	152,914	22.3%	159,698	22.2%
Marine Corps	43,152	6.3%	45,874	6.4%
Air Force Total	**192,920**		**207,757**	
Air Force	154,915	22.6%	165,648	23.1%
Non-Blue Air Force	38,005	5.5%	39,109	5.4%
Defense Agencies	117,553	17.2%	116,623	16.2%
Total	**685,425**	**100.0%**	**718,349**	**100.0%**

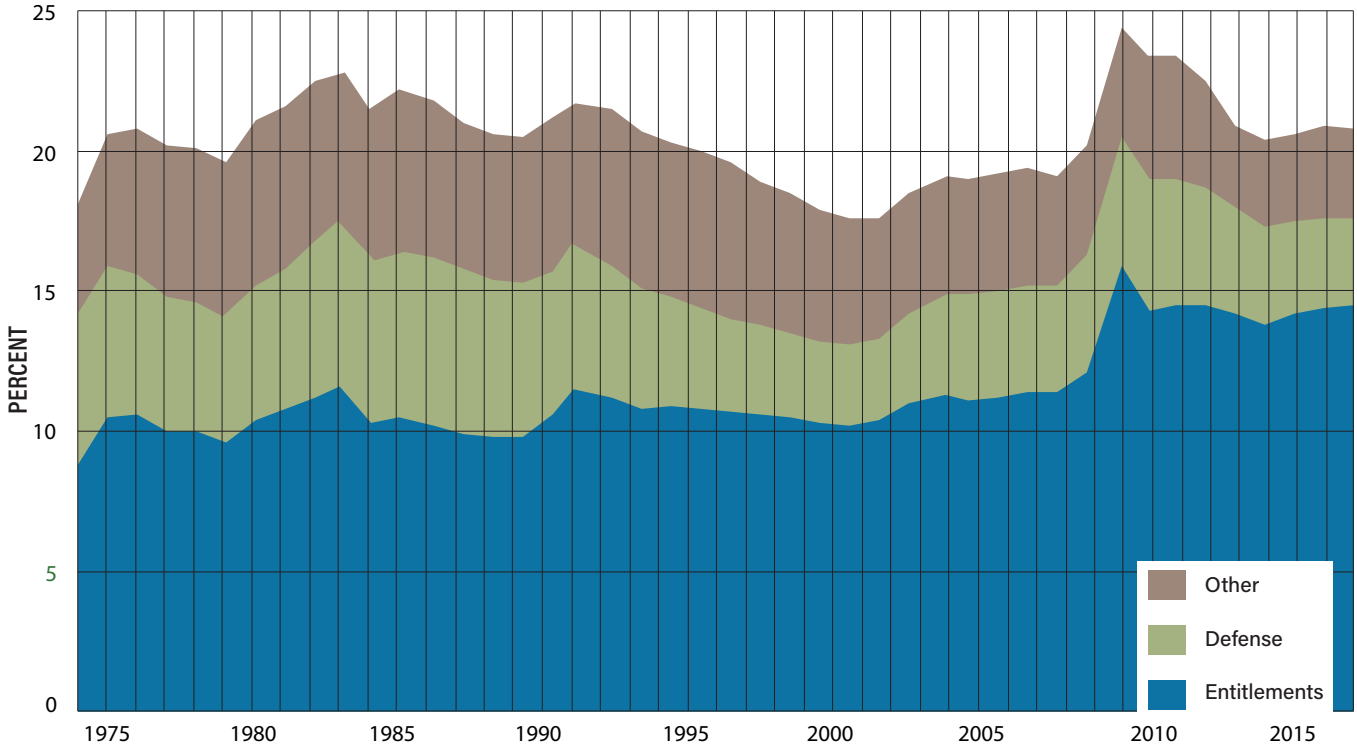
The Air Force budget includes Blue dollars, money for USAF programs, and non-Blue dollars, money (such as some intelligence- and space-related funding) USAF does not manage but that simply passes through Air Force accounts.

FEDERAL BUDGET OUTLAY CATEGORIES AS PERCENTAGE OF GDP

YEAR	TOTAL OUTLAYS	DEFICIT/ SURPLUS	ENTITLEMENTS	DEFENSE
1974	18.1	-0.5	8.8	5.4
1975	20.6	-3.4	10.5	5.4
1976	20.8	-3.9	10.6	5.0
1977	20.2	-2.5	10.0	4.8
1978	20.1	-2.4	10.0	4.6
1979	19.6	-1.5	9.6	4.5
1980	21.1	-2.6	10.4	4.8
1981	21.6	-2.4	10.8	5.0
1982	22.5	-3.6	11.2	5.6
1983	22.8	-5.9	11.6	5.9
1984	21.5	-4.7	10.3	5.8
1985	22.2	-5.2	10.5	5.9
1986	21.8	-5.2	10.2	6.0
1987	21.0	-3.5	9.9	5.9
1988	20.6	-3.7	9.8	5.6
1989	20.5	-3.7	9.8	5.5
1990	21.2	-4.7	10.6	5.1
1991	21.7	-5.3	11.5	5.2
1992	21.5	-5.3	11.2	4.7
1993	20.7	-4.4	10.8	4.3
1994	20.3	-3.6	10.9	3.9
1995	20.0	-3.0	10.8	3.6
1996	19.6	-2.2	10.7	3.3
1997	18.9	-1.2	10.6	3.2
1998	18.5	-0.3	10.5	3.0
1999	17.9	-0.0	10.3	2.9
2000	17.6	**+0.9**	10.2	2.9
2001	17.6	-0.3	10.4	2.9
2002	18.5	-2.9	11.0	3.2
2003	19.1	-4.8	11.3	3.6
2004	19.0	-4.7	11.1	3.8
2005	19.2	-3.8	11.2	3.8
2006	19.4	-3.2	11.4	3.8
2007	19.1	-2.4	11.4	3.8
2008	20.2	-4.4	12.1	4.2
2009	24.4	-10.8	15.9	4.6
2010	23.4	-9.3	14.3	4.7
2011	23.4	-8.9	14.5	4.5
2012	22.1	-7.2	14.1	4.2
2013	20.9	-4.4	14.2	3.8
2014	20.4	-3.0	13.8	3.5
2015	20.6	-2.6	14.2	3.3
2016	20.9	-3.4	14.4	3.1
2017	20.8	-3.7	14.5	3.1
2018	20.3	-3.8	12.5	3.1

This data is based on figures from the White House Office of Management and Budget.

FEDERAL BUDGET OUTLAY CATEGORIES AS PERCENTAGE OF GDP



Source: "The Budget and Economic Outlook: 2018 to 2028," Congressional Budget Office, January 2018.

DEFENSE BUDGET AUTHORITY

(In billions)

			Actual	Enacted	Planned		
	2015	2016	2017	2018	2019	2020	2021
No War Costs, Current Dollars	$497.3	$521.7	$523.5	$599.6	$616.1	$544.5	$585.2
With War Costs, Current Dollars	560.4	580.3	606.0	670.6*	685.0*	718.3*	654.9*

*Includes placeholder value of $67.9 billion in war funding.

DOD BUDGET BY CATEGORY

(Base budget in fiscal years, not including overseas contingency operations (aka "war funding) in current dollars)

	2015	2016	2017	2018	2019	2020
Military Personnel	$139.0	$138.3	$139.0	$136.0	$146.1	$151.3
O&M	248.2	247.8	258.1	199.7	229.3	158.0
Procurement	104.0	119.9	126.0	107.1	134.8	120.0
RDT&E	64.1	70.6	74.8	71.8	94.1	102.6
Military Construction	6.4	7.6	7.6	6.4	8.8	9.9
Family Housing	1.3	1.5	1.4	1.2	1.6	1.3
Revolving Funds	2.3	2.3	2.3	1.5	1.6	1.4
Total	**$565.4**	**$588.0**	**$609.2**	**$523.7**	**$616.1**	**$544.5**

Sources: Department of Defense "National Defense Budget Estimates for FY 2019" (years 2015-2018) ; and the "Defense Budget Overview: United States DOD Fiscal Year 2020 Budget Request" (years 2019-2020).

SERVICE AND AGENCY SHARES OF BASE DOD BUDGET

(Budget authority in billions of current FY20 dollars)

					Planned		
	2015	2016	2017	2018	2019	2020	2021
Constant Dollars							
Air Force	$147.6	$154.9	$165.3	$163.0	$161.0	$158.8	$159.0
Army	129.2	131.0	136.2	135.2	132.8	131.0	129.7
Navy/Marine Corps	160.8	169.4	172.1	168.9	166.5	162.8	163.4
Defense Agencies	97.6	99.3	100.7	102.8	104.5	103.0	102.7
Total	**$535.1**	**$554.5**	**$574.3**	**$570.1**	**$564.8**	**$555.5**	**$554.8**
Percentages							
Air Force	27.6%	27.9%	28.8%	28.6%	28.5%	28.6%	28.7%
Army	24.1%	23.6%	23.7%	23.7%	23.5%	23.6%	23.4%
Navy/Marine Corps	30.0%	30.5%	30.0%	29.6%	29.5%	29.3%	29.5%
Defense Agencies	18.2%	17.9%	17.5%	18.0%	18.5%	18.5%	18.5%

USAF shares above include non-Blue funding. Outyears estimates based on FY20 shares.

SERVICE AND AGENCY PERCENTAGE OF BASE DOD BUDGET

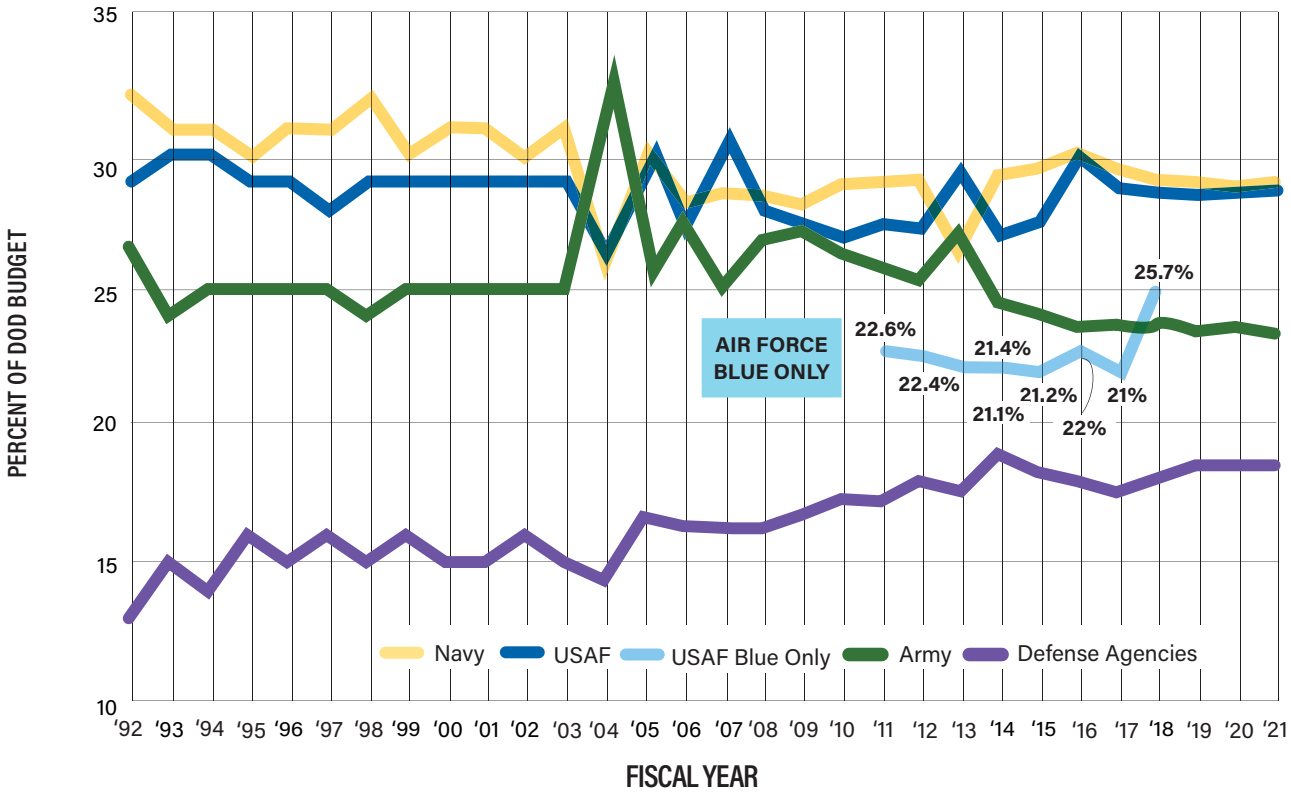


Photo: SrA. Thomas Barley

Above, a B-2 Spirit on the ramp at JB Pearl Harbor-Hickam, Hawaii.

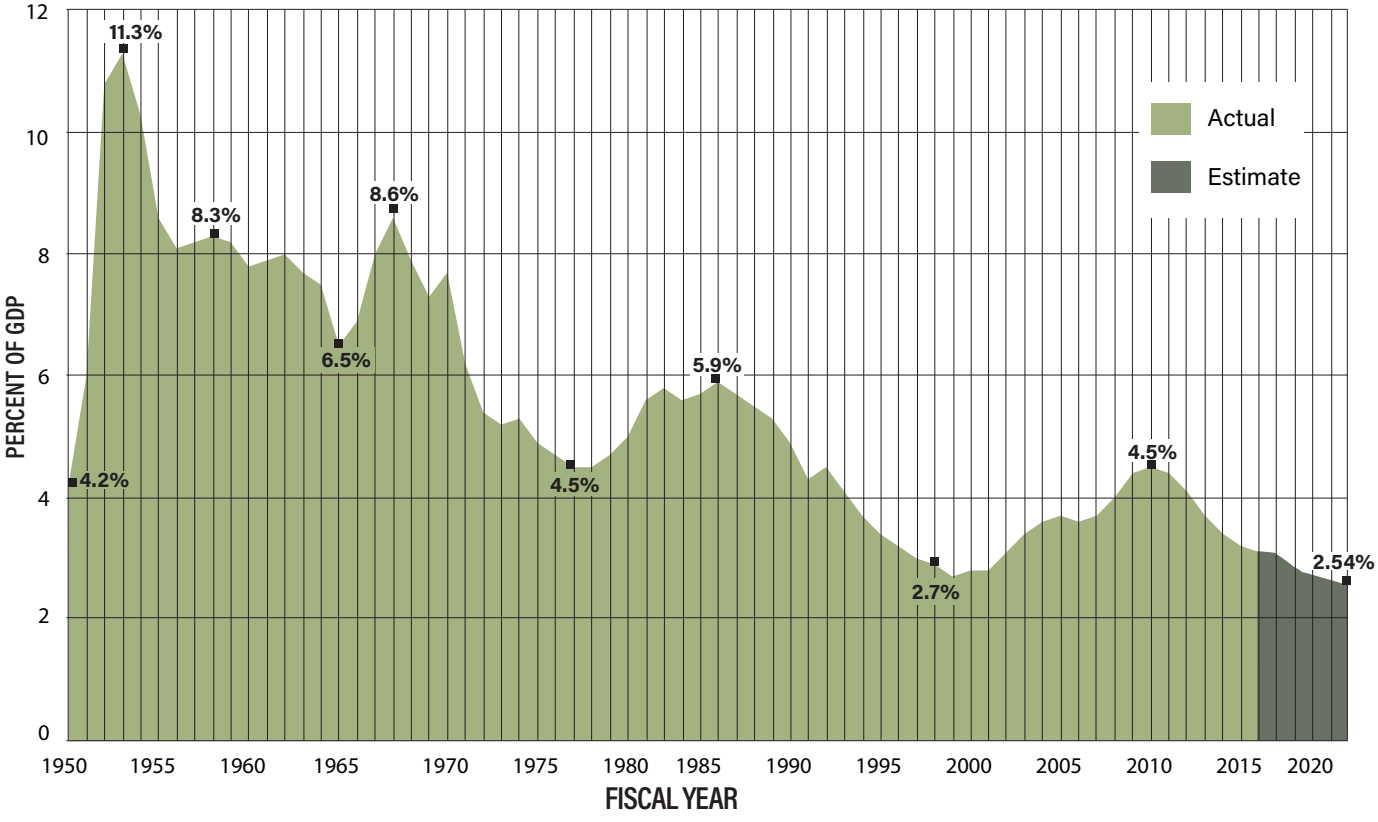
DEFENSE OUTLAYS

(In billions)

				Planned			
	2015	2016	2017	2018	2019	2020	2021
Current Dollars	$562.5	$576.3	$586.8	$568.6	$569.9	$575.3	$582.0

This data is based on figures from the White House Office of Management and Budget.

DEFENSE OUTLAYS AS A SHARE OF GROSS DOMESTIC PRODUCT



This data is based on figures from the White House Office of Management and Budget.

MAJOR USAF PROGRAMS RDT&E
(Current million dollars)

MAJOR USAF PROGRAMS PROCUREMENT
(Current million dollars)

	PROGRAM	2018	2019	2020	2018	2019	2020
BOMBER	B-1B Lancer	$60.4	60.0	1.0	$121.6	$40.0	22.0
	B-2A Spirit	238.7	358.8	392.0	95.0	62.0	11.0
	B-21 Raider	1,914.6	2,279.2	3,003.0	0.0	0.0	0.0
	B-52H Stratofortress	108.0	325.0	326.0	98.3	130.0	74.0
FIGHTER/ ATTACK	A-10C Thunderbolt II	17.5	28.0	37.0	109.0	168.0	132.0
	F-15C/D/E Eagle/Strike Eagle	510.4	340.3	316.0	452.8	664.1	632.7
	F-16C/D Fighting Falcon	250.3	186.0	193.0	252.0	308.0	250.0
	F-15EX	0.0	0.0	0.0	0.0	0.0	1,050.0
	F-22A Raptor	594.5	584.7	496.3	271.9	352.2	323.6
	F-35A Lightning II	607.3	572.9	809.8	6,505.0	5,267.0	4,929.9
HELO	HH-60G/U Pave Hawk	0.0	0.0	0.0	76.0	92.0	20.1
	HH-60W Combat Rescue	342.0	446.0	247.0	0.0	660.4	884.0
	UH-1N Iroquois	188.3	258.0	171.0	3.7	12.0	3.8
ICBM	Minuteman III	204.2	155.0	130.0	64.9	125.0	50.8
	ICBM Fuze Modernization	166.6	168.0	161.0	6.3	16.0	5.0
ISR/BM/C3	Air & Space Ops Center	86.4	105.0	114.9	25.5	38.6	3.7
	Airborne Recon Systems	19.5	195.3	122.9	0.2	7.5	29.6
	Airborne Sigint Enterprise	116.1	109.9	102.7	0.0	0.0	0.0
	DCGS	26.3	26.6	37.8	264.4	378.4	116.1
	E-3B/C/G Sentry (AWACS)	118.7	122.2	68.0	120.0	116.9	216.3
	E-4B NAOC	43.6	65.2	86.8	25.9	67.9	58.5
	E-8C JSTARS	390.7	0.0	0.0	16.2	37.8	28.8
	EC-130H/J Compass Call/Commando Solo	34.2	43.9	15.9	237.4	388.4	224.8
	Endurance UAV	40.0	15.0	0.0	0.0	0.0	0.0
	MQ-1B Predator	0.0	0.0	0.0	224.5	163.3	54.0
	MQ-9A Reaper	184.4	108.8	155.0	648.2	589.2	764.8
	NATO AGS	44.7	51.5	32.6	0.0	0.0	0.0
	RC-135S/U/V/W	N/A	N/A	N/A	204.6	394.5	227.7
	RQ-4B Global Hawk	222.7	221.7	191.7	162.7	164.3	49.0
	U-2S Dragon Lady	34.5	87.6	38.9	32.2	56.7	86.9
MOBILITY	C-5A/B/C/M Galaxy	11.4	25.1	10.2	25.0	68.0	73.6
	C-17A Globemaster III	21.7	48.3	25.1	108.4	87.3	648.2
	C-32 Executive Transport Recapitalization	2.9	7.9	9.9	79.4	4.5	11.5
	C-130H Hercules	10.2	106.0	140.4	446.4	331.9	190.3
	C-130J Super Hercules	24.9	15.4	8.6	2,428.4	2,057.9	2,335.3
	KC-10A Extender	9.2	6.6	0.2	0.0	0.0	0.0
	KC-46A Pegasus	75.6	80.2	59.6	2,927.1	2,290.9	2,234.5
	PAR/VC-25A	418.5	657.9	757.9	52.1	27.2	48.6
MUNITION	AGM-158A JASSM	29.4	42.5	78.5	443.1	602.8	503.4
	AIM-9X Sidewinder	36.3	37.2	10.3	124.7	121.3	160.4
	AIM-120 AMRAAM	51.4	57.3	55.4	264.3	307.5	332.3
	Air Launched Cruise Missile (ACLM)	4.5	6.0	10.2	31.7	47.6	77.4
	GBU-31/32/38 JDAM	0.0	0.0	0.0	985.1	922.6	1,066.2
	GBU-39 SDB	37.7	78.1	31.2	384.3	209.4	275.4
	AGM-114 Hellfire	0.0	0.0	0.0	82.9	100.9	212.4
SOF	CV-22B Osprey	30.0	38.8	46.0	103.2	92.9	82.6
	HC/MC-130H/J/P	30.8	16.2	17.2	200.5	125.7	51.5
	Tactical Air Control Party Modifications	10.6	6.1	6.2	0.0	0.0	12.3
SPACE	Advanced EHF (MILSATCOM)	134.8	144.8	118.3	55.7	29.8	31.9
	Counterspace Systems	64.2	20.2	29.0	28.8	1.1	5.7
	Cyberspace	19.6	38.4	51.6	160.8	102.8	0.0
	NSSL National Security Space Launch	381.9	443.0	432.0	1,392.9	1,614.5	1,237.6
	GPS III	1,054.9	1,339.8	1,280.6	99.9	85.0	476.6
	MilSatCom	227.4	554.2	544.7	35.2	11.3	11.1
	Nudet Detection System	31.3	19.8	49.3	6.4	7.7	7.4
	Rocket Systems Launch Program	33.0	19.7	13.1	0	47.6	11.5
	SATCOM	304.0	728.5	1,013.4	770.5	102.2	99.3
	SBIRS	119.6	61.0	1.0	929.1	108.4	244.0
	Space Control Technology	44.1	91.6	64.2	0.0	0.0	0.0
	Space Fence	34.0	19.4	0.0	0.0	46.4	71.8
	Spacelift Range System	20.0	20.2	10.8	113.2	117.6	118.1
	Wideband Global SATCOM	6.5	4.0	1.9	675.3	12.1	0.0
OTHER	T-X Advanced Pilot Training Program	82.6	245.5	348.5	82.6	245.5	348.5
	GRAND TOTAL	**$9,979.5**	**$11,983.0**	**$12,906.6**	**$23,055.3**	**$20,230.6**	**$21,246.5**

EQUIPMENT

AIRCRAFT TOTAL ACTIVE INVENTORY (TAI)

(As of Sept. 30, 2018)

	ACTIVE	ANG	AFRC	TOTAL FORCE
Bomber				
B-1B Lancer	62	0	0	62
B-2A Spirit	20	0	0	20
B-52H Stratofortress	57	0	18	75
Total	**139**	**0**	**18**	**157**
Fighter/Attack				
A-10C Thunderbolt II	141	85	55	281
F-15C Eagle	89	123	0	212
F-15D Eagle	9	14	0	23
F-15E Strike Eagle	218	0	0	218
F-16C Fighting Falcon	447	288	52	787
F-16D Fighting Falcon	107	45	2	154
F-22A Raptor	166	20	0	186
F-35A Lightning II	155	0	0	155
Total	**1,332**	**575**	**109**	**2,016**
Special Operations Forces				
AC-130J Ghostrider	12	0	0	12
AC-130U Spooky	10	0	0	10
AC-130W Stinger II	10	0	0	10
CV-22B Osprey	50	0	0	50
MC-130H Combat Talon II	16	0	0	16
MC-130J Commando II	37	0	0	37
MC-130P Combat Shadow	0	1	0	1
Total	**135**	**1**	**0**	**136**
ISR/BM/C3				
E-3B Sentry (AWACS)	11	0	0	11
E-3C Sentry (AWACS)	3	0	0	3
E-3G Sentry (AWACS)	17	0	0	17
E-4B NAOC	4	0	0	4
E-8C JSTARS	0	16	0	16
TE-8A JSTARS (trainer)	0	1	0	1
E-9A Widget	2	0	0	2
E-11A BACN	4	0	0	4
EC-130H Compass Call	14	0	0	14
EC-130J Commando Solo	0	7	0	7
MQ-1B Predator	57	9	0	66
MQ-9A Reaper	222	29	0	251
NC-135W (test bed)	1	0	0	1
OC-135B Open Skies	2	0	0	2
RC-26B Condor	0	11	0	11
RC-135S Cobra Ball	3	0	0	3
RC-135U Combat Sent	2	0	0	2
RC-135V Rivet Joint	8	0	0	8
RC-135W Rivet Joint	12	0	0	12
RQ-4B Global Hawk	34	0	0	34
TC-135W (trainer)	3	0	0	3
TU-2S Dragon Lady (trainer)	4	0	0	4
U-2S Dragon Lady	27	0	0	27
WC-130H Hercules	0	5	0	5
WC-130J Hercules	0	0	10	10
WC-135C Constant Phoenix	1	0	0	1
WC-135W Constant Phoenix	1	0	0	1
Total	**432**	**78**	**10**	**520**

	ACTIVE	ANG	AFRC	TOTAL FORCE
Tanker				
HC-130J Combat King II	19	5	0	24
HC-130N King	0	6	0	6
HC-130P King	0	3	0	3
KC-10A Extender	59	0	0	59
KC-135R Stratotanker	107	147	72	326
KC-135T Stratotanker	30	24	0	54
Total	**215**	**185**	**72**	**472**
Transport				
C-5C Galaxy	0	0	0	0
C-5M Super Galaxy	36	0	16	52
C-12C Huron	13	0	0	13
C-12D Huron	6	0	0	6
C-12F Huron	3	0	0	3
C-12J Huron	4	0	0	4
C-17A Globemaster III	154	50	18	222
C-21A Learjet	18	0	0	18
C-32A Air Force Two	4	0	0	4
C-32B Air Force Two	0	2	0	2
C-37A Gulfstream V	9	0	0	9
C-37B Gulfstream V	3	0	0	3
C-40B Clipper	4	0	0	4
C-40C Clipper	0	3	4	7
C-130H Hercules	1	127	48	176
C-130J Super Hercules	99	16	10	125
LC-130H Hercules	0	10	0	10
VC-25A Air Force One	2	0	0	2
Total	**356**	**208**	**96**	**660**
Helicopter				
HH-60G Pave Hawk	60	17	15	92
HH-60U Pave Hawk	3	0	0	3
TH-1H Iroquois (trainer)	28	0	0	28
UH-1N Iroquois	63	0	0	63
Total	**154**	**17**	**15**	**186**
Trainer				
T-1A Jayhawk	178	0	0	178
T-6A Texan II	444	0	0	444
T-38A Talon	53	0	0	53
(A)T-38B Talon	6	0	0	6
T-38C Talon	442	0	0	442
T-41D Mescalero	4	0	0	4
T-51A Cessna	3	0	0	3
T-53A Kadet II	24	0	0	24
UV-18B Twin Otter	3	0	0	3
Gliders	24	0	0	24
Total	**1,181**	**0**	**0**	**1,181**
GRAND TOTAL	**3,944**	**1,064**	**320**	**5,328**

Total active inventory (TAI): aircraft assigned to operating forces for mission, training, test, or maintenance. Includes primary, backup, and attrition reserve aircraft. For other aircraft acronyms, see Gallery of Weapons.

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TOTAL NUMBER OF AIRCRAFT IN SERVICE OVER TIME

(As of Sept. 30, 2018)

ACTIVE	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18
Bomber	154	150	144	144	141	141	140	140	139	139
Fighter/Attack	1,468	1,256	1,287	1,289	1,287	1,273	1,312	1,282	1,297	1,332
Special Ops Forces	89	98	105	117	122	124	144	132	138	135
ISR/BM/C3	320	362	381	413	394	444	437	434	441	432
Tanker	260	263	247	246	243	244	239	236	234	215
Transport	452	458	429	425	413	410	381	384	363	356
Helicopter	159	160	151	170	138	137	157	160	131	154
Trainer	1,114	1,000	1,190	1,213	1,189	1,195	1,187	1,194	1,211	1,181
Total Active Duty	**4,016**	**3,747**	**3,934**	**4,017**	**3,927**	**3,968**	**3,997**	**3,962**	**3,954**	**3,944**
ANG										
Bomber	0	0	0	0	0	0	0	0	0	000
Fighter/Attack	664	614	639	635	630	585	611	577	575	575
Special Ops Forces	4	4	4	4	4	4	4	4	4	1
ISR/BM/C3	45	80	80	87	86	88	91	89	93	78
Tanker	182	179	189	189	187	185	184	181	181	185
Transport	241	240	242	232	223	207	207	212	210	208
Helicopter	17	17	17	17	17	17	17	17	17	17
Total ANG	**1,153**	**1,134**	**1,171**	**1,164**	**1,147**	**1,086**	**1,114**	**1,080**	**1.080**	**1,064**
AFRC										
Bomber	9	9	18	18	18	18	18	18	18	18
Fighter/Attack	108	97	100	101	95	104	111	111	109	109
Special Ops Forces	14	10	10	5	4	0	0	0	0	0
ISR/BM/C3	11	14	12	11	11	10	10	10	10	10
Tanker	69	69	72	72	71	68	68	72	72	72
Transport	149	149	152	148	147	145	139	101	91	96
Helicopter	15	15	15	15	15	15	15	15	15	15
Total AFRC	**375**	**363**	**379**	**370**	**361**	**360**	**361**	**327**	**315**	**320**
TOTAL FORCE	**5,544**	**5,244**	**5,484**	**5,551**	**5,435**	**5,414**	**5,472**	**5,369**	**5,349**	**5,328**

ICBMs AND SPACECRAFT IN SERVICE OVER TIME

(As of Sept. 30, 2018)

TYPE OF SYSTEM	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18
Minuteman III	450	450	450	450	450	450	450	406	400	400
Total ICBMs	**450**	**450**	**450**	**450**	**450**	**450**	**450**	**406**	**400**	**400**
AEHF	0	1	1	2	2	3	3	3	3	4
ATRR	0	0	0	1	1	0	0	0	1	1
DMSP	6	6	6	4	4	6	6	6	5	5
DSCS	9	8	8	8	8	7	6	6	6	6
DSP (classified)										5
GPS	30	36	34	30	31	38	41	37	35	31
GSSAP	0	0	0	0	0	2	2	4	4	4
Milstar	5	5	5	5	5	5	5	5	5	5
SBIRS			1	1	2	2	2	2	3	7
SBSS	0	1	1	1	1	1	1	1	1	2
WGS	2	3	3	3	4	6	7	7	9	7
Total Satellites	**52**	**60**	**59**	**55**	**58**	**70**	**73**	**71**	**72**	**77**

AEHF: Advanced Extremely High Frequency; **ATRR:** Advanced Technology Risk Reduction; **DMSP:** Defense Meteorological Satellite Program; **DSCS:** Defense Satellite Communications System; **DSP:** Defense Support Program; **GPS:** Global Positioning System; **GSSAP:** Geosynchronous Space Situational Awareness Program; **SBIRS:** Space Based Infrared System; **SBSS:** Space Based Surveillance System; **WGS:** Wideband Global SATCOM.

TOTAL FORCE AVERAGE AIRCRAFT AGE

(As of Sept. 30, 2018)

	TOTAL FORCE TAI	AVERAGE AGE
Bomber		
B-1B Lancer	62	31.1
B-2A Spirit	20	24.2
B-52H Stratofortress	75	56.8
Total	**157**	**42.6**
Fighter/Attack		
A-10C Thunderbolt II	281	37.4
F-15C Eagle	212	34.4
F-15D Eagle	23	33.9
F-15E Strike Eagle	218	26.4
F-16C Fighting Falcon	787	27.7
F-16D Fighting Falcon	154	28.4
F-22A Raptor	186	11.0
F-35A Lightning II	155	3.6
Total	**2,016**	**26.8**
Special Operations Forces		
AC-130J Ghostrider	12	3.0
AC-130U Spooky	10	27.7
AC-130W Stinger II	10	29.2
CV-22B Osprey	50	6.6
MC-130H Combat Talon II	16	30.2
MC-130J Commando II	37	4.5
MC-130P Combat Shadow	1	51.9
Total	**136**	**13.9**
ISR/BM/C3		
E-3B Sentry (AWACS)	11	40.6
E-3C Sentry (AWACS)	3	35.5
E-3G Sentry (AWACS)	17	36.5
E-4B NAOC	4	44.4
TE-8A JSTARS	1	27.7
E-8C JSTARS	16	17.8
E-9A Widget	2	26.0
E-11A BACN	4	6.7
EC-130H Compass Call	14	45.3
EC-130J Commando Solo	7	18.3
MQ-1B Predator	66	11.4
MQ-9A Reaper	251	5.4
NC-135W (test bed)	1	56.5
OC-135B Open Skies	2	56.4
RC-26B Condor	11	24.4
RC-135S Cobra Ball	3	56.5
RC-135U Combat Sent	2	53.7
RC-135V Rivet Joint	8	53.9
RC-135W Rivet Joint	12	55.7
RQ-4B Global Hawk	34	7.6
TC-135W (trainer)	3	56.3
TU-2S Dragon Lady (trainer)	4	33.9
U-2S Dragon Lady	27	35.7
WC-130H Hercules	5	52.7
WC-130J Hercules (Hurricane Hunter)	10	17.5
WC-135C Constant Phoenix	1	54.3
WC-135W Constant Phoenix	1	56.4
Total	**520**	**16.8**

	TOTAL FORCE TAI	AVERAGE AGE
Tanker		
HC-130J Combat King II	24	4.7
HC-130N King	6	28.1
HC-130P King	3	52.4
KC-10A Extender	59	33.7
KC-135R Stratotanker	326	56.9
KC-135T Stratotanker	54	58.6
Total	**472**	**51.7**
Transport		
C-5M Super Galaxy	52	31.4
C-12C Huron	13	42.2
C-12D Huron	6	34.4
C-12F Huron	3	33.6
C-12J Huron	4	30.7
C-17A Globemaster III	222	15.0
C-21A Learjet	18	33.3
C-32A Air Force Two	4	20.0
C-32B Air Force Two	2	15.3
C-37A Gulfstream V	9	17.7
C-37B Gulfstream V	3	8.7
C-40B Clipper	4	14.7
C-40C Clipper	7	12.4
C-130H Hercules	176	28.9
C-130J Hercules	125	9.8
LC-130H Hercules	10	33.1
VC-25A Air Force One	2	28.0
Total	**660**	**21.3**
Helicopter		
HH-60G Pave Hawk	92	28.0
HH-60U Pave Hawk	3	7.4
TH-1H Iroquois	28	36.5
UH-1N Iroquois	63	45.7
Total	**186**	**29.4**
Trainer		
T-1A Jayhawk	178	23.9
T-6A Texan II	444	13.0
T-38A Talon	53	51.9
(A)T-38B Talon	6	55.1
T-38C Talon	442	51.2
T-41D Mescalero	4	49.1
T-51A	3	13.2
T-53A	24	6.7
UV-18B Twin Otter	3	34.5
Gliders	24	8.4
Total	**1,181**	**30.9**
GRAND TOTAL	**5,328**	**29.2**

Average age for category totals and grand total are weighted by quantity of aircraft.

PILOT TRAINING

Number of Air Force officers completing pilot training:

(Actual)	(Projected)	(Projected)
2018	2019	2020
1,200	1,340	1,480

UNDERGRADUATE PILOT TRAINING

Graduation rates for undergraduate pilot training:

2016	2017	2018
93%	98%	97%

AVERAGE FIGHTER PILOT TRAINING SORTIES PER MONTH BY AIRFRAME

	(Actual)	(Oct.-April)
AIRCRAFT	2018	2019
A-10	5.4	5.5
F-15C	5.4	5.2
F-15E	5.4	5.6
F-16	5.6	5.7
F-22	4.8	5.0
F-35A	3.8	4.2

AVERAGE FIGHTER PILOT HOURS PER MONTH BY AIRFRAME

	(Actual)	(Oct.-April)
AIRCRAFT	2018	2019
A-10	11.6	11.9
F-15C	8.0	8.4
F-15E	12.6	13.3
F-16	93	9.6
F-22	8.2	7.5
F-35A	5.9	6.5

Source: USAF

USAF AIRCRAFT TAIL CODES

AC 177th FW (ANG), Atlantic City Arpt., N.J.
AF USAF Academy, Colo.
AK 3rd Wing (PACAF), JB Elmendorf-Richardson, Alaska
354th FW (PACAF), Eielson AFB, Alaska
176th Wing (ANG), JB Elmendorf-Richardson, Alaska
AL 187th FW (ANG), Montgomery Regional Arpt., Ala.
AP 12th FTW (AETC), NAS Pensacola, Fla.
AV 31st FW (USAFE), Aviano AB, Italy
AZ 162nd Wing (ANG), Tucson Arpt., Ariz.
BB 9th RW (ACC), Beale AFB, Calif.
Det. 2, 53rd Wing (ACC), Beale AFB, Calif.
BD 307th BW (AFRC), Barksdale AFB, La.
CA 129th RQW (ANG), Moffett ANGB, Calif.
144th FW (ANG), Fresno Yosemite Arpt., Calif.
163rd ATKW (ANG), March ARB, Calif.
CB 14th FTW (AETC), Columbus AFB, Miss.
CH 432nd Wing (ACC), Creech AFB, Nev.
CO 140th Wing (ANG), Buckley AFB, Colo.
CT 103rd AW (ANG), Bradley ANGB, Conn.
D 100th ARW (USAFE), RAF Mildenhall, UK
DC 113th Wing (ANG), JB Andrews, Md.
DM 355th FW (ACC), Davis-Monthan AFB, Ariz.
DR 943rd RQG (AFRC), Davis-Monthan AFB, Ariz.
DY 7th BW (AFGSC), Dyess AFB, Texas
ED 412th TW (AFMC), Edwards AFB, Calif.
EG 33rd FW (AETC), Eglin AFB, Fla.
EL 28th BW (AFGSC), Ellsworth AFB, S.D.
EN 80th FTW (AETC), Sheppard AFB, Texas
ET 96th TW (AFMC), Eglin AFB, Fla.
FC 336th TRG (AETC), Fairchild AFB, Wash.
FE 90th MW (AFGSC), F. E. Warren AFB, Wyo.
FF 1st FW (ACC), JB Langley-Eustis, Va.
192nd FW (ANG), JB Langley-Eustis, Va.
FL 920th RQW (AFRC), Patrick AFB, Fla.
FM 482nd FW (AFRC), Homestead ARB, Fla.
FS 188th Wing (ANG), Fort Smith Arpt., Ark.
FT 23rd Wing (ACC), Moody AFB, Ga.
GA 116th ACW (ANG), Robins AFB, Ga.
165th AW (ANG), Savannah Hilton Head Arpt., Ga.
HD Det. 1, 53rd Wing (ACC), Holloman AFB, N.M.
HH 15th Wing (PACAF), JB Pearl Harbor-Hickam, Hawaii
154th Wing (ANG), JB Pearl Harbor-Hickam, Hawaii
HL 388th FW (ACC), Hill AFB, Utah
419th FW (AFRC), Hill AFB, Utah
HO 49th Wing (ACC), Holloman AFB, N.M.
IA 132nd Wing (ANG), Des Moines Arpt., Iowa
ID 124th FW (ANG), Boise Air Terminal, Idaho
IN 122nd FW (ANG), Fort Wayne, Ind.
JZ 159th FW (ANG), NAS JRB New Orleans, La.
KC 442nd FW (AFRC), Whiteman AFB, Mo.
LA 2nd BW (AFGSC), Barksdale AFB, La.
LF 56th FW (AETC), Luke AFB, Ariz.
LI 106th RQW (ANG), F. S. Gabreski Arpt., N.Y.
LN 48th FW (USAFE), RAF Lakenheath, UK
MA 104th FW (ANG), Barnes Arpt., Mass.
MD 175th Wing (ANG), Warfield ANGB/Martin State Arpt., Md.
MI 127th Wing (ANG), Selfridge ANGB, Mich.
MM 341st MW (AFGSC), Malmstrom AFB, Mont.
MN 133rd AW (ANG), Minn.-St. Paul Arpt./ARS, Minn.
148th FW (ANG), Duluth Arpt., Minn.
MO 366th FW (ACC), Mountain Home AFB, Idaho
MT 5th BW (AFGSC), Minot AFB, N.D.
91st MW (AFGSC), Minot AFB, N.D.
NY 174th ATKW (ANG), Hancock Fld., N.Y.
OF 55th Wing (ACC), Offutt AFB, Neb.
OH 179th AW (ANG), Mansfield Lahm Arpt., Ohio
180th FW (ANG), Toledo Express Arpt., Ohio
OK 137th SOW (ANG), Will Rogers ANGB, Okla.
138th FW (ANG), Tulsa Arpt., Okla.
552nd ACW (ACC), Tinker AFB, Okla.
OS 51st FW (PACAF), Osan AB, South Korea
OT 31st TES (ACC), Edwards AFB, Calif.
49th TES (ACC), Barksdale AFB, La.
53rd Wing (ACC), Eglin AFB, Fla.
88th TES (ACC), Nellis AFB, Nev.
337th TES (ACC), Dyess AFB, Texas
422nd TES (ACC), Nellis AFB, Nev.
556th TES (ACC), Creech AFB, Nev.
Det. 4, 53rd Wing (ACC), Creech AFB, Nev.
RA 12th FTW (AETC), JBSA-Randolph, Texas
RS 86th AW (USAFE), Ramstein AB, Germany
SA 149th FW (ANG), JBSA-Lackland, Texas
SC 169th FW (ANG), McEntire JNGB, S.C.
SD 114th FW (ANG), Joe Foss Fld., S.D.
SJ 4th FW (ACC), Seymour Johnson AFB, N.C.
SP 52nd FW (USAFE), Spangdahlem AB, Germany
SW 20th FW (ACC), Shaw AFB, S.C.
TD 53rd WEG (ACC), Tyndall AFB, Fla.
TX 147th ATKW (ANG), Ellington Fld., Texas
301st FW (AFRC), NAS Fort Worth JRB, Texas
TY 325th FW (ACC), Tyndall AFB, Fla.
VN 71st FTW (AETC), Vance AFB, Okla.
WA 57th Wing (ACC), Nellis AFB, Nev.
WI 115th FW (ANG), Truax Fld., Wis.
WM 72nd TES (AFGSC), Whiteman AFB, Mo.
509th BW (AFGSC), Whiteman AFB, Mo.
WP 8th FW (PACAF), Kunsan AB, South Korea
WV 130th AW (ANG), Yeager Arpt., W.Va.
WW 35th FW (PACAF), Misawa AB, Japan
XL 47th FTW (AETC), Laughlin AFB, Texas
YJ 374th AW (PACAF), Yokota AB, Japan
ZZ 18th Wing (PACAF), Kadena AB, Japan

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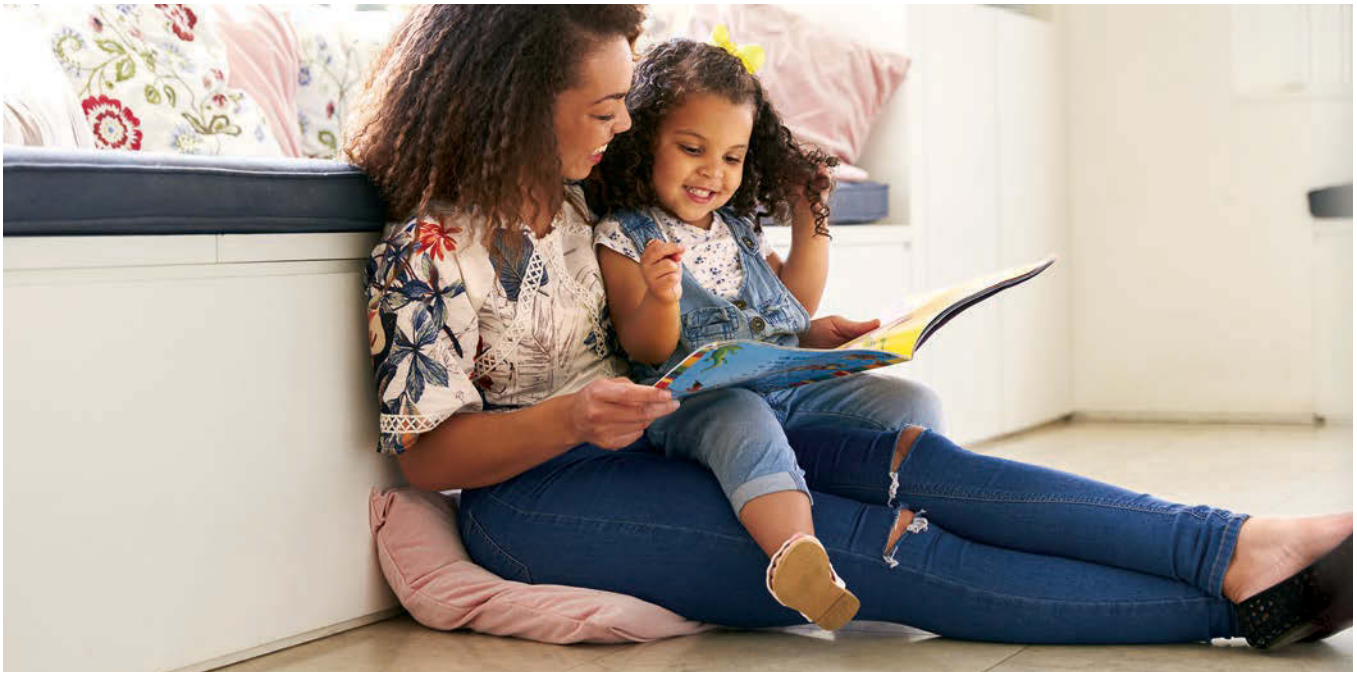

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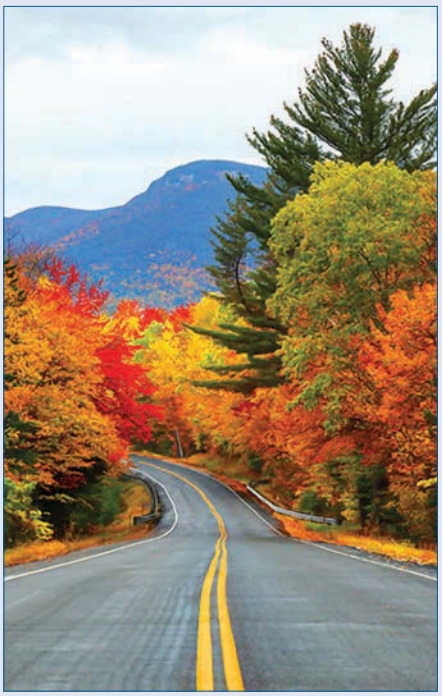

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MAJOR COMMANDS AND AIR NATIONAL GUARD

Pilots from the 388th Fighter Wing's, 4th Fighter Squadron prepare to lead Red Flag 19-1, the Air Force's premier combat exercise, at Nellis AFB, Nev.

Photo: R. Nial Bradshaw/USAF

The Air Force has 10 major commands and two Air Reserve Components. (Air Force Reserve Command is both a majcom and an ARC.)

ACRONYMS

AA	active associate: ANG/AFRC owned aircraft
AATTC	Advanced Airlift Tactics Training Center
AEHF	Advanced Extremely High Frequency
AFS	Air Force Station
ALCF	airlift control flight
AOC/G/S	air and space operations center/group/squadron
ARB	Air Reserve Base
ATCS	air traffic control squadron
BM	battle management
BMEWS	Ballistic Missile Early Warning System
C2	command and control
C3	command, control, and communications
CACS	command and control squadron (space)
CC	combat communications
CEF	civil engineering flight
CFACC	combined force air component commander
CRF	centralized repair facility
CRG	contingency response group
CRTC	Combat Readiness Training Center
CSO	combat systems officer
CW	combat weather
DCGS	Distributed Common Ground Station
DMSP	Defense Meteorological Satellite Program
DSCS	Defense Satellite Communications System
DSP	Defense Support Program
EIS(G)	engineering installation squadron (group)
EOD	explosive ordnance disposal
FTU	formal training unit
GA	Guardian Angel (pararescuemen, combat rescue officers, and survival, evasion, resistance, and escape specialists)
GEODSS	Ground-based Electro-Optical Deep Space Surveillance system
GPS	Global Positioning System
GSSAP	Geosynchronous Space Situational Awareness Program
ISR	intelligence, surveillance, and reconnaissance
JB	Joint Base
JBSA	Joint Base San Antonio
JMS	Joint Space Operations Center (JSpOC) Mission System
JRB	Joint Reserve Base
JROTC	Junior Reserve Officer Training Corps
MAFFS	Modular Airborne Firefighting System
MCE	mission control element
NAS	Naval Air Station
NOSS	network operations security squadron
PARCS	Perimeter Acquisition Radar Attack Characterization System
RAOC	regional Air Operations Center
ROTC	Reserve Officer Training Corps
SBIRS	Space Based Infrared System
SCMS	supply chain management squadron
SBSS	Space Based Surveillance System
SOS	special operations squadron
SOW	special operations wing
SPADOC	Space Defense Operations Center
TACP	tactical air control party
TAI	total active inventory
WGS	Wideband Global Satcom
WXF	Weather Flight

As significant subdivisions of the Air Force, major commands conduct a considerable part of the service's mission and are directly subordinate to Headquarters, USAF.

Majcoms are organized on a functional basis in the US and on a geographic basis overseas. In addition to accomplishing designated portions of USAF's worldwide activities, they organize, administer, equip, and train their subordinate elements.

The majcom sits atop a skip-echelon staffing structure, which means every other organizational level (i.e., majcom, wing, and squadron) will have a full range of staff functions. The other organizations (NAF, group, and flight) are tactical, mission-centered echelons. These tactical echelons are designed to increase operational effectiveness without the burden of additional staff functions.

ACC

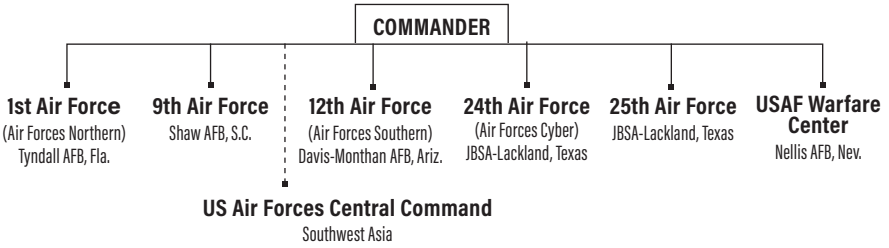
Air Combat Command

Headquarters: JB Langley-Eustis, Va.
Date of current designation: June 1, 1992
Commander: Gen. James M. "Mike" Holmes

Primary Mission

Primary force provider of combat airpower—fighter, conventional bomber, reconnaissance, battle management, and electronic combat aircraft—to combatant commands. Provide command, control, communications, and intelligence (C3I) systems. Conduct global information operations.

ACC Structure



PERSONNEL		
Active Duty	**Civilian**	**Total**
80,349	N/A	**N/A**

EQUIPMENT (TAI)	
Fighter/Attack	659
Helicopter	39
ISR/BM/C3	366
Trainer	45

WINGS/CENTERS	LOCATION	AIRCRAFT/MISSION/WEAPON
1st Fighter Wing (FW)	JB Langley-Eustis, Va.	F-22, T-38A
4th FW	Seymour Johnson AFB, N.C.	F-15E
9th Reconnaissance Wing	Beale AFB, Calif.	RQ-4, T-38A, U-2
20th FW	Shaw AFB, S.C.	F-16CM
23rd Wing	Moody AFB, Ga.	A-10C, HC-130J, HH-60G
53rd Wing	Eglin AFB, Fla.	A-10C, B-1B, B-2, B-52H, BQM-167A, E-9A, F-15C/D/E, F-16C/D, F-22A, F-35A, HC-130J, HH-60G, MQ-1, MQ-9, QF-4, QF-16, RQ-4, U-2
55th Wing	Offutt AFB, Neb.	EC-130H, OC-135B, RC-135S/U/V/W, TC-135S/W, WC-135
57th Wing	Nellis AFB, Nev.	A-10C, EC-130, F-15, F-15E, F-16, F-22A, F-35A, HH-60G (23rd Wing), MQ-9
67th Cyberspace Wing	JBSA-Lackland, Texas	Cyberspace operations
70th ISR Wing (ISRW)	Fort Meade, Md.	Cryptologic operations
93rd Air Ground Operations Wing	Moody AFB, Ga.	Battlefield airmen operations, support
99th Air Base Wing (ABW)	Nellis AFB, Nev.	Base support
319th ABW	Grand Forks AFB, N.D.	Base support
325th FW	Tyndall AFB, Fla.	F-22A
355th Wing	Davis-Monthan AFB, Ariz.	A-10, EC-130H, (55th Wing), F-16CG, HC-130J, HH-60G (23rd Wing)
363rd ISRW	JB Langley-Eustis, Va.	Multi-intelligence analysis, targeting
366th FW	Mountain Home AFB, Idaho	F-15E
388th FW	Hill AFB, Utah	F-16C/D, F-35A
432nd Wing	Creech AFB, Nev	MQ-1, MQ-9, RQ-170
480th ISRW	JB Langley-Eustis, Va.	DCGS, cyber ISR, CFACC support, signals intelligence integration
461st Air Control Wing (ACW)	Robins AFB, Ga.	E-8C (AA)
505th Command and Control Wing	Hurlburt Field, Fla.	Command and control operational-level tactics, testing, training
552nd ACW	Tinker AFB, Okla.	E-3B/C/G
557th Weather Wing	Offutt AFB, Neb.	Weather information
601st Air & Space Operations Center	Tyndall AFB, Fla.	Plan and direct air operations
624th Operations Center	JBSA-Lackland, Texas	Plan/direct cyber operations
633rd ABW	JB Langley-Eustis, Va.	Joint base facilities support
688th Cyberspace Wing	JBSA-Lackland, Texas	Information operations, engineering installations
Air Force Rescue Coordination Center	Tyndall AFB, Fla.	National search and rescue coordination
Air Force Technical Applications Center	Patrick AFB, Fla.	Nuclear treaty monitoring, nuclear event detection

A TU-2S Dragon Lady flying high above Beale AFB, Calif.

Photo: A1C Tristan Viglianco

AETC

Air Education and Training Command

Headquarters: JBSA-Randolph, Texas
Date of current designation: July 1, 1993
Commander: Lt. Gen. Steven L. Kwast*

Primary Mission

Recruit, train, and educate airmen through basic military training, initial and advanced technical training, and professional military education.

AETC Structure

PERSONNEL		
Active Duty	**Civilian**	**Total**
56,303	14,536	70,839

EQUIPMENT (TAI)	
Fighter/Attack	212
Helicopter	44
Special Operations Forces	15
Tanker	18
Trainer	1,132
Transport	31

MAJOR UNITS	LOCATION	AIRCRAFT/MISSION/WEAPON
12th Flying Training Wing (FTW)	JBSA-Randolph, Texas	T-1A, T-6A, T-38C (CSO at NAS Pensacola, Fla.)
14th FTW	Columbus AFB, Miss.	T-1A, T-6A, T-38C (A-29 at Moody AFB, Ga.)
17th Training Wing (TRW)	Goodfellow AFB, Texas	Technical training
33rd Fighter Wing (FW)	Eglin AFB, Fla.	F-35
37th TRW	JBSA-Lackland, Texas	Basic military and technical training
42nd Air Base Wing (ABW)	Maxwell AFB, Ala.	Base support
47th FTW	Laughlin AFB, Texas	T-1A, T-6A, T-38C
49th Wing	Holloman AFB, N.M.	MQ-1, MQ-9, QF-16
56th FW	Luke AFB, Ariz.	F-16, F-35
58th Special Operations Wing	Kirtland AFB, N.M.	CV-22, HC-130J/P/N, HH-60G, MC-130H/J/P, UH-1N, TH-1H
59th Medical Wing	JBSA-Lackland, Texas	Wilford Hall Ambulatory Surgical Center
71st FTW	Vance AFB, Okla.	T-1A, T-6A, T-38C
80th FTW	Sheppard AFB, Texas	T-6A, T-38C
81st TRW	Keesler AFB, Miss.	Technical training
82nd TRW	Sheppard AFB, Texas	Technical training
97th Air Mobility Wing	Altus AFB, Okla.	C-17, KC-135R
314th Air Mobility Wing	Little Rock AFB, Ark.	C-130J
502nd ABW	JBSA-Fort Sam Houston, Texas	JBSA facilities support
Air Force Profession of Arms Center of Excellence	JBSA-Randolph, Texas	Professional training
Air Force Institute of Technology	Wright-Patterson AFB, Ohio	Postgraduate education
Carl A. Spaatz Center for Officer Education	Maxwell AFB, Ala.	Officer professional military education (PME)
Curtis E. LeMay Center for Doctrine Dev. & Education	Maxwell AFB, Ala.	Air Force doctrine development
Ira C. Eaker Center for Professional Dev.	Maxwell AFB, Ala.	Professional and technical continuing education
Jeanne M. Holm Center for Officer Accessions	Maxwell AFB, Ala.	Officer training, ROTC and JROTC oversight and Citizen Development
Muir S. Fairchild Research Information Center	Maxwell AFB, Ala.	Information resources
Thomas N. Barnes Center for Enlisted Education	Maxwell AFB, Ala.	Enlisted PME

Photo: Kemberly Groue/USAF

A T-6 Texan II aircraft on static display at Keesler AFB, Miss., provides hands-on training.

*Lt. Gen. Marshall B. "Brad" Webb was nominated to be AETC commander on May 7, 2019.

AFGSC

Air Force Global Strike Command

Headquarters: Barksdale AFB, La.
Date of current designation: Aug. 7, 2009
Commander: Gen. Timothy M. Ray

Primary Mission

Organize, train, equip, maintain, and provide ICBM forces and long-range bomber forces to combatant commanders; provide installation mission support.

AFGSC Structure

COMMANDER

- **8th Air Force** — Barksdale AFB, La.
- **20th Air Force** — F. E. Warren AFB, Wyo.

PERSONNEL		
Active Duty	**Civilian**	**Total**
28,151	4,096	32,247

EQUIPMENT (TAI)	
Bomber	134
Helicopter	25
ICBM	400
ISR/BM/C3	4
Trainer	14

MAJOR UNITS	LOCATION	AIRCRAFT/MISSION/WEAPON
2nd Bomb Wing (BW)	Barksdale AFB, La.	B-52H
5th BW	Minot AFB, N.D.	B-52H
7th BW	Dyess AFB, Texas	B-1B
28th BW	Ellsworth AFB, S.D.	B-1B
90th Missile Wing (MW)	F. E. Warren AFB, Wyo.	Minuteman III, UH-1N
91st MW	Minot AFB, N.D.	Minuteman III, UH-1N
341st MW	Malmstrom AFB, Mont.	Minuteman III, UH-1N
377th Air Base Wing	Kirtland AFB, N.M.	Nuclear operations, expeditionary force training, base support
509th BW	Whiteman AFB, Mo.	B-2A, T-38C
595th Command and Control Group	Offutt, Neb.	Command and control, E-4B

Airmen from the 90th Missile Maintenance Squadron prepare to remove a Minuteman reentry system in a silo at F.E. Warren AFB, Wyo.

Photo: A1C Braydon Williams

AFMC

Air Force Materiel Command

Headquarters: Wright-Patterson AFB, Ohio
Date of current designation: July 1, 1992
Commander: Lt. Gen. Robert D. McMurry Jr. (interim)*

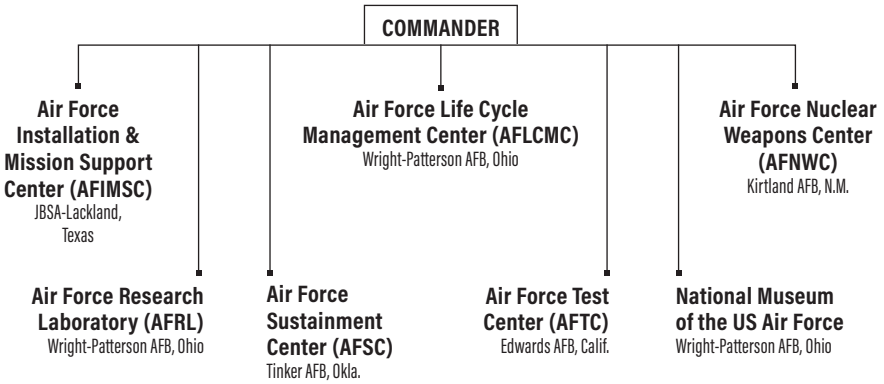
Primary Mission

Research, develop, procure, test, and sustain USAF weapon systems.

PERSONNEL		
Active Duty	**Civilian**	**Total**
16,487	65,686	82,173

EQUIPMENT (TAI)	
Bomber	5
Fighter/Attack	46
Helicopter	5
ISR/BM/C3	23
Tanker	2
Trainer	15
Transport	21

AFMC Structure



	MAJOR UNITS	LOCATION	AIRCRAFT/MISSION/WEAPON
AFIMSC	Air Force Civil Engineer Center	JBSA-Lackland, Texas	Installation support (civil engineering)
	Air Force Financial Management Center of Expertise	Buckley AFB, Colo.	Installation support (financial analysis)
	Air Force Financial Services Center	Ellsworth AFB, S.D.	Installation support (payment processing)
	Air Force Installation Contracting Agency	Wright-Patterson AFB, Ohio	Enterprise contracting support
	Air Force Security Forces Center	JBSA-Lackland, Texas	Installation support (security forces programs)
	Air Force Services Activity	JBSA-Lackland, Texas	Installation support (lodging, recreation)
AFLCMC	Air Force Program Executive Officer–Agile Combat Support	Wright-Patterson AFB, Ohio	Systems acquisition
	AFPEO–Armament	Eglin AFB, Fla.	Systems acquisition
	AFPEO–Battle Management	Hanscom AFB, Mass.	Systems acquisition
	AFPEO–Business and Enterprise Systems	Maxwell AFB-Gunter Annex, Ala.	Systems acquisition
	AFPEO–C3I and Networks	Hanscom AFB, Mass.	Systems acquisition
	AFPEO–Fighters and Bombers	Wright-Patterson AFB, Ohio	Systems acquisition
	AFPEO–ISR and Special Operations Forces	Wright-Patterson AFB, Ohio	Systems acquisition
	AFPEO–Mobility	Wright-Patterson AFB, Ohio	Systems acquisition
	AFPEO-Presidential Aircraft Recapitalization	Wright-Patterson AFB, Ohio	Systems acquisition
	AFPEO–Tanker	Wright-Patterson AFB, Ohio	Systems acquisition
	88th Air Base Wing (ABW)	Wright-Patterson AFB, Ohio	Base support
AFNWC	AFPEO–Nuclear Command, Control, and Communications	Hanscom AFB, Mass.	Systems acquisition
	AFPEO–Strategic Systems	Kirtland AFB, N.M.	Systems acquisition
AFRL	Aerospace Systems	Wright-Patterson AFB, Ohio	Research and development (R&D)
	Air Force Office of Scientific Research	Arlington, Va.	Research
	Air Force Strategic Development Planning and Experimentation Office	Wright-Patterson AFB, Ohio	R&D
	Directed Energy	Kirtland AFB, N.M.	R&D
	Information	Rome, N.Y.	R&D
	Materials and Manufacturing	Wright-Patterson AFB, Ohio	R&D
	Munitions	Eglin AFB, Fla.	R&D
	Sensors	Wright-Patterson AFB, Ohio	R&D
	Space Vehicles	Kirtland AFB, N.M.	R&D
	711th Human Performance Wing	Wright-Patterson AFB, Ohio	Airman performance research and education
AFSC	Ogden Air Logistics Complex (ALC)	Hill AFB, Utah	Weapons sustainment
	Oklahoma City ALC	Tinker AFB, Okla.	Weapons sustainment
	Warner Robins ALC	Robins AFB, Ga.	Weapons sustainment
	72nd ABW	Tinker AFB, Okla.	Base support
	75th ABW	Hill AFB, Utah	Base and Utah Test and Training Range support
	78th ABW	Robins AFB, Ga.	Base support
	448th Supply Chain Management Wing	Tinker AFB, Okla.	Depot line repairables and consumables
	635th Supply Chain Operations Wing	Scott AFB, Ill.	Global sustainment support
AFTC	Arnold Engineering Development Complex	Arnold AFB, Tenn.	Flight, space, and missile ground testing
	96th Test Wing (TW)	Eglin AFB, Fla.	Aircraft/system testing, base & range support
	412th TW	Edwards AFB, Calif.	Aircraft/system testing, base & range support

Lt. Gen. Arnold W. Bunch Jr. was nominated to be AFMC commander on Dec. 13, 2018.

AFRC

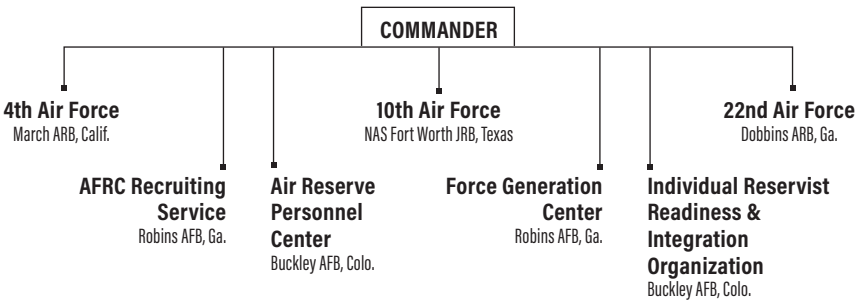
Air Force Reserve Command

Headquarters: Robins AFB, Ga.
Date of current designation: Feb. 17, 1997
Commander: Lt. Gen. Richard W. Scobee

Primary Mission

Provide strike, air mobility, special operations forces, rescue, aeromedical evacuation, aerial firefighting and spraying, weather reconnaissance, cyberspace operations, ISR, space, flying training, and other capabilities to support the Active Duty force and assist with domestic and foreign disaster relief.

AFRC Structure



PERSONNEL			
Total (Selected reserve)	**Active Duty**	**Civilian** (Includes technicians)	**Total**
68,703	3,386	N/A	N/A

EQUIPMENT (TAI)	
Bomber	18
Fighter/Attack	109
Helicopter	15
ISR/BM/C3	10
Tanker	72
Transport	96

WINGS/CENTERS	LOCATION	AIRCRAFT/MISSION/WEAPON
94th Airlift Wing (AW)	Dobbins ARB, Ga.	C-130H
301st Fighter Wing (FW)	NAS Fort Worth, JRB, Texas	F-16 (Texas)
302nd AW	Peterson AFB, Colo.	C-130H (including Modular Airborne Firefighting System)
307th Bomb Wing	Barksdale AFB, La.	B-52H
310th Space Wing	Schriever AFB, Colo.	Space control and operations and warning, information operations
315th AW (classic associate)	JB Charleston, S.C.	C-17
349th Air Mobility Wing (classic associate)	Travis AFB, Calif.	C-5, C-17, KC-10
403rd Wing	Keesler AFB, Miss.	C-130J, WC-130J
419th FW (classic associate)	Hill AFB, Utah	F-35A
433rd AW	JBSA-Lackland, Texas	C-5M, formal training unit
434th Air Refueling Wing (ARW)	Grissom ARB, Ind.	KC-135R
439th AW	Westover ARB, Mass.	C-5M
442nd FW	Whiteman AFB, Mo.	A-10C
445th AW	Wright-Patterson AFB, Ohio	C-17
446th AW (classic associate)	JB Lewis-McChord, Wash.	C-17
452nd AMW	March ARB, Calif.	C-17, KC-135R
459th ARW	JB Andrews, Md.	KC-135R
482nd FW	Homestead ARB, Fla.	F-16C
507th ARW	Tinker AFB, Okla.	KC-135R
512th AW (classic associate)	Dover AFB, Del.	C-5M, C-17
514th AMW (classic associate)	JB McGuire-Dix-Lakehurst, N.J.	C-17, KC-10
908th AW	Maxwell AFB, Ala.	C-130H
910th AW	Youngstown ARS, Ohio	C-130H
911th AW	Pittsburgh Arpt., Pa.	Converting from C-130 to C-17
914th ARW	Niagara Falls ARS, N.Y.	KC-135R
916th ARW	Seymour Johnson AFB, N.C.	KC-135R
919th Special Operations Wing (classic associate)	Duke Field, Fla.	AC-130U, C-145A, C-146, C-208 MC-130H, MQ-9, PC-12, U-28
920th Rescue Wing	Patrick AFB, Fla.	HC-130N/P, HH-60G
926th Wing (classic associate)	Nellis AFB, Nev.	F-15C, F-15E, F-16, F-22A, F-35A, MQ-1 and MQ-9 (Creech AFB, Nev.), RQ-4 (Beale AFB, Calif.)
927th ARW (classic associate)	MacDill AFB, Fla.	KC-135R
931st ARW (classic associate)	McConnell AFB, Kan.	KC-1355R, KC-46A
932nd AW	Scott AFB, Ill.	C-40C
934th AW	Minneapolis-St. Paul Arpt., Minn	C-130H
940th Air Refueling Wing	Beale AFB, Calif.	KC-135R
944th FW (classic and active associate)	Luke AFB, Ariz	A-10 (active associate-Davis Monthan AFB, Ariz.)
		F-15E (Seymour Johnson A FB, N.C.), F-16 (Luke AFB and Holloman AFB, Ariz.), F-35A (Luke AFB and Eglin AFB, Fla.)

Classic associate: Active Duty unit owns aircraft.

AFSPC

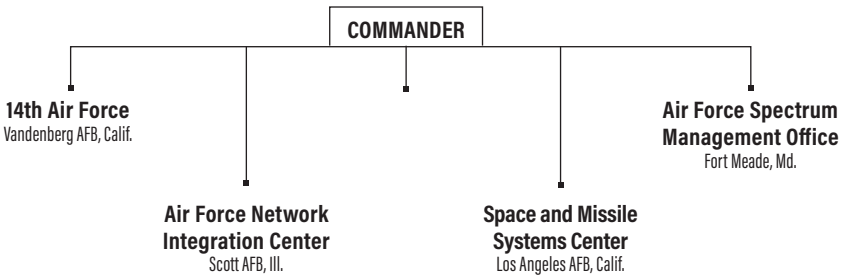
Air Force Space Command

Headquarters: Peterson AFB, Colo.
Date of current designation: Sept. 1, 1982
Commander: Gen. John W. "Jay" Raymond

Primary Mission

Organize, train, equip, maintain, and provide space and cyberspace operations forces. Develop, procure, and test space systems. Sustain national space launch facilities.

AFSPC Structure



PERSONNEL		
Active Duty	**Civilian**	**Total**
9,870	6,826	16,696

EQUIPMENT

Air Force Satellite Control Network, BMEWS, Cyber Weapon Systems, GEODSS, JMS, Launch/test ranges, Pave Phased Array Warning System, PARCS, SPADOC, Space surveillance radars.

Satellite systems (on orbit):

AEHF	4	DSP	5	SBIRS	7
ATRR	1	GPS	31	SBSS	2
DMSP	5	GSSAP	4	WGS	7
DSCS	6	Milstar	5		

WINGS/CENTERS	LOCATION	AIRCRAFT/MISSION/WEAPON
21st Space Wing (SW)	Peterson AFB, Colo.	Space control/warning
30th SW	Vandenberg AFB, Calif.	Space launch, ICBM test, launch range operations
45th SW	Patrick AFB, Fla.	Space launch, launch range operations
50th SW	Schriever AFB, Colo.	C2 space operations
460th SW	Buckley AFB, Colo.	Space surveillance/warning
614th Air & Space Operations Center	Vandenberg AFB, Calif.	Theater and global space operations

Photo: A1C Aubree Milks

Airmen watch the launch of SSO-A on a SpaceX Falcon 9 rocket from the Emergency Operations Center at Vandenberg AFB, Calif., Dec. 3, 2018.

AFSOC

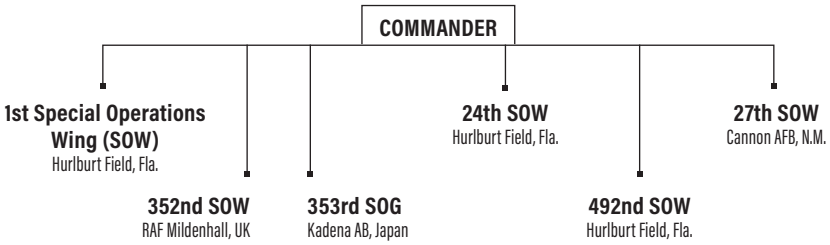
Air Force Special Operations Command

Headquarters: Hurlburt Field, Fla.
Date of current designation: May 22, 1990
Commander: Lt. Gen. Marshall B. "Brad" Webb*

Primary Mission

Organize, train, equip, maintain, and provide special operations airpower forces to combatant commanders.

AFSOC Structure



PERSONNEL		
Active Duty	**Civilian**	**Total**
14,949	1,771	16,720

EQUIPMENT (TAI)	
ISR/BM/C3	44
Special Operations Forces	124

MAJOR UNITS	LOCATION	AIRCRAFT/MISSION/WEAPON
1st Special Operations Group (SOG)	Hurlburt Field, Fla.	AC-130J/U, CV-22, MC-130 H/P, MQ-9, U-28A-
27th SOG	Cannon AFB, N.M.	AC-130W, C-146A, CV-22B, MC-130J, MQ-1, MQ-9, U-28A
551st SOS	Cannon AFB, N.M.	AC-130H/W, CV-22, MC-130J, MQ-9
720th Special Tactics Group (STG)	Hurlburt Field, Fla.	Special tactics operations
724th STG	Pope Field, N.C.	Special tactics operations
752nd SOG	RAF Mildenhall, UK	CV-22, MC-130J

Photo: A1C Gage Adison Daniel

Airmen use simulated scenarios to train at the Emergency Medical Technician Rodeo at Melrose AFS, N.M.

*Lt. Gen. Marshall B. "Brad" Webb was nominated to be AETC commander on May 7, 2019. Lt. Gen. James C. "Jim" Slife was confirmed to be AFSOC commander March 28.

AMC

Air Mobility Command

Headquarters: Scott AFB, Ill.
Date of current designation: June 1, 1992
Commander: Gen. Maryanne Miller

Primary Mission

Organize, train, equip, maintain, and provide air mobility forces to sustain worldwide airpower operations.

AMC Structure

COMMANDER

18th Air Force (Air Forces Transportation)
Scott AFB, Ill.

US Air Force Expeditionary Center
JB McGuire-Dix-Lakehurst, N.J.

PERSONNEL		
Active Duty	**Civilian**	**Total**
40,843	7,875	48.718

EQUIPMENT (TAI)	
Tanker	161
Transport	251

WINGS/CENTERS	LOCATION	AIRCRAFT/MISSION/WEAPON
6th Air Mobility Wing (AMW)	MacDill AFB, Fla.	C-37, KC-135R
19th Airlift Wing (AW)	Little Rock AFB, Ark.	C-130H/J
22nd Air Refueling Wing (ARW)	McConnell AFB, Kan.	KC-135R
60th AMW	Travis AFB, Calif.	C-5, C-17, KC-10
62nd AW	JB Lewis-McChord, Wash.	C-17
87th Air Base Wing (ABW)	JB McGuire-Dix-Lakehurst, N.J.	Joint base facilities support
89th AW	JB Andrews, Md.	C-20B, C-32A, C-37A/B, C-40B, VC-25A
92nd ARW	Fairchild AFB, Wash.	KC-135R
305th AMW	JB McGuire-Dix-Lakehurst, N.J.	C-17, KC-10
317th AW	Dyess AFB, Texas	C-130J
375th AMW	Scott AFB, Ill.	C-21, C-40 (AA), KC-135R (AA), NC-21
436th AW	Dover AFB, Del.	C-5, C-17
437th AW	JB Charleston, S.C.	C-17A
515th Air Mobility Operations Wing (AMOW)	JB Pearl Harbor-Hickam, Hawaii	Contingency airfield operations
521st AMOW	Ramstein AB, Germany	Contingency airfield operations
618th Air & Space Operations Center	Scott AFB, Ill.	Tanker Airlift Control Center operations
621st Contingency Response Wing	JB McGuire-Dix-Lakehurst, N.J.	Rapidly deployable bare base operations
628th ABW	JB Charleston, S.C.	Joint base facilities support

Photo: SrA. Sean Campbell

A bird's-eye view of a KC-135 Stratotanker refueling a B-52 Stratofortress.

PACAF

Pacific Air Forces

Headquarters: JB Pearl Harbor-Hickam, Hawaii
Date of current designation: July 1, 1957
Commander: Gen. Charles Q. Brown Jr.

Primary Mission

Provide US Pacific Command integrated expeditionary Air Force capabilities, including strike, air mobility, and rescue forces.

PACAF Structure

COMMANDER

- **5th Air Force (Air Forces Japan)** — Yokota AB, Japan
- **7th Air Force (Air Forces Korea)** — Osan AB, South Korea
- **11th Air Force** — JB Elmendorf-Richardson, Alaska

PERSONNEL		
Active Duty	**Civilian**	**Total**
28,468	N/A	N/A

EQUIPMENT (TAI)	
Fighter/Attack	259
Helicopter	13
ISR/BM/C3	4
Tanker	18
Transport	30

WINGS/CENTERS	LOCATION	AIRCRAFT/MISSION/WEAPON
3rd Wing	JB Elmendorf-Richardson, Alaska	C-12, C-17, E-3, F-22A
8th Fighter Wing (FW)	Kunsan AB, South Korea	F-16C/D
15th Wing	JB Pearl Harbor-Hickam, Hawaii	C-17A, C-37A, C-40B, F-22A (AA), KC-135R (AA)
18th Wing	Kadena AB, Japan	E-3B/C, F-15C/D, HH-60G, KC-135R
35th FW	Misawa AB, Japan	F-16C/D
36th Wing	Andersen AFB, Guam	Operational platform for rotating combat forces
51st FW	Osan AB, South Korea	A-10C, F-16C/D
354th FW	Eielson AFB, Alaska	F-16C/D
374th Airlift Wing	Yokota AB, Japan	C-12J, C-130H, UH-1N
607th Air & Space Operations Center (AOC)	Osan AB, South Korea	Plan and direct air operations
611th AOC	JB Elmendorf-Richardson, Alaska	Plan and direct air operations
613th AOC	JB Pearl Harbor-Hickam, Hawaii	Plan and direct air operations
673rd Air Base Wing	JB Elmendorf-Richardson, Alaska	Joint base facilities support
Regional Support Center	JB Elmendorf-Richardson, Alaska	Remote facility operations, communications, engineering

Photo: SrA. Donald Hudson

A 459th Airlift Squadron C-12 Huron flies over the cherry blossom trees at Yokota AB, Japan.

USAFE

US Air Forces in Europe - Air Forces Africa

Headquarters: Ramstein AB, Germany
Date of current designation: April 20, 2012
Commander: Gen. Jeffrey L. Harrigian

Primary Mission

Serves as the air component for US European Command and US Africa Command, directing air operations, including warfighting and humanitarian/peacekeeping actions, and maintains combat-ready forces for NATO responsibilities.

USAFE Structure

COMMANDER

- **3rd Air Force (Air Forces Europe)** — Ramstein AB, Germany
- **Hq. USAFE-AFAFRICA (Air Forces Africa)** — Ramstein AB, Germany

PERSONNEL		
Active Duty	**Civilian**	**Total**
22,571	N/A	N/A

EQUIPMENT (TAI)	
Fighter/Attack	155
Helicopter	5
Tanker	15
Transport	22

WINGS/CENTERS	LOCATION	AIRCRAFT/MISSION/WEAPON
31st Fighter Wing (FW)	Aviano AB, Italy	F-16C/D
39th Air Base Wing	Incirlik AB, Turkey	Operational location for deployed US and NATO forces
48th FW	RAF Lakenheath, UK	F-15C/D, F-15E, HH-60G
52nd FW	Spangdahlem AB, Germany	F-16C/D
86th Airlift Wing	Ramstein AB, Germany	C-21, C-37A, C-40B, C-130J
100th Air Refueling Wing	RAF Mildenhall, UK	CV-22, KC-135R, MC-130J, RC-135V/W
435th Air Ground Operations Wing	Ramstein AB, Germany	Battlefield airmen support and operations
501st Combat Support Wing	RAF Alconbury, UK	Facilitates support for seven geographically separated units
603rd Air & Space Operations Center	Ramstein AB, Germany	Plan and direct air operations

Photo: Courtesy

F-15C Eagles and an F-15E Strike Eagle fly in tandem in support of ongoing theater operations in Southeast Asia.

ANG

Air National Guard

Headquarters: Washington, D.C.
Date of current designation: Sept. 18, 1947
Director: Lt. Gen. L. Scott Rice

Primary Mission

Provide combat capability to the Active Duty force and security for the homeland. Support US domestic and foreign humanitarian and disaster relief.

PERSONNEL			
Total (Selected reserve)	**Active Duty**	**Civilian** (Includes technicians)	**Total**
107,469	15,252	N/A	N/A

EQUIPMENT (TAI)			
Fighter/Attack	575	Special Operations Forces	4
Helicopter	17	Tanker	171
ISR/BM/C3	74	Transport	209

WING (STATE)	SYSTEM/MISSION
101st Air Refueling Wing (Maine)	KC-135R, CC
102nd Intelligence Wing (Mass.)	DCGS, cyber, ISR, EISG, WXF
103rd Airlift Wing (Conn.)	C-130H
104th Fighter Wing (Mass.)	F-15C/D
105th AW (N.Y.)	C-17, EIS, WXF
106th Rescue Wing (N.Y.)	HC-130, HH-60G, GA
107th AW (N.Y.)	MQ-9
108th Wing (N.J.)	KC-135R, C-32B, intel, SOS
109th AW (N.Y.)	LC-130
110th Attack Wing (Mich.)	MQ-9, AOG, C2, cyber
111th Attack Wing (Pa.)	MQ-9, cyber, EIS
113th Wing (D.C.)	C-40C, F-16C/D, WXF
114th FW (S.D.)	F-16C/D
115th FW (Wis.)	F-16C/D, RC-26B, WXF
116th Air Control Wing (Ga.)	E-8C, WXF
117th ARW (Ala.)	KC-135R, DCGS
118th Wing (Tenn.)	MQ-9, cyber
119th Wing (N.D.)	MQ-9, ISR, WXF
120th AW (Mont.)	C-130H, WXF
121st ARW (Ohio)	KC-135R, WXF
122nd FW (Ind.)	A-10C
123rd AW (Ky.)	C-130H, CRG, special tactics, WXF, intel
124th FW (Idaho)	A-10C, TACP, cyber
125th FW (Fla.)	F-15C/D, WXF
126th ARW (Ill.)	KC-135R, SCMS
127th Wing (Mich.)	A-10C, KC-135T, WXF
128th ARW (Wis.)	KC-135R
129th RQW (Calif.)	MC-130P, HH-60G, GA
130th AW (W.Va.)	C-130H, RC-26B
131st Bomb Wing (Mo.)	B-2 (CA)
132nd Wing (Iowa)	MQ-9, RC-26B, cyber, ISR
133rd AW (Minn.)	C-130H, ALCF, WXF
134th ARW (Tenn.)	KC-135R
136th AW (Texas)	C-130H, ALCF, WXF
137th SOW (Okla.)	MC-12, EIS, SOS, TACP
138th FW (Okla.)	F-16C/D, EIS, WXF
139th AW (Mo.)	C-130H, AATTC (ANG/AFRC), ATCS
140th Wing (Colo.)	F-16C/D, CEF, WXF
141st ARW (Wash.)	KC-135R, CC, RC-26B, intel
142nd FW (Ore.)	F-15C/D, special tactics, WXF
143rd AW (R.I.)	C-130J, cyber
144th FW (Calif.)	F-15C/D, RC-26B, WXF
145th AW (N.C.)	C-130H, CEF, MAFFS
146th AW (Calif.)	C-130J, ALCF, MAFFS, WXF
147th Reconnaissance Wing (Texas)	MQ-1B, RC-26, TACP, EIS, WXF
148th FW (Minn.)	F-16C/D
149th FW (Texas)	F-16C/D
150th SOW (N.M.)	Special ops training (CA), RC-26B
151st ARW (Utah)	KC-135R
152nd AW (Nev.)	C-130H, DCGS
153rd AW (Wyo.)	C-130H, MAFFS
154th Wing (Hawaii)	C-17 (CA), F-22, KC-135R, intel, WXF
155th ARW (Neb.)	KC-135R
156th AW (Puerto Rico)	WC-130H
157th ARW (N.H.)	KC-135R
158th FW (Vt.)	F-16C, WXF
159th FW (La.)	F-15C/D, CC
161st ARW (Ariz.)	KC-135R
162nd Wing (Ariz.)	F-16, RC-26B, WXF
163rd Attack Wing (Calif.)	MQ-9, FTU, WXF
164th AW (Tenn.)	C-17A
165th AW (Ga.)	C-130H, CRTC, AOS
166th AW (Del.)	C-130H, cyber
167th AW (W.Va.)	C-17A
168th ARW (Alaska)	KC-135R
169th FW (S.C.)	F-16C/D, ATCS
171st ARW (Pa.)	KC-135R/T, WXF
172nd AW (Miss.)	C-17, ALCF
173rd FW (Ore.)	F-15C/D, FTU, ATCS
174th Attack Wing (N.Y.)	MQ-9, RC-26B, AOC, FTU,
175th Wing (Md.)	A-10C, CEF, cyber, intel
176th Wing (Alaska)	C-17 (CA), HC-130J, HH-60G, GA, RAOC
177th FW (N.J.)	F-16C, AOS, WXF
178th Wing (Ohio)	MQ-1, cyber, MCE, ISR
179th AW (Ohio)	C-130H
180th FW (Ohio)	F-16C/D
181st IW (Ind.)	DCGS, ISR, TACP, WXF
182nd AW (Ill.)	C-130H, CC, TACP
183rd FW (Ill.)	CRF, DCGS
184th IW (Kan.)	CACS, cyber, DCGS, ISR, NOSS, TACP
185th ARW (Iowa)	KC-135R
186th ARW (Miss.)	KC-135R, RC-26B, AOG, ATCS
187th FW (Ala.)	F-16C/D, RC-26B
188th Wing (Ark.)	MQ-9, MCE, ISR, DCGS
189th AW (Ark.)	C-130H, intel, FTU, WXF
190th ARW (Kan.)	KC-135R, CW
192nd FW (Va.)	F-22 (CA), cyber, DCGS
193rd SOW (Pa.)	EC-130J, AOS, CC, cyber, TACP
194th Regional Support Wing (Wash.)	CC, CW
195th Wing (Calif.)	DCGS, intel

FOAs, DRUs, and Auxiliary

Air Force Agency for Modeling and Simulation

Headquarters: Orlando, Fla.
Date of Current Designation: June 3, 1996
Type: Field Operating Agency (FOA)
Mission: Oversee air, space, and cyberspace modeling and simulation requirements and provide joint interoperability standards within live, virtual, and constructive (LVC) domains.

Air Force Audit Agency

Headquarters: Pentagon
Date of Current Designation: Dec. 31, 1971
Type: FOA
Mission: Provide independent, objective, and quality internal audit service.

Air Force Cost Analysis Agency

Headquarters: Arlington, Va.
Date of Current Designation: Aug. 1, 1991
Type: FOA
Mission: Perform independent cost and risk analyses and provide special studies to aid long-range planning.

Air Force District of Washington

Headquarters: JB Andrews, Md.
Date of Current Designation: July 7, 2005
Type: Direct Reporting Unit (DRU)
Mission: Orchestrate support for National Capital Region activities; train, equip, and provide forces for contingency, homeland, and ceremonial support operations

Air Force Flight Standards Agency

Headquarters: Oklahoma City
Date of Current Designation: Oct. 1, 1991
Type: FOA
Mission: Develop, standardize, evaluate, and certify policy, procedures, and equipment for flight operations and centrally manage air traffic control and landing systems.

A FOA Is a Field Operating Unit, an organization that performs a specialized function not performed by any other command, which reports to Headquarters, USAF. A Direct Reporting Unit (DRU) reports directly to the Chief of Staff. The Air Force Auxiliary is the Civil Air Patrol.

Air Force Historical Research Agency

Headquarters: Maxwell AFB, Ala.
Date of Current Designation: Sept. 1, 1991
Type: FOA
Mission: Research, record, and disseminate history; collect, preserve, and manage historical document collection and oral history program; determine unit lineage and honors; verify aerial victory credits.

Air Force Inspection Agency

Headquarters: Kirtland AFB, N.M.
Date of Current Designation: Aug. 1, 1991
Type: FOA
Mission: Provide independent assessments of operations and activities; conduct nuclear surety inspection oversight, training, and certification; serve as primary action arm of the Secretary of the Air Force's inspection system.

Air Force Legal Operations Agency

Headquarters: JB Andrews, Md.
Date of Current Designation: Sept. 1, 1991
Type: FOA
Mission: Administer military justice programs; provide legal research technology and train legal professionals; support the Department of Justice in civil or criminal litigation pertaining to the Air Force.

Air Force Manpower Analysis Agency

Headquarters: JBSA-Randolph, Texas
Date of Current Designation: June 1, 2015
Type: FOA
Mission: Measure and document Air Force manpower requirements.

Air Force Medical Operations Agency

Headquarters: JBSA-Lackland, Texas
Date of Current Designation: July 1, 1992
Type: FOA
Mission: Oversee execution of surgeon general policies; provide leadership for medical personnel and medical treatment facilities; promote a cost-effective, modern, and prevention-based health care continuum.

Air Force Medical Support Agency

Headquarters: Falls Church, Va.
Date of Current Designation: July 1, 1992
Type: FOA

Mission: Develop surgeon general plans and programs; provide medical expeditionary capabilities and national security strategy; define and execute health care policy.

Air Force Mortuary Affairs Operations

Headquarters: Dover AFB, Del.
Date of Current Designation: Jan. 6, 2009
Type: FOA

Mission: Ensure respectful handling, dignity, and honor of the fallen; provide care, service, and support to family of the fallen; transfer remains.

Air Force Office of Special Investigations

Headquarters: Quantico, Va.
Date of Current Designation: Dec. 20, 1971
Type: FOA

Mission: Provide investigative service to USAF commanders; identify, exploit, and neutralize criminal, terrorist, and intelligence threats; combat threats to information systems and technologies; defeat fraud affecting acquisitions and base-level capabilities.

Air Force Operational Test and Evaluation Center

Headquarters: Kirtland AFB, N.M.
Date of Current Designation: April 4, 1983
Type: DRU

Mission: Test and evaluate new weapon systems.

Air Force Operations Group

Headquarters: Pentagon
Date of Current Designation: April 1, 1995
Type: FOA

Mission: Provide 24-hour watch on current operations; train and staff Crisis Action Team; develop weather data for National Command Authority, Joint Chiefs of Staff, National Military Command Center, Army Operations Center, and other federal agencies.

Air Force Personnel Center

Headquarters: JBSA-Randolph, Texas
Date of Current Designation: Oct. 1, 1995
Type: FOA

Mission: Identify proper grades, specialties, and skill levels for USAF mission; manage assignments; monitor professional development; plan and schedule expeditionary forces; oversee airmen and family readiness centers; assist casualty reporting and missing in action/prisoner of war actions.

Air Force Public Affairs Agency

Headquarters: JBSA-Lackland, Texas
Date of Current Designation: Oct. 1, 2008
Type: FOA

Mission: Develop and sustain public affairs products; provide combat camera and graphics support; test emerging technologies; manage public affairs personnel deployments.

Air Force Review Boards Agency

Headquarters: JB Andrews, Md.
Date of Current Designation: Aug. 1, 1991
Type: FOA

Mission: Manage military and civilian appellate processes; serve as lead agent for DOD Physical Disability Board of Review.

Air Force Safety Center

Headquarters: Kirtland AFB, N.M.
Date of Current Designation: Jan. 1, 1996
Type: FOA

Mission: Manage mishap prevention, risk management, and nuclear surety programs; provide flight, ground, weapons, human factors, and space safety technical assistance; oversee major command mishap investigations and evaluate corrective actions; direct safety education programs.

Air National Guard Readiness Center

Headquarters: JB Andrews, Md.
Date of Current Designation: June 1, 1992
Type: FOA

Mission: Ensure field units have resources to train and equip forces for state and federal missions; sustain airmen and help shape leadership capability.

Civil Air Patrol

Headquarters: Maxwell AFB, Ala.
Date of Current Designation: Dec. 1, 1941
Type: Auxiliary

Mission: Provide operational capabilities to support search and rescue, disaster relief, a nationwide communications network, and counterdrug and homeland security missions; conduct leadership training, and career and technical education for CAP Cadet Program; promote aerospace education.

US Air Force Academy

Headquarters: Colorado Springs, Colo.
Date of Current Designation: April 1, 1954
Type: DRU

Mission: Develop, educate, and inspire young men and women to become USAF officers with knowledge, character, and discipline.

LEADERS THROUGH THE YEARS

HEADQUARTERS USAF LEADERS

SECRETARY OF THE AIR FORCE

Stuart Symington	Sept. 18, 1947	April 24, 1950
Thomas K. Finletter	April 24, 1950	Jan. 20, 1953
Harold E. Talbott	Feb. 4, 1953	Aug. 13, 1955
Donald A. Quarles	Aug. 15, 1955	April 30, 1957
James H. Douglas Jr.	May 1, 1957	Dec. 10, 1959
Dudley C. Sharp	Dec. 11, 1959	Jan. 20, 1961
Eugene M. Zuckert	Jan. 23, 1961	Sept. 30, 1965
Harold Brown	Oct. 1, 1965	Feb. 14, 1969
Robert C. Seamans Jr.	Feb. 15, 1969	May 14, 1973
John L. McLucas*	May 15, 1973	Nov. 23, 1975
James W. Plummer (acting)	Nov. 23, 1975	Jan. 2, 1976
Thomas C. Reed	Jan. 2, 1976	April 6, 1977
John C. Stetson	April 6, 1977	May 18, 1979
Hans M. Mark*	May 18, 1979	Feb. 9, 1981
Verne Orr	Feb. 9, 1981	Nov. 30, 1985
Russell A. Rourke	Dec. 6, 1985	April 7, 1986
Edward C. Aldridge Jr.*	April 8, 1986	Dec. 16, 1988
James F. McGovern (acting)	Dec. 16, 1988	April 29, 1989
John J. Welch Jr. (acting)	April 29, 1989	May 21, 1989
Donald B. Rice	May 22, 1989	Jan. 20, 1993
Michael B. Donley (acting)	Jan. 20, 1993	July 13, 1993
Gen. Merrill A. McPeak (acting)	July 14, 1993	Aug. 5, 1993
Sheila E. Widnall	Aug. 6, 1993	Oct. 31, 1997
F. Whitten Peters*	Nov. 1, 1997	Jan. 20, 2001
Lawrence J. Delaney (acting)	Jan. 20, 2001	June 1, 2001
James G. Roche	June 1, 2001	Jan. 20, 2005
Peter B. Teets (acting)	Jan. 20, 2005	March 25, 2005
Michael L. Dominguez (acting)	March 25, 2005	July 29, 2005
Preston M. Geren (acting)	July 29, 2005	Nov. 3, 2005
Michael W. Wynne	Nov. 3, 2005	June 20, 2008
Michael B. Donley*	June 21, 2008	June 21, 2013
Eric K. Fanning (acting)	June 21, 2013	Dec. 20, 2013
Deborah Lee James	Dec. 20, 2013	Jan. 19, 2017
Lisa S. Disbrow (acting)	Jan. 20, 2017	May 16, 2017
Heather A. Wilson	May 16, 2017	May 31, 2019
Matthew P. Donovan (acting)	June 1, 2019	

*Served as acting Secretary: McLucas until July 18, 1973; Mark until July 26, 1979; Aldridge until June 9, 1986; Peters until July 30, 1999; Donley until Oct. 17, 2008.

CHIEF OF STAFF OF THE AIR FORCE

Gen. Carl A. Spaatz	Sept. 26, 1947	April 29, 1948
Gen. Hoyt S. Vandenberg	April 30, 1948	June 29, 1953
Gen. Nathan F. Twining	June 30, 1953	June 30, 1957
Gen. Thomas D. White	July 1, 1957	June 30, 1961
Gen. Curtis E. LeMay	June 30, 1961	Jan. 31, 1965
Gen. John P. McConnell	Feb. 1, 1965	July 31, 1969
Gen. John D. Ryan	Aug. 1, 1969	July 31, 1973
Gen. George S. Brown	Aug. 1, 1973	June 30, 1974
Gen. David C. Jones	July 1, 1974	June 20, 1978
Gen. Lew Allen Jr.	July 1, 1978	June 30, 1982
Gen. Charles A. Gabriel	July 1, 1982	June 30, 1986
Gen. Larry D. Welch	July 1, 1986	June 30, 1990
Gen. Michael J. Dugan	July 1, 1990	Sept. 17, 1990
Gen. John Michael Loh (acting)	Sept. 18, 1990	Oct. 27, 1990
Gen. Merrill A. McPeak	Oct. 27, 1990	Oct. 25, 1994
Gen. Ronald R. Fogleman	Oct. 25, 1994	Sept. 1, 1997
Gen. Ralph E. Eberhart (acting)	Sept. 1, 1997	Oct. 6, 1997
Gen. Michael E. Ryan	Oct. 6, 1997	Sept. 6, 2001
Gen. John P. Jumper	Sept. 6, 2001	Sept. 2, 2005
Gen. T. Michael Moseley	Sept. 2, 2005	July 12, 2008
Gen. Duncan J. McNabb (acting)	July 12, 2008	Aug. 12, 2008
Gen. Norton A. Schwartz	Aug. 12, 2008	Aug. 10, 2012
Gen. Mark A. Welsh III	Aug. 10, 2012	July 1, 2016
Gen. David L. Goldfein	July 1, 2016	

VICE CHIEF OF STAFF OF THE AIR FORCE

Gen. Hoyt S. Vandenberg	Oct. 10, 1947	April 28, 1948
Gen. Muir S. Fairchild	May 27, 1948	March 17, 1950
Lt. Gen. Lauris Norstad (acting)	May 22, 1950	Oct. 9, 1950
Gen. Nathan F. Twining	Oct. 10, 1950	June 29, 1953
Gen. Thomas D. White	June 30, 1953	June 30, 1957
Gen. Curtis E. LeMay	July 1, 1957	June 30, 1961
Gen. Frederic H. Smith Jr.	July 1, 1961	June 30, 1962
Gen. William F. McKee	July 1, 1962	July 31, 1964
Gen. John P. McConnell	Aug. 1, 1964	Jan. 31, 1965
Gen. William H. Blanchard	Feb. 19, 1965	May 31, 1966
Lt. Gen. Hewitt T. Wheless (acting)	June 13, 1966	July 31, 1966
Gen. Bruce K. Holloway	Aug. 1, 1966	July 31, 1968
Gen. John D. Ryan	Aug. 1, 1968	July 31, 1969
Gen. John C. Meyer	Aug. 1, 1969	April 30, 1972
Gen. Horace M. Wade	May 1, 1972	Oct. 31, 1973
Gen. Richard H. Ellis	Nov. 1, 1973	Aug. 18, 1975
Gen. William V. McBride	Sept. 1, 1975	March 31, 1978
Gen. Lew Allen Jr.	April 1, 1978	June 30, 1978
Gen. James A. Hill	July 1, 1978	Feb. 29, 1980
Gen. Robert C. Mathis	March 1, 1980	May 31, 1982
Gen. Jerome F. O'Malley	June 1, 1982	Oct. 5, 1983
Gen. Lawrence A. Skantze	Oct. 6, 1983	July 31, 1984
Gen. Larry D. Welch	Aug. 1, 1984	July 31, 1985
Gen. John L. Piotrowski	Aug. 1, 1985	Jan. 31, 1987
Gen. Monroe W. Hatch Jr.	Feb. 1, 1987	May 24, 1990
Gen. John Michael Loh	May 25, 1990	March 25, 1991
Gen. Michael P. C. Carns	May 16, 1991	July 28, 1994
Gen. Thomas S. Moorman Jr.	July 29, 1994	July 11, 1997
Gen. Ralph E. Eberhart	July 11, 1997	May 26, 1999
Gen. Lester L. Lyles	May 27, 1999	April 17, 2000
Gen. John W. Handy	April 17, 2000	Nov. 5, 2001
Gen. Robert H. Foglesong	Nov. 5, 2001	Aug. 11, 2003
Gen. T. Michael Moseley	Aug. 12, 2003	Sept. 2, 2005
Gen. John D. W. Corley	Sept. 2, 2005	Sept. 17, 2007
Gen. Duncan J. McNabb	Sept. 17, 2007	Sept. 4, 2008
Gen. William M. Fraser III	Oct. 8, 2008	Aug. 27, 2009
Gen. Carrol H. Chandler	Aug. 27, 2009	Jan. 14, 2011
Gen. Philip M. Breedlove	Jan. 14, 2011	July 27, 2012
Gen. Larry O. Spencer	July 27, 2012	Aug. 6, 2015
Gen. David L. Goldfein	Aug. 6, 2015	July 1, 2016
Gen. Stephen W. Wilson	July 22, 2016	

CHIEF MASTER SERGEANT OF THE AIR FORCE

CMSAF Paul W. Airey	April 3, 1967	July 31, 1969
CMSAF Donald L. Harlow	Aug. 1, 1969	Sept. 30, 1971
CMSAF Richard D. Kisling	Oct. 1, 1971	Sept. 30, 1973
CMSAF Thomas N. Barnes	Oct. 1, 1973	July 31, 1977
CMSAF Robert D. Gaylor	Aug. 1, 1977	July 31, 1979
CMSAF James M. McCoy	Aug. 1, 1979	July 31, 1981
CMSAF Arthur L. Andrews	Aug. 1, 1981	July 31, 1983
CMSAF Sam E. Parish	Aug. 1, 1983	June 30, 1986
CMSAF James C. Binnicker	July 1, 1986	July 31, 1990
CMSAF Gary R. Pfingston	Aug. 1, 1990	Oct. 25, 1994
CMSAF David J. Campanale	Oct. 26, 1994	Nov. 4, 1996
CMSAF Eric W. Benken	Nov. 5, 1996	July 30, 1999
CMSAF Frederick J. Finch	July 30, 1999	July 1, 2002
CMSAF Gerald R. Murray	July 1, 2002	June 30, 2006
CMSAF Rodney J. McKinley	June 30, 2006	June 30, 2009
CMSAF James A. Roy	June 30, 2009	Jan. 24, 2013
CMSAF James A. Cody	Jan. 24, 2013	Feb. 17, 2017
CMSAF Kaleth O. Wright	Feb. 17, 2017	

MAJOR COMMAND AND ANG LEADERS

This section presents the leaders of USAF's Major Commands and the Air National Guard (ANG) under a command's current designation. **Leaders of historic Air Force major commands (and of active commands' previous designations) are listed online.**

AIR COMBAT COMMAND

Gen. John Michael Loh	June 1, 1992	June 23, 1995
Gen. Joseph W. Ralston	June 23, 1995	Feb. 28, 1996
Lt. Gen. Brett M. Dula (acting)	Feb. 28, 1996	April 5, 1996
Gen. Richard E. Hawley	April 5, 1996	June 11, 1999
Gen. Ralph E. Eberhart	June 11, 1999	Feb. 8, 2000
Gen. John P. Jumper	Feb. 8, 2000	Aug. 25, 2001
Lt. Gen. Donald G. Cook (acting)	Aug. 25, 2001	Nov. 14, 2001
Gen. Hal M. Hornburg	Nov. 14, 2001	Nov. 17, 2004
Lt. Gen. Bruce A. Wright (acting)	Nov. 17, 2004	Feb. 3, 2005
Lt. Gen. William Fraser III (acting)	Feb. 3, 2005	May 27, 2005
Gen. Ronald E. Keys	May 27, 2005	Oct. 2, 2007
Gen. John D. W. Corley	Oct. 2, 2007	Sept. 10, 2009
Gen. William M. Fraser III	Sept. 10, 2009	Sept. 13, 2011
Gen. Gilmary Michael Hostage III	Sept. 13, 2011	Nov. 4, 2014
Gen. Herbert J. Carlisle	Nov. 4, 2014	March 10, 2017
Gen. James M. Holmes	March 10, 2017	

For past leaders, see Tactical Air Command in Historic Major Command Leaders.

AIR EDUCATION AND TRAINING COMMAND

Gen. Henry Viccellio Jr.	July 1, 1993	June 20, 1995
Gen. Billy J. Boles	June 20, 1995	March 17, 1997
Gen. Lloyd W. Newton	March 17, 1997	June 22, 2000
Gen. Hal M. Hornburg	June 22, 2000	Nov. 10, 2001
Lt. Gen. John D. Hopper Jr. (acting)	Nov. 10, 2001	Dec. 15, 2001
Gen. Donald G. Cook	Dec. 15, 2001	June 17, 2005
Gen. William R. Looney III	June 17, 2005	July 2, 2008
Gen. Stephen R. Lorenz	July 2, 2008	Nov. 17, 2010
Gen. Edward A. Rice Jr.	Nov. 17, 2010	Oct. 10, 2013
Gen. Robin Rand	Oct. 10, 2013	July 21, 2015
Lt. Gen. Darryl L. Roberson	July 21, 2015	Nov. 16, 2017
*Lt. Gen. Steven L. Kwast	Nov. 16, 2017	

Lt. Gen. Marshall B. "Brad Webb was nominated to be AETC commander May 7.

For past leaders see Air Training Command in Historic Major Command Leaders.

AIR FORCE GLOBAL STRIKE COMMAND

Lt. Gen. Frank G. Klotz	Aug. 7, 2009	Jan. 6, 2011
Lt. Gen. James M. Kowalski	Jan. 6, 2011	Oct. 23, 2013
Lt. Gen. Stephen W. Wilson	Oct. 23, 2013	July 28, 2015
Gen. Robin Rand	July 28, 2015	Aug. 21, 2018
Gen. Timothy M. Ray	Aug. 21, 2018	

For past leaders, see Strategic Air Command in Historic Major Command leaders.

AIR FORCE MATERIEL COMMAND

Gen. Ronald W. Yates	July 1, 1992	June 30, 1995
Gen. Henry Viccellio Jr.	June 30, 1995	May 9, 1997
Lt. Gen. Kenneth Eickmann (acting)	May 9, 1997	May 29, 1997
Gen. George T. Babbitt Jr.	May 29, 1997	April 20, 2000
Gen. Lester L. Lyles	April 20, 2000	Aug. 22, 2003
Gen. Gregory S. Martin	Aug. 22, 2003	Aug. 19, 2005
Gen. Bruce Carlson	Aug. 19, 2005	Nov. 21, 2008
Gen. Donald J. Hoffman	Nov. 21, 2008	June 5, 2012
Gen. Janet C. Wolfenbarger	June 5, 2012	June 8, 2015
Gen. Ellen M. Pawlikowski	June 8, 2015	Sept. 1, 2018
*Lt. Gen. Robert D. McMurry Jr. (interim)	Sept. 1, 2018	

*Lt. Gen. Arnold W. Bunch Jr. was nominated Dec. 13, 2018, to be AFMC commander.

AIR FORCE RESERVE COMMAND

Maj. Gen. Robert A. McIntosh	Feb. 17, 1997	June 9, 1998
Maj. Gen. David R. Smith (acting)	June 9, 1998	Sept. 25, 1998
Lt. Gen. James E. Sherrard III	Sept. 25, 1998	June 1, 2004
Maj. Gen. J. J. Batbie Jr. (acting)	June 1, 2004	June 24, 2004
Lt. Gen. John A. Bradley	June 24, 2004	June 24, 2008
Lt. Gen. Charles E. Stenner Jr.	June 24, 2008	July 30, 2012
Lt. Gen. James F. Jackson	July 30, 2012	July 15, 2016
Lt. Gen. Maryanne Miller	July 15, 2016	Sept. 7, 2018
Lt. Gen. Richard W. Scobee	Sept. 7, 2018	

For past leaders, see Air Force Reserve in Historic Major Command Leaders.

AIR FORCE SPACE COMMAND

Gen. James V. Hartinger	Sept. 1, 1982	July 30, 1984
Gen. Robert T. Herres	July 30, 1984	Oct. 1, 1986
Maj. Gen. Maurice C. Padden	Oct. 1, 1986	Oct. 29, 1987
Lt. Gen. Donald J. Kutyna	Oct. 29, 1987	March 29, 1990
Lt. Gen. Thomas S. Moorman Jr.	March 29, 1990	March 23, 1992
Gen. Donald J. Kutyna	March 23, 1992	June 30, 1992
Gen. Charles A. Horner	June 30, 1992	Sept. 13, 1994
Gen. Joseph W. Ashy	Sept. 13, 1994	Aug. 26, 1996
Gen. Howell M. Estes III	Aug. 26, 1996	Aug. 14, 1998
Gen. Richard B. Myers	Aug. 14, 1998	Feb. 22, 2000
Gen. Ralph E. Eberhart	Feb. 22, 2000	April 19, 2002
Gen. Lance W. Lord	April 19, 2002	April 1, 2006
Lt. Gen. Frank G. Klotz (acting)	April 1, 2006	June 26, 2006
Gen. Kevin P. Chilton	June 26, 2006	Oct. 3, 2007
Lt. Gen. Michael A. Hamel (acting)	Oct. 3, 2007	Oct. 12, 2007
Gen. C. Robert Kehler	Oct. 12, 2007	Jan. 5, 2011
Gen. William L. Shelton	Jan. 5, 2011	Aug. 15, 2014
Gen. John E. Hyten	Aug. 15, 2014	Oct. 25, 2016
Gen. John W. Raymond	Oct. 25, 2016	

AIR FORCE SPECIAL OPERATIONS COMMAND

Maj. Gen. Thomas E. Eggers	May 22, 1990	June 30, 1991
Maj. Gen. Bruce L. Fister	June 30, 1991	July 22, 1994
Maj. Gen. James L. Hobson Jr.	July 22, 1994	July 9, 1997
Maj. Gen. Charles R. Holland	July 9, 1997	Aug. 5, 1999
Lt. Gen. Maxwell C. Bailey	Aug. 5, 1999	Jan. 16, 2002
Lt. Gen. Paul V. Hester	Jan. 16, 2002	July 1, 2004
Lt. Gen. Michael W. Wooley	July 1, 2004	Nov. 27, 2007
Lt. Gen. Donald C. Wurster	Nov. 27, 2007	June 24, 2011
Lt. Gen. Eric E. Fiel	June 24, 2011	July 3, 2014
Lt. Gen. Bradley A. Heithold	July 3, 2014	July 19, 2016
Lt. Gen. Marshall B. Webb	July 19, 2016	

*Lt. Gen. James C. Slife was confirmed as incoming AFSOC commander March 28.

AIR MOBILITY COMMAND

Gen. Hansford T. Johnson	June 1, 1992	Aug. 25, 1992
Gen. Ronald R. Fogleman	Aug. 25, 1992	Oct. 18, 1994
Gen. Robert L. Rutherford	Oct. 18, 1994	July 15, 1996
Gen. Walter Kross	July 15, 1996	Aug. 3, 1998
Gen. Charles T. Robertson Jr.	Aug. 3, 1998	Nov. 5, 2001
Gen. John W. Handy	Nov. 5, 2001	Sept. 7, 2005
Lt. Gen. Christopher Kelly (acting)	Sept. 7, 2005	Oct. 14, 2005
Gen. Duncan J. McNabb	Oct. 14, 2005	Sept. 7, 2007

MAJOR COMMAND AND ANG LEADERS (continued)

Gen. Arthur J. Lichte	Sept. 7, 2007	Nov. 20, 2009
Gen. Raymond E. Johns Jr.	Nov. 20, 2009	Nov. 30, 2012
Gen. Paul J. Selva	Nov. 30, 2012	May 5, 2014
Gen. Darren W. McDew	May 5, 2014	Aug. 11, 2015
Gen. Carlton D. Everhart II	Aug. 11, 2015	Sept. 7, 2018
Gen. Maryanne Miller	Sept. 7, 2018	

For past leaders, see Military Airlift Command in Historic Major Command Leaders.

AIR NATIONAL GUARD

Col. William A. R. Robertson	Nov. 28, 1945	October 1948
Maj. Gen. George G. Finch	October 1948	Sept. 25, 1950
Maj. Gen. Earl T. Ricks	Oct. 13, 1950	Jan. 4, 1954
Maj. Gen. Winston P. Wilson	Jan. 26, 1954	Aug. 5, 1962
Maj. Gen. I. G. Brown	Aug. 6, 1962	April 19, 1974
Maj. Gen. John J. Pesch	April 20, 1974	Jan. 31, 1977
Maj. Gen. John T. Guice	Feb. 1, 1977	April 1, 1981
Maj. Gen. John B. Conaway	April 1, 1981	Nov. 1, 1988
Maj. Gen. Philip G. Killey	Nov. 1, 1988	Jan. 28, 1994
Maj. Gen. Donald W. Shepperd	Jan. 28, 1994	Jan. 28, 1998
Maj. Gen. Paul A. Weaver Jr.	Jan. 28, 1998	Dec. 3, 2001
Brig. Gen. David Brubaker (acting)	Dec. 3, 2001	June 3, 2002
Lt. Gen. Daniel James III	June 3, 2002	May 20, 2006
Lt. Gen. Craig R. McKinley	May 20, 2006	Nov. 17, 2008
Maj. Gen. Emmett Titshaw (acting)	Nov. 17, 2008	Feb. 2, 2009
Lt. Gen. Harry M. Wyatt III	Feb. 2, 2009	March 22, 2013
Lt. Gen. Stanley E. Clarke III	March 22, 2013	Dec. 18, 2015
Maj. Gen. Brian G. Neal (acting)	Dec. 18, 2015	May 10, 2016
Lt. Gen. L. Scott Rice	May 10, 2016	

PACIFIC AIR FORCES

Gen. Laurence S. Kuter	July 1, 1957	Aug. 1, 1959
Gen. Emmett O'Donnell Jr.	Aug. 1, 1959	Aug. 1, 1963
Gen. Jacob E. Smart	Aug. 1, 1963	Aug. 1, 1964
Gen. Hunter Harris Jr.	Aug. 1, 1964	Feb. 1, 1967
Gen. John D. Ryan	Feb. 1, 1967	Aug. 1, 1968
Gen. Joseph J. Nazzaro	Aug. 1, 1968	Aug. 1, 1971
Gen. Lucius D. Clay Jr.	Aug. 1, 1971	Oct. 1, 1973
Gen. John W. Vogt Jr.	Oct. 1, 1973	July 1, 1974
Gen. Louis L. Wilson Jr.	July 1, 1974	June 3, 1977
Lt. Gen. James A. Hill	June 3, 1977	June 15, 1978
Lt. Gen. James D. Hughes	June 15, 1978	June 8, 1981
Lt. Gen. Arnold W. Braswell	June 8, 1981	Oct. 8, 1983
Gen. Jerome F. O'Malley	Oct. 8, 1983	Sept. 25, 1984
Gen. Robert W. Bazley	Sept. 25, 1984	Dec. 16, 1986
Gen. Jack I. Gregory	Dec. 16, 1986	July 22, 1988
Gen. Merrill A. McPeak	July 22, 1988	Nov. 5, 1990
Lt. Gen. James B. Davis	Nov. 5, 1990	Feb. 19, 1991
Gen. Jimmie V. Adams	Feb. 19, 1991	Jan. 22, 1993
Gen. Robert L. Rutherford	Jan. 22, 1993	Oct. 12, 1994
Gen. John G. Lorber	Oct. 12, 1994	July 7, 1997
Gen. Richard B. Myers	July 7, 1997	July 23, 1998
Gen. Patrick K. Gamble	July 23, 1998	April 9, 2001
Lt. Gen. Lansford E. Trapp (acting)	April 9, 2001	May 4, 2001
Gen. William J. Begert	May 4, 2001	July 2, 2004
Gen. Paul V. Hester	July 2, 2004	Nov. 30, 2007
Gen. Carrol H. Chandler	Nov. 30, 2007	Aug. 19, 2009
Gen. Gary L. North	Aug. 19, 2009	Aug. 3, 2012
Gen. Herbert J. Carlisle	Aug. 3, 2012	Oct. 16, 2014
Gen. Lori J. Robinson	Oct. 16, 2014	May 11, 2016
Lt. Gen. Russell J. Handy (acting)	May 11, 2016	July 12, 2016
Gen. Terrence J. O'Shaughnessy	July 12, 2016	July 26, 2018
Gen. Charles Q. Brown Jr.	July 26, 2018	

For past leaders, see Far East Air Forces in Historic Major Command Leaders.

US AIR FORCES IN EUROPE

Lt. Gen. John K. Cannon	Aug. 7, 1945	Aug. 14, 1947
Brig. Gen. John F. McBlain (acting)	Aug. 14, 1947	Oct. 20, 1947
Lt. Gen. Curtis E. LeMay	Oct. 20, 1947	Oct. 16, 1948
Lt. Gen. John K. Cannon	Oct. 16, 1948	Jan. 21, 1951
Gen. Lauris Norstad	Jan. 21, 1951	July 27, 1953
Lt. Gen. William H. Tunner	July 27, 1953	July 1, 1957
Gen. Frank F. Everest	July 1, 1957	Aug. 1, 1959
Gen. Frederic H. Smith Jr.	Aug. 1, 1959	July 1, 1961
Gen. Truman H. Landon	July 1, 1961	Aug. 1, 1963
Gen. Gabriel P. Disosway	Aug. 1, 1963	Aug. 1, 1965
Gen. Bruce K. Holloway	Aug. 1, 1965	Aug. 1, 1966
Gen. Maurice A. Preston	Aug. 1, 1966	Aug. 1, 1968
Gen. Horace M. Wade	Aug. 1, 1968	Aug. 1, 1969
Gen. Joseph R. Holzapple	Feb. 1, 1969	Sept. 1, 1971
Gen. David C. Jones	Sept. 1, 1971	July 1, 1974
Gen. John W. Vogt	July 1, 1974	Sept. 1, 1975
Gen. Richard H. Ellis	Sept. 1, 1975	Aug. 1, 1977
Gen. William J. Evans	Aug. 1, 1977	Aug. 1, 1978
Gen. John W. Pauly	Aug. 1, 1978	Aug. 1, 1980
Gen. Charles A. Gabriel	Aug. 1, 1980	June 30, 1982
Gen. Billy M. Minter	July 1, 1982	Nov. 1, 1984
Gen. Charles L. Donnelly Jr.	Nov. 1, 1984	May 1, 1987
Gen. William L. Kirk	May 1, 1987	April 12, 1989
Gen. Michael J. Dugan	April 12, 1989	June 26, 1990
Gen. Robert C. Oaks	June 26, 1990	July 29, 1994
Gen. James L. Jamerson	July 29, 1994	July 17, 1995
Gen. Richard E. Hawley	July 17, 1995	April 4, 1996
Gen. Michael E. Ryan	April 4, 1996	Oct. 6, 1997
Lt. Gen. William J. Begert (acting)	Oct. 6, 1997	Dec. 5, 1997
Gen. John P. Jumper	Dec. 5, 1997	Jan. 13, 2000
Gen. Gregory S. Martin	Jan. 13, 2000	Aug. 12, 2003
Gen. Robert H. Foglesong	Aug. 12, 2003	Dec. 6, 2005
Gen. William T. Hobbins	Dec. 6, 2005	Dec. 10, 2007
Lt. Gen. Robert D. Bishop Jr.	Dec. 10, 2007	Jan. 9, 2008
Gen. Roger A. Brady	Jan. 9, 2008	Dec. 13, 2010
Gen. Mark A. Welsh III	Dec. 13, 2010	July 31, 2012
Gen. Philip M. Breedlove	July 31, 2012	May 10, 2013
Lt. Gen. Noel T. Jones (acting)	May 10, 2013	Aug. 2, 2013
Gen. Frank Gorenc	Aug. 2, 2013	Aug. 11, 2016
Gen. Tod D. Wolters	Aug. 11, 2016	May 1, 2019
Gen. Gen. Jeffrey L. Harrigian	May 1, 2019	

For past leaders, see US Strategic Air Forces in Europe in Historic Major Command Leaders.

Photo: SrA. Cassandra Johnson

A C-17 is marshaled at Barksdale AFB, La. Its cargo will support the US Strategic Bomber Task Force in Europe.

HEADQUARTERS DOD LEADERS

SECRETARY OF DEFENSE

James V. Forrestal	Sept. 17, 1947	March 28, 1949
Louis A. Johnson	March 28, 1949	Sept. 19, 1950
George C. Marshall	Sept. 21, 1950	Sept. 12, 1951
Robert A. Lovett	Sept. 17, 1951	Jan. 20, 1953
Charles E. Wilson	Jan. 28, 1953	Oct. 8, 1957
Neil H. McElroy	Oct. 9, 1957	Dec. 1, 1959
Thomas S. Gates	Dec. 2, 1959	Jan. 20, 1961
Robert S. McNamara	Jan. 21, 1961	Feb. 29, 1968
Clark M. Clifford	March 1, 1968	Jan. 20, 1969
Melvin R. Laird	Jan. 22, 1969	Jan. 29, 1973
Elliot L. Richardson	Jan. 30, 1973	May 24, 1973
James R. Schlesinger	July 2, 1973	Nov. 19, 1975
Donald H. Rumsfeld	Nov. 20, 1975	Jan. 20, 1977
Harold Brown	Jan. 21, 1977	Jan. 20, 1981
Caspar W. Weinberger	Jan. 21, 1981	Nov. 23, 1987
Frank C. Carlucci	Nov. 23, 1987	Jan. 20, 1989
Richard B. Cheney	March 21, 1989	Jan. 20, 1993
Les Aspin	Jan. 21, 1993	Feb. 3, 1994
William J. Perry	Feb. 3, 1994	Jan. 23, 1997
William S. Cohen	Jan. 24, 1997	Jan. 20, 2001
Donald H. Rumsfeld	Jan. 20, 2001	Dec. 18, 2006
Robert M. Gates	Dec. 18, 2006	July 1, 2011
Leon E. Panetta	July 1, 2011	Feb. 27, 2013
Chuck Hagel	Feb. 27, 2013	Feb. 17, 2015
Ashton B. Carter	Feb. 17, 2015	Jan. 19, 2017
James N. Mattis	Jan. 20, 2017	Dec. 31, 2018
*Patrick. M. Shanahan (acting)	Jan. 1, 2019	

* Nominated to be SECDEF May 10, 2019

CHAIRMAN OF THE JOINT CHIEFS OF STAFF

Gen. of the Army Omar N. Bradley	Aug. 16, 1949	Aug. 15, 1953
Adm. Arthur W. Radford, USN	Aug. 15, 1953	Aug. 15, 1957
Gen. Nathan F. Twining, USAF	Aug. 15, 1957	Sept. 30, 1960
Gen. Lyman L. Lemnitzer, USA	Oct. 1, 1960	Sept. 30, 1962
Gen. Maxwell D. Taylor, USA	Oct. 1, 1962	July 1, 1964
Gen. Earle G. Wheeler, USA	July 3, 1964	July 2, 1970
Adm. Thomas H. Moorer, USN	July 2, 1970	July 1, 1974
Gen. George S. Brown, USAF	July 1, 1974	June 20, 1978
Gen. David C. Jones, USAF	June 21, 1978	June 18, 1982
Gen. John W. Vessey Jr., USA	June 18, 1982	Sept. 30, 1985
Adm. William J. Crowe Jr., USN	Oct. 1, 1985	Sept. 30, 1989
Gen. Colin L. Powell, USA	Oct. 1, 1989	Sept. 30, 1993
Adm. David Jeremiah, USN (acting)	Oct. 1, 1993	Oct. 24, 1993
Gen. John M. Shalikashvili, USA	Oct. 25, 1993	Sept. 30, 1997
Gen. Henry H. Shelton, USA	Oct. 1, 1997	Oct. 1, 2001
Gen. Richard B. Myers, USAF	Oct. 1, 2001	Sept. 30, 2005
Gen. Peter Pace, USMC	Sept. 30, 2005	Oct. 1, 2007
Adm. Michael G. Mullen, USN	Oct. 1, 2007	Sept. 30, 2011
Gen. Martin E. Dempsey, USA	Sept. 30, 2011	Sept. 25, 2015
Gen. Joseph F. Dunford Jr., USMC	Sept. 25, 2015	

VICE CHAIRMAN OF THE JOINT CHIEFS OF STAFF

Gen. Robert T. Herres, USAF	Feb. 6, 1987	Feb. 28, 1990
Adm. David E. Jeremiah, USN	March 1, 1990	Feb. 28, 1994
Adm. William A. Owens, USN	March 1, 1994	Feb. 27, 1996
Gen. Joseph W. Ralston, USAF	March 1, 1996	Feb. 29, 2000
Gen. Richard B. Myers, USAF	March 1, 2000	Oct. 1, 2001
Gen. Peter Pace, USMC	Oct. 1, 2001	Aug. 12, 2005
Adm. Edmund Giambastiani Jr., USN	Aug. 12, 2005	Aug. 3, 2007
Gen. James E. Cartwright, USMC	Aug. 4, 2007	Aug. 4, 2011
Adm. James A. Winnefeld Jr., USN	Aug. 4, 2011	July 31, 2015
Gen. Paul J. Selva, USAF	July 31, 2015	

Photo: DOD

The US Joint Chiefs in 2015. Pictured are (left to right): USAF Gen. Paul Selva, Vice Chairman, Joint Chiefs of Staff; USMC Gen. Joseph Dunford Jr., Chairman, Joint Chiefs of Staff; Gen. Mark Milley, Army Chief of Staff; Adm. John Richardson, Chief of Naval Operations; Gen. Robert Neller, Commandant, Marine Corps; Gen. David Goldfein, Air Force Chief of Staff; and Gen. Joseph Lengyel, National Guard Bureau Chief.

UNIFIED COMMAND, NATIONAL GUARD BUREAU, AND NORAD LEADERS

This section presents the leaders of DOD's Unified Commands, the National Guard Bureau, and NORAD under the current designation. **Leaders of historic DOD commands (and of active commands' previous designations) are listed online.**

Photo: R. D. Ward/DOD

USAF Gen. Douglas Fraser, commander of US Southern Command, briefs reporters at the Pentagon in 2010.

US AFRICA COMMAND

Gen. William E. Ward, USA	Oct. 1, 2008	March 9, 2011
Gen. Carter F. Ham, USA	March 9, 2011	April 5, 2013
Gen. David M. Rodriguez, USA	April 5, 2013	July 18, 2016
Gen. Thomas D. Waldhauser, USMC	July 18, 2016	

US CENTRAL COMMAND

Gen. Robert C. Kingston, USA	Jan. 1, 1983	Nov. 27, 1985
Gen. George B. Crist, USMC	Nov. 27, 1985	Nov. 23, 1988
Gen. H. Norman Schwarzkopf, USA	Nov. 23, 1988	Aug. 9, 1991
Gen. Joseph P. Hoar, USMC	Aug. 9, 1991	Aug. 5, 1994
Gen. J. H. Binford Peay III, USA	Aug. 5, 1994	Aug. 13, 1997
Gen. Anthony C. Zinni, USMC	Aug. 13, 1997	July 6, 2000
Gen. Tommy R. Franks, USA	July 6, 2000	July 7, 2003
Gen. John P. Abizaid, USA	July 7, 2003	March 16, 2007
Adm. William J. Fallon, USN	March 16, 2007	March 31, 2008
Lt. Gen. Martin Dempsey, USA (acting)	March 31, 2008	Oct. 31, 2008
Gen. David H. Petraeus, USA	Oct. 31, 2008	June 30, 2010
Lt. Gen. John R. Allen, USMC (acting)	June 30, 2010	Aug. 11, 2010
Gen. James N. Mattis, USMC	Aug. 11, 2010	March 22, 2013
Gen. Lloyd J. Austin III, USA	March 22, 2013	March 30, 2016
Gen. Joseph L. Votel, USA	March 30, 2016	March 28, 2019
Gen. Kenneth F. McKenzie Jr., USMC	March 28, 2019	

US EUROPEAN COMMAND

Gen. Matthew B. Ridgway, USA	Aug. 1, 1952	July 11, 1953
Gen. Alfred M. Gruenther, USA	July 11, 1953	Nov. 20, 1956
Gen. Lauris Norstad, USAF	Nov. 20, 1956	Nov. 1, 1962
Gen. Lyman L. Lemnitzer, USA	Nov. 1, 1962	May 5, 1969
Gen. Andrew J. Goodpaster, USA	May 5, 1969	Nov. 1, 1974
Gen. Alexander M. Haig Jr., USA	Nov. 1, 1974	June 27, 1979
Gen. Bernard W. Rogers, USA	June 27, 1979	June 25, 1987
Gen. John R. Galvin, USA	June 25, 1987	June 23, 1992
Gen. John M. Shalikashvili, USA	June 23, 1992	Oct. 21, 1993
Gen. George A. Joulwan, USA	Oct. 21, 1993	July 10, 1997
Gen. Wesley K. Clark, USA	July 10, 1997	May 2, 2000
Gen. Joseph W. Ralston, USAF	May 2, 2000	Jan. 16, 2003
Gen. James L. Jones, USMC	Jan. 16, 2003	Dec. 4, 2006
Gen. Bantz J. Craddock, USA	Dec. 4, 2006	June 30, 2009
Adm. James G. Stavridis, USN	June 30, 2009	May 10, 2013
Gen. Philip M. Breedlove, USAF	May 10, 2013	May 3, 2016
Gen. Curtis M. Scaparrotti, USA	May 3, 2016	May 3, 2019
Gen. Tod D. Wolters, USAF	May 3, 2019	

US NORTHERN COMMAND

Gen. Ralph E. Eberhart, USAF	Oct. 1, 2002	Nov. 5, 2004
Adm. Timothy J. Keating, USN	Nov. 5, 2004	March 23, 2007
Gen. Victor E. Renuart Jr., USAF	March 23, 2007	May 19, 2010
Adm. James A. Winnefeld Jr., USN	May 19, 2010	Aug. 4, 2011
Gen. Charles H. Jacoby Jr., USA	Aug. 4, 2011	Dec. 5, 2014
Adm. William E. Gortney, USN	Dec. 5, 2014	May 13, 2016
Gen. Lori J. Robinson, USAF	May 13, 2016	May 24, 2018
Gen. Terrence J. O'Shaughnessy	May 24, 2018	

US PACIFIC COMMAND

Adm. John H. Towers, USN	Jan. 1, 1947	Feb. 28, 1947
Adm. Louis E. Denfeld, USN	Feb. 28, 1947	Dec. 3, 1947
Adm. Dewitt C. Ramsey, USN	Dec. 3, 1947	April 30, 1949
Adm. Arthur W. Radford, USN	April 30, 1949	July 10, 1953
Adm. Felix B. Stump, USN	July 10, 1953	July 31, 1958
Adm. Harry D. Felt, USN	July 31, 1958	June 30, 1964
Adm. U. S. Grant Sharp, USN	June 30, 1964	July 31, 1968
Adm. John S. McCain Jr., USN	July 31, 1968	Sept. 1, 1972
Adm. Noel A. M. Gayler, USN	Sept. 1, 1972	Aug. 30, 1976
Adm. Maurice E. Weisner, USN	Aug. 30, 1976	Oct. 31, 1979
Adm. Robert L. J. Long, USN	Oct. 31, 1979	July 1, 1983
Adm. William J. Crowe Jr., USN	July 1, 1983	Sept. 18, 1985
Adm. Ronald J. Hays Jr., USN	Sept. 18, 1985	Sept. 30, 1988
Adm. Huntington Hardisty, USN	Sept. 30, 1988	March 1, 1991
Adm. Charles R. Larson, USN	March 1, 1991	July 11, 1994
Lt. Gen. Harold Fields, USA (acting)	July 11, 1994	July 19, 1994
Adm. Richard C. Macke, USN	July 19, 1994	Jan. 31, 1996
Adm. Joseph W. Prueher, USN	Jan. 31, 1996	Feb. 20, 1999
Adm. Dennis C. Blair, USN	Feb. 20, 1999	May 2, 2002
Adm. Thomas B. Fargo, USN	May 2, 2002	Feb. 26, 2005
Adm. William J. Fallon, USN	Feb. 26, 2005	March 12, 2007
Lt. Gen. Daniel Leaf, USAF (acting)	March 12, 2007	March 26, 2007
Adm. Timothy J. Keating, USN	March 26, 2007	Oct. 19, 2009
Adm. Robert F. Willard, USN	Oct. 19, 2009	March 9, 2012
Adm. Samuel J. Locklear III, USN	March 9, 2012	May 27, 2015
Adm. Harry B. Harris Jr., USN	May 27, 2015	May 31, 2018
Adm. Philip S. Davidson, USN	May 31, 2018	

Photo: Jhomil Bansil/DOD

NORAD Commander Gen. Terrence O'Shaughnessy speaks to subordinate commanders following the change of command ceremony at Peterson AFB, Colo., May 24, 2018.

UNIFIED COMMAND, NATIONAL GUARD BUREAU, AND NORAD LEADERS (continued)

US SOUTHERN COMMAND

Gen. Andrew P. O'Meara, USA	June 6, 1963	Feb. 22, 1965
Gen. Robert W. Porter Jr., USA	Feb. 22, 1965	Feb. 18, 1969
Gen. George R. Mather, USA	Feb. 18, 1969	Sept. 20, 1971
Gen. George V. Underwood, USA	Sept. 20, 1971	Jan. 17, 1973
Gen. William B. Rosson, USA	Jan. 17, 1973	Aug. 1, 1975
Lt. Gen. Dennis P. McAuliffe, USA	Aug. 1, 1975	Oct. 1, 1979
Lt. Gen. Wallace H. Nutting, USA	Oct. 1, 1979	May 24, 1983
Gen. Paul F. Gorman, USA	May 24, 1983	March 1, 1985
Gen. John R. Galvin, USA	March 1, 1985	June 6, 1987
Gen. Fred F. Woerner, USA	June 6, 1987	Oct. 1, 1989
Gen. Maxwell R. Thurman, USA	Oct. 1, 1989	Nov. 21, 1990
Gen. George A. Joulwan, USA	Nov. 21, 1990	October 1993
Maj. Gen. W. Worthington, USAF (acting)	October 1993	Feb. 17, 1994
Gen. Barry R. McCaffrey, USA	Feb. 17, 1994	March 1, 1996
RAdm. James Perkins, USN (acting)	March 1, 1996	June 26, 1996
Gen. Wesley K. Clark, USA	June 26, 1996	July 13, 1997
RAdm. Walter F. Doran, USN (acting)	July 13, 1997	Sept. 25, 1997
Gen. Charles E. Wilhelm, USMC	Sept. 25, 1997	Sept. 8, 2000
Gen. Peter Pace, USMC	Sept. 8, 2000	Sept. 30, 2001
Maj. Gen. G. D. Speer, USA (acting)	Sept. 30, 2001	Aug. 18, 2002
Gen. James T. Hill, USA	Aug. 18, 2002	Nov. 9, 2004
Gen. Bantz J. Craddock, USA	Nov. 9, 2004	Oct. 19, 2006
Adm. James G. Stavridis, USN	Oct. 19, 2006	June 25, 2009
Gen. Douglas M. Fraser, USAF	June 25, 2009	Nov. 19, 2012
Gen. John F. Kelly, USMC	Nov. 19, 2012	Jan 14, 2016
Adm. Kurt W. Tidd, USN	Jan. 14, 2016	Nov. 26, 2018
Adm. Craig S. Faller, USN	Nov. 26, 2018	

Formerly US Caribbean Command Nov. 1, 1947. Redesignated June 6, 1963. For historical leaders, see US Caribbean Command in Historic Unified Command Leaders section.

US SPECIAL OPERATIONS COMMAND

Gen. James J. Lindsay, USA	April 16, 1987	June 27, 1990
Gen. Carl W. Stiner, USA	June 27, 1990	May 20, 1993
Gen. Wayne A. Downing, USA	May 20, 1993	Feb. 29, 1996
Gen. Henry H. Shelton, USA	Feb. 29, 1996	Sept. 25, 1997
Gen. Peter J. Schoomaker, USA	Nov. 5, 1997	Oct. 27, 2000
Gen. Charles R. Holland, USAF	Oct. 27, 2000	Sept. 2, 2003
Gen. Bryan D. Brown, USA	Sept. 2, 2003	July 9, 2007
Adm. Eric T. Olson, USN	July 9, 2007	Aug. 15, 2011
Adm. William H. McRaven, USN	Aug. 15, 2011	Aug. 28, 2014
Gen. Joseph L. Votel, USA	Aug. 28, 2014	March 30, 2016
Gen. Raymond A. Thomas, USA	March 30, 2016	March 29, 2019
Gen. Richard D. Clarke, USA	March 29, 2019	

US STRATEGIC COMMAND

Gen. George L. Butler, USAF	June 1, 1992	Feb. 13, 1994
Adm. Henry G. Chiles Jr., USN	Feb. 14, 1994	Feb. 21, 1996
Gen. Eugene E. Habiger, USAF	Feb. 22, 1996	June 25, 1998
Adm. Richard W. Mies, USN	June 26, 1998	Nov. 30, 2001
Adm. James O. Ellis Jr., USN	Nov. 30, 2001	July 9, 2004
Gen. James E. Cartwright, USMC	July 9, 2004	Aug. 10, 2007
Lt. Gen. Robert Kehler, USAF (acting)	Aug. 10, 2007	Oct. 3, 2007
Gen. Kevin P. Chilton, USAF	Oct. 3, 2007	Jan. 28, 2011
Gen. Robert Kehler, USAF	Jan. 28, 2011	Nov. 15, 2013
Adm. Cecil D. Haney, USN	Nov. 15, 2013	Nov. 3, 2016
Gen. John E. Hyten, USAF	Nov. 3, 2016	

Merged the functions of US Space Command into US Strategic Command Oct. 1, 2002.

US TRANSPORTATION COMMAND

Gen. Duane H. Cassidy, USAF	July 1, 1987	Sept. 21, 1989
Gen. H. T. Johnson, USAF	Sept. 22, 1989	Aug. 24, 1992
Gen. Ronald R. Fogleman, USAF	Aug. 25, 1992	Oct. 17, 1994
Gen. Robert L. Rutherford, USAF	Oct. 18, 1994	July 14, 1996
Gen. Walter Kross, USAF	July 15, 1996	Aug. 2, 1998
Gen. Charles T. Robertson Jr., USAF	Aug. 3, 1998	Nov. 5, 2001
Gen. John W. Handy, USAF	Nov. 5, 2001	Sept. 7, 2005
Gen. Norton A. Schwartz, USAF	Sept. 7, 2005	Aug. 11, 2008
VAdm. Ann E. Rondeau, USN (acting)	Aug. 12, 2008	Sept. 4, 2008
Gen. Duncan J. McNabb, USAF	Sept. 5, 2008	Oct. 14, 2011
Gen. William M. Fraser III, USAF	Oct. 14, 2011	May 5, 2014
Gen. Paul J. Selva, USAF	May 5, 2014	July 31, 2015
VAdm. William Brown, USN (acting)	July 31, 2015	Aug. 26, 2015
Gen. Darren W. McDew, USAF	Aug. 26, 2015	Aug. 24, 2018
Gen. Stephne R. Lyons, USA	Aug. 24, 2018	

NATIONAL GUARD BUREAU

Maj. Gen. Butler B. Miltonberger, USA	Feb. 1, 1946	Sept. 29, 1947
Maj. Gen. Kenneth F. Cramer, USA	Sept. 30, 1947	Sept. 4, 1950
Maj. Gen. Raymond H. Fleming, USA	Sept. 5, 1950	Feb. 15, 1953
Maj. Gen. Earl T. Ricks, USAF (acting)	Feb. 16, 1953	June 21, 1953
Maj. Gen. Edgar C. Erickson, USA	June 22, 1953	May 31, 1959
Maj. Gen. Winston P. Wilson, USAF (acting)	June 1, 1959	July 19, 1959
Maj. Gen. Donald W. McGowan, USA	July 20, 1959	Aug. 30, 1963
Maj. Gen. Winston P. Wilson, USAF	Aug. 31, 1963	Aug. 31, 1971
Maj. Gen. Francis S. Greenlief, USA	Sept. 1, 1971	June 23, 1974
Lt. Gen. La Vern E. Weber, USA	Aug. 16, 1974	Aug. 15, 1982
Lt. Gen. Emmett H. Walker Jr., USA	Aug. 16, 1982	Aug. 15, 1986
Lt. Gen. Herbert R. Temple Jr., USA	Aug. 16, 1986	Jan. 31, 1990
Lt. Gen. John B. Conaway, USAF	Feb. 1, 1990	Dec. 1, 1993
Maj. Gen. Raymond Rees, USA (acting)	Jan. 1, 1994	July 31, 1994
Lt. Gen. Edward D. Baca, USA	Oct. 1, 1994	July 31, 1998
Lt. Gen. Russell C. Davis, USAF	Aug. 4, 1998	Aug. 3, 2002
Maj. Gen. Raymond Rees, USA (acting)	Aug. 4, 2002	April 10, 2003
Lt. Gen. H. Steven Blum, USA	April 11, 2003	Nov. 16, 2008
Gen. Craig R. McKinley, USAF	Nov. 17, 2008	Sept. 7, 2012
Gen. Frank J. Grass, USA	Sept. 7, 2012	Aug. 3, 2016
Gen. Joseph L. Lengyel, USAF	Aug. 3, 2016	

Served as acting chief: Fleming until Aug. 14, 1951.

NORTH AMERICAN AEROSPACE DEFENSE COMMAND

Gen. Earle E. Partridge, USAF	Sept. 12, 1957	July 30, 1959
Gen. Laurence S. Kuter, USAF	Aug. 1, 1959	July 30, 1962
Gen. John K. Gerhart, USAF	Aug. 1, 1962	March 30, 1965
Gen. Dean C. Strother, USAF	April 1, 1965	July 29, 1966
Gen. Raymond J. Reeves, USAF	Aug. 1, 1966	July 31, 1969
Gen. Seth J. McKee, USAF	Aug. 1, 1969	Sept. 30, 1973
Gen. Lucius D. Clay Jr., USAF	Oct. 1, 1973	Aug. 29, 1975
Gen. Daniel James Jr., USAF	Sept. 1, 1975	Dec. 5, 1977
Gen. James E. Hill, USAF	Dec. 6, 1977	Dec. 31, 1979
Gen. James V. Hartinger, USAF	Jan. 1, 1980	July 30, 1984
Gen. Robert T. Herres, USAF	July 30, 1984	Feb. 5, 1987
Gen. John L. Piotrowski, USAF	Feb. 6, 1987	March 30, 1990
Gen. Donald J. Kutyna, USAF	April 1, 1990	June 30, 1992
Gen. Charles A. Horner, USAF	June 30, 1992	Sept. 12, 1994
Gen. Joseph W. Ashy, USAF	Sept. 13, 1994	Aug. 26, 1996
Gen. Howell M. Estes III, USAF	Aug. 27, 1996	Aug. 13, 1998
Gen. Richard B. Myers, USAF	Aug. 14, 1998	Feb. 22, 2000
Gen. Ralph E. Eberhart, USAF	Feb. 22, 2000	Nov. 5, 2004
Adm. Timothy J. Keating, USN	Nov. 5, 2004	March 23, 2007
Gen. Victor E. Renuart Jr., USAF	March 23, 2007	May 19, 2010
Adm. James A. Winnefeld Jr., USN	May 19, 2010	Aug. 4, 2011
Gen. Charles H. Jacoby Jr., USA	Aug. 4, 2011	Dec. 5, 2014
Adm. William E. Gortney, USN	Dec. 5, 2014	May 13, 2016
Gen. Lori J. Robinson, USAF	May 13, 2016	May 24, 2018
Gen. Terrance J. O'Shaughnessy	May 24, 2018	

2019 USAF ALMANAC

INSTALLATIONS WORLDWIDE

Photo: A1C Michael Mathews

A C-17 at Buckley AFB, Colo.

Active Duty Installations

This section includes Air Force-owned and -operated facilities around the world, as well as joint bases with substantial USAF presence The section does not list all units or agencies at each base.

Altus AFB, Okla. 73523. **Nearest city:** Altus. **Phone:** 580-482-8100. **Owning command:** AETC. **Unit/mission:** 97th AMW (AETC), training. **History:** activated January 1943. Inactivated May 1945. Reactivated August 1953.

Andersen AFB, Guam APO AP 96543. **Nearest city:** Yigo. **Phone:** 671-366-1110. **Owning command:** PACAF. **Unit/mission:** 9th Operations Group Det. 3 (ACC), RPA operations; 22nd SOPS Det. 5 (AFSPC), space operations; 36th Wing (PACAF), support; 36th CRG (PACAF), bare base operations; 44th APS (AFRC), aerial port operations; 254th ABG (ANG), support, bare base operations (254th RED HORSE); 724th ASTF (AFRC); 734th AMS (AMC), air transportation services. **History:** activated 1945 as North Field. Renamed 1949 for Brig. Gen. James R. Andersen, lost at sea Feb. 26, 1945. Became part of Joint Region Marianas 2009.

Arnold AFB, Tenn. 37389. **Nearest city:** Manchester. **Phone:** 931-454-3000. **Owning command:** AFMC. **Unit/mission:** Arnold Engineering Development Complex (AFTC/AFMC), flight, space, and missile ground testing. **History:** dedicated June 25, 1951. Named for General of the Air Force Henry H. "Hap" Arnold.

Aviano AB, Italy APO AE 09604. **Nearest city:** Aviano. **Phone:** 011-39-0434-30-1110. **Owning command:** USAFE. **Unit/mission:** 31st FW (USAFE), fighter operations; 724th AMS (AMC), air transportation services. **History:** dates from 1911 as Italian air base. USAF began operations 1954.

Barksdale AFB, La. 71110. **Nearest city:** Bossier City. **Phone:** 318-456-1110. **Owning command:** AFGSC. **Unit/mission:** 2nd BW (AFGSC), bomber operations; 307th BW (AFRC), bomber operations, training; Hq. AFGSC, management; Hq. 8th Air Force (AFGSC), operational leadership. **History:** activated Feb. 2, 1933. Named for Lt. Eugene H. Barksdale, WWI airman killed in August 1926 crash.

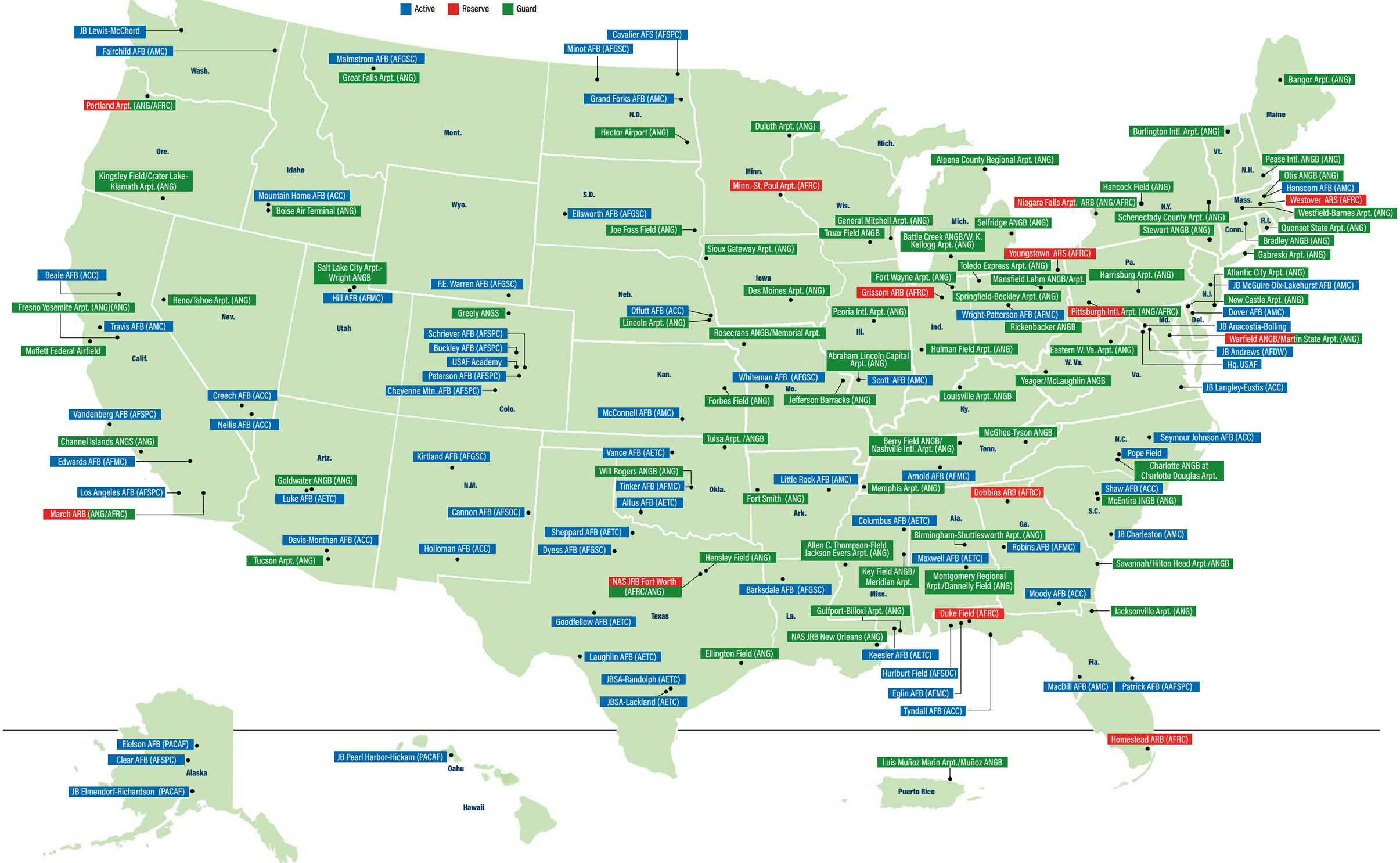
Beale AFB, Calif. 95903. **Nearest city:** Marysville. **Phone:** 530-634-3000. **Owning command:** ACC. **Unit/mission:** 7th SWS (AFSPC), missile warning; 9th RW (ACC), ISR, RPA operations; 195th Wing (ANG), DCGS, intel; 548th ISRG (ACC), DCGS; 940th Air Refueling Wing (AFRC), KC-135R. **History:** opened October 1942 as Army's Camp Beale. Named for Edward F. Beale, a former Navy officer who became a hero of the Mexican-American War and early developer of California, as well as a senior appointee/diplomat for four presidents. Transferred to USAF 1948. Designated AFB April 1951.

Buckley AFB, Colo. 80011. **Nearest city:** Denver. **Phone:** 720-847-9431. **Owning command:** AFSPC. **Unit/mission:** 140th Wing (ANG), air mobility, fighter operations, mobile missile warning; 460th SW (AFSPC), space surveillance, missile warning; 566th IS (ACC), intelligence; Air Reserve Personnel Center, Guard and Reserve personnel support. **History:** activated April 1, 1942, as gunnery training facility. ANG assumed control from Navy 1959. Became Active Duty Air Force facility Oct. 1, 2000. Named for 1st Lt. John H. Buckley, WWI flier, killed Sept. 17, 1918.

Cannon AFB, N.M. 88103. **Nearest city:** Clovis. **Phone:** 575-784-4131. **Owning command:** AFSOC. **Unit/mission:** 27th SOW (AFSOC), special operations. **History:** activated August 1942. Named for Gen. John K. Cannon, WWII commander of all Allied air forces in the Mediterranean Theater and former commander, Tactical Air Command.

Cape Canaveral AFS, Fla. 32925. **Nearest city:** Cocoa Beach. **Phone:** 321-494-5933. **Owning command:** AFSPC. **Unit/mission:** 45th Space Wing (AFSPC), space launch operations. **History:** formerly NAS Banana River. Site of Joint Long Range Proving Ground 1949. USAF took

MAJOR ACTIVE, GUARD, AND RESERVE AIR FORCE BASES IN THE US



sole control 1950. Combined with NASA to form John F. Kennedy Space Center 1973. Designated Cape Canaveral AS in 1974.

Cape Cod AFS, Mass. 02561. **Nearest city:** Sandwich. **Phone:** 508-968-3277. **Owning command:** AFSPC. **Unit/mission:** 6th SWS (AFSPC), missile warning. **History:** established April 4, 1980, as Cape Cod Missile Early Warning Station. Renamed Jan. 5, 1982.

Cavalier AFS, N.D. 58220. **Nearest city:** Cavalier. **Phone:** 701-993-3292. **Owning command:** AFSPC. **Unit/mission:** 10th SWS (AFSPC), missile warning. **History:** established 1975 as Army's Mickelsen Complex, an anti-ballistic missile facility. All but perimeter acquisition radar inactivated 1976. USAF took radar operational control 1977 and site control 2007.

Cheyenne Mountain AFS, Colo. 80914. **Nearest city:** Colorado Springs. **Phone:** N/A. **Owning command:** AFSPC. **Unit/mission:** 721st MSG (AFSPC), support; NORAD/NORTHCOM Alternate Command Center, Integrated Tactical Warning and Attack Assessment operations, training. **History:** operational April 20, 1966.

Clear AFS, Alaska 99704. **Nearest city:** Fairbanks. **Phone:** 907-585-6110. **Owning command:** AFSPC. **Unit/mission:** 13th SWS (AFSPC), 213th SWS (ANG), missile warning. **History:** dates from 1961.

Columbus AFB, Miss. 39710. **Nearest city:** Columbus. **Phone (automated):** 662-434-1110. **Owning command:** AETC. **Unit/mission:** 14th FTW (AETC), pilot training. **History:** activated 1942 for pilot training.

Creech AFB, Nev. 89191. **Nearest city:** Indian Springs. **Phone:** 702-652-1110. **Owning command:** ACC. **Unit/mission:** 432nd WG (ACC), 726th OG (AFRC), 556th Test and Evaluation Sq. (ACC), 232nd Operations Sq. (ANG), RPA operations; 799 ABG (ACC), support. **History:** built in 1943 as auxiliary landing field to support air-to-air gunnery and other AAF training. Called Indian Springs Arpt. Closed in 1947. Reopened in 1949. Became Indian Springs AFB in 1950. Transferred to Air Research and Development Command in 1952. Redesignated Indian Springs Air Force Auxiliary Field and assigned to Nellis AFB in 1964. In 2005, renamed Creech AFB for Gen. Wilbur L. "Bill" Creech, commander, Tactical Air Command, 1978 to 1984.

Davis-Monthan AFB, Ariz. 85707. **Nearest city:** Tucson. **Phone:** 520-228-1110. **Owning command:** ACC. **Unit/mission:** 55th ECG (ACC), electronic combat operations; 214th RG (ANG), RPA operations; 309th Aerospace Maintenance and Regeneration Group (AFMC), aerospace vehicle storage, regeneration; 355th Wing (ACC), fighter operations; 563rd RQG (ACC), personnel recovery operations; 924th FG (AFRC), fighter operations; 943rd RQG (AFRC), personnel recovery operations; Hq. 12th Air Force (ACC), operational leadership. **History:** activated 1927. Named for two local aviators: 2nd Lt. Samuel H. Davis Jr., killed Dec. 28, 1921, and 2nd Lt. Oscar Monthan, killed March 27, 1924.

Dover AFB, Del. 19902. **Nearest city:** Dover. **Phone:** 302-677-3000. **Owning command:** AMC. **Unit/mission:** 436th AW (AMC), 512th AW (AFRC), air mobility operations; Air Force Mortuary Affairs Operations (USAF). **History:** activated December 1941. Inactivated 1946. Reactivated February 1951.

Dyess AFB, Texas 79607. **Nearest city:** Abilene. **Phone:** 325-696-2863. **Owning command:** AFGSC. **Unit/mission:** 7th BW (AFGSC), bomber operations; 317th AW (AMC), air mobility operations. **History:** Abilene AAB opened Dec. 18, 1942. Inactivated Jan. 31, 1946. Reopened and renamed Dec. 1, 1956, for Lt. Col. William E. Dyess, WWII pilot who escaped from a Japanese prison camp, killed in P-38 crash in December 1943.

Edwards AFB, Calif. 93524. **Nearest city:** Rosamond. **Phone:** 661-277-1110. **Owning command:** AFMC. **Unit/mission:** 412th TW (AFMC), T&E, base support; Hq. Air Force Test Center (AFMC), T&E management; US Air Force Test Pilot School (AFMC), training. **History:** Muroc Bombing and Gunnery Range established September 1933. Designated Muroc AAB 1942. Renamed in 1949 for Capt. Glen W. Edwards, killed June 5, 1948, in crash of YB-49 "Flying Wing."

Eglin AFB, Fla. 32542. **Nearest city:** Niceville-Valparaiso. **Phone:** 850-882-1110. **Owning command:** AFMC. **Unit/mission:** 20th SPCS (AFSPC), space surveillance; 33rd FW (AETC), training; 53rd Wing (ACC), OT&E; 96th TW (AFMC), T&E, base support; Air Force Armament Museum (AFMC); AFRL Munitions Directorate (AFMC), R&D; PEO-Weapons/Air Force Life Cycle Management Center Armament Directorate (AFMC), acquisition. **History:** activated 1935. Named for Lt. Col. Frederick I. Eglin, WWI flier killed in aircraft accident Jan. 1, 1937.

Eielson AFB, Alaska 99702. **Nearest city:** Fairbanks. **Phone:** 907-377-2116. **Owning command:** PACAF. **Unit/mission:** 168th ARW (ANG), air mobility operations; 354th FW (PACAF), aggressor force, fighter, Red Flag-Alaska operations, Joint Pacific Alaska Range Complex support; Arctic Survival School (AETC), training. **History:** activated October 1944. Named for Carl Ben Eielson, Arctic aviation pioneer who died in Arctic rescue mission November 1929.

Ellsworth AFB, S.D. 57706. **Nearest city:** Rapid City. **Phone:** 605-385-5056. **Owning command:** AFGSC. **Unit/mission:** 28th BW (AFGSC), bomber operations; Air Force Financial Services Center (AFMC). **History:** activated January 1942 as Rapid City AAB. Renamed June 13, 1953, for Brig. Gen. Richard E. Ellsworth, killed March 18, 1953, in RB-36 crash.

Fairchild AFB, Wash. 99011. **Nearest city:** Spokane. **Phone:** 509-247-1212. **Owning command:** AMC. **Unit/mission:** 92nd ARW (AMC), 141st ARW (ANG), air mobility operations; USAF SERE School (AETC), training. **History:** activated January 1942. Named for Gen. Muir S. Fairchild, USAF Vice Chief of Staff at his death in 1950.

F.E. Warren AFB, Wyo. 82005. **Nearest city:** Cheyenne. **Phone:** 307-773-3381. **Owning command:** AFGSC. **Unit/mission:** 90th MW (AFGSC), ICBM operations; 153rd CACS (ANG), space C2 operations; Hq. 20th Air Force (AFGSC), operational leadership; Warren ICBM and Heritage Museum. **History:** activated as Fort D. A. Russell July 4, 1867. Renamed in 1930 for Francis Emory Warren, Wyoming senator and first state governor. Reassigned to USAF in 1947 and received current designation in 1949.

Acronyms and Abbreviations

AAB	Army Air Base
AAF	Army Airfield
AB	Air Base
ABG	Air Base Group
ABW	Air Base Wing
ACC	Air Combat Command
ACG	Air Control Group
ACS	Air Control Squadron
ACTS	Air Combat Training Squadron
ACW	Air Control Wing
AETC	Air Education and Training Command
AFB	Air Force Base
AFDW	Air Force District of Washington
AFGSC	Air Force Global Strike Command
AFMC	Air Force Materiel Command
AFNWC	Air Force Nuclear Weapons Center
AFRC	Air Force Reserve Command
AFRL	Air Force Research Laboratory
AFS	Air Force Station
AFSOC	Air Force Special Operations Command
AFSPC	Air Force Space Command
AFTC	Air Force Test Center
AG	Airlift Group
AGOW	Air Ground Operations Wing
AGS	Air Guard Station
ALC	Air Logistics Complex
AMC	Air Mobility Command
AMOG	Air Mobility Operations Group
AMOW	Air Mobility Operations Wing
AMS	Air Mobility Squadron
AMW	Air Mobility Wing
ANG	Air National Guard
ANGB	Air National Guard Base
ANGS	Air National Guard Station
APO AP	Army/Air Force Post Office Pacific
APO AE	Army/Air Force Post Office Europe
AOC	Air and Space Operations Center
AOG	Air and Space Operations Group
APS	Aerial Port Squadron
ARB	Air Reserve Base
ARG	Air Refueling Group
Arpt.	Airport
ARS	Air Refueling Squadron or Air Reserve Station
ARW	Air Refueling Wing
AS	Air Station or Airlift Squadron
ASOG	Air Support Operations Group
ASOS	Air Support Operations Squadron
ASTF	Aeromedical Staging Flight
ATKW	Attack Wing
AW	Airlift Wing
BW	Bomb Wing
C2	command and control
C3I	command, control, communications, and intelligence
C4	command, control, communications, and computers
CACS	Command and Control Squadron
CBCS	Combat Communications Squadron
CCG	Combat Communications Group
CCW	Command and Control Wing
CENTCOM	US Central Command
CG	Communications Group
CRF	Centralized Repair Facility
CONUS	continental US
COS	Cyberspace Operations
CRG	Contingency Response Group
CRW	Contingency Response Wing
CSAR	combat search and rescue
CTS	Combat Training Squadron
CW	Cyberspace Wing
DCGS	Distributed Common Ground Station
DMOC	Distributed Mission Operations Center
DTOC	Distributed Training Operations Center
ECG	Electronic Combat Group
EIS(G)	Engineering Installation Squadron/Group

Goodfellow AFB, Texas 76908. **Nearest city:** San Angelo. **Phone:** 325-654-1110. **Owning command:** AETC. **Unit/mission:** 17th TRW (AETC), training. **History:** established August 1940. Officially activated January 1941. Named for 1st Lt. John J. Goodfellow Jr., WWI observation airplane pilot killed in combat Sept. 14, 1918.

Grand Forks AFB, N.D. 58205. **Nearest city:** Grand Forks. **Phone:** 701-747-3000. **Owning command:** ACC. **Unit/mission:** 69th RG (ACC), RPA operations; *319th ABW (ACC), support. **History:** activated 1956. Named after town of Grand Forks, whose citizens bought the property for the Air Force. The 319th is due to be redesignated 319th RW in mid-summer.

Hanscom AFB, Mass. 01731. **Nearest city:** Boston. **Phone:** 781-225-1110. **Owning command:** AFMC. **Unit/mission:** 66th ABG (AFMC), support; PEO-Battle Management, PEO-C3I and Networks (AFMC), PEO-Nuclear Command, Control, and Communications (NC3) (AFMC) acquisition. **History:** activated 1941. Named for Laurence G. Hanscom, a pre-WWII advocate of private aviation, killed in lightplane accident 1941.

Hill AFB, Utah 84056. **Nearest city:** Salt Lake City. **Phone:** 801-777-4681. **Owning command:** AFMC. **Unit/mission:** 75th ABW (AFMC), support; 388th FW (ACC), fighter, Utah Test and Training Range operations; 419th FW (AFRC), fighter operations; 748th SCMG (AFMC), systems life cycle support; AFNWC ICBM Systems Directorate (AFMC), ICBM acquisition, support; Hill Aerospace Museum (AFMC); Ogden ALC (AFMC), weapons maintenance, repair. **History:** activated 1940. Named for Maj. Ployer P. Hill, killed Oct. 30, 1935, test-flying first B-17.

Holloman AFB, N.M. 88330. **Nearest city:** Alamogordo. **Phone:** 575-572-7381. **Owning command:** AETC. **Unit/mission:** 49th Wing (ACC), RPA training; 54th FG (AETC), fighter operations; 704th TG (AFMC), test; 429th ACTS (AFRC), RPA training. **History:** activated 1941. Named for Col. George Holloman, guided-missile pioneer.

Hurlburt Field, Fla. 32544. **Nearest city:** Fort Walton Beach. **Phone:** 850-884-1110. **Owning command:** AFSOC. **Unit/mission:** 1st SOW (AFSOC), special operations; 24th SOW (AFSOC), special tactics operations; 39th IOS (AFSPC), training; 361st ISRG (ACC), ISR operations; 492nd SOW (AFSOC) training; 505th CCW (ACC), C2, ISR TTP development, test; 556th RED HORSE (AFRC), 823rd RED HORSE (ACC), bare base operations; 2nd Combat Weather Systems Squadron (ACC), OT&E, training; Hq. AFSOC, management. **History:** activated 1943. Named for Lt. Donald W. Hurlburt, WWII pilot killed Oct. 1, 1943.

Incirlik AB, Turkey APO AE 09824. **Nearest city:** Adana. **Phone:** (commercial, from CONUS) 011-90-322-6060. **Owning command:** USAFE. **Unit/mission:** 39th ABW (USAFE), support; 728th AMS (AMC), air transportation services. **History:** activated 1954. Named Adana AB Feb. 21, 1955. Renamed Incirlik AB Feb. 28, 1958.

JB Anacostia-Bolling, D.C. 20032. **Nearest city:** Washington, D.C. **Phone:** 703-545-6700. **Bolling owning command:** AFDW. **Unit/mission:** 11th Operations Group (AFDW), support; 579th MDG (AFDW), clinic operations; Hq. Surgeon General (USAF). **History:** activated October 1917 with Army air and Navy elements. Formed joint base under Navy lead 2010. Naval Support Facility Anacostia named for adjacent Anacostia River. Bolling named for Col. Raynal C. Bolling, first high-ranking Army Air Service officer killed in WWI.

JB Andrews, Md. 20762. **Nearest city:** Washington, D.C. **Phone:** 301-981-1110. **Owning command:** AFDW. **Unit/mission:** 11th Wing (AFDW), helicopter operations, support; 89th AW (AMC), air mobility operations; 113th Wing (ANG), air mobility, fighter operations; 459th ARW (AFRC), air mobility operations; 844th CG (AFDW), cyber operations; Air Force Legal Operations Agency (USAF); Air Force Review Boards Agency (USAF); ANG Readiness Center (ANG), support. **History:** activated May 1943. NAF Washington dates from 1919 at Anacostia (above); moved to Andrews 1958. Formed JB Andrews-NAF Washington under Air Force lead 2010. Andrews named for Lt. Gen. Frank M. Andrews, military air pioneer and WWII commander of the European Theater, killed in aircraft accident May 3, 1943, in Iceland.

JB Charleston, S.C. 29404. **Nearest city:** Charleston. **Phone:** 843-963-1110. **Owning command:** AMC. **Unit/mission:** 315th AW (AFRC), 437th AW (AMC), air mobility operations; 628th ABW (AMC), support. **History:** activated 1942. Inactivated March 1946. Reactivated August 1953. Formed joint base with Naval Weapons Station Charleston under Air Force lead 2010. Named for city of Charleston.

JB Elmendorf-Richardson, Alaska 99506. **Nearest city:** Anchorage. **Phone:** 907-552-1110. **Owning command:** PACAF. **Unit/mission:** 3rd Wing (PACAF), air mobility, C2, fighter operations; 176th Wing (ANG), air mobility, personnel recovery operations; 477th FG (AFRC), fighter operations; 673rd ABW (PACAF), support; 715th AMOG (AMC), air mobility operations; Alaskan NORAD Region, operational leadership; Hq. 11th Air Force (PACAF), operational leadership; Hq. Alaskan Command (PACOM), management. **History:** activated July 1940. Formed as joint base under Air Force lead 2010. Elmendorf named for Capt. Hugh M. Elmendorf, killed Jan. 13, 1933, flying an experimental fighter. Richardson named for Army Brig. Gen. Wilds P. Richardson, who served in Alaska territory from 1897 to 1917.

JB Langley-Eustis, Va. 23665. **Nearest city:** Hampton. **Phone:** 757-764-1110. **Langley owning command:** ACC. **Unit/mission:** 1st FW (ACC), 192nd FW (ANG), cyber, fighter operations; 480th ISRW (ACC), ISR operations; 633rd ABW (ACC), support; 363rd ISRW (ACC), ISR operations; Hq. ACC, management. **History:** activated Dec. 30, 1916. Formed as joint base under Air Force lead 2010. Langley is first military base in US purchased and built specifically for military aviation. Langley named for aviation pioneer and scientist Samuel Pierpont Langley, who died 1906. Eustis named for Brevet Brig. Gen. Abraham Eustis, first commanding officer of Fort Monroe, Va.

JB Lewis-McChord, Wash. 98438. Nearest city: Tacoma. **Phone:** 253-967-1110. **McChord Field owning command:** AMC. **Unit/mission:** 62nd AW (AMC), 446th AW (AFRC), air mobility operations; 627th ABG (AMC), support; Western Air Defense Sector (NORAD/ANG), warning and control. **History:** Fort Lewis established 1917; McChord Field activated July 3, 1940. Formed as

Acronyms and Abbreviations

EOD	explosive ordnance disposal
FG	Fighter Group
FLTS	Flight Test Squadron
FTG	Flying Training Group
FTU	Formal Training Unit
FTW	Flying Training Wing
FW	Fighter Wing
IOF	Information Operations Flight
IOS	Information Operations Squadron
IOW	Information Operations Wing
IS	Intelligence Squadron
ISR	intelligence, surveillance, and reconnaissance
ISRG	ISR Group
ISRW	ISR Wing
IW	Intelligence Wing
IWS	Information Warfare Squadron
JB	Joint Base
JBSA	Joint Base San Antonio
JNGB	Joint National Guard Base
JRB	Joint Reserve Base
MAFFS	Modular Airborne Firefighting System
MDG	Medical Group
MDW	Medical Wing
MOH	Medal of Honor
MSG	Mission Support Group
MW	Missile Wing
NAF	Naval Air Facility
NAS	Naval Air Station
NORTHCOM	US Northern Command
OT&E	operational test and evaluation
PACAF	Pacific Air Forces
PACOM	US Indo-Pacific Command
PEO	Program Executive Officer
R&D	research and development
RED HORSE	Rapid Engineer Deployable Heavy Operational Repair Squadron, Engineers
RG	Reconnaissance Group
RPA	remotely piloted aircraft
RQG	Rescue Group
RQS	Rescue Squadron
RQW	Rescue Wing
RS	Reconnaissance Squadron
RSG	Regional Support Group
RW	Reconnaissance Wing
SCMG	Supply Chain Management Group
SCMW	Supply Chain Management Wing
SCOW	Supply Chain Operations Wing
SERE	survival, evasion, resistance, and escape
SMC	Space and Missile Systems Center
SOCOM	US Special Operations Command
SOF	Special Operations Forces
SOG	Special Operations Group
SOPS	Space Operations Squadron
SOW	Special Operations Wing
SPCS	Space Control Squadron
STRATCOM	US Strategic Command
STS	Special Tactics Squadron
SW	Space Wing
SWS	Space Warning Squadron
T&E	Test and Evaluation
TACC	Tanker Airlift Control Center
TACP	tactical air control party
TG	Test Group
TRANSCOM	US Transportation Command
TRG	Training Group
TRW	Training Wing
TTP	tactics, techniques, and procedures
TW	Test Wing
USAFE	US Air Forces in Europe
WEG	Weapons Evaluation Group
WF	Weather Flight
WXF	Weather Forecast
WPS	Weapons Squadron

MAJOR OVERSEAS AIR FORCE OPERATING LOCATIONS

Locations on this map include principal bases and many forward operating locations. While not intended to be fully comprehensive, the map provides a sense of the Air Force's global presence.

Main Operating Bases • Forward Operating Locations Countries where US forces do not operate

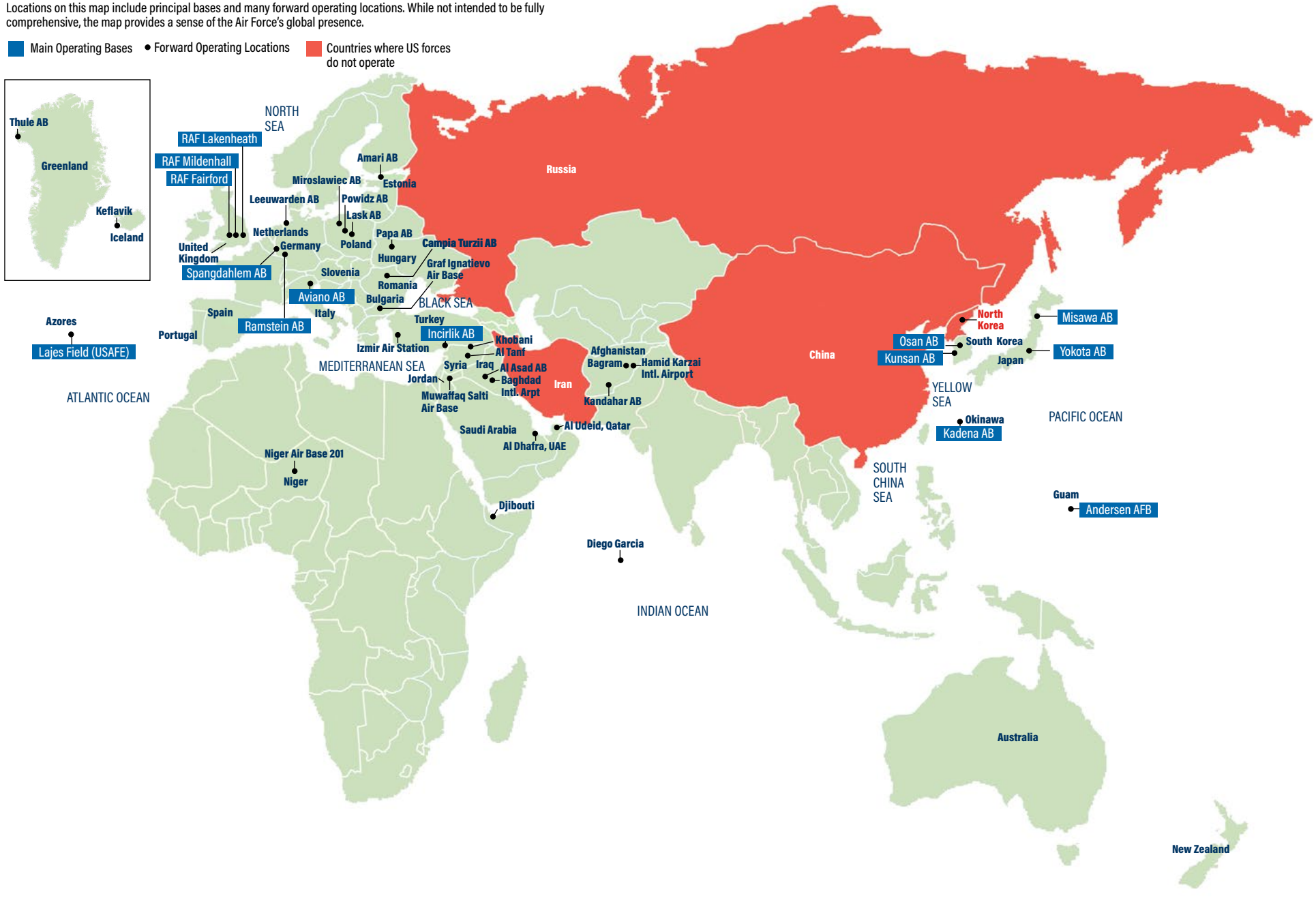


Photo: SrA. Thomas Barley

A B-2 Spirit out of Whiteman AFB, Mo., and two F-22 Raptors from JB Pearl Harbor-Hickam, Hawaii, fly in formation.

joint base under Army lead 2010. Lewis named for Capt. Meriwether Lewis of Lewis and Clark Expedition (1804-05). McChord named for Col. William C. McChord, died in aircraft crash, Aug. 18, 1937.

JB McGuire-Dix-Lakehurst, N.J. 08641. **Nearest city:** Wrightstown. **Phone:** 609-754-1100. **Owning command:** AMC. **Unit/mission:** 87th ABW (AMC), support; 108th Wing (ANG), air mobility, bare base operations; 305th AMW (AMC), 514th AMW (AFRC), air mobility operations; 621st CRW (AMC), bare base operations; US Air Force Expeditionary Center (AMC), training. **History:** McGuire activated 1941 as Fort Dix AAB. Closed after WWII. Reopened as McGuire 1948. Dix activated 1917. Navy purchased Army's Camp Kendrick in 1921 for airship station, renamed Lakehurst for city of Lakehurst, N.J. Formed as joint base under Air Force lead 2009. McGuire named for Maj. Thomas B. McGuire Jr., P-38 pilot, second leading US ace of WWII, MOH recipient, killed in action Jan. 7, 1945. Dix named for Maj. Gen. John Adams Dix, War of 1812 and Civil War veteran and US senator.

JB Pearl Harbor-Hickam, Hawaii 96853. **Nearest city:** Honolulu. **Phone:** 808-449-7110. **Hickam owning command:** PACAF. **Unit/mission:** 15th Wing (PACAF), 154th Wing (ANG), air mobility, fighter operations; 515th AMOW (AMC); 613th AOC (PACAF), C2 operations; 624th RSG (AFRC), bare base operations; 647th ABG (PACAF), support; Hq. PACAF, management, operational leadership. **History:** Pearl Harbor established 1908. Hickam dedicated 1935. Activated 1938. Formed as joint base under Navy lead 2010. Hickam named for Lt. Col. Horace M. Hickam, aviation pioneer killed in crash in Texas Nov. 5, 1934.

JB San Antonio, Texas 78234. **Nearest city:** San Antonio. **Phone:** 210-221-1211 (JBSA-Fort Sam Houston operator). **Major components:** JBSA-Fort Sam Houston, JBSA-Lackland, JBSA-Randolph, JBSA-Camp Bullis. **Unit/mission:** 502nd ABW (AETC), located at Fort Sam Houston, support. **History:** established 2009 to consolidate the installation management and support functions for the military facilities in San Antonio as part of 2005 base realignment and closure actions.

JBSA-Lackland, Texas 78236. **Nearest city:** San Antonio. **Phone:** 210-671-1110. **Owning command:** AETC. **Unit/mission:** 37th TRW (AETC), training; 59th MDW (AETC), ambulatory surgical, management, training; 67th CW (ACC), network defense operations; 149th FW (ANG), cyber, fighter operations; 433rd AW (AFRC), air mobility operations; 624th Operations Center (ACC), cyberspace operations; 688th Cyberspace Wing (ACC), information operations, engineering infrastructure services; Air Force Civil Engineer Center (AFMC), engineering services; Air Force Installation and Mission Support Center (AFMC), resourcing and combat support; Air Force Services Agency (AFMC) support; Hq. 24th Air Force (ACC), operational leadership; Hq. 25th Air Force (ACC), operational leadership; Hq. Air Force Security Forces Center (AFMC), management. **History:** activated 1941 as part of Kelly Field. designated an independent installation July 1942 as San Antonio Aviation Cadet Center. Placed under Joint Base San Antonio installation management umbrella 2009. (See JBSA entry.) Named 1947 for Brig. Gen. Frank D. Lackland, early commandant of Kelly Field flying school, who died 1943. (Note: Several USAF agencies reside within Port San Antonio, the business development area created from the former Kelly AFB, but maintain JBSA-Lackland mailing addresses.)

JBSA-Randolph, Texas 78150. **Nearest city:** San Antonio. **Phone:** 210-652-1110. **Owning command:** AETC. **Unit/mission:** 12th FTW (AETC), training; 340th FTG (AFRC), training; 502 ABW (AETC), support; Air Force Personnel Center (USAF), management; Air Force Recruiting Service (AETC), management; Hq. AETC, management. **History:** dedicated June 20, 1930. Placed under Joint Base San Antonio installation management umbrella 2009. (See JBSA) Named for Capt. William M. Randolph, died Feb. 17, 1928, on a training mission.

Kadena AB, Japan APO AP 96368. **Nearest city:** Naha. **Phone:** (commercial, from CONUS) 011-81-98-961-1110. **Owning command:** PACAF. **Unit/mission:** 18th Wing (PACAF), air mobility, fighter, ISR, personnel recovery operations; 82nd RS (ACC), reconnaissance; 353rd SOG (AFSOC), special operations; 390th IS (ACC), intelligence; 733rd AMS (AMC), air transportation services. **History:** occupied by US forces April 1945. Named for city of Kadena on island of Okinawa.

Keesler AFB, Miss. 39534. **Nearest city:** Biloxi. **Phone:** 228-377-1110. **Owning command:** AETC. **Unit/mission:** 81st TRW (AETC), training; 403rd Wing (AFRC), air mobility operations, weather reconnaissance; Hq. 2nd Air Force (AETC), operational leadership. **History:** activated June 12, 1941. Named for 2nd Lt. Samuel R. Keesler Jr., a native of Mississippi and WWI aerial observer killed in action Oct. 9, 1918.

Kirtland AFB, N.M. 87117. **Nearest city:** Albuquerque. **Phone:** 505-846-1110. **Owning command:** AFGSC. **Unit/mission:** 58th SOW (AETC), 150th SOW (ANG), special operations, CSAR training; 377th ABW (AFGSC), executive agent for installation, support, nuclear operations; AFNWC (AFMC), acquisition, sustainment; Air Force Safety Center (USAF), management; AFRL Directed Energy Directorate (AFMC), R&D; PEO-Strategic Systems (AFMC), acquisition; Space Development and Test Directorate (AFSPC), test; AFRL Space Vehicles Directorate (AFMC), R&D. **History:** activated January 1941. Named for Col. Roy C. Kirtland, aviation pioneer who died May 2, 1941.

Kunsan AB, South Korea APO AP 96264. **Nearest city:** Gunsan City. **Phone:** 011-82-63-470-1110. **Owning command:** PACAF. **Unit/mission:** 8th FW (PACAF), fighter operations. **History:** built by the Japanese in 1938. US operations began in April 1951.

Lajes Field, Azores, Portugal APO AE 09720. **Nearest city:** Praia de Vitoria. **Phone:** 011-351-295-57-6161. **Owning command:** USAFE. **Unit/mission:** 65th ABG, support; 729th AMS (AMC), air transportation services. **History:** US operations began 1943.

Laughlin AFB, Texas 78843. **Nearest city:** Del Rio. **Phone:** 830-298-3511. **Owning command:** AETC. **Unit/mission:** 47th FTW (AETC), training. **History:** activated July 1942. Named for 1st Lt. Jack Thomas Laughlin, Del Rio native, B-17 pilot, killed Jan. 29, 1942.

Little Rock AFB, Ark. 72099. **Nearest city:** Jacksonville. **Phone:** 501-987-1110. **Owning command:** AMC. **Unit/mission:** 19th AW (AMC), air mobility operations; 913th AG (AFRC), 189th AW (ANG), air mobility operations, training; 314th AMW (AETC), training. **History:** base opened Oct. 9, 1955.

Los Angeles AFB, Calif. 90245. **Nearest city:** El Segundo. **Phone:** 310-653-1110. **Owning command:** AFSPC. **Unit/mission:** 61st ABG (AFSPC), support; Hq. Space and Missile Systems Center (AFSPC), acquisition, R&D. **History:** designated Los Angeles AFS April 30, 1964. Redesignated Los Angeles AFB Sept. 15, 1987. SMC, activated July 1, 1992, dates from

Air Research and Development Command's Western Development Division, activated July 1, 1954.

Luke AFB, Ariz. 85309. **Nearest city:** Phoenix. **Phone:** 623-856-1110. **Owning command:** AETC. **Unit/mission:** 56th FW (AETC), training, Barry M. Goldwater Range operations; 944th FW (AFRC), training. **History:** activated 1941. Named for 2nd Lt. Frank Luke Jr., observation balloon-busting ace of WWI and first aviator to receive MOH, killed in action Sept. 29, 1918.

MacDill AFB, Fla. 33621. **Nearest city:** Tampa. **Phone:** 813-828-1110. **Owning command:** AMC. **Unit/mission:** 6th AMW (AMC), 927th ARW (AFRC), air mobility operations; Hq. CENTCOM, operational leadership; Hq. SOCOM, operational leadership; Hq. Joint Communications Support Element, C4 operations, management; Joint Special Operations University (SOCOM), education. **History:** activated April 15, 1941. Named for Col. Leslie MacDill, killed in aircraft accident Nov. 8, 1938.

Malmstrom AFB, Mont. 59402. **Nearest city:** Great Falls. **Phone:** 406-731-1110. **Owning command:** AFGSC. **Unit/mission:** 341st MW (AFGSC), ICBM operations; 819th RED HORSE (ACC/ANG), bare base operations. **History:** activated Dec. 15, 1942. Named for Col. Einar A. Malmstrom, WWII fighter commander killed in air accident Aug. 21, 1954.

Maxwell AFB, Ala. 36112. **Nearest city:** Montgomery. **Phone:** 334-953-1110. **Owning command:** AETC. **Unit/mission:** 42nd ABW (AETC), support; 908th AW (AFRC), air mobility operations; Air Force Historical Research Agency (USAF), historical documentation, research; Air University (AETC); Hq. Civil Air Patrol (USAF), management; Hq. Air Force Judge Advocate General Corps (USAF), management; PEO-Business and Enterprise Systems (AFMC), acquisition. **History:** activated 1918 at the site of the Wright brothers' flight school. Named for 2nd Lt. William C. Maxwell, killed in air accident Aug. 12, 1920.

McConnell AFB, Kan. 67221. **Nearest city:** Wichita. **Phone:** 316-759-6100. **Owning command:** AMC. **Unit/mission:** 22nd ARW (AMC), air mobility operations; 184th IW (ANG), cyber, DCGS, ISR operations, space C2, TACP operations; 931st ARG (AFRC), air mobility operations. **History:** activated June 5, 1951. Named for three Wichita natives, the McConnell brothers—Lt. Col. Edwin M. (died Sept. 1, 1997), Capt. Fred J. (died in a private airplane crash Oct. 22, 1945), and 2nd Lt. Thomas L. (killed July 10, 1943)—all WWII B-24 pilots.

Minot AFB, N.D. 58705. **Nearest city:** Minot. **Phone:** 701-723-7979. **Owning command:** AFGSC. **Unit/mission:** 5th BW (AFGSC), bomber operations; 91st MW (AFGSC), ICBM operations. **History:** activated January 1957. Named after city of Minot, whose citizens donated $50,000 toward purchase of the land.

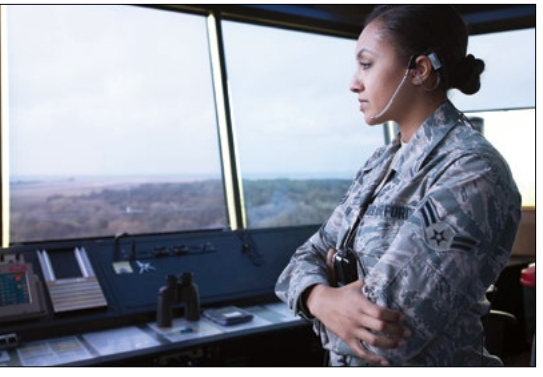


Photo: SrA. Ashley Perdue

A1C Sade Jelani keeps an eye on the flight line at MacDill AFB, Fla.

Misawa AB, Japan, APO AP 96319. **Nearest city:** Misawa. **Phone:** 011-81-176-53-5181, ext. 226-3075. **Owning command:** PACAF. **Unit/mission:** 35th FW (PACAF), fighter operations. **History:** occupied by US forces September 1945.

Moody AFB, Ga. 31699. **Nearest city:** Valdosta. **Phone:** 229-257-1110. **Owning command:** ACC. **Unit/mission:** 23rd Wing (ACC), fighter, personnel recovery operations; 81st FS (AETC); 93rd AGOW (ACC), battlefield airmen operations, expeditionary force protection, support; 476th FG (AFRC), fighter operations. **History:** activated June 1941. Named for Maj. George P. Moody, killed May 5, 1941.

Mountain Home AFB, Idaho 83648. **Nearest city:** Mountain Home. **Phone:** 208-828-2111. **Owning command:** ACC. **Unit/mission:** 366th FW (ACC), fighter operations, range management. **History:** activated August 1943 as B-24 training base. Inactivated October 1945. Reactivated December 1948. Inactivated April 1950. Reactivated 1951.

Nellis AFB, Nev. 89191. **Nearest city:** Las Vegas. **Phone:** 702-652-1110. **Owning command:** ACC. **Unit/mission:** 57th Wing (ACC), combat training; 99th ABW (ACC), support; 820th RED HORSE (ACC), bare base operations; 926th Wing (AFRC), associate missions at Beale, Creech, Eglin, Hurlburt, Nellis, Schriever; USAF Warfare Center (ACC), operational testing, tactics development, training; Nevada Test and Training Range (ACC), range management, operations. **History:** activated July 1941 as Las Vegas AAF with Army Air Corps Flexible Gunnery School. Closed 1947. Reopened 1948. Named for 1st Lt. William H. Nellis, WWII P-47 fighter pilot, killed Dec. 27, 1944.

Offutt AFB, Neb. 68113. **Nearest city:** Bellevue. **Phone:** 402-294-1110. **Owning command:** ACC. **Unit/mission:** 55th Wing (ACC), ISR, electronic attack; Hq. STRATCOM, operational leadership; 557th Weather Wing (ACC), management; 595th C2 Group (AFGSC), operations (NC2); 170th Group (ANG), support, training. **History:** activated 1896 as Army's Fort Crook. Used for airships from 1918 and aircraft cross-country stop from 1921. Landing field named May 10, 1924, for 1st Lt. Jarvis J. Offutt, WWI pilot who died Aug. 13, 1918. Served as bomber production facility January 1942 to September 1945. Redesignated Offutt Field June 1946. Redesignated Offutt AFB on Jan. 13, 1948, transferred to USAF.

Osan AB, South Korea APO AP 96278. **Nearest city:** Pyeongtaek. **Phone:** 011-82-784-1110. **Owning command:** PACAF. **Unit/mission:** 5th RS (ACC), reconnaissance operations; 51st FW (PACAF), fighter operations; 694th ISRG (ACC), DCGS operations; 731st AMS (AMC), air transportation services; Hq. 7th Air Force (PACAF), operational leadership. **History:** originally designated K-55. Runway opened December 1952. Renamed Osan AB in 1956 for nearby town that was the scene of first fighting in July 1950 between US and North Korean forces.

Patrick AFB, Fla. 32925. **Nearest city:** Cocoa Beach. **Phone:** 321-494-1110. **Owning command:** AFSPC. **Unit/mission:** 45th SW (AFSPC), space launch operations; 114th SPCS (ANG), launch range support; 920th RQW (AFRC), personnel recovery operations; Air Force Technical Applications Center (ACC), nuclear monitoring. **History:** activated 1940. Named for Maj. Gen. Mason M. Patrick, Chief of American Expeditionary Forces' Air Service in WWI and Chief of Air Service/Air Corps, 1921-27.

Peterson AFB, Colo. 80914. **Nearest city:** Colorado Springs. **Phone:** 719-556-7321. **Owning command:** AFSPC. **Unit/mission:** 21st SW (AFSPC), missile warning, space operations, support; 52nd AS (AMC) (active associate), 200th AS (ANG), air mobility operations; 302nd AW (AFRC), air mobility, MAFFS operations; Hq. AFSPC, management; Hq. NORAD, Hq. NORTHCOM, operational leadership. **History:** activated 1942. Named for 1st Lt. Edward J. Peterson, killed Aug. 8, 1942.

Pope Field, N.C. 28308. **Nearest city:** Fayetteville. **Phone:** 910-394-1110. **Unit/mission:** 18th ASOG (ACC), combat weather, TACP operations; 21st STS, 24th STS (AFSOC), special tactics operations; 43rd AG (AMC), air mobility operations; USAF Combat Control School (AFSOC), training. **History:** activated 1919. Pope AFB became Pope Field, part of Fort Bragg, March 1, 2011. Named for 1st Lt. Harley H. Pope, WWI pilot, killed Jan. 7, 1919.

RAF Lakenheath, UK APO AE 09461. **Nearest city:** Cambridge. **Phone:** 011-44-1638-52-1110. **Owning command:** USAFE. **Unit/mission:** 48th FW (USAFE), fighter, personnel recovery operations. **History:** began as Royal Air Force decoy field in 1930s. Activated as RAF airfield November 1941. USAF bombers arrived August 1948. USAF took administrative control May 1951. Named after nearby village.

RAF Mildenhall, UK APO AE 09459. **Nearest city:** Cambridge. **Phone:** 011-44-1638-54-1110. **Owning command:** USAFE. **Unit/mission:** 95th RS (ACC), reconnaissance operations; 100th ARW (USAFE), air mobility operations; 352nd SOW (AFSOC), special operations; 488th IS (ACC), intelligence operations; 727th AMS (AMC), air transportation services. **History:** activated as RAF bomber base October 1934. Named after nearby town. US bomber operations began July 1950. Strategic Air Command had control from October 1951 to September 1959, when USAFE took over.

Ramstein AB, Germany APO AE 09094. **Nearest city:** Landstuhl. **Phone:** 011-49-6371-47-1110. **Owning command:** USAFE. **Unit/mission:** 86th AW (USAFE), air mobility operations, support (including Kaiserslautern Military Community); 435th AGOW (USAFE), bare base, combat communications, combat weather, TACP operations; 521st AMOW (AMC), air transportation services; 603rd AOC (USAFE), C2 operations; Hq. 3rd AF (USAFE), operational leadership; Hq. USAFE, management, operational leadership. **History:** originally Landstuhl AB, activated August 1952. Reactivated December 1957 as Ramstein-Landstuhl AB; later redesignated Ramstein AB.

Robins AFB, Ga. 31098. **Nearest city:** Warner Robins. **Phone:** 478-926-1110. **Owning command:** AFMC. **Unit/mission:** 78th ABW (AFMC), support; 94th APS (AFRC), aerial port operations; 116th ACW (ANG), 461st ACW (ACC), C2 operations; 638th SCMG (AFMC), systems life cycle support; 5th CCG (ACC), combat communications

operations; Hq. AFRC, management; Warner Robins ALC (AFMC), weapons maintenance, repair. **History:** activated March 1942. Named for Brig. Gen. Augustine Warner Robins, an early chief of the Air Corps' Materiel Division, who died June 16, 1940.

Schriever AFB, Colo. 80912. **Nearest city:** Colorado Springs. **Phone:** 719-567-1110. **Owning command:** AFSPC. **Unit/mission:** 50th SW (AFSPC), 310th SW (AFRC), space operations; US Air Force Warfare Center-Space (ACC/AFSPC), R&D. **History:** activated as Falcon AFS Sept. 26, 1985. Redesignated AFB June 13, 1988. Renamed for Gen. Bernard A. Schriever June 5, 1998.

Scott AFB, Ill. 62225. **Nearest city:** Belleville. **Phone:** 618-256-1110. **Owning command:** AMC. **Unit/mission:** 126th ARW (ANG), 375th AMW (AMC), air mobility operations; 618th AOC (TACC) (AMC), planning/directing worldwide air mobility operations; 635th SCOW (AFMC), global logistics support; 932nd AW (AFRC), air mobility operations; Air Force Network Integration Center (AFSPC), network integration, engineering, simulation; Hq. 18th Air Force (AMC), operational leadership; Hq. AMC, management; Hq. TRANSCOM, operational leadership. **History:** activated June 14, 1917. Named for Cpl. Frank S. Scott, first enlisted man to die in an aircraft accident, Sept. 28, 1912.

Seymour Johnson AFB, N.C. 27531. **Nearest city:** Goldsboro. **Phone:** 919-722-1110. **Owning command:** ACC. **Unit/mission:** 4th FW (ACC), 414th FG (AFRC), fighter operations; 567th RED HORSE (ACC), bare base operations; 916th ARW (AFRC), air mobility operations. **History:** activated Sept. 12, 1942. Named for Navy Lt. Seymour A. Johnson, Goldsboro native, killed March 5, 1941.

Shaw AFB, S.C. 29152. **Nearest city:** Sumter. **Phone:** 803-895-1110. **Owning command:** ACC. **Unit/mission:** 20th FW (ACC), fighter operations; Hq. 9th Air Force (ACC), management (Hq. Air Forces Central in Southwest Asia, operational leadership). **History:** activated Aug. 30, 1941. Named for 1st Lt. Ervin D. Shaw, one of the first Americans to see air action in WWI, killed in France July 9, 1918.

Sheppard AFB, Texas 76311. **Nearest city:** Wichita Falls. **Phone:** 940-676-2732. **Owning command:** AETC. **Unit/mission:** 80th FTW (AETC), Euro-NATO Joint Jet Pilot Training program; 82nd TRW (AETC), training. **History:** activated June 14, 1941. Named for US Sen. Morris Sheppard, who died April 9, 1941.

Spangdahlem AB, Germany APO AE 09126. **Nearest city:** Bitburg. **Phone:** 011-49-6565-61-1110. **Owning command:** USAFE. **Unit/mission:** 52nd FW (USAFE), fighter operations, 726th AMS (AMC), air transport services. **History:** built by French 1951 and turned over to US 1952.

Thule AB, Greenland APO AE 09074. **Nearest city:** Qaanaaq. **Phone:** (through Cheyenne Mountain AFS operator) 719-474-3840. **Owning command:** AFSPC. **Unit/mission:** 12th SWS (AFSPC), missile warning; 821st ABG (AFSPC), support. **History:** dates from 1946 as a Danish-American radio and weather station. USAF Ballistic Missile Early Warning System radar began operations 1961.

Tinker AFB, Okla. 73145. **Nearest city:** Oklahoma City. **Phone:** 405-739-2025. **Owning command:** AFMC. **Unit/mission:** 72nd ABW (AFMC), support; 137th ARW (ANG), air mobility, cyber, TACP operations; 448th SCMW (AFMC), supply chain management; 507th ARW (AFRC), air mobility operations; 513th ACG (AFRC), 552nd ACW (ACC), C2 operations; Hq. Air Force Sustainment Center (AFMC), weapon systems sustainment; Oklahoma City ALC (AFMC), weapon systems maintenance, repair, overhaul. **History:** activated March 1942. Named for Maj. Gen. Clarence L. Tinker, who went down at sea June 7, 1942, leading a group of LB-30 bombers against Japan.

Travis AFB, Calif. 94535. **Nearest city:** Fairfield. **Phone:** 707-424-1110. **Owning command:** AMC. **Unit/mission:** 60th AMW (AMC), 349th AMW (AFRC), air mobility operations; David Grant USAF Medical Center. **History:** activated May 17, 1943. Named for Brig. Gen. Robert F. Travis, killed Aug. 5, 1950.

Tyndall AFB, Fla. 32403. **Nearest city:** Panama City. **Phone:** 850-283-1113. **Owning command:** ACC. **Unit/mission:** 53rd WEG (ACC), T&E; 101st AOG (ANG), C2 operations; 325th FW (ACC), 325th FW associate unit (ANG), training; 601st AOC (ACC/ANG), plan/direct air operations; Air Force Rescue Coordination Center (ACC), plan/direct inland rescue operations; Hq. Continental US NORAD Region (NORAD)/1st Air Force (Air Forces Northern) (ACC/ANG), operational leadership. **History:** activated Dec. 7, 1941. Named for 1st Lt. Frank B. Tyndall, WWI fighter pilot killed July 15, 1930.

Photo: John Ingle/USAF

Lt. Col. Jason Turner (r) helps ROTC cadet Ian Palmer during a T-38C simulator training session at Sheppard AFB, Texas.

US Air Force Academy, Colo. 80840. **Nearest city:** Colorado Springs. **Phone:** 719-333-1110. **Next Higher Echelon of Command:** HQ Air Force. **Unit/mission:** Air Force Academy (USAFA), education/training; Preparatory School, education/training; 10th ABW (Air Force Academy), support; 306th FTG (AETC), training. **History:** established April 1, 1954; headquartered at Lowry AFB until August 1958. Moved to permanent location in Colorado Springs August 1958.

Vance AFB, Okla. 73705. **Nearest city:** Enid. **Phone:** 580-213-5000. **Owning command:** AETC. **Unit/mission:** 71st FTW (AETC), training. **History:** activated November 1941. Named for Lt. Col. Leon R. Vance Jr., Enid native, 1939 West Point graduate, and MOH recipient, killed July 26, 1944.

Vandenberg AFB, Calif. 93437. **Nearest city:** Lompoc. **Phone:** 805-606-1110. **Owning command:** AFSPC. **Unit/mission:** 30th SW (AFSPC), space and launch range operations, host unit; 381st TRG (AETC), training; 576th FLTS (AFSPC), test; 21st SOPS (AFSPC), space operations; Hq. 14th Air Force (AFSPC), operational leadership; Joint Space Operations Center (STRATCOM), space C2 operations. **History:** originally Army's Camp Cooke; activated October 1941. Reassigned to USAF June 7, 1957. Renamed for Gen. Hoyt S. Vandenberg, USAF's second Chief of Staff.

Whiteman AFB, Mo. 65305. **Nearest city:** Knob Noster. **Phone:** 660-687-1110. **Owning command:** AFGSC. **Unit/mission:** 72nd Test and Evaluation Squadron (AFGSC), T&E; 131st BW (ANG), bomber operations; 325th WPS (ACC), tactics training; 442nd FW (AFRC), fighter operations; 509th BW (AFGSC), bomber operations. **History:** activated 1942. Named for 2nd Lt. George A. Whiteman, first pilot to die in aerial combat during the attack on Pearl Harbor.

Wright-Patterson AFB, Ohio 45433. **Nearest city:** Dayton. **Phone:** 937-257-1110. **Owning command:** AFMC. **Unit/mission:** 88th ABW (AFMC), support; 445th AW (AFRC), air mobility operations; 591st SCMG (AFMC), systems life cycle support; Air Force Installation Contracting Agency (AFMC) operational acquisition; Air Force Institute of Technology (AETC), education; PEO-Agile Combat Support, PEO-Fighters and Bombers, PEO-ISR and SOF, PEO-Mobility, PEO-Tanker (AFMC), acquisition; Hq. Air Force Life Cycle Management Center (AFMC), acquisition and development; Hq. AFMC, management; Hq. AFRL (AFMC), R&D; National Air and Space Intelligence Center (USAF), foreign aerospace analysis; National Museum of the US Air Force (AFMC). **History:** originally separate, Wright Field and Patterson Field were merged and redesignated Wright-Patterson AFB Jan. 13, 1948. Named for aviation pioneers Orville and Wilbur Wright and for 1st Lt. Frank S. Patterson, killed June 19, 1918.

Yokota AB, Japan, APO AP 96328. **Nearest city:** Tokyo. **Phone:** 011-81-425-52-2510-5-1110. **Owning command:** PACAF. **Unit/mission:** 374th AW (PACAF), air mobility, personnel recovery operations; 515th AMOG (AMC), air transportation services; Hq. 5th Air Force (PACAF), Hq. US Forces Japan (PACOM), operational leadership. **History:** opened as Tama AAF by Japan 1939. Turned over to US forces and renamed Yokota AB Sept. 6, 1945.

Photo: MSgt. Michael Crane

Airmen prepare to remove a vertical stabilizer from a C-130 at Rosecrans ANGB, Mo.

ANG and AFRC Installations

This section consolidates Air National Guard and Air Force Reserve Command facilities, listing them by base names or according to the airport facilities they share. Some ANG and AFRC units are located on USAF bases and are included under those bases in the Active Duty Installations section. In addition, some Air Force Reserve Individual Mobilization Augmentees serve with various USAF and DOD commands and agencies.

Abraham Lincoln Capital Arpt., Ill. 62707. **Nearest city:** Springfield. **Phone:** 217-757-1267. **Component:** ANG. **Unit/mission:** 183rd Wing, 183rd Centralized Repair Facility (CRF), 183rd Air Operations Group (AOG).

Allen C. Thompson Field/Jackson-Evers Arpt., Miss. 39232. **Nearest city:** Jackson. **Phone:** 601-405-8300. **Component:** ANG. **Unit/mission:** 172nd AW, 183rd AS, 183rd Air Evacuation Squadron, air mobility operations.

Alpena County Regional Arpt., Mich. 49707. **Nearest city:** Alpena. **Phone:** 989-751-62593. **Component:** ANG. **Unit/mission:** Alpena Combat Readiness Training Center.

Atlantic City Arpt., N.J. 08234. **Nearest city:** Egg Harbor Township. **Phone:** 609-645-6000. **Component:** ANG. **Unit/mission:** 177th FW, fighter, TACP operations.

Bangor Arpt., Maine 04401. **Nearest city:** Bangor. **Phone:** 202-404-7700. **Component:** ANG. **Unit/mission:** 101st ARW, air mobility, combat communications.

Battle Creek ANGB/W. K. Kellogg Arpt., Mich. 49037. **Nearest city:** Battle Creek. **Phone:** 269-969-3234. **Component:** ANG. **Unit/mission:** 110th ATKW, MQ-9 Reaper, C2, cyber, agile combat support.

Berry Field ANGB/Nashville Intl. Arpt., Tenn. 37217. **Nearest city:** Nashville. **Phone:** 615-660-8062. **Component:** ANG. **Unit/mission:** 118th Wing, cyber, intel, RPA operations.

Boise Air Terminal (Gowen Field), Idaho 83705. **Nearest city:** Boise. **Phone:** 208-422-5333. **Component:** ANG. **Unit/mission:** 124th FW, fighter, cyber, TACP operations. **History:** named for Lt. Paul R. Gowen, killed in B-10 crash in Panama July 11, 1938.

Bradley ANGB, Conn. 06026. **Nearest cities:** Hartford, Conn., and Springfield, Mass. **Phone:** 860-292-2460. **Component:** ANG. **Unit/mission:** 103rd AW, air mobility operations. **History:** named for Lt. Eugene M. Bradley, killed in P-40 crash August 1941.

Burlington Intl. Arpt., Vt. 05403. **Nearest city:** South Burlington. **Phone:** 802-660-5379 (Public Affairs). **Component:** ANG. **Unit/mission:** 158th FW, fighter operations; 229th COS, cyber training.

Channel Islands ANGS, Calif. 93041. **Nearest city:** Oxnard. **Phone:** 805-986-8000. **Component:** ANG. **Unit/mission:** 146th AW, air mobility, MAFFS operations.

Charlotte ANGB at Charlotte Douglas Arpt., N.C. 28208. **Nearest city:** Charlotte. **Phone:** 704-391-4100. **Component:** ANG. **Unit/mission:** 145th AW, aeromedical evacuation, air mobility, combat communications, TACP operations.

Cheyenne Arpt., Wyo. 82009. **Nearest city:** Cheyenne. **Phone:** 307-772-6424. **Component:** ANG. **Unit/mission:** 153rd AW, air mobility, MAFFS operations.

Des Moines Arpt., Iowa 50321. **Nearest city:** Des Moines. **Phone:** 515-261-8210. **Component:** ANG. **Unit/mission:** 132nd Wing, DTOC and RPA, cyber, and ISR operations.

Dobbins ARB, Ga. 30069. **Nearest city:** Marietta. **Phone:** 678-655-5055. **Component:** AFRC. **Unit/mission:** 94th AW, aeromedical evacuation, air mobility operations; Hq. 22nd Air Force, operational leadership. **History:** activated 1943. Named for Capt. Charles Dobbins, pilot killed in WWII.

Duke Field, Fla. 32542. **Nearest city:** Crestview. **Phone:** 850-883-6347. **Component:** AFRC. **Unit/mission:** 919th SOW (classic associate), special operations. **History:** named for Lt. Robert L. Duke, pilot killed Dec. 29, 1943, in test flight.

Duluth Arpt., Minn. 55811. **Nearest city:** Duluth. **Phone:** 218-788-7210. **Component:** ANG. **Unit/mission:** 148th FW, EOD, fighter operations.

Eastern West Virginia Arpt. (Shepherd Field), W.Va. 25405. **Nearest city:** Martinsburg. **Phone:** 304-616-5100. **Component:** ANG. **Unit/mission:** 167th AW, air mobility operations.

Ellington Field, Texas 77034. **Nearest city:** Houston. **Phone:** 281-929-2662. **Component:** ANG. **Unit/mission:** 147th RW, ISR, RPA, TACP operations. **History:** named for Lt. Eric L. Ellington, pilot killed November 1913.

Forbes Field, Kan. 66619. **Nearest city:** Topeka. **Phone:** 785-862-1234. **Component:** ANG. **Unit/mission:** 190th ARW, air mobility, combat weather operations. **History:** named for Maj. Daniel H. Forbes Jr., pilot killed June 5, 1948, test-flying Northrop YB-49 "Flying Wing."

Fort Smith Arpt., Ark. 72903. **Nearest city:** Fort Smith. **Phone:** 479-573-5100. **Component:** ANG. **Unit/mission:** 188th Wing, RPA, ISR.

Fort Wayne ANGB/Arpt., Ind. 46809. **Nearest city:** Fort Wayne. **Phone:** 260-478-3700. **Component:** ANG. **Unit/mission:** 122nd FW, fighter operations.

Francis S. Gabreski Arpt., N.Y. 11978. **Nearest city:** Westhampton Beach. **Phone:** 631-723-7470. **Component:** ANG. **Unit/mission:** 106th RQW, personnel recovery operations. **History:** named for Col. Francis S. Gabreski, WWII and Korean War ace.

Fresno Yosemite Arpt./California ANGB, Calif. 93727. **Nearest city:** Fresno. **Phone:** 559-454-5100. **Component:** ANG. **Unit/mission:** 144th FW, fighter, ISR operations.

General Mitchell Arpt., Wis. 53207. **Nearest city:** Milwaukee. **Phone:** 414-944-88715. **Component:** ANG. **Unit/mission:** 128th ARW, air mobility operations. **History:** named for Brig. Gen. William "Billy" Mitchell.

Goldwater ANGB, Ariz. 85034. **Nearest city:** Phoenix. **Phone:** 602-302-9004. **Component:** ANG. **Unit/mission:** 161st ARW, air mobility operations.

Great Falls Arpt., Mont. 59404. **Nearest city:** Great Falls. **Phone:** 406-791-0159. **Component:** ANG. **Unit/mission:** 120th AW, air mobility operations, RED HORSE.

Greeley ANGS, Colo. 80631. **Nearest city:** Greeley. **Phone:** 720-259-5001. **Component:** ANG. **Unit/mission:** 137th SWS, mobile missile warning. **History:** activated January 1996.

Grissom ARB, Ind. 46971. **Nearest city:** Kokomo. **Phone:** 765-688-5211. **Component:** AFRC. **Unit/mission:** 434th ARW, air refueling operations. **History:** activated 1942 as NAS Bunker Hill. Reactivated June 1954 as Bunker Hill AFB. Renamed May 1968 for Lt. Col. Virgil I. "Gus" Grissom, killed Jan. 27, 1967, in Apollo capsule fire. Realigned as AFRC base Oct. 1, 1994. Home to Air Force Reserve, Army Reserve, and Marine Corps Reserve units.

Gulfport-Biloxi Arpt., Miss. 39507. **Nearest city:** Gulfport. **Phone:** 228-214-6070. **Component:** ANG. **Unit/mission:** Gulfport Combat Readiness Training Center.

Hancock Field ANGB, N.Y. 13211. **Nearest city:** Syracuse. **Phone:** 1-800-982-3696. **Component:** ANG. **Unit/mission:** 174th ATKW, ISR, RPA, space C2, TACP operations; ISR, RPA training.

Harrisburg Arpt., Pa. 17057. **Nearest city:** Middletown. **Phone:** 717-948-2311. **Component:** ANG. **Unit/mission:** 193rd SOW, C2, combat communications, cyber, special, TACP operations.

Hector Intl. Arpt., N.D. 58102. **Nearest city:** Fargo. **Phone:** 701-451-2259. **Component:** ANG. **Unit/mission:** 119th Wing, 178th ATKS (MQ-9 operations), 119th ISRG (targeting).

Hensley Field AGS (Grand Prairie Armed Forces Reserve Complex), Texas 75211. **Nearest city:** Dallas. **Phone:** 972-619-4444. **Component:** ANG. **Unit/mission:** 254th CCG, combat communications.

Homestead ARB, Fla. 33039. **Nearest city:** Homestead. **Phone:** 786-415-7000. **Component:** AFRC. **Unit/mission:** 20th Operations Group Det. 2 (ACC) (active associate), 125th FW Det. 1 (ANG), 482nd FW (AFRC), fighter operations.

Hulman Field ANGB, Ind. 47803. **Nearest city:** Terre Haute. **Phone:** 812-877-55210. **Component:** ANG. **Unit/mission:** 181st IW, DCGS, TACP operations.

Jacksonville ANGB/Arpt., Fla. 32218. **Nearest city:** Jacksonville. **Phone:** 904-741-7030. **Component:** ANG. **Unit/mission:** 125th FW, fighter, ISR operations.

Jefferson Barracks ANGB., Mo. 63215. **Nearest city:** St. Louis. **Phone:** 314-527-8000. **Component:** ANG. **Unit/mission:** 131st MSG, support: 157th AOG, C2 operations; 239th CBCS, combat communications.

Joe Foss Field, S.D. 57104. **Nearest city:** Sioux Falls. **Phone:** 605-988-5700. **Component:** ANG. **Unit/mission:** 114th FW, fighter operations. **History:** named for ANG Brig. Gen. Joseph J. Foss, WWII USMC ace and MOH recipient, former governor, former Air Force Association national president and board chairman, and founder of the South Dakota ANG.

Photo: SMSgt. Emily Beightol-Deyerle/ANG

A C-17 from the West Virginia ANG's 167th AW flies over Shepherdstown, W.Va.

Key Field ANGB/Meridian Arpt., Miss. 39307. **Nearest city:** Meridian. **Phone:** 601-484-9000. **Component:** ANG. **Unit/mission:** 186th ARW, air mobility, C2, ISR, TACP operations. **History:** named after Fred and Al Key, air-to-air refueling pioneers and 1935 flight-endurance record holders for 27 days aloft in *Ole Miss,* on permanent display at the National Air and Space Museum.

Kingsley Field/Crater Lake-Klamath Arpt., Ore. 97603. **Nearest city:** Klamath Falls. **Phone:** 541-885-6350. **Component:** ANG. **Unit/mission:** 173rd FW (active associate), training. **History:** named for 2nd Lt. David R. Kingsley, MOH recipient, killed June 23, 1944, on Ploesti, Romania, oil field bombing mission.

Lincoln Arpt., Neb. 68524. **Nearest city:** Lincoln. **Phone:** 402-309-1234. **Component:** ANG. **Unit/mission:** 155th ARW, air mobility operations.

Louisville Arpt./ANGB (Standiford Field), Ky. 40213. **Nearest city:** Louisville. **Phone:** 502-413-4400. **Component:** ANG. **Unit/mission:** 123rd AW, air mobility, bare base, special tactics operations.

Luis Muñoz Marin Arpt./Muñoz ANGB, Puerto Rico 00979. **Nearest city:** San Juan. **Phone:** 787-253-5108. **Component:** ANG. **Unit/mission:** 156th AW, air mobility operations, weather reconnaissance.

Mansfield Lahm ANGB/Arpt., Ohio 44903. **Nearest city:** Mansfield. **Phone:** 419-520-6420. **Component:** ANG. **Unit/mission:** 179th AW, air mobility operations. **History:** named in 1948 for nearby city and aviation pioneer Brig. Gen. Frank P. Lahm.

March ARB, Calif. 92518. **Nearest city:** Moreno Valley/Riverside. **Phone:** 951-655-4138. **Component:** AFRC/ANG. **Unit/mission:** 452nd AMW (AFRC), air mobility operations; 163rd ATKW (ANG), RPA operations, training; Hq. 4th Air Force (AFRC), operational leadership. **History:** activated March 1, 1918. Named for 2nd Lt. Peyton C. March Jr., who died of injuries sustained in a crash Feb. 18, 1918.

McEntire JNGB, S.C. 29044. **Nearest city:** Columbia. **Phone:** 803-647-8200. **Component:** ANG. **Unit/mission:** 169th FW, 316th Fighter Squadron (active associate), fighter operations. **History:** named for ANG Brig. Gen. B. B. McEntire Jr., killed in F-104 accident 1961.

McGhee Tyson ANGB/Arpt., Tenn. 37777. **Nearest city:** Knoxville. **Phone:** 865-336-3205. **Component:** ANG. **Unit/mission:** 134th ARW, air mobility operations; 119th CACS, space C2 operations; 228th CBCS, combat communications; I. G. Brown ANG Training and Education Center. **History:** named for Naval aviator Lt. j.g. Charles McGhee Tyson, killed in WWI.

Memphis Arpt., Tenn. 38118. **Nearest city:** Memphis. **Phone:** 901-291-7435. **Component:** ANG. **Unit/mission:** 164th AW, air mobility operations.

Minneapolis-St. Paul Arpt./ARS, Minn. 55450. **Nearest city:** Minneapolis. **Phone:** 612-713-1000. **Component:** ANG/AFRC. **Unit/mission:** 133rd AW (ANG), air mobility operations; 934th AW (AFRC), air mobility, cyber operations.

Moffett Federal Airfield, Calif. 94035. **Nearest city:** Mountain View. **Phone:** 650-603-9129. **Component:** ANG. **Unit/mission:** 129th RQW, personnel recovery operations. **History:** activated as NAS Sunnyvale April 1933. Renamed Moffett Field June 1933 for Rear Adm. William A. Moffett, killed in crash of USS Akron airship April 4, 1933. Later renamed to Moffett Air National Guard Base.

Montgomery Regional Arpt./Dannelly Field, Ala. 36108. **Nearest city:** Montgomery. **Phone:** 334-394-7200. **Component:** ANG. **Unit/mission:** 187th FW, fighter, ISR operations. **History:** originally named for Ens. Clarence Dannelly, Navy pilot killed in WWII.

NAS JRB Fort Worth, Texas 76127. **Nearest city:** Fort Worth. **Navy-hosted switchboard:** 817-782-5000. **ANG Phone:** 817-852-3136. **Component:** ANG/AFRC. **Unit/mission:** 136th AW (ANG), air mobility, combat communications operations; 301st FW (AFRC), fighter operations; Hq. 10th Air Force (AFRC), operational leadership.

NAS JRB New Orleans, La. 70143. **Nearest city:** New Orleans. **Phone:** 504-391-8600. **Component:** ANG. **Unit/mission:** 122nd ASOS (Pineville, La.), TACP; 159th FW, fighter operations; 214th EIS, cyber operations; 236th CBCS (Hammond, La.), combat communications.

New Castle County Arpt., Del. 19720. **Nearest city:** Wilmington. **Phone:** 302-323-3408. **Component:** ANG. **Unit/mission:** 166th AW, air mobility, cyber operations.

Niagara Falls Arpt./ARS, N.Y. 14304. **Nearest city:** Niagara Falls. **Phone:** 716-236-2000. **Component:** ANG/AFRC. **Unit/mission:** 107th ATKW

Photo: A1C Adam Smith/ANG

Col. Phillip Layman gives a "thumbs up" as pilot Col. Geoff Jenson prepares to take off in an F-15C at Kingsley Field in Klamath Falls, Ore.

(ANG), RPA operations; 914th ARW (AFRC), air mobility operations.

Otis ANGB, Mass. 02542. **Nearest city:** Falmouth. **Phone:** 508-968-4003. **Component:** ANG. **Unit/mission:** 102nd IW, C2, DCGS operations, EIG, WXF; 202nd ISRG, cyber intelligence; 253rd CEIG, combat communications, cyber. **History:** named for 1st Lt. Frank J. Otis, Massachusetts ANG flight surgeon and pilot killed in 1937 crash.

Pease Intl. Tradeport ANGB, N.H. 03803. **Nearest city:** Portsmouth. **Phone:** 603-430-3577. **Component:** ANG. **Unit/mission:** 64th ARS (AMC) (active associate), 157th ARW (ANG), air mobility operations. **History:** site of former Portsmouth AFB, activated June 1956. Renamed Sept. 7, 1957, for Capt. Harl Pease Jr., MOH recipient, B-17 pilot killed in WWII. Air Force base closed March 31, 1991.

Peoria Intl. Arpt., Ill. 61607. **Nearest city:** Peoria. **Phone:** 800-942-3771. **Component:** ANG. **Unit/mission:** 182nd AW, air mobility, combat communications, TACP operations.

Pittsburgh Intl. Arpt./ARS, Pa. 15108. **Nearest city:** Coraopolis. **AFRC phone:** 412-474-8511. **ANG phone:** 412-776-8010. **Component:** ANG/AFRC. **Unit/mission:** 171st ARW (ANG), air mobility operations; 911th AW (AFRC), aeromedical evacuation, air mobility operations.

Portland Arpt., Ore. 97218. **Nearest city:** Portland. **Phone:** 503-335-4104. **Component:** ANG/AFRC. **Unit/mission:** 123rd WF (ANG), combat weather operations; 125th STS (ANG), special tactics operations; 142nd FW (ANG), fighter operations; 304th RQS (AFRC), personnel recovery operations.

Quonset State Arpt. (Quonset ANGB), R.I. 02852. **Nearest city:** North Kingstown. **Phone:** 401-267-3229. **Component:** ANG. **Unit/mission:** 143rd AW, air mobility operations, cyber.

Reno-Tahoe Arpt. (May Field), Nev. 89502. **Nearest city:** Reno. **Phone:** 775-788-4500. **Component:** ANG. **Unit/mission:** 152nd AW, air mobility, DCGS operations. **History:** named for Maj. Gen. James A. May, Nevada adjutant general, 1947 to 1967.

Rickenbacker ANGB, Ohio 43217. **Nearest city:** Columbus. **Phone:** 614-492-3269. **Component:** ANG. **Unit/mission:** 121st ARW, air mobility operations. **History:** activated 1942. Formerly Lockbourne AFB. Renamed May 7, 1974, for Capt. Edward V. Rickenbacker. Base transferred from Strategic Air Command to ANG April 1, 1980.

Rosecrans ANGB/Memorial Arpt., Mo. 64503. **Nearest city:** St. Joseph. **Phone:** 816-236-3300. **Component:** ANG. **Unit/mission:** 139th AW (ANG), air mobility operations; Advanced Airlift Tactics Training Center (ANG/AFRC).

Salt Lake City Arpt./Wright ANGB, Utah 84116. **Nearest city:** Salt Lake City. **Phone:** 801-245-2200. **Component:** ANG. **Unit/mission:** 151st ARW, air mobility operations; 101st IOF, 130th EIS, cyber operations; 169th IS, intelligence operations.

Savannah/Hilton Head Arpt./ANGB, Ga. 31408. **Nearest city:** Garden City. **Phone:** 912-966-8223. **Component:** ANG. **Unit/mission:** 165th AW, air mobility, tactical communications, TACP operations, Air Dominance Center.

Schenectady County Arpt. (Stratton ANGB), N.Y. 12302. **Nearest city:** Scotia. **Phone:** 518-344-2000. **Component:** ANG. **Unit/mission:** 109th AW, air mobility operations, Antarctic support.

Selfridge ANGB, Mich. 48045. **Nearest city:** Mount Clemens. **Phone:** 586-239-5576. **Component:** ANG. **Unit/mission:** 127th Wing, air mobility, fighter operations. **History:** activated July 1917. Transferred to Michigan ANG July 1971. Named for 1st Lt. Thomas E. Selfridge, killed Sept. 17, 1908, at Fort Myer, Va., when airplane piloted by Orville Wright crashed.

Sioux Gateway Arpt./Col. Bud Day Field, Iowa 51111. **Nearest city:** Sioux City. **Phone:** 712-233-0200. **Component:** ANG. **Unit/mission:** 185th ARW, air mobility operations. **History:** activated as Sioux City AAB in July 1942. Closed in December 1945. Reopened in September 1946 as Sioux City ARB. Returned to joint civil-military use. Named in 2002 for retired Col. George E. "Bud" Day, Vietnam POW and MOH recipient.

Springfield-Beckley Arpt., Ohio 45502. **Nearest city:** Springfield. **Phone:** 800-851-4503. **Component:** ANG. **Unit/mission:** 178th Wing, cyber, ISR, space, RPA operations.

Stewart ANGB, N.Y. 12550. **Nearest city:** Newburgh. **Phone:** 845-563-2000. **Component:** ANG. **Unit/mission:** 105th AW, air mobility, EIS. **History:** Stewart AFB until 1969. Acquired by state of New York 1970.

Sumpter Smith ANGB/Birmingham-Shuttlesworth Arpt., Ala. 35217. **Nearest city:** Birmingham. **Phone:** 205-714-2855. **Component:** ANG. **Unit/mission:** 99th ARS (AMC) (active associate), air mobility operations; 117th ARW, air mobility, intelligence operations. **History:** Named for Col. Walter Sumpter Smith, electrical engineer and pilot.

Toledo Express Arpt., Ohio 43558. **Nearest city:** Swanton. **Phone:** 419-868-4250. **Component:** ANG. **Unit/mission:** 180th FW, fighter operations.

Truax Field ANGB, Wis. 53704. **Nearest city:** Madison. **Phone:** 608-245-4395. **Component:** ANG. **Unit/mission:** 115th FW, fighter, ISR operations (active associate), WFX. **History:** activated June 1942 as AAF base. Taken over by Wisconsin ANG April 1968. Named for Lt. T. L. Truax, killed in P-40 training accident 1941.

Tucson Arpt., Ariz. 85706. **Nearest city:** Tucson. **Phone:** 520-295-6192. **Component:** ANG. **Unit/mission:** 162nd Wing, fighter, ISR, RPA (at Davis-Monthan AFB, Ariz.) operations, training.

Tulsa Arpt./ANGB, Okla. 74115. **Nearest city:** Tulsa. **Phone:** 918-833-7000. **Component:** ANG. **Unit/mission:** 138th FW, fighter, cyber operations, TACP training.

Volk Field ANGB, Wis. 54618. **Nearest city:** Madison. **Phone:** 608-427-1204. **Component:** ANG. **Unit/mission:** Combat Readiness Training Center; 128th ACS, C2 operations. **History:** named for Lt. Jerome A. Volk, first Wisconsin ANG pilot to be killed in the Korean War.

Warfield ANGB/Martin State Arpt., Md. 21220. **Nearest city:** Baltimore. **Phone:** 410-918-6001. **Component:** ANG. **Unit/mission:** 175th Wing, cyber, fighter operations.

Westfield-Barnes Arpt., Mass. 01085. **Nearest city:** Westfield. **Phone:** 413-568-9151. **Component:** ANG. **Unit/mission:** 104th FW, fighter operations.

Westover ARB, Mass. 01022. **Nearest city:** Chicopee. **Phone:** 413-557-1110. **Component:** AFRC. **Unit/mission:** 439th AW, C-5M air mobility operations. **History:** dedicated April 6, 1940. Named for Maj. Gen. Oscar Westover, Chief of the Air Corps, killed Sept. 21, 1938.

Will Rogers ANGB, Okla. 73179. **Nearest city:** Oklahoma City. **Phone:** 405-686-5227. **Component:** ANG/AFSOC. **Unit/mission:** 137th SOW, ISR operations; 146th ASOS, TACP operations; 205th EIS, cyber operations.

Yeager Arpt./McLaughlin ANGB, W.Va. 25311. **Nearest city:** Charleston. **Phone:** 304-341-6249. **Component:** ANG. **Unit/mission:** 130th AW, air mobility, ISR operations. **History:** named for Brig. Gen. Charles E. "Chuck" Yeager; and Brig. Gen. James K. McLaughlin, West Virginia ANG's first commanding officer.

Youngstown ARS, Ohio 44473. **Nearest city:** Youngstown. **Phone:** 330-609-1000. **Component:** AFRC. **Unit/mission:** 910th AW, air mobility operations.

2019 USAF ALMANAC

WEAPONS & PLATFORMS

By Aaron M. U. Church

Photo: Courtesy Mike Killian

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B-1 LANCER

Long-range conventional bomber

Brief: The B-1B is a conventional, long-range, supersonic penetrating strike aircraft, derived from the cancelled B-1A. Four B-1A prototypes were developed and tested until cancellation in 1977. The program was revived in 1981 as the B-1B. The vastly upgraded aircraft added 74,000 lb of usable payload, improved radar, and reduced radar cross section, but cut top speed to Mach 1.2. B-1B saw first combat over Iraq during Desert Fox in 1998. Its three internal weapons bays hold a substantial payload, allowing different weapons in each bay. The bomber's blended wing/body configuration, variable-geometry design, and turbofan engines provide long range and loiter time. Offensive avionics include SAR for terrain-following, as well as tracking and targeting moving vehicles. Sniper pod was added in 2008. The ongoing integrated battle station (IBS) modification is the most comprehensive refresh in the bomber's history. The three-part upgrade includes the Vertical Situation Display (VSD), which adds a digital cockpit, Fully Integrated Data Link (FIDL) to enhance targeting and LOS/BLOS C2, and the Central Integrated Test System (CITS), gives crew real-time diagnostics and simplified troubleshooting. Sustainment Block 16 (IBS) upgrades started in 2016 will be completed fleetwide by 2020. Higher powered jam-resistant GPS is in development. Future upgrades include Fully Integrated Targeting Pod (FITP), Multifunctional Information Distribution System/Joint Tactical Radio System (MIDS/JTRS), airspace-compliant CNS/ATM, updated BLOS cryptography, and bomb rack improvements. Boeing recently proposed a design to add a modular cannon to the weapons bay. The fleet was briefly grounded due to an engine fire and ejection seat malfunction in 2018. It was again grounded in March after inspectors identified issues with the drogue chute system. Successful LRASM tests conducted against a moving vessel paved the way for early adoption in 2019. The B-1B is slated for phase-out circa 2032, in favor of the new B-21 Raider stealth bomber.

Contractor: Boeing (formerly Rockwell), Harris Corp.
First Flight: Dec. 23, 1974 (B-1A); Oct. 18, 1984 (B-1B).
Delivered: June 1985-May 1988.
IOC: Oct. 1, 1986, Dyess AFB, Texas (B-1B).
Production: 104.
Inventory: 62.
Operator: AFGSC, AFMC.
Aircraft Location: Dyess AFB, Texas; Edwards AFB, Calif.; Eglin AFB, Fla.; Ellsworth AFB, S.D.
Active Variant: B-1B. Upgraded production version of the B-1A.
Dimensions: Span 137 ft (forward sweep) to 79 ft (aft sweep), length 146 ft, height 34 ft.
Weight: Max T-O 477,000 lb.
Power Plant: Four General Electric F101-GE-102 turbofans, each 30,780 lb thrust.
Performance: Speed 900+ mph at S-L, range intercontinental.
Ceiling: More than 30,000 ft.
Armament: 84 Mk 82 (500-lb) or 24 Mk 84 (2,000-lb) general-purpose bombs; 84 Mk 62 (500-lb) or eight Mk 65 (2,000-lb) Quick Strike naval mines; 30 CBU-87/89 cluster bombs or 30 CBU-103/104/105 WCMDs; 24 GBU-31 or 15 GBU-38 JDAMs/GBU-54 JDAM; 24 AGM-158A JASSM or JASSM-ER.
Accommodation: Pilot, copilot, and two WSOs (offensive/defensive), on ACES II zero/zero ejection seats.

Photo: MSgt. Russ Scalf

B-2 SPIRIT

Long-range heavy bomber

Brief: The B-2 is a stealthy long-range penetrating nuclear and conventional strike bomber. It is based on a flying wing design combining LO with high aerodynamic efficiency. Spirit entered combat during Allied Force on March 24, 1999, striking Serb targets. Production was completed in three blocks and all aircraft were upgraded to Block 30 standard with AESA radar. AESA paves the way for future advanced weapons integration including the Long-Range Standoff (LRSO) missile and B61-12 bomb. The aircraft's blended fuselage/wing holds two weapons bays capable of holding nearly 60,000 lb in various combinations. Weapons integration includes the improved B61-12 nuclear free-fall bomb, JASSM-ER, GBU-57 Massive Ordnance Penetrator, and future weapons such as GBU-53 SDB II, GBU-56 Laser JDAM, and JDAM-5000. Flexible Strike Package mods will feed GPS data to the bays prerelease to thwart jamming, and are required for B61-12. Phase 2 will allow simultaneous nuclear and conventional loadout for increased flexibility. Significant development includes Defensive Management System-Modernization (DMS-M), AEHF satcom, VLF receiver, LO signature mods, and crash-survivable flight-data memory. DMS-M improves survivability in signal-dense, anti-access, area denial environments, aids situational awareness, and enables real-time threat avoidance. AEHF gives two-way, survivable comms for nuclear missions in A2/AD zones, and VLF-receive adds nuclear C2 redundancy. Ongoing upgrades include Adaptable Communications Suite (ACS) for time-sensitive mission updates, and Link 16-based jam-resistant in-flight retasking. Efforts underway shorten depot maintenance, increase intervals between overhauls, and add airspace-compliant CNS/ATM. USAF plans to add wideband nuclear C2 under the FAB-T program. FY19 begins radar-linked non-GPS guidance for B61-12, which will be fully integrated this year. USAF plans to replace the B-2 with the B-21 Raider, retiring the B-2 about 2032.

Contractor: Northrop Grumman, Boeing, Vought.
First Flight: July 17, 1989.
Delivered: December 1993-December 1997. (Test-aircraft redelivered combat capable, July 2000).
IOC: April 1997, Whiteman AFB, Mo.
Production: 21.
Inventory: 20.
Operator: AFGSC, AFMC, ANG (associate).
Aircraft Location: Edwards AFB, Calif.; Whiteman AFB, Mo.
Active Variant:
• B-2A. Production aircraft upgraded to Block 30 standards.
Dimensions: Span 172 ft, length 69 ft, height 17 ft.
Weight: Max T-O 336,500 lb.
Power Plant: Four General Electric F118-GE-100 turbofans, each 17,300 lb thrust.
Performance: Speed high subsonic, estimated unrefueled range 5,000 miles.
Ceiling: 50,000 ft.
Armament: Nuclear: 16 B61-7, B61-12, B83, or eight B61-11 bombs (on rotary launchers). Conventional: 80 Mk 62 (500-lb) sea mines, 80 Mk 82 (500-lb) bombs, 80 GBU-38 JDAMs, or 34 CBU-87/89 munitions (on rack assemblies); or 16 GBU-31 JDAMs, 16 Mk 84 (2,000-lb) bombs, 16 AGM-154 JSOWs, 16 AGM-158 JASSMs, or eight GBU-28 LGBs.
Accommodation: Two pilots, on ACES II zero/zero ejection seats.

Photo: SrA. Malcolm Mayfield

B-52 STRATOFORTRESS

Long-range heavy bomber

Brief: The B-52H is a long-range nuclear/conventional bomber and USAF's only standoff cruise missile carrier. The H model is the last serving variant of the Stratofortress. Multimission capabilities include long-range precision strike, CAS, air interdiction, defense suppression, and maritime surveillance. Litening and Sniper targeting pods have been added. The overall B-52 System Improvements project is replacing key obsolescent components. The Combat Network Communications Technology (CONECT) program is replacing cockpit displays and comms, adding Link 16, and enabling machine-to-machine tasking/retargeting. The first CONECT airframe was redelivered in 2014, and a total of 35 airframes were upgraded as of March 2018. CNS/ATM replaces the B-52's analog systems with digital systems. The Internal Weapons Bay Upgrade enables internal smart weapon carriage. The Conventional Rotary Launcher roughly doubles smart weapon payloads, while reducing drag and increasing range. The upgrade was deployed to combat for the first time in Afghanistan in 2017 and supports transition from CALCM to the AGM-158B JASSM-ER long-range cruise missile. Both CONECT and Weapons Bay Upgrades are slated for completion fleetwide by 2020. Future weapons include the GBU-54 Laser JDAM. A total of 31 B-52s underwent conventional-only modifications to comply with the New START agreement, completed in 2017. Ongoing development includes replacing obsolescent radar with a reliable, modern, off-the-shelf system, adding low-latency, jam-resistant C2/comms, and upgrading BLOS voice/data capability to preserve current capabilities. New development adds additional airspace compliance mods and begins re-engining efforts to replace the TF33 with a more reliable, efficient, and powerful engine. FY19 funds also launch VLF/LF receiver modernization, ATP color MFDs to provide enhanced situational awareness, and AEHF satcom integration. USAF projects service life to the 2050s with new engines, complementing the B-21 Raider after retirement of the B-1 and B-2.

Contractor: Boeing, Harris Corp.
First Flight: April 15, 1952 (YB-52 prototype); July 20, 1960 (B-52H).
Delivered: May 9, 1961-Oct. 26, 1962 (B-52H).
IOC: May 1961 (B-52H).
Production: 744 (incl 102 B-52H).
Inventory: 75.
Operator: AFGSC, AFMC, AFRC.
Aircraft Location: Barksdale AFB, La.; Edwards AFB, Calif.; Minot AFB, N.D.
Active Variants:
• B-52H. Longer-range development of the original B-52A, with more efficient turbofan engines.
Dimensions: Span 185 ft, length 159.3 ft, height 40.7 ft.
Weight: Max T-O 488,000 lb.
Power Plant: Eight Pratt & Whitney TF33-P-3 turbofans, each 17,000 lb thrust.
Performance: Speed 650 mph, range 10,000+ miles.
Ceiling: 50,000 ft.
Armament: Nuclear: 12 AGM-86B ALCMs externally, and eight ALCMs or gravity weapons internally. 12 AGM-158 JASSM externally, and eight JASSM(ER)/MALD/MALD-J internally (upgraded aircraft). Conventional: AGM-86C/D CALCMs, Mk 62 sea mines, Mk 82/84 bombs, CBU-87/89 cluster bombs, CBU-103/104/105 WCMDs, GBU-31/38 JDAMs, AGM-158A JASSMs, and GBU-10/12/28 LGBs, MALD, and MALD-J jammer variant.
Accommodation: Two pilots, side by side, plus navigator, radar navigator, and EWO on upward/downward ejection seats.

ACRONYMS AND ABBREVIATIONS

A2/AD	Anti-access, area-denial
ADS-B	Automatic Dependent Surveillance-Broadcast
AE	aeromedical evacuation
AEHF	Advanced Extremely High Frequency
AESA	active electronically scanned array
AGM	air-to-ground missile
AIM	air intercept missile
ALCM	Air Launched Cruise Missile
AMRAAM	Advanced Medium-Range Air-to-Air Missile
ASIP	Airborne Signals Intelligence Payload
ATP	advanced targeting pod
BLOS	beyond line of sight
BLU	bomb live unit
BM	battle management
C2	command and control
C3	command, control, and communications
CALCM	Conventional Air Launched Cruise Missile
CAS	close air support
CBU	cluster bomb unit
CEM	combat effects munition
CEP	circular error probable
CFIN	combat flight inspection
CFT	conformal fuel tank
CNS/ATM	communications, navigation, surveillance/air traffic management
Comint	communications intelligence
CSAR	combat search and rescue
CSO	combat systems officer
DV	distinguished visitors
EA	electronic attack
ECM	electronic countermeasures
EHF	extremely high frequency
Elint	electronic intelligence
EO	electro optical
ER	extended range
EW	electronic warfare
EWO	electronic warfare officer
FAB-T	Family of Advanced Beyond Line of Sight Terminals
FAC-A	forward air controller airborne
FLIR	forward-looking infrared
FMV	full-motion video
FY	fiscal year
GATM	Global Air Traffic Management
GBU	guided bomb unit
GCS	ground control station
HARM	High-speed Anti-Radiation Missile
HE	high-explosive
HUD	head-up display
IADS	integrated air defense system
IBS	integrated battle station
IFF	identification, friend or foe
IIR	imaging infrared
INS	inertial navigation system
IOC	initial operational capability
IR	infrared
ISR	intelligence, surveillance, and reconnaissance
JASSM	Joint Air-to-Surface Standoff Missile
JDAM	Joint Direct Attack Munition
JSOW	Joint Standoff Weapon
JSUPT	Joint Specialized Undergraduate Pilot Training
JTIDS	Joint Tactical Information Distribution System
LANTIRN	Low-Altitude Navigation and Targeting Infrared for Night
LCD	liquid crystal display
LGB	laser guided bomb
LJDAM	Laser Joint Direct Attack Munition
LO	low observable
LOS	line of sight
LRASM	Long-Range Anti-Ship Missile
MALD	Miniature Air Launched Decoy
Masint	measurement and signature intelligence
MFD	multifunction display
N/A	not available
NVG	night vision goggles
NSSL	National Security Space Launch
PGM	precision guided munition
PSP	Precision Strike Package
ROVER	Remotely Operated Video Enhanced Receiver
RPA	remotely piloted aircraft
RWR	radar warning receiver
SAR	synthetic aperture radar
satcom	satellite communications
SDB	Small Diameter Bomb
SEAD	suppression of enemy air defenses
SHF	super high frequency
shp	shaft horsepower
Sigint	signals intelligence
S-L	sea level
SLEP	service life extension program
SOF	special operations forces
START	Strategic Arms Reduction Treaty
STOL	short takeoff and landing
TACAN	tactical air navigation
TBD	to be determined
TF/TA	terrain-following/terrain-avoidance
T-O	takeoff
UHF	ultra high frequency
USAFA	US Air Force Academy
VHF	very high frequency
VLF	very low frequency
WCMD	Wind-Corrected Munitions Dispenser

Photo: SrA. Betty Chevalier

A-10 THUNDERBOLT II

Attack, Close Air Support, Forward Air Control

Brief: The A-10 "Warthog" is a CAS aircraft effective against armored surface/maritime targets and additionally tasked with interdiction, Forward Air Controller-Airborne (FAC-A), CSAR, and Strike Control & Reconnaissance. A-10C is an upgraded variant of the original A-10A. It adds precision engagement, color cockpit MFDs, hands-on throttle and stick, digital stores management, improved fire-control, GPS-guided weapons, Litening/Sniper pods, advanced data links, and integrated sensors. A-10C debuted in combat in 2007. It combines a large, diverse weapons payload, long loiter times, austere airfield capability, maneuverability, and wide combat radius. Using night vision and targeting pods, it is capable of operating under 1,000-ft ceilings in darkness. The aircraft has 11 hardpoints for up to 16,000 lb of ordnance. Its 30 mm gun can destroy heavy armor, and a titanium cockpit tub protects the pilot. Current development includes advanced IFF and open architecture software to allow quick integration of future weapons and sensors. Software is continuously updated in response to emerging operational requirements, including advanced weapons integration, situational awareness, targeting, navigation, comm, and cyber security under the A-10 Operational Flight Program (OFP). Lightweight Airborne Recovery System/Combat Survivor Evader Locator (LARS/CSEL) upgrades enhance the A-10's ability to locate and aid recovery of downed aircrew. The last of 278 aircraft were upgraded with Helmet Mounted Cueing System (HMCS) in 2015, and FY19 funds would restart wing replacement for 109 airframes not upgraded under the original program and convert surplus F-15 external tanks to increase endurance and permit unhindered cannon reloading. Other ongoing upgrades include HMCS improvements, ATP improvements, and airspace compliance mods. USAF reversed retirement and plans to retain the fleet until 2030.

Contractor: Fairchild Republic (Lockheed Martin).
First Flight: Feb. 15, 1975 (preproduction).
Delivered: October 1975-March 1984.
IOC: October 1977 (A-10A); 2007 (A-10C).
Production: 713.
Inventory: 281.
Operator: ACC, AFMC, PACAF, ANG, AFRC.
Aircraft Location: Barksdale AFB, La.; Boise Air Terminal, Idaho; Davis-Monthan AFB, Ariz.; Eglin AFB, Fla.; Fort Wayne Arpt., Ind.; Martin State Arpt., Md.; Moody AFB, Ga.; Nellis AFB, Nev.; Osan AB, South Korea; Selfridge ANGB, Mich.; Whiteman AFB, Mo.
Active Variant:
• A-10C. Upgraded version of the A-10A ground attack aircraft.
Dimensions: Span 57.5 ft, length 53.3 ft, height 14.7 ft.
Weight: Max T-O 51,000 lb.
Power Plant: Two General Electric TF34-GE-100 turbofans, each 9,065 lb thrust.
Performance: Speed 518 mph, range 800 miles.
Ceiling: 45,000 ft.
Armament: One 30 mm, seven-barrel GAU-8/A Gatling gun (1,174 rd), straight high-explosive incendiary (HEI), or anti-armor HE/armor-piercing incendiary (API). Combat mix incl various types of free-fall or guided bombs such as Mk 82, Mk 84, GBU-10/12/38, CBU-87, laser guided rockets, various WCMDs, illumination rockets/flares, AGM-65 Mavericks, and AIM-9 Sidewinders.
Accommodation: Pilot on ACES II zero/zero ejection seat.

Photo: SrA. Zachary Bumpus

F-15 EAGLE

Air superiority fighter

Brief: The F-15 Eagle was the world's dominant, supersonic, all-weather, day/night air superiority fighter for more than 30 years. F-15C/Ds began replacing F-15A/Bs in 1979 and offered superior maneuverability, acceleration, range, weapons, and avionics. The C/D incorporates internal EW countermeasures and an added 2,000 lb of internal fuel (with provision for CFTs). The aircraft accounted for 34 of 37 USAF air-to-air kills during its combat debut in Desert Storm. The final 43 production aircraft received the F-15E's APG-70 radar, and the Multistage Improvement Program enhanced tactical capabilities. The F-15C/D is undergoing vital improvements, including new AESA radar and self-defenses needed to survive and fight in contested airspace. The first APG-63(V)3 AESA-modified F-15 was delivered in 2010, and the Eagle Passive/Active Warning Survivability System (EPAWSS) engineering development contract was awarded in 2016. EPAWSS initially replaces the current, obsolete system. A second phase will add a towed decoy/angled countermeasure. A total of 214 aircraft will be upgraded to partner with the F-22. Major development includes EPAWSS and infrared search and track (IRST). USAF plans to procure 100 belly-mounted IRST pods to discreetly detect, track, and engage air targets. Ongoing upgrades include advanced data links to enhance interoperability with fifth generation aircraft, safety-critical forward fuselage longeron replacements, Multifunctional Information Distribution System/Joint Tactical Radio System (MIDS/JTRS), and new digital cockpit displays to fully exploit AESA capabilities (common with the F-15E). MIDS/JTRS will enable higher capacity, jam-resistant Link 16 networking. FY19 begins FAA-mandated airspace integration mods and jam-resistant Mode 5-compliant IFF. European Deterrence Initiative funding keeps F-15C/Ds at RAF Lakenheath to boost allied air superiority. Wing replacement testing is underway and SLEP/re-winging is needed to reach 2045. USAF announced plans to purchase up to 144 new-build F-15EX to replace legacy airframes and augment the limited F-22 fleet, starting in FY20.

Contractor: McDonnell Douglas (now Boeing), BAE Systems (EPAWSS), Raytheon (AESA), Rockwell Collins (MIDS/JTRS).
First Flight: July 27, 1972 (F-15A); Feb. 26, 1979 (F-15C).
Delivered: 1974-79 (F-15A/B); 1979-85 (F-15C/D).
IOC: September 1975 (F-15A/B); 1979 (F-15C/D).
Production: 874.
Inventory: 212 (F-15C); 23 (F-15D).
Operator: ACC, AFMC, PACAF, USAFE, ANG.
Aircraft Location: Barnes Arpt., Mass.; Eglin AFB, Fla.; Fresno ANGB, Calif.; Jacksonville Arpt., Fla.; Kadena AB, Japan; Klamath Falls (Kingsley Field), Ore.; NAS JRB New Orleans, La.; Portland Arpt., Ore.; RAF Lakenheath, UK.
Active Variants:
• F-15C. Upgraded version of the single-seat F-15A.
• F-15D. Upgraded version of the two-seat F-15B.
Dimensions: Span 42.8 ft, length 63.8 ft, height 18.7 ft.
Weight: Max T-O 68,000 lb.
Power Plant: Two Pratt & Whitney F100-PW-220 turbofan engines, each 23,450 lb thrust; or two P&W F100-PW-229 turbofan engines with afterburners, each 29,000 lb thrust.
Performance: F-15C: speed Mach 2.5, ferry range 2,878 miles (3,450 miles with CFTs and three external tanks).
Ceiling: 60,000 ft.
Armament: One internally mounted M61A1 20 mm six-barrel cannon (940 rd); four AIM-9 Sidewinders and four AIM-120 AMRAAMs, or eight AIM-120s. In a one-time test, an Eagle has successfully launched an anti-satellite missile.
Accommodation: Pilot (C); two pilots (D) on ACES II zero/zero ejection seats.

Photo: SSgt. Clayton Cupit

F-15E STRIKE EAGLE

Multirole fighter

Brief: F-15E is an upgraded two-seat, all-weather F-15 capable of deep interdiction/attack, tactical nuclear delivery, and air-to-air combat. Strike Eagle is capable of sustaining nine Gs throughout the flight envelope. It first saw combat in Desert Storm in 1991. F-15E's large, varied load of precision weapons and 20 mm cannon gives it potent ground attack capability. Radar-guided and IR-homing missiles give it an additional air-to-air capability. Its advanced cockpit controls and displays include a wide-field-of-view HUD and helmet mounted cockpit-cueing, and its avionics permit all-weather day/night engagement. The F-15E carries LANTIRN, Sniper, and Litening ATPs on dedicated pylons. The "Dragon's Eye" SAR pod fielded in 2009 provides all-weather surveillance/reconnaissance capability. F-15Es are equipped with Link 16 and ARC-210 BLOS satcom. The Strike Eagle is undergoing major avionics modernization, centered on the new APG-82(V)1 AESA radar. The Eagle Passive/Active Warning Survivability System (EPAWSS) is a second major effort to replace its obsolete self-defense suite. Ongoing avionics upgrades include a new central computer and cockpit displays (in common with the F-15C/D), jam-resistant Link 16, Mode 5 IFF, Joint Helmet Mounted Cueing System (JHMCS) upgrades, ATP improvements, and airspace compliance mods. Ongoing developments include AESA integration, EPAWSS, and MIDS/JTRS to enable higher capacity, jam-resistant Link 16 networking. The F-15E completed JASSM-ER integration in 2018, and future weapons include SDB II. FY19 begins anti-jam tactical UHF radio to support NORTHCOM's air sovereignty missions and FAA-mandated ADS-B.

Contractor: McDonnell Douglas (now Boeing), BAE Systems (EPAWSS), Raytheon (AESA).
First Flight: Dec. 11, 1986.
Delivered: April 1988-2004.
IOC: September 1989.
Production: 236.
Inventory: 218.
Operator: ACC, AFMC, USAFE.
Aircraft Location: Eglin AFB, Fla.; Mountain Home AFB, Idaho; Nellis AFB, Nev.; RAF Lakenheath, UK; Seymour Johnson AFB, N.C.
Active Variant:
▪ F-15E. All-weather strike aircraft derived from the F-15C/D.
Dimensions: Span 42.8 ft, length 63.8 ft, height 18.5 ft.
Weight: Max T-O 81,000 lb.
Power Plant: Two Pratt & Whitney F100-PW-220, each 23,450 lb thrust; or two F100-PW-229 turbofans with afterburners, each 29,000 lb thrust.
Performance: Speed Mach 2.5, ferry range 2,400 miles with CFTs and three external tanks.
Ceiling: 50,000 ft.
Armament: One internally mounted M61A1 20 mm six-barrel cannon (500 rd); four AIM-9 Sidewinders and four AIM-120 AMRAAMs or eight AIM-120s; most air-to-surface weapons in USAF inventory (nuclear and conventional) and ECM pods.
Accommodation: Pilot and WSO on ACES II zero/zero ejection seats.

Photo: TSgt. Gregory Brook

F-16 FIGHTING FALCON

Multirole fighter

Brief: The F-16 is a multirole fighter capable of air-to-air, CAS, SEAD, interdiction, FAC-A, tactical nuclear delivery, and all-weather strike. The "Viper" comprises 50 percent of USAF's fighter fleet and is among the most maneuverable fighters ever built. The F-16 is capable of carrying the majority of PGMs in the inventory and is USAF's primary SEAD platform. In USAF service, the F-16 saw its first combat in the 1991 Gulf War. The F-16C/D was introduced in 1984 at Block 25. It featured cockpit, airframe, and core avionics upgrades and added the increased-range APG-68 radar and AMRAAM. Block 30/32 added next stage improvements, new engines, and weapons including HARM. Block 40/42, delivered in 1988, introduced the LANTIRN pod, enabling automatic terrain following and high-speed night/all-weather penetration. It also introduced wide-angle HUD, increased takeoff weight, expanded flight envelope, and higher G limits. Block 50/52, delivered in 1991, is optimized for SEAD, employing HARM and a longer-range radar. It added the uprated F110-GE-129 and F100-PW-229 engines, upgradable cockpit, Sniper/Litening ATPs, and ROVER to coordinate with strike controllers. Most upgrades are managed in Pre-Block (Blocks 25/30/32) and Post-Block (Blocks 40/42/50/52) tranches. The fleet has recently been cockpit-standardized with a new color MFD, modular mission computer, Helmet Mounted Integrated Targeting (HMIT), and Link 16. Automatic Ground Collision Avoidance System (A-GCAS) was added in 2014, and future efforts include adding air collision avoidance and merging the two systems. Development of the similar Hybrid Flight Control Computer/A-GCAS for Pre-Block aircraft equipped with analog flight-control systems will pave the way for A-GCAS installation fleetwide by 2022. Ongoing upgrades include SLEP, AESA radar retrofits, MIDS/JTRS to enable higher capacity, jam-resistant Link 16 networking, Aggressor capability improvements, and low-cost mods. USAF completed the first depot-level SLEP to extend fatigue life to 10,000 hours or beyond in April 2018. AESA radar upgrades NORAD alert aircraft to counter cruise missile threats and includes additional capability improvements. Development includes mission computer, sensor, radar, and self-defensive suite capability enhancements, HFLCC/A-GCAS, comm modernization, fourth/fifth gen fighter network capabilities, airspace compliance mods (ADS-B), and digital RWR. JASSM-ER integration is nearing completion. Lockheed is shifting support work and future production for foreign customers from Fort Worth, Texas, to Greenville, S. C., to make way for ramped-up F-35 production.

Contractor: General Dynamics (now Lockheed Martin), Northrop Grumman (radar).
First Flight: Dec. 8, 1976 (full-scale development); June 19, 1984 (F-16C).
Delivered: January 1979 (F-16A); July 13, 1984-2005 (F-16C/D).
IOC: 1980, (F-16A); 1981 (Block 25-32); 1989 (Block 40/42); 1994 (Block 50/52).
Production: 2,206.
Inventory: 787 (F-16C); 154 (F-16D).
Operator: ACC, AETC, AFMC, PACAF, USAFE, ANG, AFRC.
Aircraft Location: Aviano AB, Italy; Edwards AFB, Calif.; Eglin AFB, Fla.; Eielson AFB, Alaska; Holloman AFB, N.M.; Homestead ARB, Fla.; Kunsan AB, South Korea; Luke AFB, Ariz.; Misawa AB, Japan; NAS JRB Fort Worth, Texas; Nellis AFB, Nev.; Osan AB, South Korea; Shaw AFB, S.C.; Spangdahlem AB, Germany; and ANG in Alabama, Arizona, Colorado, District of Columbia (flying from Maryland), Minnesota, New Jersey, Ohio, Oklahoma, South Carolina, South Dakota, Texas, Vermont, Wisconsin.
Active Variants:
▪ F-16C/D Block 30/32. Multinational Staged Improvement Program II upgraded

with new engines, flown by ANG, AFRC, and test and aggressor units.
• F-16CG Block 40/42. Optimized for night/all-weather attack.
• F-16CJ Block 50/52. Optimized for SEAD with long-range radar, engines, and weapons.
Dimensions: Span 32.8 ft, length 49.3 ft, height 16.7 ft.
Weight: F-16C: empty (F100-PW-229) 18,591 lb, (F110-GE-129) 18,917 lb; gross, with external load (Block 40/42) 42,000 lb.
Power Plant: Block 40: one General Electric F110-GE-100 (29,000 lb thrust); Block 42: one Pratt & Whitney F100-PW-220 (24,000 lb thrust); Block 50: one F110-GE-129 (29,000 lb thrust); Block 52: one F100-PW-229 (29,000 lb thrust).
Performance: Speed Mach 2, ferry range 2,002+ miles.
Ceiling: 50,000 ft.
Armament: One M61A1 20 mm cannon (500 rd); up to six air-to-air missiles, AGMs, and ECM pods externally.
Accommodation: Pilot (C), two pilots (D), on ACES II zero/zero ejection seats.

Photo: SrA. John Linzmeier/ANG

F-22 RAPTOR

Air superiority/multirole fighter

Brief: The F-22 is a stealthy, penetrating, air dominance and multirole attack fighter built for day, night, and adverse weather full-spectrum operations. The world's most advanced fighter, it combines stealth, supercruise, high maneuverability, and integrated avionics. Its integrated avionics and data links permit simultaneous multitarget engagement. Advanced flight controls and thrust-vectoring high-performance engines enable great maneuverability. Features include six LCD color cockpit displays, APG-77 radar, EW system with RWR and missile launch detection, JTIDS, IFF, laser gyroscope inertial reference, and GPS. The Raptor flew its first operational sortie during Noble Eagle in 2006 and debuted in combat during Inherent Resolve over Iraq and Syria in 2014. Four aircraft successfully employed 1,000-lb JDAMs against ISIS ground targets during the aircraft's first combat sortie. Ongoing upgrades include the Reliability, Availability, and Maintainability Program (RAMP), Software Increment 3.2B, and tactical capability improvements. RAMP is adding AIM-9X-capable launch rails, more durable LO, as well as structural and wiring fixes. 3.2B software will add high resolution ground mapping SAR, threat geolocation, EA capability, and integration of SDB I, AIM-120D, and AIM-9X. TACLink-16 will be fielded with 3.2B and enable data link transmit capability between F-22 and legacy aircraft. Five 3.2B-modified test aircraft began operational testing in 2018 alongside fleetwide concurrent mods. Talon SPITBALL selects a new Helmet Mounted Display and Cueing System (HMDCS) to fully utilize advanced weapons such as AIM-9X. Additional upgrades include engine safety, performance, and maintainability mods and structural life extension to 8,000 hours. FY19 begins crypto mods, Mode 5 IFF tactical improvements, and sensor upgrades to retain lethality to 2025 and beyond. Several F-22s were damaged in 2018 incidents including a gear-up aborted take-off at NAS Fallon, Nev., on April 13; a runway excursion at JB Elmendorf-Richardson on Oct. 10, and Hurricane Michael. Tyndall-based aircraft were semi-permanently relocated to other F-22 bases following the hurricane and training temporarily moved to Eglin.

Contractor: Lockheed Martin, Boeing.
First Flight: Sept. 7, 1997.
Delivered: April 9, 1997 (prototype); Oct. 23, 2002-May 2, 2012.
IOC: Dec. 15, 2005.
Production: 195.
Inventory: 186.
Operator: ACC, AFMC, AFRC (associate), PACAF, ANG.
Aircraft Location: Edwards AFB, Calif.; Eglin AFB, Fla.; JB Elmendorf-Richardson, Alaska; JB Langley-Eustis, Va.; JB Pearl Harbor-Hickam, Hawaii; Nellis AFB, Nev.
Active Variant:
• F-22A. Fifth generation air dominance fighter.
Dimensions: Span 44.5 ft, length 62 ft, height 16.6 ft.
Weight: Max T-O 83,500 lb.
Power Plant: Two Pratt & Whitney F119-PW-100 turbofans, each 35,000 lb thrust.
Performance: Speed Mach 2 with supercruise capability, ferry range 1,850+ miles with two external wing fuel tanks.
Ceiling: Above 50,000 ft.
Armament: One internal M61A2 20 mm gun (480 rds); two AIM-9 Sidewinders inside internal weapons bays; six AIM-120 AMRAAMs (air-to-air loadout) or two AIM-120s and two GBU-32 JDAMs (air-to-ground loadout) in main internal weapons bay.
Accommodation: Pilot on ACES II zero/zero ejection seat.

Photo: A1C Lillian Miller

F-35 LIGHTNING II

Multirole fighter

Brief: The F-35 is a stealthy, penetrating, mutirole, all-weather fighter/attack aircraft. Lightning II is a joint/multinational program intended to provide a highly common family of strike fighters for all US services and close allies. USAF's F-35A will replace F-16 and A-10 fleets with a stealth platform capable of penetrating advanced enemy air defenses and striking targets at will. An Israeli Air Force F-35I "Adir" made the type's combat debut, purportedly striking Iranian targets in Syria in May 2018. The F-35A carries up to 18,000 lb of weapons on 10 stations, including two internal bays (for maximum stealth) and six additional wing, fuselage (or centerline) mounted pylons. The Marine Corps declared IOC in 2015, followed by USAF in 2016 (using the first Block 3I software-upgraded aircraft). The Navy F-35C attained IOC Feb. 28, 2019. F-35 development, production, and operational use are concurrent, requiring rolling retrofit of earlier airframes. USAF began ongoing Block 3I software upgrades in 2015, and launched Block 3F updates in 2018. Block 3I improves the baseline Block 2B software, adding 89 percent of the code needed for full-combat capability. Block 3F is in operational testing. It will enable full combat capability, adding a range of precision guided munitions. Block 4 development will add new weapons (including SDB II) and sensors, improve the F-35's EW and maritime strike capabilities, and integrate nuclear weapons beyond 2020. Current combat capabilities include interdiction, basic CAS, and limited SEAD. The F-35 began initial operational test and evaluation in late 2018 and will continue through at least late summer. Continuous Capability Development and Delivery (C2D2), also known as Block 4, develops future capabilities and corrects early production deficiencies discovered during concurrent production/testing. FY19 funding procures 48 F-35As, and long-lead items for 48 aircraft in FY20. Full-rate production is planned for April 2019.

Contractor: Lockheed Martin, BAE Systems, Northrop Grumman, Pratt & Whitney.
First Flight: Dec. 15, 2006 (F-35A prototype).
Delivered: April 2011 (first production aircraft)-present.
IOC: Aug. 2, 2016 (Hill AFB, Utah).
Production: Planned: 1,763 USAF (F-35A); 680 Navy and Marine Corps (F-35B/C); unspecified number to development partners and foreign military sales customers.
Inventory: 155 (USAF).
Operator: ACC, AETC, AFMC, AFRC (associate). Planned: PACAF, USAFE, ANG.
Aircraft Location: Edwards AFB, Calif.; Eglin AFB, Fla.; Hill AFB, Utah; Luke AFB, Ariz.; Nellis AFB, Nev.; future locations include Burlington Arpt., Vt.;

Dannelly Field, Ala.; Eielson AFB, Alaska; RAF Lakenheath, UK; Truax Field, Wis.; Tyndall AFB, Fla.; others TBD.

Active Variants:

- F-35A. Conventional takeoff and landing (CTOL) variant for the Air Force.
- F-35B. Short takeoff and vertical landing (STOVL) variant for USMC.
- F-35C. Carrier-capable variant for Navy.

Dimensions: Span 35 ft, length 51.4 ft, height 14.4 ft.
Weight: Max T-O 70,000 lb.
Power Plant: F-35A: one Pratt & Whitney F135-PW-100, 40,000 lb thrust.
Performance: Speed Mach 1.6 with full internal weapons load, range 1,380 miles.
Ceiling: 50,000 ft.
Armament: F-35A: one 25 mm GAU-22/A cannon; standard internal loadout: two AIM-120 AMRAAMs and two GBU-31 JDAMs.
Accommodation: Pilot on Martin Baker MK16 zero/zero ejection seat.

SPECIAL OPERATIONS AIRCRAFT

Photo: SMSgt. John Rohrer

AC-130J GHOSTRIDER

Attack

Brief: The AC-130J is a CAS, air interdiction, and armed reconnaissance platform optimized for convoy escort, point defense, and supporting urban combat. The next generation gunship is based on a highly modified MC-130J, fitted with a modular precision strike package and wing-mounted weapons. The AC-130J is designed to provide ground forces a persistent direct-fire platform for urban operations. PSP includes a mission management console, robust communications suite, two EO/IR sensors, advanced fire-control equipment, PGM delivery capability, and trainable cannons. The initial Block 10 was superseded by the Block 20 , adding a 105 mm gun, laser guided SDB, side-mounted pilot tactical display, and Large Aircraft Infrared Countermeasures (LAIRCM). Airframes are delivered as MC-130Js and modified to gunship standards. The airframe is then upgraded and managed in common with the HC/MC-130J, receiving Block 8.1 avionics upgrades (including airspace compliance) along with the baseline C-130J. The first Block 20 was delivered to Hurlburt for operational testing in 2016 and deemed operationally effective for most CAS/interdiction taskings in April 2018. Post-initial operational test upgrades will result in Block 20+/30 configuration. Significant mods include software updates to improve gun accuracy, wing-mounted Hellfire and GUB-69 Small Glide Munitions, a permanent CSO cockpit workstation, EW/self-defensive upgrades, and added bubble-type observation windows. The first Block 30 aircraft was delivered for testing March 12, 2019. FY19 launches a multiyear contract for 23 combined AC/MC-130J airframes and funds delivery/conversion of five airframes. Development includes a high-energy laser weapon planned for integration in 2021, radio frequency countermeasures to detect, locate, and respond to threats, and PSP and EO/IR sensor improvements. FY19 adds enhanced all-weather strike capability and sensors testing to enable through-cloud engagement.

Contractor: Lockheed Martin.
First Flight: Jan. 31, 2014.
Delivered: July 29, 2015-present.
IOC: Sept. 30, 2017.
Production: 12 (37 to be converted from new-build MC-130Js).
Inventory: 12.
Operator: AFSOC.
Aircraft Location: Hurlburt Field, Fla.

Active Variants:

- AC-130J Ghostrider Block 10. Prototype gunship based on the MC-130J.
- AC-130J Ghostrider Block 20. Production standard gunship with additional 105 mm gun.
- AC-130J Ghostrider Block 30. Production aircraft with post operational test upgrades.

Dimensions: Span 132.6 ft, length 97.7 ft, height 39.1 ft.
Weight: Max T-O 164,000 lb.
Power Plant: Four Rolls-Royce AE 2100D3 turboprops, each 4,700 shp.
Performance: Speed 416 mph, range 3,000 miles (further with air refueling).
Ceiling: 28,000 ft., 42,000 lb payload.
Armament: Trainable 30 mm GAU-23/A cannon; 105 mm cannon; PGMs including pylon-mounted GBU-39 SDB, AGM-114 Hellfire, and ramp-mounted AGM-176 Griffin.
Accommodation: Two pilots, two CSOs, three gunners (four, with inclusion of 105 mm gun).

Photo: A1C Tiffany Emery

AC-130U SPOOKY

Attack

Brief: AC-130U is a gunship-modified C-130H optimized for CAS, interdiction, armed reconnaissance, convoy escort, strike coordination, overwatch, and point defense. Spooky is modified with electronic and EO sensors, fire-control systems, enhanced navigation, sophisticated comms, defensive systems, and in-flight refueling capability. All AC-130U weapons can be subordinated to the APQ-180 digital fire-control radar, FLIR, or all-light-level television (ALLTV) for adverse weather attack operations. Rockwell converted the initial 13 AC-130Us between 1994 and 95, and Boeing converted four more, all dubbed "Spooky" in honor of early AC-47D gunship. The command retired a single nonstandard AC-130U in 2015 and held the fleet at 16 aircraft until restarting phaseout in FY18. USAF is continuing center wing box replacements to extend service life and meet high operational demands until the fleet can be fully replaced by the AC-130J. Recent upgrades include Enhanced Situational Awareness (ESA) mods to provide near real-time intel and data fusion of threat detection, avoidance, geolocation, and adversary-emitter identification. AFSOC also replaced obsolescent mission computers and EO/IR sensors with a new high-definition suite; GPS updates are ongoing. AC-130Us are undergoing center wing box replacement/structural mods in common with the C-130H fleet. AC-130U is the only DOD platform equipped with increasingly rare 40 mm weapons. The service is remanufacturing some 80,000 40 mm rounds with a safer, more reliable fuse. All AC-130Us serve with the 1st Special Operations Wing at Hurlburt.

Contractor: Lockheed Martin (airframe), Boeing (formerly Rockwell).
First Flight: 1967.
Delivered: 1968-present.
IOC: 1996.
Production: 43, incl four more recent conversions.
Inventory: 10 (AC-130U).
Operator: AFSOC.
Aircraft Location: Hurlburt Field, Fla.

Active Variant:

- AC-130U Spooky II. Third generation gunship based on C-130H.

Dimensions: Span 132.6 ft, length 97.8 ft, height 38.5 ft.
Weight: Gross 155,000 lb.
Power Plant: Four Allison T56-A-15 turboprops, each 4,910 shp.
Performance: Speed 300 mph, range 1,300 miles (further with air refueling).
Ceiling: 25,000 ft.
Armament: One 25 mm Gatling gun, plus one 40 mm and one 105 mm cannon.
Accommodation: Two pilots, navigator, fire-control officer, EWO, flight engineer, TV operator, IR detection set operator, loadmaster, four aerial gunners.

Photo: SSgt. Keith James

AC-130W STINGER II

Attack, armed reconnaissance

Brief: The AC-130W is a gunship-modified C-130H optimized for CAS, interdiction, armed reconnaissance, convoy escort, strike coordination, overwatch, and point defense. AC-130Ws also provide strike coordination, nontraditional ISR, and C2. PSP mod includes a mission management console, communications suite, and flight deck hardware. Airframes are significantly modified with improved navigation, threat detection, countermeasures, comms, and a standoff Precision Strike Package. The aircraft is entirely separate from the retired AC-130H Spectre. The airframes were originally converted as MC-130W Combat Spear for SOF infiltration/exfiltration and in-flight refueling. They were redesignated Dragon Spear with the addition of the roll on/roll off PSP, filling a need for more gunships in 2010. The aircraft was redesignated AC-130W Stinger II after further enhancements in 2012. AC-130J will eventually replace the AC-130W fleet, which averages more than 24 years. Recent upgrades include Enhanced Situational Awareness (ESA) for near real-time intel and data fusion including threat detection, avoidance, geolocation, and adversary-emitter identification. SDB was added in 2012, and AFSOC is retrofitting the fleet with a 105 mm gun in common with the AC-130U/J fleets. Weapons integration includes Laser Guided SDB (LSDB), and GBU-69B Small Glide Munition, which SOCOM is pursuing instead of continued Hellfire integration. Recent enhancements include IR suppression to cut engine heat signatures and other low-cost mods. A single aircraft will be modified with a high-energy laser (in place of the 30 mm gun) to develop future AC-130J armament.

Contractor: Lockheed Martin.
First Flight: Circa 2006 (Combat Spear).
Delivered: November 2010 (Dragon Spear).
IOC: 2010 (Dragon Spear).
Production: 12 (converted).
Inventory: 10.
Operator: AFSOC.
Aircraft Location: Cannon AFB, N.M.
Active Variant:
• AC-130W Stinger II. Converted MC-130W armed with PSP and PGMs.
Dimensions: Span 132.6 ft, length 98.8 ft, height 38.5 ft.
Weight: Max T-O 155,000 lb.
Power Plant: Four Allison T56-A-15 turboprops, each 4,910 shp.
Performance: Speed 300 mph, range 2,875 miles.
Ceiling: 28,000 ft.
Armament: 30 mm GAU-23/A Bushmaster II chain gun; PGMs, incl GBU-39 SDB and AGM-176A Griffin, 105 mm cannon.
Accommodation: Two pilots, two CSOs, flight engineer, two special mission aviators.

Photo: A1C Joel Miller

C-145 SKYTRUCK

Foreign training and light mobility

Brief: The C-145 is a STOL multipurpose utility and SOF proficiency training aircraft based on the Polish-built PZL Mielec M-28 Skytruck. The high-wing STOL aircraft features nonretractable landing gear for austere operations. USSOCOM assets are operated by AFSOC as a nonstandard fleet, initially supporting small combat teams. The aircraft first deployed in 2011 to Afghanistan. The aircraft is reconfigurable for 2,400 lb of cargo airdrop, casualty evacuation, CSAR, and humanitarian missions. C-145As later shifted to partnership capacity building Aviation Foreign Internal Defense (AvFID) missions. AFSOC now uses contract aircraft to provide partner countries with more tailored assistance and opted to cut the fleet from 16 to the current five aircraft in 2015, supplying surplus aircraft to several partners, including NATO ally Estonia. C-145s now provide aircrew proficiency for combat aviation advisors.

Contractor: PZL Mielec (Sikorsky subsidiary).
First Flight: July 1993 (PZL M-28).
Delivered: 2009-2013.
IOC: N/A.
Production: 16.
Inventory: Five, USSOCOM-owned.
Operator: AFSOC, AFRC (associate).
Aircraft Location: Duke Field, Fla.
Active Variants:
• C-145A. Militarized civilian M-28 Skytruck used for SOF support and training.
Dimensions: Span 72.3 ft, length 43 ft, height 16.1 ft.
Weight: Max T-O 16,534 lb.
Power Plant: Two Pratt & Whitney PT6A-65B turboprops, 1,100 shp.
Performance: Speed 256.5 mph, range 1,161.5 miles.
Ceiling: 25,000 ft.
Accommodation: Crew: two pilots, one loadmaster. Load: 16 passengers or 10 paratroopers; up to four litters; max cargo 5,000 lb.

Photo: A1C Joel Miller

C-146 WOLFHOUND

Multimission mobility

Brief: The C-146 provides flexible, responsive airlift for special operations teams operating from austere and semiprepared airfields worldwide. Wolfhound is based on the German-built Dornier 328 regional airliner and was purchased by USSOCOM, modified by Sierra Nevada Corp., and designated C-146. The aircraft are operated by AFSOC as a nonstandard fleet providing direct support to SOF teams worldwide, often from austere airstrips. Modifications include ARC-231, PRC-117, and Iridium communications suite, troop/cargo-capable cabin, casualty evacuation capability, NVG compatibility, and STOL/ austere operations enhancements. The aircraft first deployed in support of USAFRICOM in 2011. FY19 funds support navigation enhancements to permit ops in GPS-degraded environments.

Contractor: Fairchild-Dornier, Sierra Nevada Corp.
First Flight: December 1991 (Do 328).

Delivered: 2011-2017.
IOC: N/A.
Production: 20 (converted).
Inventory: 20, USSOCOM-owned.
Operator: AFSOC.
Aircraft Location: Cannon AFB, N.M.; Duke Field, Fla.
Active Variant:
• C-146A. Preowned civil Dornier 328 modified for SOF airlift.
Dimensions: Span 69.6 ft, length 68.8 ft, height 23.8 ft.
Weight: Max T-O 30,843 lb.
Power Plant: Two Pratt & Whitney 119C turboprops, 2,150 shp.
Performance: Speed 335 mph, range 2,070 miles (2,000 lb cargo).
Ceiling: 31,000 ft.
Accommodation: Crew: two pilots, one loadmaster. Load: 27 passengers; up to four litters; max cargo 6,000 lb.

Photo: SrA. Joseph Pick

CV-22 OSPREY

Multimission lift

Brief: The CV-22 is a medium-lift vertical takeoff and landing (VTOL) tiltrotor, primarily used for clandestine long-range, all-weather penetration to insert, recover, and support SOF teams in hostile, denied, and politically sensitive areas. USAF CV-22Bs are equipped with a fully integrated precision TF/TA radar navigation, digital cockpit management system, FLIR, integrated NVG/HUD, digital map system, robust self-defense systems, and secure anti-jam comms. CV-22 can conduct shipboard and austere forward operations. It is capable of operating in nuclear, biological, and chemical (NBC) warfare conditions. It deployed to Africa in November 2008 and first saw combat in Iraq in 2009. AFSOC is retrofitting the CV-22 to Block 20 standards, in common with USMC MV-22s. Mods include new cabin lighting, color helmet mounted displays, IR searchlight, lightweight ballistic armor, EW upgrades, avionics, self-defensive improvements, weapons integration, and ISR and situational awareness enhancements. Silent Knight TF/TA radar will replace the current radar with a stealthier, low-altitude, night/all-weather navigation radar. Development includes improving rapid, long-distance self-deployment capabilities and reducing engine dust/debris ingestion. Future plans call for a trainable, helmet-cued, self-defense weapon with a 360-degree field of fire. Europe-based CV-22s will shift from RAF Mildenhall to Spangdahlem and a permanent Pacific-based unit is standing up at Yokota. The final CV-22 under the current multiyear contract is slated for delivery by December 2022.

Contractor: Boeing, Bell Helicopter Textron.
First Flight: March 19, 1989 (V-22).
Delivered: January 2007-present.
IOC: 2009.
Production: 51 planned (CV-22; incl three replacements).
Inventory: 50.
Operator: AETC, AFSOC, ANG (associate).
Aircraft Location: Cannon AFB, N.M.; Hurlburt Field, Fla.; Kirtland AFB, N.M.; RAF Mildenhall, UK; Yokota AB, Japan. Planned: Spangdahlem AB, Germany.
Active Variant:
• CV-22B. Air Force special operations variant of the V-22 Osprey.
Dimensions: Span 84.6 ft, length 57.3 ft, height 22.1 ft, rotor diameter 38 ft.
Weight: Max vertical T-O 52,870 lb; max rolling T-O 60,500 lb.
Power Plant: Two Rolls-Royce-Allison AE1107C turboshafts, each 6,200 shp.
Performance: Cruise speed 277 mph, combat radius 575 miles with one internal auxiliary fuel tank, self-deploy 2,100 miles with one in-flight refueling.
Ceiling: 25,000 ft.
Armament: One ramp-mounted .50-caliber machine gun.
Accommodation: Crew: two pilots; two flight engineers. Load: 24 troops seated, 32 troops on floor, or 10,000 lb cargo.

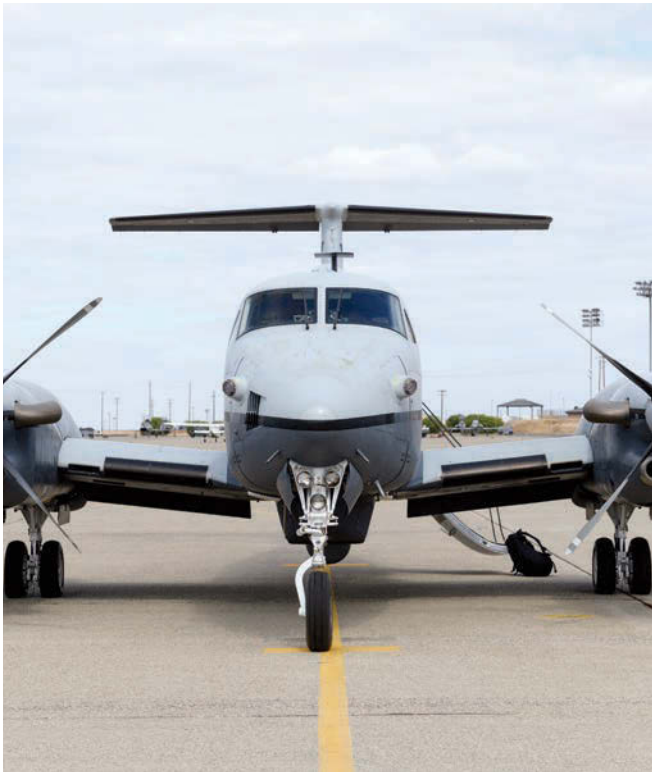

Photo: A1C Ramon Adelan

MC-12W LIBERTY

Tactical ISR

Brief: The MC-12W is a manned, medium/low-altitude tactical ISR, Sigint, and targeting platform based on the Beechcraft King Air 350. The MC-12W is capable of complete ISR collection, processing, analysis, and dissemination. The aircraft provides targeting data and tactical ISR direct to special operations ground forces. Specialized equipment includes FMV, laser designation, various sensors, BLOS connectivity, and satcom. An initial seven King Air 350s were modified with FMV, a ROVER compatible LOS satcom data link, limited Sigint, and basic BLOS connectivity. An additional 30 extended-range King Air 350s were modified, adding enhanced FMV with laser designator, improved Sigint, and increased bandwidth BLOS. The sensor-equipped C-12s were acquired to augment RPA systems operating in Southwest Asia and entered combat in both Iraq and Afghanistan in 2009. ACC divested its 33-strong MC-12 fleet in 2015, and ex-USAF aircraft operated by USSOCOM are designated MC-12W/Javaman III. The Oklahoma ANG acquired 13 airframes to form a dedicated SOF support mission, deploying for the first time to Afghanistan in 2016. FY19 funds install navigation enhancements to permit ops in GPS-degraded environments, IR suppression to improve survivability, and an improved high-definition EO/IR sensor. Upgrade priorities include uprated engines and five-bladed propellers to improve performance and cut noise-signature. Nine aircraft require "Slim Fast" mods to consolidate mission systems and interface, reducing weight to improve aircraft performance. A high-fidelity roll-on/roll-off EO/IR sensor is needed fleet-wide to meet COCOM requirements, in addition to safety and short/austere airfield situational awareness improvements.

Contractor: Beechcraft, L3 Technologies.
First Flight: April 2009.
Delivered: From April 2009.
IOC: June 2009.
Production: 42.
Inventory: 13.
Operator: ANG.
Aircraft Location: Will Rogers ANGB, Okla.
Active Variant:
• MC-12W. Modified Beechcraft King Air equipped for battlefield ISR and targeting.
Dimensions: Span 57.9 ft, length 46.7 ft, height 14.3 ft.
Weight: Max T-O 15,000 lb (350) and 16,500 lb (350ER).
Power Plant: Two Pratt & Whitney Canada PT6A-60A turboprops, each 1,050 shp.
Performance: Speed 359 mph, range 1,725 miles (350) and 2,760 miles (350ER).
Ceiling: 35,000 ft.
Accommodation: Two pilots and two sensor operators.

Photo: John Ingle/USAF

MC-130P/H COMBAT SHADOW/COMBAT TALON II

Special operations airlift/aerial refueling

Brief: The MC-130H is a special operations tanker/mobility aircraft based on the C-130H. Its primary missions are covert day, night, and adverse-weather infiltration, exfiltration, and resupply of special operations forces in hostile or denied territory. They also provide air-drop resupply, rotary wing aerial refueling, and psyops. MC-130H are equipped with TF/TA radar, precision navigation systems using INS/GPS, and electronic and IR countermeasures for self-protection. All models are fitted with wing-mounted external fuel tanks and drogue refueling pods to refuel HH-60 and CV-22, and can also receive fuel inflight. Aircraft are capable of airdrop using Joint Precision Airdrop System and operating from austere and unmarked strips. MC-130Es were converted from C-130E airframes in the mid-1960s. The MC-130P (previously HC-130N/P) delivered in the mid-1980s was a specialized aerial refueling version designed to support SOF. MC-130Hs were converted from base-model C-130H to supplement existing Combat Talon I and Combat Shadow fleets in the late 1980s and early 1990s. MC-130H have integrated glass cockpit and a modernized pod-based aerial refueling system. Ongoing mods include center wing replacement, GPS upgrades, permanent Sigint installation, datalink integration, new lightweight armor, digital propeller control system and flight data recorders, and airspace compliance mods. Kadena is retaining a squadron of H models until its MC-130J squadron achieves TF/TA capability. The last MC-130Ps retired in 2017, and a final airframe flew to Sheppard for use as a maintenance trainer in March 2018.

Contractor: Lockheed Martin (airframe), Boeing.
First Flight: Circa 1965 MC-130E; 1984 MC-130H.
Delivered: Initially 1966.
IOC: 1986 (MC-130N/P); June 30, 1993 (MC-130H).
Production: 24 new-build MC-130Hs.
Inventory: 16 (MC-130H); one (MC-130P).
Operator: AFSOC, ANG.
Aircraft Location: Hurlburt Field, Fla.; Kadena AB, Japan; Sheppard AFB, Texas (MC-130P).
Active Variant:
• MC-130H Combat Talon II. SOF support and aerial refueling tanker fielded in 1991.
Dimensions: Span 132.6 ft, height 38.5 ft, length 99.8 ft.
Weight: Max T-O 155,000 lb.
Power Plant: Four Allison T56-A-15 turboprops, each 4,910 shp.
Performance: Speed 290 mph, range 4,000+ miles (MC-130P); speed 300 mph, range 3,105 miles (MC-130H).
Fuel Capacity: 63,000 lb (81,120 lb with additional internal tanks) at 310 gpm; 80-160 gpm (MC-130N/P).
Ceiling: 33,000 ft.
Accommodation: MC-130H crew: two pilots, navigator, EWO; flight engineer, two loadmasters. MC-130H load: 77 troops, 52 paratroops, or 57 litters.

Photo: SrA. Lane T. Plummer

MC-130J COMMANDO II

Special operations airlift/aerial refueling

Brief: The MC-130J is a special operations tanker/mobility aircraft based on the C-130J. Its primary missions are covert day, night, and adverse weather infiltration, exfiltration, and resupply of special operations forces in hostile or denied territory. They also provide air-drop resupply, rotary wing aerial refueling, and psyops. MC-130J are fitted with wing-mounted external fuel tanks and drogue refueling pods to refuel HH-60 and CV-22, and can also receive fuel inflight. Mods include fully integrated INS/GPS, color cockpit LCDs, NVG lighting, HUDs, integrated defensive systems, digital moving map display, EO/IR system, dual secure voice/data satcom, enhanced cargo handling, and extended-life wings. MC-130Js have secondary leaflet and rubber raiding craft aerial delivery roles for psyops and littoral ingress/egress. Crew is smaller than legacy models, but includes CSO/auxiliary flight deck stations to handle aerial refueling (otherwise performed by the flight engineer). Loadmasters handle remaining flight engineer/comms functions. Combat Shadow II was redesignated Commando II in reference to the WWII C-47 in 2012. The type fully replaced the legacy MC-130P in 2017. FY19 funds advance procurement of six airframes under a multiyear contract and nine SOF-specific aircraft mods. Funds cover LRIP and installation of five Radio Frequency Countermeasure (RFCM) EW kits to detect, locate, and respond to emerging threats, and auxiliary crew station upgrades to better operate SOF-unique systems. Development includes critical terrain-following/terrain-avoidance (TF/TA) radar, secure, networked voice/data BLOS comms, and mission tracking/threat ID. Development and integration of the Silent Knight TF/TA radar will enable low-level nighttime and adverse weather flight with low probability of detection to fully replace legacy platforms. IOC is slated for 2021, and FY19 funds support installing TF/TA radar on a third aircraft for flight testing. Europe-based MC-130Js will move from RAF Mildenhall to Spangdahlem.

Contractor: Lockheed Martin (airframe), Boeing.
First Flight: April 20, 2011.
Delivered: Sept. 29, 2011-present.
IOC: 2011.
Production: 57 (planned).
Inventory: 37.
Operator: AETC, AFSOC.
Aircraft Location: Cannon AFB, N.M.; Kadena AB, Japan; Kirtland AFB, N.M.; RAF Mildenhall, UK. Planned: Spangdahlem AB, Germany.
Active Variant:
• MC-130J. New-build aircraft based on the standard-length fuselage C-130J.
Dimensions: Span 132.6 ft, length 97.8 ft, height 38.8 ft.
Weight: Max T-O 164,000 lb.
Power Plant: Four Rolls-Royce AE2100D3 turboprops, each 4,591 shp.
Performance: Speed 416 mph, range 3,000 miles.
Fuel Capacity: 61,360 lb at 150-300 gpm (100 gpm dual, simultaneous refueling).
Ceiling: 28,000 ft with 42,000-lb payload.
Accommodation: Crew: two pilots, CSO; two loadmasters. Load: N/A.

Photo: A1C Joel Miller

U-28A

Tactical ISR

Brief: The U-28A is a manned, tactical ISR and targeting platform based on the Pilatus PC-12. It is employed worldwide in support of special operations ground forces. Mods include advanced radio-comms suite, survivability equipment, EO sensors, and advanced navigation systems. The USSOCOM-owned aircraft are operated by AFSOC as a nonstandard fleet. AFSOC first employed the aircraft during Enduring Freedom in Afghanistan and Iraqi Freedom. The fleet includes 28 operational and eight training aircraft. Two aircraft were lost to fatal mishaps in Djibouti in 2012 and at Cannon in 2017. Ongoing upgrades include sensor, self-defense, and navigation mods to enable ops in GPS-degraded environments and comply with FAA airspace mandates. Multispectral Targeting System installation includes FMV, EO-IR, IR real-time video, and co-aligned laser designator. New Advanced Threat Warning (ATW) includes missile, hostile fire, and laser warning. Urgent infrared suppression mods are ongoing, and FY19 adds Enhanced Ground Proximity Warning in response to mishaps including the 2012 accident. U-28 EQ+ mods enable deployment of two additional high-definition FMV-equipped aircraft for extended stand-off "find, fix, finish" capabilities in support of counter-ISIS ops.

Contractor: Pilatus Aircraft Ltd.
First Flight: Circa 1994 (PC-12).
Delivered: From 2006.
IOC: N/A.
Production: 36 (converted).
Inventory: 34 (USSOCOM-owned).
Operator: AFSOC, AFRC.
Aircraft Location: Cannon AFB, N.M.; Hurlburt Field, Fla.
Active Variant:
• U-28A. Special operations variant of the civilian Pilatus PC-12.
Dimensions: Span 53.3 ft, length 47.3 ft, height 14 ft.
Weight: Max T-O 10,935 lb.
Power Plant: Single Pratt & Whitney PT6A-67B, 1,200 shp.
Performance: Speed 253 mph, range 1,725 miles.
Ceiling: 30,000 ft.
Accommodation: Two pilots, one CSO, one tactical systems officer.

ISR/BM/C3 AIRCRAFT

Photo: Stefaano Benedetto

CHALLENGER CL-600 COMBAT FLIGHT INSPECTION

Combat Flight Inspection.

Brief: Challenger is a modified, long-range executive-class jet equipped with specialized instrumentation for Combat Flight Inspection (CFIN). The three-aircraft fleet is owned by the Federal Aviation Administration and operated by USAF to certify that airbase NAVAIDs (Navigational Aids) such as TACAN, VOR, and ILS, as well as approach/departure procedures are safe and meet applicable standards before all-weather combat flight operations can begin. USAF has lacked a fully organic CFIN capability since retiring the C-29A and handing flight inspection over to the FAA in 1991. The FAA and USAF jointly funded replacing the aging and range-limited C-29A, and USAF procured a single airframe in FY09. Due to the high-risk environment, Air Force Flight Standards Agency Det. 1 crews from Will Rogers ANGB conduct flight checks in combat theaters, as well as forward locations including Antarctica. In addition to combat ops, the fleet is tasked with inspecting US, allied, and partner-nation facilities overseas. FY19 funds support procurement and maintenance of military-specific equipment required for CFIN, including secure anti-jam radios, IFF, Mode 4/5 transponders, and self-defensive suites for protection during forward-deployed operations.

Contractor: Canadair (Bombardier).
First Flight: Nov. 8, 1978.
Delivered: 2009 (USAF procured airframe).
IOC: Circa 2010.
Production: N/A.
Inventory: Three (FAA-owned).
Operator: AMC, AFRC (associate).
Aircraft Location: Will Rogers ANGB, Okla.; various locations overseas.
Active Variant:
• CL-600-2B16. CL-600 with uprated turbofans and winglets, equipped for the CFIN role.
Dimensions: Span 61.8 ft, length 68.4 ft, height 20.6 ft.
Weight: Max T-O 40,125 lb.
Power Plant: Two General Electric CF34 turbofans, each 9,140 lb thrust.
Performance: speed Mach 0.83, range 3,915 miles.
Ceiling: 45,000 ft.
Accommodation: Two pilots and one flight inspection technician.

Photo: A1C Matthew Seefeldt

E-3 SENTRY

Battle management/early warning/C2

Brief: The E-3 airborne warning and control system (AWACS) is a heavily modified Boeing 707-320B. It is tasked with all-weather, air and maritime surveillance, command and control, battle management, target, threat, and emitter detection, classification, and tracking. The aircraft is capable of surveilling airspace in excess of 200 miles from surface to stratosphere. AWACS coordinates theater air operations in direct subordination to joint/combined air and space operations centers. It can simultaneously conduct C2, BM, and target detection/tracking. E-3Bs were upgraded to Block 30/35 standards in 2001. USAF is equipping the aircraft with interim IFF to keep it airspace-compliant until Block 40/45 upgrade or divestiture. Block 40/45 aircraft are redesignated E-3G. The upgrade is the most comprehensive AWACS enhancement to date and improves tracking/identification, system reliability, and life-cycle cost. Mods include open architecture computing, operator workload reduction, new consoles, improved electronic support measures (ESM), and passive surveillance capability. DRAGON (Diminishing Manufacturing Sources Replacement of Avionics for Global Operations and Navigation) upgrades add a digital cockpit and next generation CNS/GATM. Ongoing upgrades include an urgent operational requirement to shorten kill-chains on time-sensitive targets, modernizing airborne moving target indication, and add high-speed jam-resistant Link 16. Electronic Protection (EP) will improve radar processing in response to a classified requirement. FY19 launches "bridge capability" upgrades to enable the E-3G to meet requirements until replacement in the early 2040s and accelerates airspace compliance mods. A single airframe will enter Block 40/45 upgrade and three aircraft will be redelivered in FY19, bringing the total upgraded fleet to 24. Seven AWACS are slated for divestiture this year.

Contractor: Boeing, Northrop Grumman (radar), Lockheed Martin (computer), Rockwell Collins (DRAGON cockpit upgrade).
First Flight: Oct. 31, 1975 (full avionics).
Delivered: March 1977-84.

IOC: 1977.
Production: 31.
Inventory: 11 (E-3B); three (E-3C); 17 (E-3G).
Operator: ACC, PACAF, AFRC (associate).
Aircraft Location: JB Elmendorf-Richardson, Alaska; Kadena AB, Japan; Tinker AFB, Okla.
Active Variants:
• E-3B. Block 30/35 upgraded aircraft.
• E-3C. Block 30/35 upgraded aircraft with additional advanced capabilities.
• E-3G. Block 40/45 upgraded aircraft.
Dimensions: Span 145.8 ft, length 152.9 ft, height 41.8 ft.
Weight: Max T-O 335,000 lb.
Power Plant: Four Pratt & Whitney TF33-PW-100A turbofans, each 21,000 lb thrust.
Performance: Speed 360 mph, range 5,000+ miles (air refuelable).
Ceiling: Above 35,000 ft.
Accommodation: Four flight crew, 13-19 mission specialists

Photo: Yasuo Oksakabe/USAF

E-4 NATIONAL AIRBORNE OPERATIONS CENTER

Nuclear command and control

Brief: The E-4B is a highly survivable flying C3 center enabling national leaders to direct nuclear and conventional forces, execute emergency war orders, and coordinate civil response actions in support of the National Military Command System (NMCS). It is hardened against the effects of nuclear explosions, including electromagnetic pulse (EMP). Comm and data processing capabilities include EHF Milstar satcom, six-channel International Maritime Satellite, and a triband radome houses the SHF communications antenna. All aircraft underwent Block 1 upgrades, enhancing electronic and communications infrastructure with commercial off-the-shelf (COTS) systems. Ongoing development includes replacing Milstar data links with AEHF-compatible FAB-T, replacing the VLF/LF transmitter, and upgrading CNS/ATM with civil compliant systems. USAF is drafting requirements to replace E-4B with a more modern platform, while DOD is looking to combine both the Navy's E-6B Mercury and USAF E-4B into a single commonly configured "Survivable Airborne Operations Center" (SAOC) fleet. Airframes are viable to 2039, but phaseout of commercial 747-200s hampers sustainment beyond 2020.

Contractor: Boeing, Rockwell, Raytheon (FAB-T).
First Flight: June 13, 1973 (E-4A); June 10, 1978 (E-4B).
Delivered: December 1974-1985.
IOC: December 1974 E-4A; January 1980 E-4B.
Production: Four.
Inventory: Four.
Operator: AFGSC.
Aircraft Location: Offutt AFB, Neb.
Active Variant:
• E-4B. Modified Boeing 747-200 equipped as a NAOC.
Dimensions: Span 195.7 ft, length 231.3 ft, height 63.4 ft.
Weight: Max T-O 800,000 lb.
Power Plant: Four General Electric CF6-50E2 turbofans, each 52,500 lb thrust.
Performance: Speed 602 mph, range 7,130 miles 12hr normal endurance, 72 hr with air refueling.
Ceiling: Above 30,000 ft.
Accommodation: Up to 112 flight crew and mission crew.

Photo: SSgt. Michael Battles

E-8 JSTARS

Command and control/ISR

Brief: E-8C is a ground moving target indication (GMTI), airborne battlefield management/command and control platform. Its primary mission is providing theater commanders with ground surveillance data to support tactical operations. E-8 evolved from the Army/Air Force Joint Surveillance Target Attack Radar System program. The first two aircraft deployed for Desert Storm while still under development, and early airframes were eventually retrofitted to Block 20 production standards featuring more powerful computers, an Internet protocol local area network, and BLOS connectivity. JSTARS is equipped with a canoe-shaped radome under the forward fuselage housing a 24-ft-long, side-looking phased array radar antenna. It can locate, classify, and track vehicles at distances exceeding 124 miles, and more recent refinements have enabled human-target tracking. Target data is transmitted via datalink to ground stations or other aircraft. USAF halted modernization funds and retired the program's testbed aircraft in 2015. Ongoing mods include networking for classified information sharing between CENTCOM coalition partners (CENTRIX), and new Emergency Locating Transmitters. FY19 launches Secure Common Data Link (SDL) to enable LOS networking with Common Ground Stations. The service canceled plans to replace the E-8 with a more affordable business-class airframe, and now plans to upgrade and retain JSTARS through the mid-2020s. USAF is evaluating system requirements for numerous disaggregated platforms. USAF conducted depot maintenance on a single E-8 in 2018 in an effort to supplement contractor support and increase fleetwide availability.

Contractor: Northrop Grumman, Raytheon.
First Flight: December 1988.
Delivered: May 1996-2005.
IOC: Dec. 18, 1997.
Production: 18.
Inventory: 16 (E-8C); one (TE-8).
Operator: ANG.
Aircraft Location: Robins AFB, Ga.
Active Variants:
• E-8C. Block 20 upgraded JSTARS platform based on the Boeing 707-300.
• TE-8A. Crew training aircraft based on the E-8.
Dimensions: Span 145.8 ft, length 152.9 ft, height 42.5 ft.
Weight: Max T-O 336,000 lb.
Power Plant: Four Pratt & Whitney TF33-102C turbojets, each 19,200 lb thrust.
Performance: Speed 584 mph (optimal orbit), range nine hr normal endurance, longer with air refueling.
Ceiling: 42,000 ft.
Accommodation: Flight crew: four; mission crew: 15 Air Force and three Army operators (can be augmented according to mission).

Photo: MSgt. Scott Wilcox

E-9A WIDGET

Range control

Brief: The E-9A is a modified DHC-8 commuter aircraft that provides air-to-air telemetry support for weapons testing, target drone operations, and range clearance. The aircraft support operations in the Eglin Test and Training Range over the Gulf of Mexico. Upgrades include AN/APS-143(V-1) airborne sea surveillance radar, UHF telemetry, and signal relay systems. The E-9 is able to track flying and surface targets. It can detect small watercraft at ranges up to 25 miles. The fleet operates in concert with three drone recovery vessels and two patrol boats to clear waterways and airspace of civil traffic before live-fire testing or hazardous military activities commence. It also provides tracking and assistance with recovering targets. The aircraft can remotely initiate destruction of damaged or malfunctioning aerial target drones.

Contractor: De Havilland Canada, now Bombardier (airframe), Sierra Nevada Corp. (conversion).
First Flight: June 1983 (De Havilland Canada Dash 8).
Delivered: 1988.
IOC: June 1988.
Production: Two.
Inventory: Two.
Operator: ACC.
Aircraft Location: Tyndall AFB, Fla.
Active Variant:
▪ E-9A. Military surveillance version of the DHC-8 commuter airliner.
Dimensions: Span 39.5 ft, length 48.6 ft, height 12.2 ft.
Weight: Max T-O 34,500 lb.
Power Plant: Two Pratt & Whitney PW-120A turboprop engines, each 1,800 shp.
Performance: Speed 280 mph, range 1,000 miles.
Ceiling: 30,000 ft.
Accommodation: Crew: two pilots; two mission operators.

Photo: SSgt. Benjamin Gonsier

E-11A BATTLEFIELD AIRBORNE COMMUNICATIONS NODE

Communications relay

Brief: The E-11A is a modified Bombardier Global Express 6000/BD-700-1A10 business jet equipped with specialized communications relay equipment to translate between tactical comm and data links. It provides joint range extension, BLOS C2, and Internet protocol-based data transfer between dissimilar systems. E-11A was fielded to meet an urgent operational need for BLOS relay between ground troops and other airborne platforms. The system entered combat in Afghanistan in 2008 and enables troops to overcome the limitations of LOS comms in rugged terrain. The fleet was designated E-11A after USAF purchased the first previously leased aircraft in 2011. The Battlefield Airborne Communications Node (BACN) payload is integrated on a mixed fleet of manned E-11As and unmanned EQ-4B Global Hawks. The combined BACN fleet has provided near-constant coverage in theater. Development includes Protected Tactical Waveform (PTW) to thwart adversary jamming in A2/AD environments. FY19 transitions E-11A from contingency funding to a long-term program of record. The current support contract awarded in January 2018 funded continued ops through January 2019. USAF is also seeking to acquire a fifth airframe for conversion to E-11A standards.

Contractor: Northrop Grumman, Bombardier.
First Flight: Oct. 6, 2003 (BD-700).
Delivered: Dec. 2008-Aug. 30, 2012.
IOC: Circa 2011.
Production: Four.
Inventory: Four.
Operator: ACC.
Aircraft Location: Kandahar Airfield, Afghanistan.
Active Variant:
▪ E-11A. Modified Bombardier BD-700 equipped with the BACN payload.
Dimensions: Span 94 ft, length 99 ft 5 in, height 25 ft 6 in.
Weight: Max T-O 99,500 lb.
Power Plant: Two Rolls-Royce BR710A2-20 turbofans, each 14,750 lb thrust.
Performance: Speed Mach 0.88, range 6,900 miles.
Ceiling: 51,000 ft.
Accommodation: Flight crew: two; mission crew: N/A.

Illustration: Gulfstream

EC-37B COMPASS CALL

EW/EA

Brief: The EC-37B is a next generation, tactical jamming platform tasked with disruption of enemy C3, radar, and navigation. It will also offer offensive counterinformation, EA, and SEAD support. The aircraft is based on the ultra-long-range Gulfstream G550 business aircraft and adapted from the Navy's special mission configuration. USAF awarded L3 Technologies a contract on Sept 7, 2017, to replace the EC-130H in the tactical EA role and transplant its "Compass Call" systems to a more modern and survivable aircraft. USAF added procurement of two EC-37B airframes to the existing Compass Call program in FY17. The program, originally dubbed "EC-X" will "re-host" upgraded EC-130H mission equipment directly to the EC-37 with nearly 70 percent remaining unchanged. d. The first aircraft was purchased in FY17, followed by a second in FY18. FY19 funds procure a third. USAF plans to procure and modify 10 aircraft at a rate of one aircraft per year. The upgraded Baseline 3 Compass Call package will include the Advanced Radar Countermeasure System (ARCS) and other significant capability enhancements. The new platform will be faster, more economical, capable of higher altitude operations, and more survivable than the current EC-130H. Modification of the first aircraft is ongoing, and USAF plans to field the first two in 2023.

Contractor: Gulfstream Aerospace (airframe), BAE Systems, L3 Technologies (mission equipment).
First Flight: N/A.
Delivered: N/A.
IOC: 2023 (planned).
Production: Two.
Inventory: 10 (planned).
Operator: ACC (planned).
Aircraft Location: Davis-Monthan AFB, Ariz. (planned).
Active Variant:
▪ EC-37B. Military Electronic Attack version of the Gulfstream G550.

Dimensions: Span 93.5 ft, length 96.4 ft, height 25.8 ft.
Weight: Max T-O 90,500 lb.
Power Plant: Two BR710C4-11 turbofans, each 15,385 lb thrust.
Performance: Speed 600 mph, range 6,300 miles.
Ceiling: 51,000 ft.
Accommodation: TBD.

Photo: TSgt. Jonahtan Hehnly

EC-130H COMPASS CALL

Electronic warfare

Brief: The EC-130H is a modified C-130H designed to disrupt enemy C3 and limit adversary coordination and force management. Tasks include tactical jamming/disruption of communications, radar, and navigation, offensive counterinformation, EA, and SEAD support. The fleet has been deployed near-constantly since the beginning of combat operations in Afghanistan in 2001. The aircraft was designed to be easily updated and modified. All aircraft have been retrofitted to Block 35 standards and are aerial refuelable. Mission equipment upgrades occur approximately every three years to ensure continued protection and effectiveness against evolving threats. Baseline 2 mods are ongoing, and the Baseline 3 configuration, including the Advanced Radar Countermeasure System (ARCS) and other significant capability enhancements, is slated for fielding in 2020. USAF is procuring the EC-37B to replace the EC-130H, but funding delays required extending the current fleet. EC-130H is undergoing center wing box replacement/structural mods (in common with the C-130H fleet). Some 70 percent of the EC-130H's mission equipment will be directly "cross-decked" to the EC-37B, and ongoing system upgrades includes counter-radar/counter satellite navigation, third generation Special Purpose Emitter Array (SPEAR), and adaptive EA to quickly react to emerging threats. Airframe improvements include digital glass cockpits, Mode 5 IFF, and airspace compliant CNS/ATM. Ten primary mission aircraft are supplemented by two backups, two attrition reserves, and one system integration testbed.

Contractor: Lockheed Martin, BAE Systems, L3 Technologies.
First Flight: 1981.
Delivered: 1982.
IOC: 1983; Block 35 from 2011.
Production: (Converted).
Inventory: 14 (EC-130H).
Operator: ACC, AFMC.
Aircraft Location: Davis-Monthan AFB, Ariz.
Active Variant:
• EC-130H. Electronic attack variant of the C-130H.
Dimensions: Span 132.6 ft, length 99 ft, height 38 ft.
Weight: Max T-O 155,000 lb.
Power Plant: Four Allison T56-A-15 turboprops, each 4,910 shp.
Performance: Speed 300 mph at 20,000 ft, unrefueled range 2,295 miles seven hr normal endurance (air refuelable).
Ceiling: 25,000 ft.
Accommodation: 13 - Two pilots, navigator, two EWOs; flight engineer, mission crew supervisor (cryptologic), four cryptologic linguists, acquisition operator, and airborne maintenance technician.

Photo: SrA. Rachel Loftis

EC-130J COMMANDO SOLO/SUPER J

Psychological warfare/special operations airlift

Brief: The EC-130J is the Air Force's primary psychological warfare platform, providing military information support operations (MISO) and civil affairs broadcast. Roles include offensive counterinformation radio, television, and military communications broadcast, EA (or SOF mobility), depending on variant. Commando Solo conducted psychological operations in almost every US contingency since 1980. The EC-130J Commando Solo is equipped with radio and color television broadcast equipment for psychological warfare, enhanced navigation, and self-protection. With transition to the EC-130J, USAF added a new, secondary mission resulting in a second variant. Three heavily modified EC-130J Commando Solo aircraft serve as a standard broadcasting station for psychological warfare operations. Four EC-130Js, dubbed Super J, perform secondary, low-cost EA on top of their special operations mobility SOF-FLEX (Special Operations Flexible) mission. SOF-FLEX includes personnel and cargo airdrop, combat offload, and infiltration/exfiltration. USAF is working to develop an Operational Flight Program Block upgrade cycle for the EC-130J's mission specific equipment, and the airframe is undergoing Block 8.1 upgrades in tandem with the baseline C-130J. The Removable Airborne MISO Systems (RAMS), digital broadcast, and RF countermeasures integration/testing are ongoing. RAMS is based on the Army's Fly Away Broadcast System and will allow all aircraft to be de-modified to a SOF multimission configuration. All variants are operated by the ANG's 193rd Special Operations Wing. Low-cost mods include safety, reliability, parts obsolescence, and smaller capability improvements.

Contractor: Lockheed Martin, Raytheon.
First Flight: April 5, 1996 (C-130J).
Delivered: 2003.
IOC: 2004.
Production: Seven.
Inventory: Three (Commando Solo); four (Super J).
Operator: ANG.
Aircraft Location: Harrisburg Arpt., Pa.
Active Variants:
• EC-130J Commando Solo. Modified C-130J used for broadcast and psyops.
• EC-130J Super J. Modified C-130J used for SOF mobility and psyops.
Dimensions: Span 132.6 ft, length 97.8 ft, height 38.8 ft.
Weight: Max T-O 164,000 lb.
Power Plant: Four Rolls-Royce-Allison AE2100D3 turboprops, each 4,637 shp.
Performance: Speed 335 mph cruise, range 2,645 miles (air refuelable).
Ceiling: 28,000 ft.
Accommodation: Two pilots, flight systems officer, mission systems officer; two loadmasters, five electronic communications systems (CS) operators.

Photo: Charles Haymond

OC-135 OPEN SKIES

Observation/treaty verification

Brief: The OC-135 is a modified WC-135B used for arms control treaty observation and imagery collection over nations party to the 1992 Open Skies Treaty. Specialized mission equipment includes side-looking synthetic aperture radar, infrared line scanning devices, video camera, and framing and panoramic optical cameras installed in the rear of the aircraft. The two oblique KS-87E framing cameras permit photography from approximately 3,000-ft altitude, and one KA-91C panoramic allows for wide sweep photography from approximately 35,000 ft. USAF is acquiring and certifying a digital camera suite to replace obsolete and difficult to maintain wet-film cameras. The upgrade aligns capabilities to a presidential directive and initial installation is planned for 2019. Planned upgrades include FAA-compliant CNS/ATM. USAF is seeking to replace the unreliable and performance-limited OC-135B with two "small airliner class" aircraft that will permit full access across the Russian Federation.

Contractor: Boeing.
First Flight: 1993.
Delivered: 1993-96.
IOC: October 1993.
Production: Three.
Inventory: Two.
Operator: ACC.
Aircraft Location: Offutt AFB, Neb.
Active Variant:
▪ OC-135B. Modified C-135 equipped for photo reconnaissance/treaty verification.
Dimensions: Span 131 ft, length 135 ft, height 42 ft.
Weight: Max T-O 297,000 lb.
Power Plant: Four Pratt & Whitney TF33-P-5 turbofans, each 16,050 lb thrust.
Performance: Speed 500+ mph, range 3,900 miles.
Ceiling: 50,000 ft (basic C-135).
Accommodation: Flight crew: three pilots, two navigators, and three sensor maintenance technicians; Defense Threat Reduction Agency mission crew: mission commander, deputy, four sensor operator/translators, and one flight follower; total seating: 35, incl space for foreign country representatives.

Photo: SrA. Sean Campbell

RC-26 CONDOR

Tactical ISR

Brief: The RC-26 is a modified Fairchild Metro 23 tasked with counternarcotics, manned tactical ISR, disaster response, and civil support missions. It is equipped with specialized digital cameras, IR video, and communications equipment, to enable domestic and international anti-trafficking. The aircraft has a secondary role providing real-time video streaming to responders following hurricanes, wildfires, and other disasters. In the fire-support role, aircraft sensors can detect and accurately identify fires from up to three miles away. An extensive communications suite allows communications from 29 to 960 MHz including provisions for plugged-in 800 MHz handheld radio and airphones. The Air Force originally planned to divest the fleet in FY15, but is looking to add several airframes and reinstate RC-26 as a permanent program of record. The fleet is currently split between three different configurations including six Block 25R, five Block 20, and two non-mission equipped C-26As. RC-26 aircraft assisted with wildfire support in the northwestern US and damage assessment after Hurricane Florence in 2018. Ongoing upgrades include airspace compliance mods to meet FAA mandates.

Contractor: Fairchild (airframe), Elbit Systems (avionics upgrade).
First Flight: 1990.
Delivered: C-26 first delivered 1989.
IOC: N/A.
Production: 11.
Inventory: 11.
Operator: ANG.
Aircraft Location: Des Moines Aprt., Iowa; Ellington Field, Texas; Fairchild AFB, Wash.; Fresno Yosemite Arpt., Calif.; Hancock Field, N.Y.; Jacksonville Arpt., Fla.; Key Field, Miss.; Kirtland AFB, N.M.; Montgomery Regional Arpt., Ala.; Truax Field, Wis.; Tucson Arpt., Ariz.; Yeager Arpt., W.Va.
Active Variants:
▪ C-26A. Non-missionized general utility aircraft.
▪ RC-26B. Surveillance version of Fairchild C-26.
Dimensions: Span 57 ft, length 59.5 ft, height 16.6 ft.
Weight: Max T-O 16,500 lb.
Power Plant: Two Garrett TPE331-12UAR-701 turboprops, each 1,100 shp.
Performance: Speed 334 mph, range 2,070 miles.
Ceiling: 25,000 ft.
Accommodation: Two pilots, one navigator-mission systems operator.

Photo: Josh Plueger/USAF

RC-135S COBRA BALL

Electronic reconnaissance

Brief: The RC-135S gathers measurement and signature intelligence (Masint) on missile-associated signatures and tracks during boost and re-entry. Cobra Ball superseded Rivet Ball and Rivet Amber in 1969 and collects both optical and electronic data on ballistic missile activity. Its specialized equipment includes wide-area IR sensors, long-range optical cameras, and an advanced communications suite. Reconnaissance data is used to assess missile threats, evaluate missile performance, characterize adversary missiles, and analyze weapons testing and technology. Data also supports treaty verification and theater ballistic missile nonproliferation. It can deploy anywhere in the world in 24 hours and provide on-scene EO reconnaissance. Continuous baseline upgrades keep the fleet viable through 2040, and aircraft are currently undergoing Baseline 5 mods (similar to Rivet Joint Baseline 11/12). Flexible funding permits rapid, variant-specific mods in response to emerging/evolving threats. Ongoing upgrades include Wideband Global Satellite reachback, improved operator interface, Rivet Joint COMINT suite integration, and new intercom.

Contractor: Boeing (original airframe), L3 Technologies.
First Flight: N/A.
Delivered: October 1969-November 2000.
IOC: Circa 1972.
Production: Converted.
Inventory: Three.
Operator: ACC.
Aircraft Location: Offutt AFB, Neb.
Active Variant:
▪ RC-135S Cobra Ball. Modified C-135 equipped for Masint/treaty verification.
Dimensions: Span 131 ft, length 135 ft, height 42 ft.
Weight: Max T-O 297,000 lb.
Power Plant: Four CFM International F108-CF-201 turbofans, each 21,600 lb thrust.
Performance: Speed 517+ mph, range 3,900 miles, farther with air refueling.
Ceiling: 45,000 ft.
Accommodation: Flight crew: two pilots, navigator. Mission crew: three EWOs, two airborne systems engineers, two airborne mission specialists.

Photo: Airwolfhound

RC-135U COMBAT SENT

Electronic reconnaissance

Brief: The RC-135U is tasked with strategic reconnaissance of adversary air defenses and technical intelligence (Techint) gathering on radar/emitter systems. The aircraft collects and examines data on airborne, land, and naval radar systems, providing strategic analysis for National Command Authorities and combatant forces. Combat Sent was fielded in 1970 to fill a critical need for scientific and technical data collection on adversary radar threats and defenses. Its distinctive antenna arrays on the chin and wing tips, large cheek fairings, and extended tail contain specialized Sigint suites to collect scientific and technical Elint data against air-, land-, and sea-based emitter systems. Each airframe has unique reconnaissance equipment. Combat Sent is critical to the effective design, programming, and reprogramming of RWRs (radar warning receivers), jammers, decoys, anti-radiation missiles, and threat simulators DOD-wide. Continuous baseline upgrades keep the fleet viable through 2040, and aircraft are currently undergoing Baseline 5 mods (similar to Rivet Joint Baseline 12). Flexible funding permits rapid variant-specific mods in response to emerging/evolving threats. Ongoing upgrades include wideband satcom reachback, integration of Rivet Joint's Comint suite, improved operator interface, new intercom, and capability enhancement for dense signal environments.

Contractor: Boeing (original airframe), L3 Technologies, Textron.
First Flight: N/A.
Delivered: 1971-74.
IOC: 1971.
Production: Converted.
Inventory: Two.
Operator: ACC.
Aircraft Location: Offutt AFB, Neb.; forward operating locations: Al Udeid AB, Qatar; NSF Diego Garcia, UK; Eielson AFB, Alaska; Kadena AB, Japan; RAF Mildenhall, UK; NSA Souda Bay, Greece.
Active Variant:
• RC-135U Combat Sent. Modified C-135 equipped for radar emissions analysis.
Dimensions: Span 135 ft, length 140 ft, height 42 ft.
Weight: Max T-O 322,500 lb.
Power Plant: Four CFM International F108-CF-201 turbofans, each 21,600 lb thrust.
Performance: Cruise speed 517 mph, range 4,140 miles 8 hr normal endurance, 24 hr crew endurance (air refuelable).
Ceiling: 42,000 ft.
Accommodation: Flight crew: two pilots, two navigators, three airborne systems engineers; mission crew: 10 EW officers, six or more electronic, technical, mission-area specialists.

Photo: 2nd Lt. Andrew Nystrom

RC-135V/W RIVET JOINT

Electronic reconnaissance

Brief: The RC-135V/W is tasked with real-time electronic and signals intelligence-gathering, analysis, and dissemination in support of theater and strategic-level commanders. The extensively modified C-135s detect, identify, and geolocate signals throughout the electromagnetic spectrum. Rivet Joint is mostly used to exploit electronic battlefield intelligence and deliver near real-time ISR information to tactical forces, combatant commanders, and National Command Authorities. Onboard capabilities encompass rapid search, detection, measurement, identification, demodulation, geolocation, and fusion of data from potentially thousands of electronic emitters. Continuous baseline upgrades keep the fleet viable through 2040 and drive standards for Combat Sent/Cobra Ball. Flexible funds permit rapid, variant-specific mods in response to emerging/evolving threats. Ongoing Baseline 11/12 upgrades include new direction finding Comint, precision Elint/Sigint system integration, wideband satcoms, enhanced near real-time data dissemination, new steerable beam antenna, improved weather radar, digital cockpit instruments, and compliant CNS/ATM. Baseline 12 efforts also include modernized operator interface, improved dense signal environment capabilities, increased signal bandwidth/exploitation, add operator 3-D maps, and integrate RC-135 with Distributed Common Ground Station (DCGS). The Royal Air Force operates three RC-135W "Airseeker" aircraft, which are co-manned by USAF/RAF personnel. USAF will shift forward deployed RC-135s from RAF Mildenhall to Fairford starting in 2023 to consolidate infrastructure.

Contractor: Boeing (original airframe), L3 Technologies (systems integrator).
First Flight: N/A.
Delivered: Circa 1973-99 (Continuous equipment updates).
IOC: Circa 1973.
Production: Converted.
Inventory: Eight (RC-135V); nine (RC-135W); three (TC-135W); one (NC-135W).
Operator: ACC, AFMC.
Aircraft Location: Offutt AFB, Neb.; Kadena AB, Japan; RAF Mildenhall, UK; RAF Waddington, UK (USAF co-manned). Planned: RAF Fairford, UK.
Active Variants:
• RC-135V/W Rivet Joint. Standoff airborne Sigint variant of the C-135.
• TC-135W. Training version of the operational aircraft.
• NC-135W. Rivet Joint systems integration testbed operated by AFMC.
Dimensions: Span 131 ft, length 135 ft, height 42 ft.
Weight: Max T-O 297,000 lb.
Power Plant: Four CFM International F108-CF-201 turbofans, each 21,600 lb thrust.
Performance: Speed 500+ mph, range 3,900 miles (air refuelable).
Ceiling: 50,000 ft.
Accommodation: Flight crew: three pilots, two navigators; mission crew: three EW officers, 14 intelligence operators, four airborne maintenance technicians (six additional, if required).

Photo: SSgt. Jeffrey Schultze

U-2 DRAGON LADY

High-altitude reconnaissance

Brief: The U-2 is the Air Force's only manned strategic high-altitude, long-endurance ISR platform. Roles include Sigint, Imint, and Masint collection. U-2 can carry a variety of advanced optical, multispectral, EO/IR, SAR, Sigint, and other payloads simultaneously. It was initially designed in the 1950s and further developed into the U-2R in the late 1960s. Current U-2s date to the 1980s when production was reopened for the larger, more capable TR-1. S model conversions began in 1994, and all current aircraft are Block 20 configured, featuring glass cockpits, digital autopilot, modernized EW system, and updated data links. Sensor upgrades include the ASARS-2A SAR sensor, SYERS-2A multispectral EO/IR imagery system, and enhanced Airborne Signals Intelligence Payload (ASIP). The legacy optical bar camera is still in use, providing broad-area synoptic imagery. U-2's modular payload and open system architecture allow rapid fielding of new sensors. Congress stipulated RQ-4 Block 30 achieve sensor parity with the U-2 before the latter can be retired. U-2s comprise 50 percent of the high-altitude ISR fleet and they are heavily tasked, pushing retirement to 2022 or beyond. Future funds are limited to

flight safety and sustainment unless critical to national security. Ongoing development and integration now include Payload Block 20.1 upgrades, stellar navigation, modular mission systems, RPA C2, GPS refresh, helmet/pressure suit, avionics, egress, and flight safety/airspace compliance mods. Payload Block 20.1 includes ASARS development, integration, and testing as well as multispectral sensor, EW system, Optical Bar Camera, and Sigint package upgrades. Block improvements also include defensive systems, data links (Link-16/IFDL, MADL), and avionics upgrades.

Contractor: Lockheed Martin, Northrop Grumman (ASIP), Raytheon (ASARS), UTC Aerospace (SYERS/Optical Bar Camera).
First Flight: Aug. 4, 1955 (U-2); October 1994 (U-2S).
Delivered: 1955-October 1989.
IOC: Circa 1956.
Production: 35 (T/U-2S).
Inventory: 27 (U-2); four (TU-2 trainers).
Operator: ACC.
Aircraft Location: Beale AFB, Calif.; permanent forward operating locations worldwide.
Active Variants:
• U-2S. Current variant of the U-2/TR-1.
• TU-2S. A two-seat trainer aircraft originally designated U-2ST.
Dimensions: Span 105 ft, length 63 ft, height 16 ft.
Weight: Max T-O 40,000 lb.
Power Plant: General Electric F118-GE-101 turbofan.
Performance: Speed 410 mph, range 7,000+ miles.
Ceiling: Above 70,000 ft.
Accommodation: Pilot (U-2S); two pilots (TU-2S) on RQ201 zero/zero ejection seats.

Photo: Bo Joyner/USAF

WC-130J

Weather reconnaissance

Brief: The WC-130J "Weatherbird" is a modularly configurable C-130J equipped with specialized modular systems to penetrate tropical and winter storms, capture meteorological data, and aid severe weather forecasting. Early WC-130Bs entered service in 1959, followed by the WC-130E in 1962, and WC-130H in 1964. The WC-130J began replacing legacy variants in 1999, though several H models remain in service with the Puerto Rico ANG. All WC-130Js are operated by AFRC's 53rd Weather Reconnaissance Squadron "Hurricane Hunters" at Keesler. Mission equipment includes pod-mounted Stepped-Frequency Microwave Radiometer (SFMR) for monitoring surface winds and precipitation rates, parachute-deployed GPS dropsondes to gather vertical atmospheric profiles, and palletized operator stations/equipment. WC-130Js are optionally equipped with two external wing tanks, as well as an internal auxiliary fuel tank to increase range and endurance. Crews include an added aerial weather reconnaissance officer/flight director and weather system specialist/loadmaster. Aircraft are capable of penetrating tropical cyclones from up to 10,000 ft to as low as 500 ft. The fleet primarily monitors oceanic weather over the Atlantic, Central Pacific, Caribbean, and Gulf of Mexico. Airframes are modernized in line with the baseline C-130J fleet, including Block 8.1 upgrades, airspace compliance mods, and enhanced service-life center wing sections.

Contractor: Lockheed Martin.
First Flight: April 5, 1996 (C-130J).
Delivered: September 1999-September 2005.
IOC: October 2006.
Production: 10.
Inventory: 10.
Operator: AFRC.
Aircraft Location: Keesler AFB, Miss.
Active Variant:
• WC-130J. Weather reconnaissance version of C-130J.
Dimensions: Span 132.6 ft, length 97.8 ft, height 38.8 ft.
Weight: Max T-O 155,000 lb; max payload 42,000 lb.
Power Plant: Four Rolls-Royce AE2100D3 turboprops, each 4,700 shp.
Performance: Speed 417 mph; range with 35,000 lb payload 1,841 miles (3,000+ miles with external/auxiliary tanks).
Ceiling: With max payload, 26,000 ft.
Accommodation: Crew: two pilots, aerial reconnaissance weather officer, loadmaster/dropsonde operator. Load: palletized weather systems.

Photo: Susan Romano/USAF

WC-135 CONSTANT PHOENIX

Air sampling and collection

Brief: WC-135's primary mission is nuclear test monitoring, airborne radiological sampling, and arms control treaty verification. Airframes are either a modified C-135B or EC-135C Looking Glass equipped with air sampling and collection equipment. The aircraft primarily support monitoring under the 1963 Limited Nuclear Test Ban Treaty. Air sampling WB-29s detected debris from the Soviet Union's first atomic test in 1949, and subsequent aircraft have monitored weapons tests, including recent North Korean activity, as well as nuclear disasters including Chernobyl and Fukushima. The WC-135's sampling and collection suite allows mission crew to detect radioactive "clouds" in real time. The collection system uses external flow-through devices to collect particles on filter paper for later analysis. The podded particulate sampler/Radiation Monitoring and Analysis System (RMAS) detects radiation contact and the Directional Gamma Sensor System (DGSS) guides the crew toward the plume for collection. The Whole Air Collection System (WACS) captures and stores radioactive samples from the aircraft's bleed-air system. An integrated control system permits real-time mission system interface and monitors internal and external radiation-levels for safety and analysis. USAF deemed replacing the aging fleet to be more cost-effective than re-engineing and modernization. FY19 funds will convert three KC-135R tankers into WC-135Rs, based on the same sensor suite, starting in September 2019.

Contractor: Boeing.
First Flight: 1965.
Delivered: 1965-96.
IOC: December 1965.
Production: Converted. 2020 (WC-135R) planned.
Inventory: One (WC-135C); one (WC-135W).
Operator: ACC.
Aircraft Location: Offutt AFB, Neb.
Active Variants:
• WC-135C. Modified EC-135C equipped for radiological monitoring and air sampling.
• WC-135R. Modified KC-135R tankers, planned to replace the aging WC-135C/W fleet.
• WC-135W. Modified C-135B equipped for radiological monitoring and air sampling.
Dimensions: Span 131 ft, length 140 ft, height 42 ft.
Weight: Max T-O 300,500 lb.
Power Plant: Four Pratt & Whitney TF33-P-5 turbofans, each 16,050 lb thrust.
Performance: Speed 403 mph, range 4,600 miles (air refuelable).
Ceiling: 40,000 ft.
Accommodation: Seating for 33, incl cockpit crew.

Photo: SrA. Kevin Tanenbaum

HC-130J COMBAT KING II

Aerial refueling/airlift

Brief: The HC-130J is tasked with helicopter in-flight refueling support for CSAR/ personnel recovery, tactical C2, and pararescue (PJ) deployment. It replaces legacy HC-130N/Ps and is based on the USMC's KC-130J tanker. It adds enhanced service-life wing, improved cargo handling system, refueling receptacle, EO/IR sensor, flight deck CSO console, and dual satcom. Features include integrated INS/GPS, NVG-compatible lighting, FLIR, radar/missile warning receivers, and chaff/flare dispensers. USAF plans to standardize HC/AC/MC-130J block upgrades, and current efforts bring all HC-130Js to a common standard. Ongoing upgrades include avionics Block 8.1 (in common with the C-130J fleet), Lightweight Airborne Radio System (LARS), integrated situational awareness (including SADL, Blue Force Tracker, etc.), Joint Precision Aerial Delivery System (JPADS), wireless intercom, Advanced Threat Warning (ATW), roll-on/roll-off RF countermeasures, and paratroop door improvements. Mode 5 IFF and CNS/ATM upgrades will be fielded ahead of cycle to meet FAA deadlines. LARS transitions to the new 406 MHz distress frequency and improves timely location of aircraft, vessels, and personnel. ATW and RF countermeasures add the latest self-defensive capability for recovery operations in contested environments. FY19 funding supports production of two aircraft including a combat loss replacement. USAF expects to complete fleet recap by 2023. The California ANG's 129th Rescue Wing received its first HC-130J on April 5, 2018, beginning transition from the MC-130P.

Contractor: Lockheed Martin.
First Flight: July 29, 2010.
Delivered: Sept. 24, 2010-present.
IOC: 2013.
Production: 37 (planned).
Inventory: 24.
Operator: ACC, AETC, ANG. Planned: AFRC.
Aircraft Location: Davis-Monthan AFB, Ariz.; JB Elmendorf-Richardson, Alaska; Kirtland AFB, N.M.; Moffett Field, Calif.; Moody AFB, Ga. Planned: Francis S. Gabreski Arpt., N.Y.; Patrick AFB, Fla.
Active Variants:
• HC-130J. C-130J modified for CSAR and aerial refueling.
Dimensions: Span 132.6 ft, length 97.8 ft, height 38.8 ft.
Weight: Max T-O 164,000 lb.
Power Plant: Four Rolls-Royce AE2100D3 turboprops, each 4,591 shp.
Performance: Speed 363.4 mph at S-L, range 4,000+ miles (air refuelable).
Ceiling: 33,000 ft.
Fuel Capacity: 61,360 lb at 150-300 gpm (100 gpm dual, simultaneous refueling).
Accommodation: Flight crew: two pilots, CSO, two loadmasters.

Photo: SSgt. Edward Eagerton

HC-130N/P KING

Aerial refueling/airlift

Brief: The HC-130N/P is tasked with helicopter in-flight refueling support for CSAR/personnel recovery, tactical C2, pararescue (PJ) deployment, and forward area refueling point missions. It conducts operations to austere airfields and denied territory for expeditionary, all-weather ops. Secondary roles include humanitarian assistance, disaster response, security cooperation/aviation advisory, emergency medical evacuation, noncombatant evacuation, and spaceflight support for NASA. Features include integrated GPS/INS navigation package, NVG lighting, FLIR, radar/missile warning receivers, chaff/flare dispensers, and data-burst communications. Both models suffer airworthiness, maintainability, and operational limitations and are being replaced by HC-130J. Corrosion issues forced early retirement of a significant part of the remaining fleet. Serviceable HC-130Ns were diverted from storage to replace increasingly unserviceable HC-130Ps at Patrick. The base's final HC-130P retired in August 2017, and conversion to the HC-130J is slated for late 2019. Ongoing efforts focus on center wing box replacement/structural mods (in common with the C-130H fleet).

Contractor: Lockheed Martin.
First Flight: Dec. 8, 1964 (as HC-130H).
Delivered: 1965-circa 1993.
IOC: 1986.
Production: 33 converted N/P models.
Inventory: Six (HC-130N); three (HC-130P).
Operator: ANG, AFRC.
Aircraft Location: Francis S. Gabreski Arpt., N.Y.; Patrick AFB, Fla.
Active Variants:
• HC-130N. C-130H model modified with new center wing and aerial refueling capability.
• HC-130P. Similar to HC-130N; initially fit with specialized radome for Fulton recovery system.
Dimensions: Span 132.6 ft, length 98.8 ft, height 38.5 ft.
Weight: Max T-O 155,000 lb.
Power Plant: Four Allison T56-A-15 turboprops, each 4,910 shp.
Performance: Speed 289 mph at S-L, range 4,000+ miles.
Ceiling: 33,000 ft.
Fuel Capacity: 73,000 lb at 160 gpm (80 gpm dual, simultaneous refueling).
Accommodation: Two pilots, navigator; flight engineer, airborne comm specialist, two loadmasters, three PJs.

Photo: SSgt. Erica Rodriguez

KC-10 EXTENDER

Aerial refueling/airlift

Brief: The KC-10 is a multirole tanker/transport capable of aeromedical evacuation, based on the McDonnell Douglas DC-10-30CF. The aircraft is USAF's largest air refueling aircraft. It is simultaneously capable of tanker and cargo roles enabling it to support worldwide fighter deployments. The aircraft employs an advanced aerial refueling boom and hose/drogue system allowing it to refuel a wide variety of US and allied aircraft, including the CV-22 tilt-rotor, within the same mission. The aircraft has three large fuel tanks under the cargo floor and an air refueling operator's station recessed into the aft fuselage. It is refuelable by boom-equipped tankers. Ongoing mods include modernized navigation, surveillance, and air traffic management (CNS/ATM) in line with FAA mandates, and advanced Mode 5 IFF. Modifications extend service life through 2045, though full divestiture is planned by 2024. USAF is working to resolve widespread reliability problems with the fleet's egress equipment after an escape slide/raft failed to deploy following an aborted takeoff in 2018.

Contractor: McDonnell Douglas (now Boeing).
First Flight: April 1980.
Delivered: March 1981-April 1990.
IOC: August 1982.
Production: 60.
Inventory: 59.
Operator: AMC, AFRC (associate).
Aircraft Location: JB McGuire-Dix-Lakehurst, N.J.; Travis AFB, Calif.

Active Variant:
▪ KC-10A. Modified McDonnell Douglas DC-10 designed as a multirole cargo-tanker.
Dimensions: Span 165.4 ft, length 181.6 ft, height 58 ft.
Weight: Max T-O 590,000 lb.
Power Plant: Three General Electric CF6-50C2 turbofans, each 52,500 lb thrust.
Performance: Speed 619 mph, range 11,500 miles, or 4,400 miles with max cargo (air refuelable).
Ceiling: 42,000 ft.
Fuel Capacity: 356,000+ lb. at 1,100 gpm (boom), 470 gpm (drogue).
Accommodation: Crew: two pilots, flight engineer, boom operator; AE crew: two flight nurses, three medical technicians; other crew depending on mission. Load: up to 75 people and 17 pallets or 27 pallets—a total of nearly 170,000 lb.

Photo: Yasuo Osakabe/USAF

KC-46 PEGASUS

Aerial refueling/airlift

Brief: The KC-46A is a heavily modified Boeing 767-200ER multirole passenger/cargo-tanker equipped with flying boom and probe/drogue refueling capability. It is also equipped for aeromedical evacuation. KC-46 incorporates the 787's state-of-the-art cockpit, a fly-by-wire boom, remote boom-operator's station, advanced self-defensive suite including Large Aircraft IR Countermeasures (LAIRCM), RWR, tactical situational awareness, comm relay hosting, and nuclear/chem/bio hardening. In 2011 Boeing was awarded a contract for 179 KC-46A tankers, the first increment (KC-X) to replace about half of USAF's KC-135R fleet. Compared to the 50-year-old KC-135, the KC-46A has more fuel capacity, improved efficiency, and enhanced cargo and AE capability. Like the KC-10, it employs an advanced refueling boom and independently operating hose/drogue system. The program's provisioned 767-2C prototype (minus refueling boom) flew in late 2014 and received FAA type-certification in December 2017. The full-up KC-46A flew for the first time from Everett, Wash., Sept. 25, 2015. USAF accepted its first production KC-46 from Boeing on Jan. 10, 2019. The airframe is slated to launch operational testing this year. The service awarded LRIP contracts for 19 aircraft in 2016, a follow-on Lot 3 contract for 15 aircraft in 2017, and a further 18 aircraft in 2018. Japan is the launch international customer and signed for its second of four planned aircraft in December 2018. FY19 funds support Lot 5 purchase of 15 tankers, while the FY20 budget proposal would fund 12 aircraft. Eighteen airframes are slated for delivery ahead of planned IOC, which has slipped due to problems with the boom, remote vision system, and electrostatic compatibility. McConnell received its first KC-46 on Jan. 25, 2019, followed by the first delivery to Altus on Feb. 8, 2019. Boeing plans to deliver three aircraft a month through the end of the year. Pease is slated to receive the first ANG KC-46 late this year.

Contractor: Boeing.
First Flight: Dec. 28, 2014 (provisioned 767-2C prototype); Sept. 25, 2015 (KC-46A).
Delivered: December 2018-present.
IOC: TBD.
Production: 179 (planned).
Development and test fleet: Six (KC-46A); two (provisioned 767-2C).
Operator: AFMC, AMC, Boeing.
Aircraft Location: Altus AFB, Okla.; Edwards AFB, Calif.; McConnell AFB, Kan.; Paine Field, Wash. Planned: JB McGuire-Dix-Lakehurst, N.J.; Pease ANGB, N.H.; Seymour Johnson AFB, N.C.; Travis AFB, Calif.; others TBD.
Active Variant:
▪ KC-46A. Modified Boeing 767 designed as a multirole cargo-tanker.
Dimensions: Span 156 ft, length 165.5 ft, height 52.8 ft.
Weight: Max T-O 415,000 lb.
Power Plant: Two Pratt & Whitney 4062, each 62,000 lb thrust.
Performance: (767) cruise speed 530 mph, range 6,500 miles.
Ceiling: 43,000 ft (767).
Fuel Capacity: 212,299 lb., max transfer load 207,672 lb at 1,200 gpm (boom), 400 gpm (drogue).
Accommodation: 15 crew seats, incl AE crew. Passenger load: 58 or up to 114 for contingency operations. AE load: 58 patients (24 litters and 34 ambulatory). Cargo load: 18 pallet positions, max 65,000 lb.

Photo: TSgt. Mary Greenwood

KC-135 STRATOTANKER

Aerial refueling/airlift

Brief: The KC-135 is an aerial tanker capable of simultaneous cargo and AE missions and has been the mainstay of the USAF tanker fleet for more than 60 years. It is based on the C-135; similar in size and appearance to the commercial 707 aircraft but designed to military specifications. The current KC-135R variant first flew in October 1982 and redeliveries began in July 1984. Twenty were modified with the Multipoint Refueling System (MPRS), allowing the use of hose/drogue pods on each wing to simultaneously refuel two NATO or US Navy aircraft. Non-MPRS-modified KC-135s use a single drogue adapter attached to the boom. A small number of McConnell-based aircraft are also receiver-capable, incorporating a forward-fuselage slipway. Upgrades include a modernized digital flight deck. Global Air Traffic Management upgrades were completed in 2011. Link 16 capability was also added to a limited number of aircraft. KC-135Ts are upgraded and sustained alongside the KC-135R fleet under common programs. USAF plans to modify 395 aircraft with Block 45 upgrades through 2026. These include additional glass cockpit display for engine instrumentation, a radar altimeter, advanced autopilot, and flight director to replace obsolescent systems. A total of 38 aircraft are slated for upgrade in 2019. Fleet service life is projected out to 2040. USAF successfully tested a modular Large-Aircraft IR Countermeasures (LAIRCM) pod to track/jam IR missiles for high-threat mission in 2018. LAIRCM IOC is slated for FY19. New starts include replacing obsolete long-distance oceanic satellite tracking/C2, and adding real-time in-cockpit threat situational awareness.

Contractor: Boeing, Rockwell Collins (Block 45).
First Flight: August 1956.
Delivered: January 1957-65.
IOC: June 1957, Castle AFB, Calif.
Production: 732.
Inventory: 344 (KC-135R); 54 (KC-135T).
Operator: AETC, AFMC, AMC, PACAF, USAFE, ANG, AFRC.
Aircraft Location: Altus AFB, Okla.; Beale AFB, Calif.; Fairchild AFB, Wash.; Grissom ARB, Ind.; JB Andrews, Md.; Kadena AB, Japan; MacDill AFB, Fla.; March ARB, Calif.; McConnell AFB, Kan.; RAF Mildenhall, UK; Seymour Johnson AFB, N.C.; Tinker AFB, Okla.; and ANG in Alabama, Alaska, Arizona, Hawaii, Illinois, Iowa, Kansas, Maine, Michigan, Mississippi, Nebraska, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Tennessee, Utah, Washington, Wisconsin. Planned: Ramstein AB, Germany.
Active Variants:
▪ KC-135R. Re-engined KC-135A/Es fitted with CFM turbofan engines.
▪ KC-135T. Former KC-135Qs, able to carry different fuels in wing and fuselage tanks.
Dimensions: Span 130.8 ft, length 136.3 ft, height 41.7 ft.
Weight: Max T-O 322,500 lb.
Power Plant: Four CFM International CFM56-2 (USAF designation F108) turbofans, each 21,634 lb thrust.
Performance: Speed 530 mph at 30,000 ft, range 1,500 miles with 150,000 lb transfer fuel, up to 11,015 miles for ferry mission.
Ceiling: 50,000 ft.
Fuel Capacity: Max transfer load 200,000 lb at 1,100 gpm (boom), 450 gpm (MPRS pods).
Accommodation: Flight crew: two pilots, boom operator, plus navigator, depending on mission; AE crew: two flight nurses, three medical technicians (adjusted for patient needs). Load: 37 passengers, six cargo pallets, max 83,000 lb.

Photo: 2nd Lt. Ashlyn Paulson

C-5 GALAXY

Strategic airlift

Brief: The C-5 is USAF's largest airlifter and one of the world's largest aircraft, capable of lifting unusually large/heavy cargo over intercontinental ranges. It is also able to take off and land in relatively short distances, and taxi on substandard surfaces if required. The Galaxy's front and rear cargo doors permit simultaneous drive-through loading/unloading. A total of 81 C-5As were delivered between 1969 and 1973 and underwent major wing modifications to extend their service lives. All but one C-5A (converted to C-5M) are retired. The C-5B first flew in 1985 incorporating all C-5A improvements including strengthened wings, uprated turbofans, color weather radar, and triple INS. The first C-5B was delivered in January 1986, and some were equipped with defensive systems. Two C-5As were modified to carry outsize space cargo and redesignated C-5C. The combined Avionics Modernization Program (AMP)—completed in 2011—and Reliability Enhancement and Re-engining Program (RERP), resulted in the C-5M Super Galaxy. Upgraded aircraft incorporate new GE CF6-80C2 (F138-GE-100) turbofans with 20 percent increased thrust, along with avionics, structural, and reliability fixes. Lockheed redelivered the last of 52 upgraded C-5Ms on Aug 2, 2018. A total of 49 B models, two C models, and the single C-5A were converted. Ongoing mods include a new weather radar and mission computer, improved Large Aircraft IR Countermeasures (LAIRCM), and lavatory redesign to fix corrosion issues. C-5s continue to suffer nose landing-gear malfunctions. AMC is replacing key mechanical components and limiting "kneeling" to reduce wear. FY19 funds begin CNS/ATM upgrades, and ADSB will be installed fleetwide to meet FAA airspace requirements by 2020.

Contractor: Lockheed Martin.
First Flight: June 30, 1968 (C-5A); June 6, 2006 (C-5M).
Delivered: 1969-1987 (C-5A); 1986-89 (C-5B); 1989-91 (C-5C); 2009-2018 (C-5M).
IOC: September 1970 (C-5A); February 2014 (C-5M).
Production: 131.
Inventory: 50 (C-5M); two (C-5M-SCM).
Operator: AFMC, AMC, AFRC.
Aircraft Location: Dover AFB, Del.; JBSA-Lackland, Texas; Travis AFB, Calif.; Westover ARB, Mass.
Active Variants:
• C-5M. Super Galaxy incorporating AMP and RERP.
• C-5M-SCM. Super Galaxy converted from C-5C to carry large NASA cargo.
Dimensions: Span 222.8 ft, length 247.8 ft, height 65.1 ft.
Weight: Max T-O 840,000 lb.
Power Plant: Four General Electric F138-GE-100 turbofans, each 50,580 lb thrust.
Performance: Speed 518 mph, range 5,524 miles with 120,000 lb of cargo.
Ceiling: 45,000 ft.
Accommodation: Crew: two pilots, two flight engineers, three loadmasters. Load: 81 troops and 36 standard pallets, max 285,000 lb; incl seven MRAP vehicles, six AH-64 Apache helicopters, four M2 Bradley fighting vehicles, or two M1 Abrams main battle tanks.

Photo: SSgt. David Owsianka

C-12 HURON

Light airlift

Brief: C-12 is tasked with multimission passenger and priority light-cargo airlift, medevac, embassy, and test support. The family of aircraft includes military versions of the Beechcraft King Air B200 and 1900C aircraft (C-12J). Flight decks and cabins are pressurized for high-altitude flight. The C-12D incorporates a cargo door with an integral airstair, high flotation landing gear, structural improvements, and optional external wingtip tanks. Both C-12C and C-12D are deployed to US embassies worldwide and incorporate earlier three-bladed propellers. The C-12F incorporated uprated engines, four-bladed propellers, and an increased service ceiling. The C-12J is a completely different aircraft based on the Beechcraft 1900C commuter airliner with a large, aft cargo door. C-12Js are operated by PACAF in support of US Forces Japan and can transport two litters or 10 ambulatory patients in the AE role. C-12Js incorporate extensive avionics upgrades, including three MFDs, integrated GPS, flight management systems, autopilot, VHF/UHF radios, and weather radar. Current updates encompass basic safety, reliability, and maintainability mods.

Contractor: Beechcraft.
First Flight: Oct. 27, 1972 (Super King Air 200), March 1, 1990 (1900C).
Delivered: 1974-late 1980s.
IOC: Circa 1974.
Production: 88 (incl all variants).
Inventory: 13 (C-12C); six (C-12D); three (C-12F); four (C-12J).
Operator: AFMC, PACAF.
Aircraft Location: Edwards AFB, Calif.; Holloman AFB, N.M.; JB Elmendorf-Richardson, Alaska; Yokota AB, Japan (J); various US embassies.
Active Variants:
• C-12C. C-12As retrofit with PT6A-41 engines.
• C-12D. C-12 with an enlarged cargo door and strengthened wings.
• C-12F. C-12 with uprated PT6A-42 engines, eight-passenger seating, and AE capability.
• C-12J. Military version of the Beechcraft Model 1900C commuter airliner.
Dimensions: Span 54.5 ft, length 43.8 ft, height 15 ft (C/D/F); span 54.5 ft, length 57 ft, height 15 ft (J).
Weight: Max T-O 15,000 lb (F); 16,710 lb (J).
Power Plant: Pratt & Whitney Canada PT6A-41 (C/D) or PT6A-42 (F) turboprops, each 850 shp; PT6A-65B turboprops, each 1,173 shp.
Performance: Speed 300 mph (C/D) 336 mph (F) range 2,271 miles; 284 mph, range 1,669 miles (J).
Ceiling: 31,000 ft (C/D); 35,000 ft (F); 25,000 ft (J).
Accommodation: Crew: two pilots, eight passengers (C/D/F); Load: up to 19 passengers or 3,500 lb cargo (C-12J).

Photo: MSgt. Joey Swatford

C-17 GLOBEMASTER III

Tactical/strategic airlift

Brief: C-17 is a heavy-lift strategic transport capable of direct tactical delivery of all classes of military cargo. It is the US military's core airlift asset, capable of operating on small, austere airfields (3,500 ft by 90 ft) previously limited to C-130s. It is the only aircraft able to directly deliver or airdrop outsize cargo into a tactical environment and is the first military

transport to feature full digital fly-by-wire control. Boeing delivered the 223rd and final USAF aircraft on Sept. 12, 2013, and the final international aircraft on Nov. 29, 2015. Fleetwide Block 16 avionics and weather radar mods were completed in 2015, and all aircraft will be upgraded to Block 20 standard during depot maintenance. Block 20 retrofits include some 60 programs to bring early production aircraft to a common configuration. Ongoing mods include next generation Large Aircraft Infrared Countermeasures (LAIRCM) to combat the proliferation of man-portable air defenses, next generation CNS/GATM, Mode 5 IFF, dynamic retasking, and structural, safety, and sustainment mods. Priority upgrades include HUD replacement and airspace compliance mods to meet FAA's 2020 deadline. Development includes Fixed Installation Satellite Antenna (FISA) to enable high-bandwidth BLOS data/comms, a roll-on/roll-off C2 capsule (replacing the "Silver Bullet") for in-flight conferencing, and real time in cockpit (RTIC) air-to-ground comms to increase SA during airdrop and tactical ops. USAF is considering options to increase the C-17 fleet to meet operational demand, though production ceased in 2015. The North Carolina ANG received its first C-17s in April 2018, and AFRC's 911th AW is also currently transitioning to the C-17.

Contractor: McDonnell Douglas (now Boeing).
First Flight: Sept. 15, 1991.
Delivered: June 1993-September 2013.
IOC: Jan. 17, 1995.
Production: 257.
Inventory: 222.
Operator: AETC, AMC, PACAF, ANG, AFRC.
Aircraft Location: Altus AFB, Okla.; Dover AFB, Del.; JB Charleston, S.C.; JB Elmendorf-Richardson, Alaska; JB Lewis-McChord, Wash.; JB McGuire-Dix-Lakehurst, N.J.; JB Pearl Harbor-Hickam, Hawaii; March ARB, Calif.; Travis AFB, Calif.; Wright-Patterson AFB, Ohio; and ANG in Hawaii (associate), Mississippi, North Carolina, West Virginia, and New York. Planned: Pittsburgh Arpt., Pa.
Active Variant:
▪ C-17A. Long-range airlifter.
Dimensions: Span 169.8 ft, length 174 ft, height 55.1 ft.
Weight: Max T-O 585,000 lb.
Power Plant: Four Pratt & Whitney F117-PW-100 turbofans, each 40,440 lb thrust.
Ceiling: 45,000 ft.
Performance: Speed 518 mph at 25,000 ft, range 2,760 miles with 169,000 lb payload (air refuelable).
Accommodation: Flight crew: two pilots, loadmaster; AE crew: two flight nurses, three medical technicians (altered as required). Load: 102 troops/paratroops; 36 litter and 54 ambulatory patients; 18 pallet positions; max payload 170,900 lb.

Photo: Greg Davis/USAF

C-21 LEARJET

Light airlift

Brief: The C-21 is a militarized Learjet 35 used for passenger and priority light-cargo airlift and aeromedical transport. It is equipped with color weather radar, TACAN, and HF/VHF/UHF radios. It provides medium-range operational support for time-sensitive movement of people and cargo throughout the US and the European Theater, including AE missions if required. USAF awarded a $32.2 million contract for CNS/ATM upgrades in May 2017. Ongoing upgrades support modifying 19 aircraft with modern digital systems including new weather radar, GPS, flight management system, satellite-updating real-time flight information, digital black boxes, and ADS-B and Mode 5 transponder to comply with FAA mandates. Funds additionally cover low-cost flight safety, reliability, and maintainability mods as needed. The 200th AS at Peterson flew the ANG's last C-21 mission in June 2018 and AMC is consolidating the US-based fleet to Scott.

Contractor: Bombardier (previously Gates Learjet), Global Aviation Technologies (CNS/ATM upgrade).
First Flight: January 1973.
Delivered: April 1984-October 1985.
IOC: April 1984.
Production: 84.
Inventory: 18.
Operator: AMC, USAFE.
Aircraft Location: JB Andrews, Md.; Ramstein AB, Germany; Scott AFB, Ill.
Active Variant:
▪C-21A. Military version of the Learjet 35A.
Dimensions: Span 39.5 ft, length 48.6 ft, height 12.2 ft
Weight: Max T-O 18,300 lb.
Power Plant: Two AlliedSignal TFE731-2 turbofans, each 3,500 lb thrust.
Performance: Speed 530 mph at 41,000 ft, range 2,306 miles.
Ceiling: 45,000 ft.
Accommodation: Crew: two pilots; AE crew: flight nurse, two medical technicians (adjusted as required). Load: eight passengers and 3,153 lb cargo; one litter or five ambulatory patients.

Photo: SSgt. Tony Harp

C-32A "AIR FORCE TWO"/ C-32B

VIP transport

Brief: The C-32A provides dedicated vice presidential and DV airlift. C-32B is tasked with politically sensitive crisis-mobility. Both types were acquired as a commercial Boeing 757s. Aircraft assigned to the 89th Airlift Wing at Andrews fly under the call sign "Air Force Two" during vice presidential missions, but additionally serve the first lady, Congress, and Cabinet officials. The cabin is divided into sections including a worldwide clear and secure voice and data communications suite, first-class cabin, two business-class cabins, center galley, lavatories, fully enclosed stateroom, and a conference and staff area. The C-32B provides DOD discreet, rapid, global airlift in support of government crisis response efforts. The C-32's modern flight deck avionics are upgradable, and current programs include nitrogen fuel-tank inerting and commercial wideband global satcom, and interior cabin refurbishment, with an aircraft better able to augment the VC-25 fleet, with better range, capacity, and more capable C2/comms. DOD is looking at possibly replacing the C-32, E-4B, and Navy E-6B Mercury with a single platform.

Contractor: Boeing.
First Flight: Feb. 11, 1998 (C-32A).
Delivered: June-December 1998.
IOC: 1998.
Production: Six.
Inventory: Four (C-32A); two (C-32B).
Operator: AMC, ANG.
Aircraft Location: JB Andrews, Md.; JB McGuire-Dix-Lakehurst, N.J.
Active Variants:
▪ C-32A. Presidential support-configured commercial Boeing 757-200 airliner.
▪ C-32B. Commercial Boeing 757-200 tasked with global crisis response airlift.
Dimensions: Span 124.6 ft, length 155.2 ft, height 44.5 ft.
Weight: Max T-O 255,000 lb.
Power Plant: Two Pratt & Whitney PW2040 turbofans, each 41,700 lb thrust.
Performance: Speed 530 mph, range 6,325 miles.
Ceiling: 42,000 ft.
Accommodation: Crew: 16 (varies with mission). Load: up to 45 passengers.

Photo: A1C Christopher Quail

C-37 GULFSTREAM V

VIP transport

Brief: The C-37 family provides worldwide special air mission and DV support, consisting of military versions of the ultra-long-range Gulfstream business aircraft. The C-37A is based on the Gulfstream V and equipped with separate VIP and passenger areas, secure global voice and data communications suites, enhanced weather radar, autopilot, and advanced HUD. The C-37B adds directional IR countermeasures for self-defense and the advanced Honeywell Plane-View flight deck. Ongoing mods include commercial wideband satcom, to ensure senior leaders' access to secure data and voice networks, and FAA-required CNS/ATM updates. The fleet has an average 28,000 flying hours of remaining service life. USAF issued a request for proposal in FY18 for procurement of as many as 40 additional C-37Bs to backfill the retired C-20 fleet. The service also recently selected a C-37 variant for its' EC-130 Compass Call replacement and is evaluating several derivatives for C2 and ISR roles.

Contractor: Gulfstream Aerospace.
First Flight: USAF October 1998.
Delivered: October 1998.
IOC: Dec. 9, 1998.
Production: 12.
Inventory: Nine (C-37A); three (C-37B).
Operator: AMC, PACAF, USAFE.
Aircraft Location: Chièvres, Belgium; JB Andrews, Md.; JB Pearl Harbor-Hickam, Hawaii; MacDill AFB, Fla.; Ramstein AB, Germany.
Active Variants:
• C-37A. Military version of the Gulfstream V.
• C-37B. Military version of the Gulfstream G550.
Dimensions: Span 93.5 ft, length 96.4 ft, height 25.8 ft.
Weight: Max T-O 90,500 lb.
Power Plant: Two BMW/Rolls-Royce BR710A1-10 turbofans, each 14,750 lb thrust (A); two BR710C4-11 turbofans, each 15,385 lb thrust (B).
Performance: Speed 600 mph, range 6,300 miles.
Ceiling: 51,000 ft.
Accommodation: Crew: five; up to 12 passengers (A); 14 passengers (B).

Photo: SMSgt. Kevin Wallace

C-40 CLIPPER

VIP transport

Brief: The C-40 is a medium-range DV airlift aircraft based on the commercial Boeing 737-700. It is used to transport senior military commanders, Cabinet officials, and members of Congress, as well as performing other support missions. C-40Bs are equipped with an office-in-the-sky arrangement, including clear and secure voice/data communication and broadband data/video. C-40Cs lack the advanced communications suite, are VIP configured with sleep accommodations, and are reconfigurable to carry 42 to 111 passengers. Both versions have modern avionics, integrated GPS and flight management system/electronic flight instrument system, and HUD. Each aircraft has auxiliary fuel tanks and managed passenger communications. Recent mods include nitrogen fuel tank inerting for the C-40C and commercial wideband satcom for the C-40B, to ensure leader's secure top-secret voice, data, and video links. Further mods include navigation, and air traffic management compliance, and low-cost sustainment upgrades. The fleet is designed for a 30-year service life, with an average of 22 years remaining.

Contractor: Boeing.
First Flight: April 14, 1999 (USN C-40A).
Delivered: 2002-2007.
IOC: Feb. 28, 2003.
Production: 11.
Inventory: Four (C-40B); seven (C-40C).
Operator: AMC, PACAF, USAFE, ANG, AFRC.
Aircraft Location: JB Andrews, Md.; JB Pearl Harbor-Hickam, Hawaii; Ramstein AB, Germany; Scott AFB, Ill.
Active Variants:
• C-40B. Military version of the Boeing 737-700 with added winglets.
• C-40C. VIP configured Boeing 737-700 with added winglets, but lacking advanced comms.
Dimensions: Span 117.4 ft, length 110.3 ft, height 41.2 ft.
Weight: Max T-O 171,000 lb.
Power Plant: Two General Electric CFM56-7 turbofans, each 27,000 lb thrust.
Performance: Speed 530 mph, range 5,750 miles.
Ceiling: 41,000 ft.
Accommodation: Crew: 10 (varies by model/mission). Load: up to 89 passengers (B); up to 111 (C).

Photo: Amn. Alexis wade/ANG

C-130H HERCULES

Tactical airlift

Brief: The C-130H is an all-purpose theater transport that performs diverse roles, including tactical and inter-theater airlift and airdrop support, AE, aerial spraying, aerial firefighting, and humanitarian support. The H model improved on the C-130E and was delivered starting in 1965, with the current, more advanced models delivered starting in 1974. Improvements included uprated engines, redesigned outer wing, improved pneumatic systems, new avionics, improved radar, and NVG lighting. C-130Hs are being replaced by the C-130J. USAF is upgrading ANG Modular Airborne Fire Fighting Systems (MAFFS)-equipped C-130Hs with the same eight-bladed propellers and engine upgrades as the LC-130H to enhance performance and safety. The first modified airframe was redelivered to the Wyoming ANG in January 2018. WC-130Hs are operated by the Puerto Rico ANG and could be equipped with palletized mission equipment for tropical storm data collection. Ongoing upgrades include critical center wing box replacement, Mode 5 IFF, as well as the C-130H Avionics Modernization Program (previously Viability and Airspace Access Program). Increment 1 will add new CNS/ATM to bring a total of 166 C-130H in compliance with US and international airspace rules. Increment 2 will add terrain awareness and warning, new flight management, and modern MFDs.

Contractor: Lockheed Martin.
First Flight: August 1954 (C-130A).
Delivered: 1974-96.
IOC: Circa 1974.
Production: 1,202 (C-130H).
Inventory: 176 (C-130H); five (WC-130H).
Operator: ANG, AFRC, AFSOC.
Aircraft Location: Dobbins ARB, Ga.; Little Rock AFB, Ark.; Maxwell AFB, Ala.; Minneapolis-St. Paul Arpt./ARS, Minn.; Patrick AFB, Fla.; Peterson AFB, Colo. (MAFFS); Youngstown ARS, Ohio (Aerial Spray); and ANG in Arkansas, Connecticut, Delaware, Georgia, Illinois, Kentucky, Minnesota, Missouri, Montana, Nevada (MAFFS), Ohio, Puerto Rico (WC-130), Texas, West Virginia, Wyoming (MAFFS).

Active Variants:
▪ C-130H Hercules. Updated version of the legacy C-130.
▪ WC-130H. Dual-capable weather reconnaissance/airlift version of C-130H.
Dimensions: Span 132.6 ft, length 97.8 ft, height 38.8 ft.; J-30 length 112.8 ft.
Weight: Max T-O 155,000 lb; max payload 42,000 lb.
Power Plant: Four Allison T56-A-15, or Rolls-Royce T56 3.5 turboprops, each 4,591 shp.
Performance: Speed 366 mph; range with 35,000 lb payload 1,496 miles.
Ceiling: With max payload, 23,000 ft.
Accommodation: Crew: two pilots, navigator, flight engineer, loadmaster; Load: up to 92 combat troops or 64 paratroopers or 74 litters or six cargo pallets or 16 Container Delivery System (CDS) bundles or any combination of these up to max weight for each version.

Photo: SrA. Donald Hudson

C-130J SUPER HERCULES

Tactical airlift

Brief: The C-130J is the redesigned, current production version of the C-130 all-purpose theater transport. Missions include tactical and inter-theater airlift, airdrop, AE, wildfire suppression using the Modular Airborne Fire Fighting System (MAFFS), and humanitarian relief. The aircraft first deployed in combat in Southwest Asia in 2004. The Super Hercules features three-crew flight operations, more powerful engines, composite six-blade propellers, and digital avionics and mission computers. The C-130J can fly faster, higher, and farther than earlier C-130s. The C-130J-30 variant features a 15-foot longer "stretched" fuselage. The combined fleet is sustained via block upgrades. USAF is combining the future Block 7/8.1 upgrades to reduce modification down time. Block 7 includes Link 16, new flight management systems, civil GPS, and a special mission processor. Block 8.1 adds improved LOS data link and BLOS comms, improved precision navigational aids, enhanced covert lighting, replaces UHF comms with satcoms, and updates mission planning systems. Block 8.1's Mode 5 IFF and air traffic management upgrades will be fielded ahead of cycle to meet the FAA's 2020 compliance deadline. Airframes delivered since 2009 incorporate enhanced service life center wings, and four of 21 contracted early production airframes will be retrofitted in 2019. The current multiyear contract procures 29 USAF C-130J-variants between FY19 and FY23 at a production rate of 16 aircraft per year.

Contractor: Lockheed Martin.
First Flight: April 5, 1996.
Delivered: February 1999-present.
IOC: October 2006.
Production: 396+.
Inventory: 125.
Operator: AETC, AMC, PACAF, USAFE, ANG, AFRC.
Aircraft Location: Dyess AFB, Texas; Little Rock AFB, Ark.; Ramstein AB, Germany; Yokota AB, Japan; and ANG in California, Kentucky, Rhode Island. Planned: Maryland.
Active Variants:
▪ C-130J Super Hercules. Current production version.
▪ C-130J-30 Super Hercules. Stretched version capable of accommodating larger loads.
Dimensions: Span 132.6 ft, length 97.8 ft, height 38.8 ft.; J-30 length 112.8 ft.
Weight: Max T-O 155,000 lb (J), 164,000 lb (J-30); max payload 42,000 lb (J), 44,000 lb (J-30).
Power Plant: Four Rolls-Royce AE2100D3 turboprops, each 4,700 shp.
Performance: Speed 417 mph (J), 410 mph (J-30); range with 35,000 lb payload 1,841 miles (J), 2,417 miles (J-30).
Ceiling: With max payload, 26,000 ft (J), 28,000 (J-30).
Accommodation: Crew: two pilots, loadmaster. Load: up to 92 combat troops or 64 paratroopers or 74 litters or six cargo pallets or 16 Container Delivery System (CDS) bundles or any combination of these up to max weight (J); 128 combat troops or 92 paratroopers or 97 litters or eight pallets or 24 CDS bundles or any combination of these up to max weight (J-30).

Photo: Capt. David Price/ANG

LC-130H SKIBIRD

Arctic support/tactical airlift

Brief: The LC-130H is a ski-equipped Arctic-support derivative of the C-130H. It is capable of direct resupply of Antarctic research stations and high-arctic radar sites utilizing ice and snowpack runways. The LC-130H fleet supports the National Science Foundation's (NSF) Antarctic research, ferrying much of the material, provisions, and personnel between Christchurch, New Zealand, and McMurdo Station, Antarctica. The aircraft also provide ongoing support to the remote Amundsen-Scott South Pole Station. USAF began augmenting the Navy's "Operation Deep Freeze" with the C-124 in 1956. C-130s began Antarctic support in 1959, operating without skis until the initial ski-borne deployment of the C-130D in January 1960. By 1975, the New York ANG's 109th AW operated USAF's only ski-equipped LC-130 supporting Distant Early Warning sites in the high-Arctic. The unit began augmenting Navy LC-130s during Deep Freeze in 1988, before taking over primary responsibility in 1999. Lockheed Martin delivered three new NSF-funded aircraft in 1995-96. The remaining six ex-LC-130s were acquired from the Navy. LC-130s have been upgraded with digital displays and flight management systems, multifunction radar, modernized comms, and a single air data computer. LC-130s are upgraded along with the baseline C-130H fleet, including center wing box replacement, Mode 5 IFF, as well as the C-130H Avionics Modernization Program adding airspace-compliant CNS/ATM. Ice Pod experiments utilizing an aft, externally mounted sensor suite to record ice composition and density began in 2015. The pod includes radar, laser, and optical sensors. USAF began testing new eight-bladed NP-2000 propellers to increase take-off performance by 20 percent and replace the dwindling stock of JATO (Jet-Assisted Takeoff) rockets in 2008. Seven of the 10 aircraft have now been upgraded with new propellers and engine enhancements. The research season ending in February 2019 marked the first time all participating LC-130s were equipped with NP-2000 propellers.

Contractor: Lockheed Martin.
First Flight: 1957 (ski-equipped C-130).
Delivered: 1974-96.
IOC: January 1960 (C-130D).
Production: N/A.
Inventory: 10.
Operator: ANG.
Aircraft Location: Stratton ANGB, N.Y.
Active Variants:
▪ LC-130H Skibird. Arctic support variant with wheel-ski gear and eight-bladed propellers.
Dimensions: Span 132.6 ft, length 97.8 ft, height 38.8 ft.; Nose Ski 10 ft by six ft wide, main gear skis 12 ft by six ft wide.
Weight: Max T-O 155,000 lb; max payload 45,000 lb.
Power Plant: Four Rolls-Royce T56 3.5 turboprops, each 4,591 shp.
Performance: Speed 366 mph; range with 35,000 lb payload 1,496 miles.
Ceiling: With max payload, 23,000 ft.
Accommodation: Crew: two pilots, navigator, flight engineer, loadmaster; Load: up to 92 passengers or 74 litters; six cargo pallets, 16 Container Delivery System (CDS) bundles, or any combination up to max weight.

Photo: TSgt. Danielle Hopkins/ANG

VC-25 AIR FORCE ONE

Presidential airlift

Brief: The VC-25 is a specially configured Boeing 747-200B equipped for airlifting the President and his entourage. VC-25s operate under the call sign "Air Force One" when the President is aboard, and SAM (Special Air Mission) during non-presidential flights. Aircraft are equipped with staff work areas, a conference room, a general seating area, and an executive office. Communications capability includes worldwide secure and clear communications, data links, and a full self-defensive suite. The fleet is operated by the Presidential Airlift Group of the 89th Airlift Wing at JB Andrews. The VC-25A fleet has four years' estimated service life remaining and requires a life extension/block upgrade to remain viable until replaced by the VC-25B (based on Boeing's modernized 747-8 Intercontinental). Block mods including protected satcom, chillers, nitrogen generation system, weather radar, digital/voice data, and network upgrades slated for completion by mid-2020. SLEP is accomplished during regular depot maintenance. Flight deck upgrades include digital avionics, compliant CNS/ATM, Mode 5 IFF, Advisory Vertical Navigation, and other pilot situational awareness aids. USAF issued Boeing a $3.9 billion presidential aircraft replacement contract to modify two undelivered commercial 747-8s to VC-25B standards on Feb. 20, 2018. The company plans to deliver the aircraft in 2024. The current specification excludes aerial refueling capabilities to reduce program cost.

Contractor: Boeing.
First Flight: Sept. 6, 1990 (as Air Force One).
Delivered: August-December 1990.
IOC: Dec. 8, 1990.
Production: Two VC-25A; two VC-25B (planned).
Inventory: Two (VC-25A).
Operator: AMC.
Aircraft Location: JB Andrews, Md.
Active Variants:
•VC-25A. Specially configured presidential support version of the Boeing 747-200B.
•VC-25B. Next generation presidential aircraft based on the Boeing 747-8 Intercontinental.
Dimensions: Span 195.8 ft, length 231.8 ft, height 63.4 ft (A); span 224.5 ft, length 250.2 ft, height 63.4 ft (B).
Weight: Max T-O 833,000 lb (A); max T-O 987,000 lb (B).
Power Plant: Four General Electric CF6-80C2B1 turbofans, each 56,700 lb thrust (A); four General Electric GEnx-2B turbofans, each 66,500 lb thrust (B).
Performance: Speed 630 mph, range 7,800 miles, further with air refueling (A); speed 660 mph, range 8,900 miles (B).
Ceiling: 45,100 ft.
Accommodation: Crew: 26; Load: up to 102 passengers (A); unk (B).

HELICOPTERS

Photo: SrA. Greg Nash

HH-60 PAVE HAWK

Personnel recovery/medium lift

Brief: The HH-60G Pave Hawk is an armed all-weather day/night CSAR helicopter derived from the UH-60 Blackhawk. Additional missions include casualty/medical evacuation, disaster and humanitarian response, firefighting, and combat/utility support. The HH-60G is equipped with advanced INS/GPS/Doppler navigation systems, satcom, and secure/anti-jam communications, and a personnel locating system (PLS) that aids location of survivor's radio. It includes automatic flight control, NVG lighting, FLIR, engine/rotor blade anti-ice system, in-flight refueling probe, additional fuel tanks, and an integral rescue hoist. Combat enhancements include a full self-defensive suite and two miniguns (or .50-caliber guns). Ongoing Block 162 upgrades include Avionics Communications Suite Upgrade as well as replacing obsolete systems and standardizing HH-60G and loss-replacement aircraft configurations. Obsolescence mods include color weather radar, improved TACAN, new RWR, auto direction finding, and digital intercoms. ACSU upgrades will wrap up in 2020, followed by fleetwide standardization in 2024. Ongoing mods include safety/survivability, situational awareness, mission avionics, and operational loss replacement. FY19 funds Hostile Fire Indicator (HFI) to pinpoint and engage threats including rocket propelled grenade and small arms, as well as missile warning and countermeasures to support operations in Afghanistan, Iraq, and Syria. Additional upgrades include sensor turret to enhance situational awareness in low-visibility condition, and data links to provide real-time access to ISR data gleaned by offboard assets for improved situational awareness. USAF plans to replace the HH-60G with the new HH-60W Combat Rescue Helicopter (CRH). The more powerful helicopter will improve hot weather/high-altitude performance and feature an enlarged cabin and longer range. Two engineering development HH-60Ws are undergoing final construction. LRIP approval and first flight are both expected in 2019. A total of nine HH-60Ws will support developmental testing at Eglin. USAF plans to procure 112 new-HH-60Ws through 2029. The last HH-60s assigned to RAF Lakenheath departed for Aviano on May 15, 2018, to better support contingencies in Africa and Europe.

Contractor: Sikorsky (Lockheed Martin).
First Flight: October 1974.
Delivered: 1982-present.
IOC: 1982.
Production: 112 (HH-60G); 21 (HH-60U); 112 (HH-60W) (planned).
Inventory: 102 (HH-60G); three (HH-60U).
Operator: ACC, AETC, AFMC, PACAF, USAFE, ANG, AFRC.
Aircraft Location: Aviano AB, Italy; Davis-Monthan AFB, Ariz.; Eglin AFB, Fla.; Francis S. Gabreski Arpt., N.Y.; JB Elmendorf-Richardson, Alaska; Kadena AB, Japan; Kirtland AFB, N.M.; Moffett Field, Calif.; Moody AFB, Ga.; Nellis AFB, Nev.; Patrick AFB, Fla.
Active Variants:
- HH-60G. Modified UH-60 helicopter equipped for CSAR.
- HH-60U. Converted surplus UH-60L.
- HH-60W. Developmental next generation Combat Rescue Helicopter.

Dimensions: Rotor diameter 53.6 ft, overall length 64.7 ft, height 16.7 ft.
Weight: Max T-O 22,000 lb.
Power Plant: Two General Electric T700-GE-700/701C turboshafts, each 1,560-1,940 shp.
Performance: Speed 184 mph; range 580 miles (air refuelable).
Ceiling: 14,000 ft.
Armament: Two 7.62 mm miniguns or two .50-caliber machine guns.
Accommodation: Crew: two pilots, flight engineer, gunner. Load: mission dependent.

Photo: Yasuo Osakabe/USAF

UH-1 HUEY/IROQUOIS

Light lift/training

Brief: The UH-1N aircraft initially provided search and rescue capabilities before replacing earlier Huey variants in the ICBM field security and support role. UH-1Ns also provide administrative lift to US National Capital Region and PACAF officials from JB Andrews and Yokota respectively, and support aircrew survival training at Fairchild. The TH-1H fleet provides Air Force

helicopter pilot training at Fort Rucker. USAF converted all single-engine UH-1H models to TH-1H variants, extending their service lives by at least 20 years. With termination of the earlier Common Vertical Lift Support Program (CVLSP), AFGSC is modifying its UH-1N with NVG-compatible cockpit, upgraded sensors, and safety and sustainment improvements to bridge the gap to a replacement helicopter. Ongoing TH-1H upgrades include FAA-compliant CNS/ATM. USAF awarded Boeing the $2.4 billion UH-1N Replacement Program contract on Sept 24, 2018. Boeing will integrate mission specific systems onto the commercial Leonardo/Agusta-Westland AW-139 to produce up to 84 MH-139s. Operational testing could begin as early as this year. Contract delays pushed initial fielding to 2021 or later.

Contractor: Bell Helicopter, Lockheed Martin (TH-1H prime).
First Flight: April 1969 (UH-1N).
Delivered: September 1970-1974; November 2005-2013 (TH-1H).
IOC: October 1970; circa 2009 (TH-1H).
Production: 28 (TH-1H); 79 (USAF UH-1Ns).
Inventory: 28 (TH-1H); 63 (UH-1N).
Operator: AETC, Air Force District of Washington, AFGSC, AFMC, PACAF.
Aircraft Location: Eglin AFB, Fla.; Fairchild AFB, Wash.; F. E. Warren AFB, Wyo.; Fort Rucker, Ala.; JB Andrews, Md.; Kirtland AFB, N.M.; Malmstrom AFB, Mont.; Minot AFB, N.D.; Yokota AB, Japan.
Active Variants:
- TH-1H. Modified twin-engine version of UH-1H used for flight training.
- UH-1N. Military version of the Bell 212 used for utility support and light lift.

Dimensions: Rotor diameter 48 ft, length 57 ft, height 13 ft. (TH-1H); rotor diameter 48 ft, length 57.1 ft, height 12.8 ft. (UH-1N).
Weight: Max gross 10,500 lb.
Power Plant: TH-1H: one Honeywell T53-L-703 turboshaft, 1,800 shp. UH-1N: two Pratt & Whitney Canada T400-CP-400 turboshafts, 1,290 shp.
Performance: (UH-1N) speed 149 mph, range 300+ miles.
Ceiling: 15,000 ft (10,000 ft with 10,000+ lb).
Armament: (Optional) two General Electric 7.62 mm miniguns or two 40 mm grenade launchers; two seven-tube 2.75-in rocket launchers.
Accommodation: Crew: two pilots, flight engineer; Load: six to 13 passengers (depending on fuel, equipment, and atmospheric conditions) or up to six litters or, without seats, bulky, oversize cargo (N).

TRAINER AIRCRAFT

Photo: A1C Keith Holcomb

T-1 JAYHAWK
Advanced trainer

Brief: The T-1A is a military version of the Beechcraft 400A business jet used in the advanced phase of JSUPT for tanker/transport pilot and CSO training pipelines. The cockpit seats an instructor and two students. Mods include UHF/VHF radios, INS, TACAN, airborne detection finder, increased bird-strike resistance, and an additional fuselage fuel tank. CSO training aircraft also incorporate GPS-driven SAR and simulated RWR, as well as a second student and instructor station. Upgrade efforts are focused on avionics modernization and include new MFD and terrain collision avoidance systems. USAF awarded a $156 million Avionics Modernization Program (AMP) contract to replace the type's obsolescent flight deck with a commercial glass cockpit on April 4, 2018. The service is working to return the last of 39 aircraft severely damaged in a hailstorm at Laughlin to flying status. The fleet's estimated 18,000 flying-hour service life keeps it structurally airworthy to 2032.

Contractor: Beechcraft (airframe), Field Aerospace/Rockwell Collins (AMP).
Operator: AETC.
First Flight: Sept. 22, 1989 (Beechcraft 400A).
Delivered: Jan. 17, 1992-July 1997.
IOC: January 1993.
Production: 180.
Inventory: 178.
Aircraft Location: Columbus AFB, Miss.; Laughlin AFB and JBSA-Randolph, Texas; Vance AFB, Okla.; NAS Pensacola, Fla.
Active Variant:
- T-1A. Military trainer version of Beechcraft 400A.

Dimensions: Span 43.5 ft, length 48.4 ft, height 13.9 ft.
Weight: Max T-O 16,100 lb.
Power Plant: Two Pratt & Whitney Canada JT15D-5B turbofans, each 2,900 lb thrust.
Performance: Speed 538 mph, range 2,555 miles.
Ceiling: 41,000 ft.
Accommodation: Three pilots, two side by side, one to the rear.

Photo: Amn. Shelby Pruitt

T-6 TEXAN II
Primary trainer

Brief: The T-6 is a joint Air Force/Navy undergraduate pilot trainer developed as the Joint Primary Aircraft Training System. The aircraft is based on the Swiss Pilatus PC-9. Mods include a strengthened fuselage, zero/zero ejection seats, upgraded engine, increased fuel capacity, pressurized cockpit, bird-resistant canopy, and digital avionics with sunlight-readable LCDs. The tandem student and instructor positions are interchangeable, including single-pilot operation from either seat. The T-6 is fully aerobatic and features an anti-G system. USAF production completed in 2010, with an expected service life of 21 years. Ongoing mods include airspace compliant avionics, improved canopy fracture system, and updated training aids. FY19 funds development of a crash-survivable flight data recorder and future plans would add controlled flight into terrain avoidance. AETC suspended all T-6 flights in early 2018 following a series of hypoxia-like incidents linked to the aircraft's onboard oxygen generating system (OBOGS). The service is improving maintenance and inspections and seeks to retrofit the fleet with a redesigned system. USAF evaluated the armed AT-6 Wolverine variant during the second phase of its light attack experiment at Holloman in 2018, evaluating rapidly procurable light CAS/ISR systems.

Contractor: Beechcraft/Textron Aviation Defense (formerly Raytheon).
First Flight: July 15, 1998.
Delivered: May 2000-May 2010.
IOC: May 2000.
Production: 452 (USAF); 328 (USN).
Inventory: 444 (USAF).
Operator: AETC, USN.
Aircraft Location: USAF: Columbus AFB, Miss.; Laughlin AFB, JBSA-Randolph, and Sheppard AFB, Texas; Vance AFB, Okla.; NAS Pensacola, Fla.
Active Variants:
- T-6A. Joint service primary training aircraft, based on the Pilatus PC-9.
- T-6B. Navy-only variant.
- AT-6 Wolverine. Experimental light attack/armed reconnaissance variant.

Dimensions: Span 33.5 ft, length 33.4 ft, height 10.7 ft.
Weight: Basic 6,500 lb.
Power Plant: One Pratt & Whitney Canada PT6A-68 turboprop, 1,100 shp.
Performance: Speed 320 mph, range 1,035 miles.
Ceiling: 31,000 ft.
Accommodation: Two pilots, in tandem, on Martin Baker MK16LA zero/zero ejection seats.

Photo: TSgt. Mary Greenwood

T-38 TALON

Advanced trainer

Brief: The T-38 was the first supersonic trainer aircraft and primarily serves AETC's advanced JSUPT fighter/bomber tracks and Introduction to Fighter Fundamentals. The aircraft is used to teach supersonic techniques, aerobatics, formation, night and instrument flying, and cross-country/ low-level navigation. The T-38 is also used by the USAF Test Pilot School to train test pilots and flight-test engineers and by ACC and AFGSC as a companion trainer to maintain pilot proficiency. ACC uses regenerated T-38s as dedicated aggressor aircraft for F-22 training. T-38Bs are equipped with a gunsight and centerline hardpoint for mounting external stores including ECM pod/practice bomb dispensers. Aircraft were redesignated T-38Cs after avionics modernization that added a glass cockpit and HUD, color MFDs, mission computer, integrated INS/GPS, and reshaped air intakes. Sustainment measures include replacement of major engine components to improve reliability and maintainability. Full fleet replacement is not projected until 2034. T-38s were designed for 7,000 flying hours and many have surpassed 20,000 hours. Pacer Classic III is the type's third structural renewal effort and the most intensive in its history. It replaces major longerons, bulkheads/formers, intakes, internal skins, and structural floors on 180 high-risk T-38Cs. The first airframe was redelivered in 2015. Additional upgrades include wing replacement, digital avionics, replacement HUD, VHF nav/comms, airspace compliance, and safety mods. Approximately 50 T-38s will not be modified with ADS-B ahead of FAA's 2020 compliance deadline. USAF is fielding the next generation Boeing T-X aircraft with initial capability in 2024. USAF awarded Boeing/SAAB a $9.2 billion T-X contract to replace the T-38 on Sept. 20, 2018. The service plans to buy between 350 and 475 of the new trainers.

Contractor: Northrop Grumman.
First Flight: April 1959.
Delivered: 1961-72 (T-38A); 2002-07 (T-38C).
IOC: March 1961.
Production: 1,187.
Inventory: 53 (T-38A); six (AT-38B); 442 (T-38C).
Operator: ACC, AETC, AFGSC, AFMC.
Aircraft Location: Beale AFB and Edwards AFB, Calif.; Columbus AFB, Miss.; Holloman AFB, N.M.; JB Langley-Eustis, Va.; JBSA-Randolph and Sheppard AFB, Texas; JB Langley-Eustis, Va.; Vance AFB, Okla.; Whiteman AFB, Mo.
Active Variants:
• T-38A. Upgraded version with Pacer Classic I and II mods.
• AT-38B. Armed weapons training version.
• T-38C. Modernized airframes incorporating glass cockpits and upgraded engines.
Dimensions: Span 25.3 ft, length 46.3 ft, height 12.8 ft.
Weight: Max T-O 12,093 lb.
Power Plant: Two General Electric J85-GE-5 turbojets, each 2,900 lb thrust with afterburning.
Performance: Speed 812 mph, range 1,093 miles.
Ceiling: Above 55,000 ft.
Accommodation: Two pilots, in tandem, on Martin Baker MK16T zero/zero ejection seats.

Photo: Mike Kaplan/USAF

T-53 KADET II

Trainer

Brief: The T-53 is the military designated civilian Cirrus SR20, primarily serving USAFA's Powered Flight Program, conducting some 12,600 annual training and competition-flying hours. The aircraft is dubbed "Kadet" in reference to the Boeing/Stearman PT-17, which was the USAAF's mainstay primary training aircraft during WWII. It is an all-composite monoplane with advanced avionics and safety features that include GPS, Cirrus Airframe Parachute System, integrated fuselage roll-cage, cuffed wing design, and other active and passive safety systems standard on Cirrus aircraft. T-53s are designed for 12,000 flying hours. Upgrades are limited to FAA-mandated airworthiness compliance mods and simulator updates.

Contractor: Cirrus.
Delivered: 2012.
Inventory: 24.
Operator: AETC.
Aircraft Location: USAFA, Colo.
Active Variant: • T-53A. Military designated Cirrus SR20.
Dimensions: Span 38.3 ft, length 26 ft, height 8.9 ft.
Weight: Max T-O 3,050 lb.
Power Plant: One Continental IO-360-ES six-cylinder, fuel-injected, air-cooled engine, 200 hp.
Performance: Speed 178 mph, range 690 miles.
Ceiling: 17,500 ft.
Accommodation: Two, side-by-side, plus three passengers.

Photo: Mike Kaplan/USAF

UV-18 TWIN OTTER

Utility

Brief: The UV-18 is a military variant of the civilian De Havilland DHC-6 Twin Otter. It serves USAFA supporting various parachuting and general utility missions. Special use includes supporting the Air Force Academy parachute team, Wings of Blue. Upgrades are limited to FAA-mandated airworthiness compliance mods.

Contractor: De Havilland Canada.
First Flight: May 1965 (commercial version).
Delivered: 1977 (two); 1982 (one).
IOC: 1977.
Production: Three.
Inventory: Three.
Operator: AETC.

Aircraft Location: USAFA, Colo.
Active Variant:
• UV-18B. Military variant of the DHC-6 Twin Otter.
Dimensions: Span 65 ft, length 51.9 ft, height 18.7 ft.
Weight: Max T-O 12,500 lb.
Power Plant: Two Pratt & Whitney Canada PT6A-27 turboprops, each 620 shp.
Performance: Speed 210 mph, range 806 miles.
Ceiling: 25,000 ft.
Accommodation: Crew: two pilots; Load: up to 20 passengers/parachutists.

FULL-SCALE AERIAL TARGETS

Photo: TSgt. Perry Aston

QF-16 FULL-SCALE AERIAL TARGET

Full-scale aerial target

Brief: QF-16 is a manned/unmanned aerial target and threat simulator serving missile/weapons development, testing, validation, and training. QF-16s began replacing the dwindling and obsolescent QF-4 Full-Scale Aerial Target (FSAT) starting in 2015, through the type's retirement in December 2017. QF-16s are capable of manned or "not under live local operator" (NULLO) control operations. The first of 13 LRIP QF-16s was delivered to Tyndall in early 2015. Boeing is under contract to deliver 121 converted airframes in five production lots through April 2021. FY19 funds procure 48 conversions. ACC declared IOC with 15 operational aircraft in 2016, and ongoing operational testing includes a comprehensive cyber security evaluation. Recent efforts include developing new EA pods and software to more accurately replicate adversary capabilities and tactics, ground control improvements, threat realism improvements, preliminary development of two-seat trainer, and future F-16 block conversions. QF-16 deliveries to hurricane-ravaged Tyndall have continued despite damage to the base, with the 18th FSAT arriving in October 2018.

Contractor: Lockheed Martin (previously General Dynamics), Boeing (drone conversion).
First Flight: May 4, 2012.
Delivered: February 2015-present.
IOC: Sept. 23, 2016.
Production: 126 (planned).
Inventory: 12 (QF-16A); 20 (QF-16C).
Operator: ACC.
Aircraft Location: Tyndall AFB, Fla., Holloman AFB, N.M.
Active Variants:
• QF-16A/B. Converted from retired F-16A/B Block 15.
• QF-16C/D. Converted from retired F-16C/D Block 25 and Block 30.
Dimensions: Span 32.8 ft, length 49.3 ft, height 16.7 ft.
Weight: F-16A: empty (F100-PW-200) 16,285 lb; F-16C: empty (F110-GE-100) 18,238 lb.
Power Plant: Block 15: one Pratt & Whitney F100-PW-200 turbofan, 23,830 lb thrust. Block 25: one Pratt & Whitney F100-PW-220 turbofan, 23,830 lb thrust. Block 30: one General Electric F110-GE-100 turbofan, 28,984 lb thrust.
Performance: Speed Mach 2, ferry range 2,000+ miles.
Ceiling: 50,000 ft.
Defensive Systems: Chaff/flares; EA pods: ALQ-188, ALQ-167.
Accommodation: Safety pilot (optional) on ACES II zero/zero ejection seat.

REMOTELY PILOTED AIRCRAFT

Photo: J. M. Eddins Jr./USAF

MQ-9 REAPER

Attack/armed reconnaissance

Brief: The MQ-9B is a medium- to high-altitude, long-endurance hunter-killer RPA, primarily tasked with eliminating time-critical and high-value targets in permissive environments. The MQ-9 fulfills a secondary tactical ISR role utilizing its Multispectral Targeting System-B (MTS-B). The system integrates EO/IR, color/monochrome daylight TV, image-intensified TV, and a laser designator/illuminator. MTS-B provides FMV as separate video streams or fused together, and the MQ-9 employs SAR for GBU-38 JDAM targeting. Additional roles include CAS, CSAR, precision strike, armed overwatch, target development/designation, and terminal weapon guidance. MQ-9B debuted in combat in Afghanistan in 2007. A Reaper system comprises three aircraft, GCS, LOS/BLOS satellite and terrestrial data links, support equipment/personnel, and crews for deployed 24-hour operations. Development is underway to incorporate automatic takeoff and landing capability, Counter-Improvised Explosive Device (C-IED), Dismount Detection Radar (DDR), Gorgon Stare wide-area surveillance, missile defense, and other sensor upgrades, weapons integration, and reliability enhancements. MQ-9 is retrofitted under a flexible acquisition structure, which can rapidly change to meet demand. Current efforts include the new DAS-4 high-definition EO/IR sensor to improve targeting accuracy, fuselage checks to improve system cooling, bandwidth-efficient data links, enhanced JDAM targeting, and more modular weapons interface software. Long-term fixed programs include Block 5 aircraft/Block 30 GCS, and Extended Range Reaper which entered combat in 2015. Reaper ER adds external fuel tanks, a four-bladed propeller, engine alcohol/water injection, heavyweight landing gear, longer wings and tail surfaces, and other enhancements. USAF plans to upgrade the entire fleet to ER standards, comprising 165 Block 1 and 136 Block 5 aircraft. FY19 funding supports Block 5, Lynx SAR, reliability and maintainability mods, ER kits, and capability upgrades, as well as procuring 29 new-build MQ-9s

Contractor: General Atomics Aeronautical Systems, L3 Technologies, Raytheon.
First Flight: February 2001.
Delivered: November 2003-present.
IOC: October 2007; 2015 (ER).
Production: 346 (planned).
Inventory: 251.
Operator: ACC, AFMC, AFSOC, ANG.
Aircraft Location: Cannon AFB, N.M.; Creech AFB, Nev.; Eglin AFB, Fla.; Ellington Field, Texas; Fort Drum, N.Y.; Fort Huachuca, Ariz.; Hancock Field, N.Y.; Hector Arpt., N.D.; Holloman AFB, N.M.; March ARB, Calif.; Nellis AFB, Nev., and deployed locations worldwide. Planned: Tyndall AFB, Fla.; Whiteman AFB, Mo.
GCS Location: Cannon AFB, N.M.; Creech AFB, Nev.; Battle Creek ANGB, Mich.; Davis-Monthan AFB, Ariz.; Des Moines Arpt., Iowa; Ellington Field, Texas; Ellsworth AFB, S.D.; Fort Smith Arpt., Ark.; Hancock Field, N.Y.; Hector Arpt., N.D.; Holloman AFB, N.M.; Horsham AGS, Pa.; Hurlburt AFB, Fla.; March ARB, Calif.; Springfield-Beckley Arpt., Ohio. Planned: Niagara Falls Arpt., N.Y.; Shaw AFB, S.C.; Tyndall AFB, Fla.; Whiteman AFB, Mo.
Active Variants:
• MQ-9B Reaper Block 1. Air Force version of the General Atomics Predator B.
• MQ-9B Reaper Block 5. Improved, current production Reaper.
• MQ-9B Reaper ER. Extended-range MQ-9 with external fuel tanks, longer wings, and other enhancements.
Dimensions: Span 66 ft, length 36 ft, height 12.5 ft.
Weight: Max T-O 10,500 lb.
Power Plant: One Honeywell TPE331-10GD turboprop, max 900 shp.
Performance: Cruise speed 230 mph, range 1,150 miles, endurance 27 hr;

34 hr (ER).
Ceiling: 50,000 ft.
Armament: Combination of AGM-114 Hellfire, GBU-12/49 Paveway II, and GBU-38 JDAMs.
Accommodation: Offboard GCS: pilot, sensor operator.

Photo: SSgt. Ramon Adelan

RQ-4 GLOBAL HAWK

High-altitude reconnaissance

Brief: The Global Hawk is a long-endurance, high-altitude, "deep look" ISR platform. It complements satellite and manned strategic ISR and is capable of generating imagery ISR, SIGINT, and ground moving target indication (GMTI), depending on variant. The weapon system consists of an aircraft with an integrated sensor suite, launch and recovery element (LRE), mission control element (MCE), and communications and mission planning equipment. The Block 10 debuted in combat in 2001 before delivery of the first production aircraft and was retired in 2011. Block 20 aircraft were initially delivered as an imagery intelligence (Imint) platform incorporating the Enhanced Integrated Sensor Suite (EISS). Five airframes were subsequently converted to EQ-4B communications relay platforms with the Battlefield Airborne Communications Node (BACN), and four remain active. The Block 30 variant is a multi-intelligence platform equipped with EO/IR, SAR, as well as SIGINT sensors and has supported combat operations worldwide. The Block 40 ground surveillance platform is equipped with the Multiplatform Radar Technology Insertion Program (MP-RTIP) sensor suite. It incorporates AESA and SAR to simultaneously gather stationary target imagery as well as detect and track moving ground targets and cruise missiles. Payload integration and mods include upgrading the Block 30's Airborne Signals Intelligence Payload (ASIP), adding more reliable and capable EO camera, enlarging onboard data storage, adding new IP-based comms, and upgraded SATCOM reach-back. A universal payload adapter enables carriage of several U-2-unique sensors including the MS-117 and SYERS II EO sensors, and wet-film Optical Bar Camera. Two Block 30s have been retrofitted with the MS-117 and are slated for an Operational Utility Evaluation in early 2019. A total of six sensor packages will be delivered through 2020 as part of congressionally mandated efforts to reach sensor parity with the U-2. FY19 funds also support Enhanced Weather Capability including weather radar and anti-icing, FAA-mandated airspace compliant Mode 5/ADS-B, increased data storage, and sense and avoid technology. Northrop Grumman retrofitted and redelivered an additional BACN-equipped EQ-4B on July 19, 2018, restoring the fleet to four airframes.

Contractor: Northrop Grumman, Raytheon, L3 Technologies.
First Flight: Feb. 28, 1998.
Delivered: August 2003-present.
IOC: August 2011 (Block 30); August 2016 (Block 40).
Production: 45 (USAF).
Inventory: 34; four (Block 20); 19 (Block 30); 11 (Block 40).
Operator: ACC, AFMC.
Aircraft Location: Beale AFB, Calif. (Block 30); Edwards AFB, Calif.; Grand Forks AFB, N.D. (Block 20/40); forward operating locations: Ali Al Salem AB, Kuwait (EQ-4B); Andersen AFB, Guam; NAS Sigonella, Italy; Yokota AB, Japan.
Active Variants:
• EQ-4B Block 20. Battlefield Airborne Communications Node (BACN) comm relay platform.
• RQ-4B Block 30. Multi-intelligence platform equipped with EO/IR and SAR sensors.
• RQ-4B Block 40. AESA and SAR equipped ground moving target indication (GMTI) and battlefield ISR platform.
Dimensions: Span 130.9 ft, length 47.6 ft, height 15.3 ft.
Weight: Max T-O 32,250 lb; max payload 3,000 lb.
Power Plant: One Rolls-Royce-North American F137-RR-100 turbofan, 7,600 lb thrust.
Performance: Speed 356.5 mph, range 10,000 miles, endurance 32+ hr (24 hr on-station loiter at 1,200 miles).
Ceiling: 60,000 ft.
Accommodation: Offboard one LRE pilot, one MCE pilot, one MCE sensor operator.

Photo: USAF

RQ-170 SENTINEL

Unmanned surveillance and reconnaissance

Brief: RQ-170 is an unmanned, stealthy, penetrating, day/night tactical ISR platform. Although the RQ-170 was still under development and test, USAF employed it in Southwest Asia for Enduring Freedom. The RPA was developed in response to DOD's call for additional RPA support for combatant commanders. USAF publicly acknowledged the aircraft after photos appeared in foreign news media of operations over Afghanistan in 2009. The type is operated by the 432nd Wing at Creech and the 30th Reconnaissance Squadron at Tonopah Test Range. An RQ-170 over Iran crashed and was captured during a mission in 2011. Iran allegedly reverse-engineered a copy of the aircraft, which the Israeli Air Force reported shooting down during an engagement inside Israeli territory on Feb. 10, 2018.

Contractor: Lockheed Martin.
Operator: ACC.
GCS Location: Creech AFB, Nev.; Tonopah Test Range, Nev.
Aircraft Location: Tonopah Test Range, Nev.; deployed worldwide.
Known Active Variant:
• RQ-170. No data available.
Dimensions: Span 65.6 ft, length 14.75 ft.

STRATEGIC WEAPONS

Photo: SSgt. Roidan Carlson

AGM-86 AIR LAUNCHED CRUISE MISSILE (ALCM)

Strategic air-to-surface cruise missile

Brief: The AGM-86 is a low-level, penetrating nuclear or conventional strike weapon for use against strategic surface targets. ALCM's small radar signature and low-level flight capability enhance the missile's effectiveness. The nuclear AGM-86B was the first production version. A total of 1,715 were delivered through 1986. USAF is to cut inventory to 528. The conventional, GPS-guided AGM-86C, called CALCM, was first delivered in 1987, and few remain in the inventory. It was operationally employed for the first time in Desert Storm and widely used in subsequent operations. CALCM is capable of adverse weather, day/night, air-to-surface, accurate, standoff strike capability at ranges greater than 500 miles. Block 1A enhancements offer improved accuracy and increased immunity to electronic jamming. The AGM-86D is CALCM's Block II penetrator version with AUP-3(M) warhead. It provides standoff capability against hardened, deeply buried targets and was successfully used in Afghanistan. ALCM is undergoing a SLEP to stretch its in-service life to 2030 to allow for planned replacement by the Long-Range Standoff (LRSO) missile. USAF awarded

Lockheed Martin and Raytheon technology maturation and risk-reduction contracts for the LRSO in 2017 and plans to field the nuclear missile by the late 2020s, possibly followed by a conventional derivative thereafter.

Contractor: Boeing.
First Flight: June 1979 (full-scale development).
Delivered: 1981-1986.
IOC: December 1982 (B); January 1991 (C); November 2001 (D).
Production: 1,715.
Inventory: 546.
Operator: AFGSC.
Unit Location: Andersen AFB, Guam (conventional only); Barksdale AFB, La.; Minot AFB, N.D.
Active Variants:
- AGM-86B. Nuclear ALCM variant.
- AGM-86C. Conventional CALCM variant.
- AGM-86D. Penetrating CALCM Block II variant.

Dimensions: Span 12 ft, length 20.8 ft, body diameter 2 ft.
Weight: 3,150 lb.
Power Plant: Williams/Teledyne CAE F107-WR-10 turbofan, 600 lb thrust.
Performance: Speed 550 mph (B), high subsonic (C/D); range 1,500+ miles (B), 690 miles (C/D).
Guidance: Inertial plus Terrain Contour Matching (B); inertial plus GPS (C/D).
Warhead: W80-1 nuclear (B), blast/fragmentation conventional (C), hard target penetrating warhead (D).
Estimated Yield: W80-1 warhead: five-150 kilotons (preselectable).
Integration: B-52H.

B61 THERMONUCLEAR BOMB

Air-to-surface thermonuclear bomb

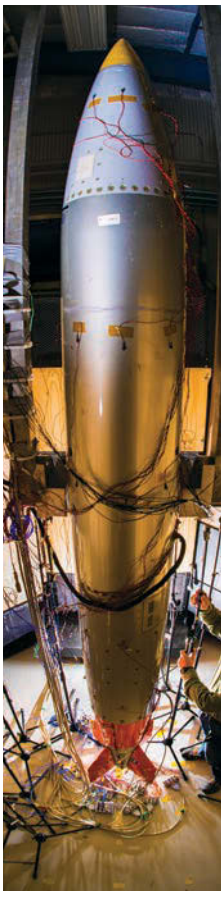

Photo: Randy Montoya/Sandia Labs, DOE

Brief: B61 is an air-dropped battlefield/tactical nuclear weapon. It is the B-2's primary strategic weapon and equips both the F-16 and F-15E in the forward-deployed, allied extended deterrent role. The weapon was first delivered in 1966, and the most recent B61 Mod 11, introduced in 1997, adds a ground-penetrating capability, enhancing its destructive effect to destroy buried and hardened targets. The weapon incorporates several preselectable yield options, tailored to mission requirements. Work is underway on the B61 Mod 12 Life Extension Program (LEP). Production engineering work began in 2016. B61-12 will consolidate the B61-3, -4, -7, and -10 weapons into a single, standardized configuration. USAF and the National Nuclear Security Administration qualification flight testing, completed June 9, 2018, included 31 inert test drops and greatly exceeded required performance. These drops validated nonnuclear components such as arming/fire control, guidance, and spin-rocket motors, and software. B61-12 completed its final design review in September 2018 and was approved for production in October. The LEP upgrades/refurbishes the warhead and aims to improve the safety, security, and reliability of the weapon through 2040. B61-12 also adds a guided tail kit, making it the first precision guided weapon of its type. Improved accuracy will permit higher effectiveness at lower yields. The first production example is scheduled for completion in March 2020. The upgraded weapon is cleared to begin operational testing in mid-2019, and Integration is planned for the B-2, F-15E, F-16, and F-35A.

Contractor: Los Alamos National Laboratory (weapon), Boeing (B61-12 tail kit).
Delivered: 1966.
IOC: 1968.
Production: N/A.
Inventory: Approx 500.
Operator: AFMC, USAFE.
Deployed locations: Aviano AB, Italy; Büchel AB, Germany; Ghedi AB, Italy; Incirlik AB, Turkey; Kleine Brogel AB, Belgium; Volkel AB, Netherlands.
Active Variant:
- B61. Supersonic-droppable free-fall thermonuclear weapon.

Dimensions: Length 11 ft 8 in., diameter 1 ft 1 in.
Weight: 700 lb; 825 lb (B61-12).
Performance: N/A.
Guidance: None (B61 Mod 1 to 11); N/A (B61 Mod 12).
Warhead: One B61 -3, -4, -7, -10, or -11.
Estimated Yield: 0.3 kilotons, 1.5 kilotons, 10 kilotons, 50 kilotons (preselectable).
Integration: B-2A, F-15E, and F-16C/D; NATO: F-16A/B Mid-Life Upgrade (MLU), and Panavia Tornado IDS/GR.4. Planned: B-21, F-35A.

Photo: SSgt. Jonathan Snyder

LGM-30 MINUTEMAN III

Strategic surface-to-surface ballistic missile

Brief: Minuteman is a three-stage solid-propellant nuclear deterrent ICBM housed in a survivable underground silo. Minuteman III became operational in 1970, providing improved range, rapid retargeting, and the capability to place up to three re-entry vehicles on three targets with a high accuracy. It is the sole remaining US land-based ICBM. Ongoing mods include updated warhead fuses, networking, and cryptography upgrades. FY18 began the Launch Control Center Block Upgrade (LCCBU), which replaces key hardware, software, comms, and environmental control systems in the crew capsule, as well as starting new missile site-security and video situational awareness upgrades. Guidance and propulsion upgrades and modernized re-entry vehicles extend service life to 2030. New efforts include developing a replacement to the current, obsolete airborne launch system fielded aboard the Navy's E-6B Mercury aircraft. Launch Control Center AEHF integration is slated for IOC in FY19. AFGSC initially deployed 550 missiles, later reducing that number to 400 based at Malmstrom, Minot, and F.E. Warren. AFGSC completed reducing its deployed ICBMs to a single-warhead configuration in 2014, under limits imposed by the New START agreement. USAF awarded Boeing and Northrop Grumman technology maturation and risk-reduction contracts on Aug. 21, 2017, to begin replacing Minuteman with a future Ground-Based Strategic Deterrent (GBSD).

Contractor: Boeing, General Electric, Lockheed Martin, Northrop Grumman (formerly Orbital ATK)
First Flight: February 1961.
Delivered: 1962-1978.
IOC: December 1962, Malmstrom AFB, Mont.
Production: 1,800.
Inventory: 400.
Operator: AFGSC.
Unit Location: F. E. Warren AFB, Wyo.; Malmstrom AFB, Mont.; Minot AFB, N.D.
Active Variant:
- LGM-30G. Current Minuteman III variant.

Dimensions: Length 59.9 ft, diameter 5.5 ft.
Weight: 79,432 lb.
Propulsion: Stage 1: Orbital ATK refurbished M55 solid-propellant motor, 202,600 lb thrust; stage 2: Orbital ATK refurbished SR19 solid-propellant motor, 60,721 lb thrust; stage 3: Orbital ATK refurbished SR73 solid-propellant motor, 34,400 lb thrust.
Performance: Speed at burnout approx 15,000 mph, range 6,000+ miles.
Guidance: Inertial guidance system.
Re-entry Vehicle: One Mk 21 RV; one to three Mk 12/12A MIRVs.
Warhead: One W87 or up to three W78 enriched uranium thermonuclear weapons.

Photo: Raytheon

ADM-160 MINIATURE AIR LAUNCHED DECOY (MALD)

Aircraft decoy; close-in radar jammer

Brief: MALD is a programmable, low-cost, modular, autonomous flight vehicle that mimics US or allied aircraft to confuse enemy Integrated Air Defense Systems (IADS). MALD-J adds radar jamming capability to the basic decoy platform and can operate alone or in concert with other EW platforms. The jammer version is designed as an expendable, close-in jammer to degrade and deny an early warning or acquisition radar's ability to establish a track on strike aircraft. It also maintains the ability to fulfill the basic decoy mission. F-16 or B-52 are lead employment aircraft for MALD. USAF capped procurement in FY12, converting Lot 4 to the MALD-J variant. Plans call for 3,000, of which 2,400 are the jammer version. USAF demonstrated in-flight retargeting capabilities and is integrating GPS-Aided Inertial Navigation System (GAINS II) to improve navigational accuracy in GPS-denied environments. An upgraded Jammer variant dubbed "MALD-X" successfully demonstrated future, low-level flight capabilities, improved EW payloads, and enhanced data links in 2018. MALD-X aims to establish USAF's future baseline and serve as the basis for a new Navy variant. USAF awarded a MALD-J contract option for Lot 10 production in 2016 and a follow-on Lot 11 contract for 250 weapons in 2018.

Contractor: Raytheon.
First Flight: 1999 (MALD); 2009 (MALD-J).
Delivered: September 2012 (MALD-J).
IOC: 2015 (MALD-J).
Active Variants:
- ADM-160B. MALD base decoy variant.
- ADM-160C. MALD-J jammer/decoy variant.

Dimensions: Span 5.6 ft (extended), length 9.3 ft.
Weight: Less than 300 lb.
Performance: Range up to 575 miles, endurance 90 minutes (50 minutes on-station loiter).
Guidance: GPS/INS.
Integration: B-52H, F-16C.

Photo: USAF

AGM-154 JOINT STANDOFF WEAPON (JSOW)

Guided air-to-surface glide bomb

Brief: JSOW is a joint USAF-Navy family of medium-range, GPS/INS guided, standoff air-to-ground glide weapons. They are used to attack a variety of soft and armored area targets during day and night and adverse weather conditions. The baseline BLU-97 CEM variant is used against soft and area targets. The BLU-108 variant provides anti-armor capability. The AGM-154C incorporates an additional imaging IR seeker and is intended for use against hardened, stationary targets. An F-35C conducted the strike fighter's first drop during integration testing on March 23, 2016. The new AGM-154C-1 variant that adds moving, maritime strike capability to the baseline C variant reached IOC with the Navy in 2016 and will eventually equip the F-35A/C.

Contractor: Raytheon.
First Flight: December 1994.
Delivered: 2000-05 (USAF).
IOC: 2000 (USAF).
Active Variants:
- AGM-154A. Baseline BLU-97 CEM variant for soft/area targets.
- AGM-154B. The BLU-108 submunition variant for anti-armor.
- AGM-154C. Imaging IR guided variant for hardened tactical targets.

Dimensions: length 13.3 ft, diameter 13 in.
Performance: range 13.8 miles low altitude, 73 miles high altitude.
Guidance: GPS/INS.
Warhead: See variants above.
Integration: B-1, B-2, B-52, F-15E, and F-16. Planned: F-35A.

Photo: Lockheed Martin/USAF

AGM-158 JOINT AIR-TO-SURFACE STANDOFF MISSILE (JASSM)

Air-to-surface cruise missile

Brief: JASSM is a joint USAF-Navy autonomous precision cruise missile for use against heavily defended or high-value targets at standoff range. It can attack fixed, relocatable, and moderately hardened/buried targets. The base-variant is a stealthy low-cost airframe equipped with GPS/INS guidance and imaging IR terminal seeker. It is integrated on most fighter and bomber types and is planned for the F-35A. The JASSM-Extended Range (JASSM-ER) version uses same baseline body but a new engine and fuel system that increases range to more than 500 miles. The ER variant was cleared for combat use on the B-1B in 2015. The variant reached full operational capability on the F-15E in 2018, and is planned for use on all fighter/bomber platforms. It is currently undergoing integration on both the F-16C/D and the B-52H (both internal and external-pylon carriage). Full-rate production of the ER began the same year and JASSM production shifted to ER-only in FY16. Total planned production includes 2,034 JASSM and 2,866 JASSM-ER. Lockheed Martin is developing the Long-Range Anti-Ship Missile (LRASM) variant for both the Air Force and Navy. LRASM was successfully tested on the B-1B last year and will be fielded early in 2019. FY19 funds support procurement of 360 JASSM-ER and 12 LRASM.

Contractor: Lockheed Martin, Raytheon, Honeywell.
First Flight: April 8, 1999.
Delivered: Through FY19 (planned).
IOC: September 2003; December 2014 (ER variant); 2018 (LRASM).
Active Variants:
- AGM-158A JASSM. Base-variant.
- AGM-158B JASSM-ER. Extended-range variant.
- AGM-158C LRASM. Long-Range Anti-Ship Missile, based on JASSM.

Dimensions: Length 14 ft.
Power Plant: Teledyne Technologies J402 turbojet (JASSM); Williams Intl. F107-WR-105 turbofan (JASSM-ER).
Performance: Speed subsonic, range 200+ miles (baseline), 500+ miles (ER).
Guidance: GPS/INS and imaging IR terminal seeker.
Warhead: 1,000-lb class penetrator (JASSM); 1,000-lb blast fragmentation (LRASM).
Integration: (JASSM) B-1B, B-2, B-52H, F-15E, and F-16 Block 40-52; planned: F-35A. (JASSM-ER) B-1B, F-15E; planned: B-2A, B-52H, F-16, and F-35A; (LRASM) B-1B.

AIR-TO-AIR MISSILES

Photo: SrA. Omari Bernard

AIM-9 SIDEWINDER

Air-to-air missile

Brief: Sidewinder is an IR-guided short-range, supersonic air-to-air missile. It was developed by the Navy for fleet air defense and adapted for USAF fighters. Early versions were used extensively in the Vietnam War. The AIM-9M is a joint Navy-USAF, all-altitude, all-aspect intercept missile. It has improved defense against IR countermeasures, background discrimination, and reduced-smoke rocket motor. AIM-9X is the newest jointly funded variant. It employs passive IR tracking, jet-vane steering for increased maneuverability, and Joint Helmet-Mounted Cueing System (JHMCS) compatibility for high off-boresight capability. The current production AIM-9X Block 2 was cleared for full-rate production in September 2015, and an F-35A conducted its first live-fire with the weapon in early 2016. Ongoing development includes control actuation, IR counter-countermeasures, improved lock-after-launch, added partial/degraded cue capability, and improved small target acquisition and surface attack capability. AIM-9X production includes 67 converted AIM-9Ms, 1,093 Block 1, and a planned 2,859 Block II (including the newly developed Block II-plus, incorporating enhanced survivability features). FY19 funds procure a combined 256 AIM-9X Block II/II-plus.

Contractor: Raytheon, Northrop Grumman (propulsion).
First Flight: September 1953.
Delivered: AIM-9M 1983; AIM-9X from 2002-2011 (Block I); 2011 to present (Block II); 2017-present (Block II-plus).
IOC: Circa 1983 (9M); 2003 (9X).
Production: 1,093 (Block I); 2,859 (Block II/Block II+) (planned).
Active Variants:
- AIM-9M. Early variant.
- AIM-9M-9. Expanded anti-countermeasure capability variant.
- AIM-9X. Newest, highly maneuverable, JHMCS compatible variant.

Dimensions: Span 2.1 ft, length 9.4 ft, diameter 5 in.
Propulsion: Mk 36 Mod 11 (9M); Orbital ATK Mk 139 solid-propellant rocket motor (9X).
Performance: Speed Mach 2+, range 10+ miles.
Guidance: Passive IR homing guidance.
Warhead: HE annular blast fragmentation.
Integration: F-15C/D/E, F-16C/D, F-22A (AIM-9X). Planned: F-35A.

Photo: A1C Caitlin Russell

AIM-120 ADVANCED MEDIUM-RANGE AIR-TO-AIR MISSILE (AMRAAM)

Air-to-air guided missile

Brief: AMRAAM is an active radar-guided, medium-range, supersonic air-to-air missile. It is a joint USAF-Navy follow-on to the AIM-7 Sparrow with launch-and-maneuver capability. The AIM-120B is an upgraded, reprogrammable variant of the original missile. The AIM-120C incorporates smaller control surfaces for internal carriage on F-22 and F-35 and a high-angle off-boresight (HOBS) launch capability. AIM-120D completed operational testing in 2014 and was fielded in 2015. The latest variant offers improved range, GPS-assisted guidance, updated data links, and jam resistance, in addition to greater lethality. Ongoing upgrades will further enhance weapon performance and electronic protection. The second phase of the AIM-120D System Improvement Program (SIP II) is in operational testing and will be fielded in early 2020. Cybersecurity testing will conclude in mid-2019. FY19 funds support AIM-120D integration on the F-22 and procures 220 AIM-120D missiles.

Contractor: Raytheon, Northrop Grumman, and Nammo Group (propulsion).
First Flight: December 1984.
Delivered: 1988.
IOC: September 1991; July 2015 (120D).
Active Variants:
- AIM-120B. Upgraded, reprogrammable variant of AIM-120A.
- AIM-120C. Production variant optimized for the F-22/F-35.
- AIM-120D. Latest variant with GPS guidance, improved range, lethality, and jam-resistance.

Dimensions: Span 1.7 ft, length 12 ft, diameter 7 in.
Propulsion: Boost-sustain solid-propellant rocket motor.
Performance: Supersonic, range 20+ miles.
Guidance: Active radar terminal/inertial midcourse.
Warhead: HE blast-fragmentation.
Integration: F-15C/D/E, F-16C/D, F-22A; planned: F-35A.

AIR-TO-GROUND WEAPONS

Photo: BAE Systems

ADVANCED PRECISION KILL WEAPON SYSTEM (APKWS)

Air-to-surface guided rocket

Brief: is a low-cost, semi-active laser-guidance system sized to fit the 2.75-in aerial rocket. It is optimized for precision, low-collateral-damage strike against moving or stationary light vehicle and personal targets. Illuminating and white phosphorous rounds are used for target marking by Forward Air Control aircraft. USAF acquired the system as an urgent operational requirement, and it was employed in combat for the first time by an F-16 in June 2016. The weapon employs a mid-body guidance package to convert the standard rocket into a guided weapon. APKWS was already in service with the three other services, and initial weapons were procured from Navy stocks. The rockets are launched from multi-round, reusable pods. FY19 funds procure 7,279 APKWS guidance kits.

Contractor: BAE Systems.
First Flight: May 2013 (USAF).
Delivered: October 2012-present.
IOC: N/A.
Active Variant:
- APKWS. Semi-active laser guided 2.75-in rocket, adapted for fixed-wing use.

Dimensions: Span 9.5 in, length 6.25 ft, diameter 2.75 in.
Propulsion: Solid-propellant rocket motor.
Performance: Subsonic, range 1.2 to 6.8 miles.
Guidance: Semi-active laser.
Warhead: HE, white phosphorous, or illuminating round.
Integration: A-10, F-16 (tests also conducted on AT-6).

Photo: Raytheon

AGM-65 MAVERICK

Air-to-surface guided missile

Brief: Maverick is a TV-, imaging IR-, or laser-guided standoff air-to-surface

missile employed by fighter/attack aircraft against tanks, vehicles, and air defenses. It was first employed during the Vietnam War and was used extensively in Desert Storm and Iraqi Freedom. AGM-65B is a launch-and-leave, EO/TV guided missile, equipped with "scene magnification" TV allowing acquisition of small/distant targets. Fielded in 1986, AGM-65D employs an imaging IR seeker for all-weather day/night use. The AGM-65E is laser guided with a heavyweight penetrator warhead. The AGM-65G fielded in 1989 combines an imaging IR seeker, software to track larger targets, with a heavyweight penetrator warhead, digital autopilot, and a pneumatic actuation system. The AGM-65H is an upgraded B variant that recently completed tracker upgrades. The AGM-65K is a modified G variant, replacing IR guidance with EO TV guidance and is also undergoing a tracker upgrade. The AGM-65L is the newest EO TV/semiactive-laser seeker equipped "Laser Maverick" designed to strike high-speed moving targets. FY19 contingency funds modify 293 legacy missiles to Laser Maverick standards and replenish weapons expended in combat.

Contractor: Raytheon, Northrop Grumman (propulsion).
First Flight: August 1969.
Delivered: August 1972.
IOC: February 1973.
Active Variants:
- AGM-65B. A launch-and-leave EO TV seeker variant.
- AGM-65D. Adverse weather B variant.
- AGM-65E. Laser guided version heavyweight penetrator variant.
- AGM-65G. Imaging IR seeker heavyweight penetrator variant.
- AGM-65H. Upgraded B variant.
- AGM-65K. Modified EO TV seeker G variant.
- AGM-65L. Laser guided EO TV seeker variant for fast moving targets.

Dimensions: Span 2.3 ft, length 8.2 ft, diameter 12 in.
Propulsion: Two-stage solid-propellant rocket motor.
Performance: Supersonic, range 20 miles.
Guidance: EO TV guidance system (B/H/K); Imaging IR seeker (D/G); laser seeker (E).
Warhead: 125-lb cone-shaped (B/D/H); 300-lb delayed-fuse penetrator (E/G/K).
Integration: A-10C, F-15E, F-16C/D.

Photo: Jim Haseltine/USAF

AGM-88 HIGH-SPEED ANTI-RADIATION MISSILE (HARM)

Air-to-surface anti-radiation missile

Brief: HARM is an anti-radiation, air-to-surface missile highly effective against enemy ground radar. AGM-88 is a joint USAF-Navy weapon, carried by SEAD-dedicated F-16CJs. AGM-88B is equipped with erasable and electronically programmable read-only memory, permitting in-field changes to missile memory. The AGM-88C is the current production model with a more lethal warhead. Raytheon began a HARM Control Section Mod (HCSM) in 2013 to convert current models to more precise AGM-88Fs incorporating improved GPS/INS guidance, anti-countermeasure performance, and reduced risk of collateral damage. The Navy is further retrofitting its missiles with advanced networking, digital homing, and terminal millimeter-wave radar seeker, resulting in the AGM-88G Advanced Anti-Radiation Guided Missile (AARGM).

Contractor: Raytheon.
First Flight: April 1979.
Delivered: 1982-98.
IOC: Circa 1984.
Active Variants:
- AGM-88B. Early production variant.
- AGM-88C. Current production variant.
- AGM-88F. Upgraded variant with greater accuracy and precision.

Dimensions: Span 3.7 ft, length 13.7 ft, diameter 10 in.
Propulsion: Thiokol dual-thrust, solid-propellant rocket motor.
Performance: Supersonic, range 30+ miles.
Guidance: Proportional with fixed antenna and seeker head in missile nose.
Warhead: HE fragmentation.
Integration: F-16CJ (Block 50).

Photo: SMSgt. David Lipp/ANG

AGM-114 HELLFIRE

Air-to-surface guided missile

Brief: Hellfire is a low-collateral damage, precision air-to-ground missile with semi-active laser guidance for use against light armor and personnel. Missiles are used on the MQ-9 Reaper. AFSOC dropped previous plans to integrate the weapons onto its AC-130W gunships in favor of the Small Glide Munition. Hellfire is procured through the Army, and numerous variants are utilized based on overseas contingency demands. An MQ-1 Predator successfully fired an AGM-114 for the first time in February 2000. The combo was employed in combat for the first time in Afghanistan on Oct. 7, 2001. USAF is working to integrate the latest AGM-114R, which replaces several types with a single, multitarget weapon, onto the MQ-9. FY19 funds procure 4,338 missiles.

Contractor: Lockheed Martin, Northrop Grumman (propulsion).
First Flight: Feb. 16, 2000 (USAF).
Delivered: March 2016-present.
IOC: N/A.
Active Variant:
- AGM-114. Numerous subvariants, depending on target and mission requirements.

Dimensions: Span 28 in, length 5.33 ft, diameter 17 in.
Propulsion: Solid-propellant rocket motor.
Performance: Subsonic, range 5+ miles.
Guidance: EO TV guidance system (B/H/K); IIR seeker (D/G); laser seeker (E).
Warhead: Shaped charge and blast fragmentation.
Integration: MQ-9.

Photo: Raytheon

AGM-176 GRIFFIN

Air-to-surface guided missile

Brief: Griffin is a light, low-cost, multiservice air-launched weapon with GPS-aided inertial guidance and semi-active laser seeker. The weapon is used for high-precision, low-collateral damage attack against light surface targets. The AGM-176A forms part of the PSP employed on AFSOC's AC-130W Stinger II and AC-130J Ghostrider gunships. Both aircraft employ the aft-firing weapon from ramp-mounted common-launch tubes. The forward-firing AGB-176B is employable on RPAs. USAF issued Raytheon a $105.2 million contract modification to supply additional Griffin missiles on Jan. 31, 2018.

Contractor: Raytheon.
First Flight: Feb. 16, 2000 (USAF).
Delivered: September 2001.
IOC: N/A.
Active Variants:
• AGM-176A. Aft-ejecting missile employed as part of the PSP.
• AGM-176B. Forward-firing variant optimized for light aircraft/RPAs.
Dimensions: Length 43 in, diameter 5.5 in.
Propulsion: Solid-propellant rocket motor.
Performance: Subsonic, range 12 + miles.
Guidance: GPS/INS/semi-active laser.
Warhead: Blast fragmentation.
Integration: AC-130W (A); MQ-9 (B); planned: AC-130J (A).

Illustration: Textron Systems

CBU-105 SENSOR FUZED WEAPON (SFW)

Wide-area munition

Brief: SFW is a tactical area weapon used against massed stationary or moving armor and ground vehicles. The munitions dispenser contains a payload of 10 BLU-108 submunitions, each containing four skeet-shaped copper projectiles totaling 40 lethal, target-seeking projectiles. The skeet's active laser and passive IR sensors can detect a vehicle's shape and IR signature; if no target is detected, the warhead detonates at a preset time. Primary targets are massed tanks, armored personnel carriers, and other self-propelled targets. SFW can be delivered from high altitude and in adverse weather. It debuted in combat in Iraq in 2003. DOD ceased cluster munition procurement in 2007 and has only employed the weapons in combat once since 2003. CBU-105 was the only standard USAF cluster munition that met the less-than-one-percent failure rate previously mandated by DOD for use beyond 2018. DOD has since reversed course, retaining existing weapons for deterrence on the Korean peninsula, but is developing a compliant family of Next Generation Area Attack Weapons (NGAAWs). NGAAW will initially be a 500-lb improved-lethality, anti-personnel/materiel weapon, followed by a second, more potent 2,000-lb high-fragmentation warhead.

Contractor: Textron Systems.
First Flight: Circa 1990.
IOC: 1997.
Active Variants:
• CBU-105. CBU-97 with WCMD tail kit.
Dimensions: Length 7.7 ft, diameter 15 in.
Performance: Delivers 40 lethal projectiles over an area of about 500 ft x 1,200 ft.
Guidance: IR sensors in each warhead.
Integration: A-10C, B-1B, B-52H, F-15E F-16C/D.
Performance: Subsonic, range 5+ miles.
Guidance: EO TV guidance system (B/H/K); IIR seeker (D/G); laser seeker (E).
Warhead: Shaped charge and blast fragmentation.
Integration: MQ-9.

Photo: TSgt. Marvin Lynchard

CBU-107 PASSIVE ATTACK WEAPON

Wide-area munition

Brief: Passive Attack Weapon is a nonexplosive, kinetic penetrating area weapon for use against sensitive targets. The CBU-107's penetrator rods limit collateral damage and do not scatter potentially contaminating debris when used against enemy WMD stockpiles. The weapon glides toward its target after release. Before impact, its inner chamber begins to rotate, and projectiles are ejected in rapid succession by centrifugal force, penetrating targets within a 200-ft radius. The weapon contains various-size, penetrating projectiles but no explosive. Full production was completed in six months. The weapon was used during Iraqi Freedom.

Contractor: General Dynamics (kinetic energy penetrator payload and canister), Lockheed Martin (WCMD), Textron (tactical munition dispenser kit).
First Flight: 2002.
IOC: December 2002.
Active Variant:
• CBU-107A. Centrifugally dispersed, armor-penetrating weapon.
Guidance: Via WCMD.
Dimensions: Length 7.7 ft, diameter 15 in.
Performance: Delivers a high-speed volley of nearly 4,000 metal projectiles in three sizes from a single canister; projectiles: 15-inch rods (350), 7-inch rods (1,000), and small-nail size (2,400).
Integration: B-52, F-15E, F-16C/D.

Photo: SrA. Stormy Archer

GBU-10/12/49 PAVEWAY II

Air-to-surface guided munition

Brief: Paveway II is a laser-guided, free-fall bomb for use against surface targets at short to standoff range. The kit is a folding-wing version of the earlier fixed-wing Paveway I with seeker and reliability improvements. The recent Paveway II Plus adds a modernized, more precise guidance package. GBU-10 is the Paveway II seeker and tail kit mounted on a 2,000-lb general-purpose bomb and primarily used against nonhardened targets. It is, however, capable of penetration. The GBU-12 uses a 500-lb bomb body and is primarily used against stationary armored targets. GBU-49 is also a 500-lb body, but adds GPS guidance for all-weather precision delivery from 2,500 ft up to 40,000 ft. USAF is procuring up to 400 GBU-49 to provide the F-35A an interim moving target capability until its Block 3F software is fully fielded. An F-35 dropped the weapon for the first time in a test at Eglin on Nov. 7, 2018.

Contractor: Lockheed Martin, Raytheon.
First Flight: Early 1970s.
IOC: 1976.
Active Variants:
• GBU-10. Laser/GPS guided 2,000-lb bomb.
• GBU-12. Laser guided 500-lb bomb.
• GBU-16. Laser guided 1,000-lb bomb.
• GBU-49. Laser/GPS guided 500-lb bomb.
Dimensions: Span 5.5 ft, length approx 14.8 ft, diameter 18 in (GBU-10); span 4.4 ft, length 10.8 ft, diameter 11-18 in (GBU-12/49).
Performance: CEP 29.7 ft, range 9.2 miles (GBU-10); CEP 29.7 ft, range about six miles (GBU-12/49).
Guidance: Semi-active laser.
Warhead: Mk 84 bomb 2,000 lb (GBU-10); Mk 82 500-lb blast/fragmentation bomb (GBU-12/49).
Integration: A-10, B-1B, B-52, F-15E, F-16C/D, MQ-9. Planed: F-35A.

Photo: MSgt. Carl Clegg

GBU-24/28 PAVEWAY III

Air-to-surface penetrating glide bomb

Brief: Paveway III is a laser guided free-fall bomb for use against surface targets from medium standoff range. The third-generation laser guided seeker/tail kit package enables greater precision over Paveway II, and its high-lift airframe enables longer glide slopes for greater standoff employment. It can be dropped from low, medium, or high altitude and is effective against a broad range of high-value targets. GBU-24 is fitted to a 2,000-lb bomb body, with a BLU-109 penetrating warhead. GBU-28 variants are large 5,000-lb class air-to-ground penetrators initially developed for use against Iraq's deeply buried, hardened C2 facilities. The GBU-28B adds GPS/INS guidance to the existing laser seeker for all-weather targeting. It entered production in 1999. The GBU-28C adds a more powerful penetrating BLU-122 warhead in addition to the enhanced guidance package. It entered production in 2005 and quantities are purchased as needed to replenish and maintain stockpiles.

Contractor: Raytheon.
First Flight: GBU-24 in service May 1985.
IOC: 1986 (GBU-24); 1991 (GBU-28).
Active Variants:
- GBU-24. Laser guided 2,000-lb penetrating bomb.
- GBU-28B/B. Laser/GPS/INS guided 5,000-lb penetrating bomb.
- GBU-28C/B. Laser/GPS/INS guided 5,000-lb improved penetrating bomb.

Dimensions: Span 6.7 ft, length 14.4 ft, diameter 18 in (GBU-24); length approx 20 ft, diameter 15 in (GBU-28).
Performance: Range more than 11 miles (GBU-24); range more than 5.75 miles (GBU-28).
Guidance: Semi-active laser.
Warhead: BLU-109 2,000-lb bomb (GBU-24); BLU-113 or BLU-122 5,000-lb bombs (GBU-28).
Integration: B-52, F-15E, F-16C/D (GBU-24); B-2A, B-52, F-15E (GBU-28).

Photo: Samuel King Jr./USAF

GBU-31/32/38 JOINT DIRECT ATTACK MUNITION (JDAM)

Air-to-surface guided bomb

Brief: JDAM is a GPS/INS guided, autonomous, all-weather surface attack weapon. The joint USAF-Navy program upgrades the existing inventory of general-purpose bombs by integrating them with a GPS/INS guidance kit to provide accurate all-weather attack from medium/high altitudes. The weapons acquire targeting information from the aircraft's avionics system. After release, an inertial guidance kit directs the weapon, aided by periodic GPS updates. JDAM seeker/tail kits can be mounted on general-purpose or penetrating warheads in each weight class. JDAM can also utilize the 500-lb carbon fiber-cased Very Low Collateral Damage Weapon (VLCDW) for sensitive targets. A JDAM kit is under development for the 5,000-lb BLU-113 penetrating weapon, slated for integration and flight testing on the F-15E. The Advanced 2,000-lb (A2K) BLU-137/B weapon is also being developed for integration onto the F-15E and B-2A. A2K will improve both precision and penetration to strike a wider variety of targets, eventually replacing the BLU-139 bunker buster. JDAM-class weapons are the most frequent air-to-ground munition expended in combat. FY19 continues to maximize production capacity to replenish stocks depleted over Iraq and Syria, procuring 36,000 guidance kits.

Contractor: Boeing, Textron, Honeywell.
First Flight: Oct. 22, 1996.
IOC: 1998.
Active Variants:
- GBU-31. GPS/INS guided 2,000-lb GP, or BLU-109 penetrating weapon.
- GBU-32. GPS/INS guided 1,000-lb GP, or BLU-110 penetrating weapon.
- GBU-38. GPS/INS guided 500-lb GP, or BLU-111 penetrating weapon.

Dimensions: Span 25 in (GBU-31), 19.6 in (GBU-32), 14 in (GBU-38); length (with JDAM and warhead) approx 12 ft (GBU-31), 10 ft (GBU-32), 7.8 ft (GBU-38).
Performance: Range up to 15 miles, CEP with GPS 16.4 ft, CEP with INS only 98 ft.
Guidance: GPS/INS.
Warhead: 2,000-lb Mk 84/BLU-109 (GBU-31); 1,000-lb Mk 83/BLU-110 (GBU-32); 500-lb Mk 82/BLU-111 (GBU-38).
Integration: A-10C, B-52H, B-2A, B-1B, F-15E, F-16, and F-22A. Planned: MQ-9, F-35A.

Photo: MSgt. Lance Cheung

GBU-39 SMALL DIAMETER BOMB I

Guided air-to-surface glide bomb

Brief: SDB is a low-yield, all-weather precision guided munition designed to limit collateral damage and strike targets from up to 46 miles away. Experimentation began in 2001, in response to an ACC requirement for a miniaturized, precision weapon. Boeing was selected to fully develop and produce the weapon in 2003, and low-rate initial production began in 2005. Its size allows it to be carried in fighters' and bombers' internal weapons bays or to increase overall loadout to enable more independent strikes per sortie. SDB I employs an advanced anti-jam GPS/INS, and target coordinates are loaded on the ground or received from the aircraft before release. Several SDBs can be simultaneously released against multiple targets. The weapon was first employed by an F-15E over Iraq in 2006. SDB I is a priority procurement and FY19 funds procure 6,826 weapons to replenish stocks depleted in combat.

Contractor: Boeing.
First Flight: May 23, 2003.
IOC: Oct. 2, 2006.
Production: 24,000 (planned).
Active Variant:
- GBU-39/B SDB I. GPS/INS guided 250-lb low-yield bomb.

Dimensions: Bomb: length 6 ft, width 7.5 in; BRU-61/A carriage (four bombs) length 12 ft, width 16 in, height 16 in.
Performance: Near-precision capability at standoff range up to 46 miles.
Guidance: GPS/INS.
Warhead: 250-lb class penetrating blast fragmentation munition.
Integration: AC-130W, F-15E, F-16, F-22; planned: A-10, AC-130J, B-1, B-52, F-35A, MQ-9.

Photo: Raytheon

GBU-53 STORMBREAKER (SMALL DIAMETER BOMB II)

Guided air-to-surface glide bomb

Brief: StormBreaker (formerly SDB II) is a joint USAF-Navy program to develop as a low-yield, precision guided munition capable of striking moving targets in all-weather from up to 46 miles away. Its size allows it to be carried in fighters' and bombers' internal weapons bays or to increase overall loadout to enable more independent strikes per sortie. Several Stormbreakers can be simultaneously released against multiple targets. SDB II adds a millimeter-wave radar, imaging IR, and semi-active laser packaged into a tri-mode seeker. The bomb is retargetable after release. Improvements include reduced susceptibility to countermeasures and network-enablement through Link 16/UHF data links. LRIP production began in 2015 and USAF awarded LRIP Lot 4 covering 660 weapons in January 2018. SDB II began operational testing in June 2018, with initial integration planned on the F-15E. Follow-on integration is planned for the F-35A. and FY19 funds support production of up to 1,260 SDB IIs.

Contractor: Raytheon.
First Flight: 2012.
IOC: 2019 (planned).
Production: 12,000 (planned).
Active Variant:
▪ GBU-53/B SDB II. Tri-mode guided 250-lb low-yield bomb.
Dimensions: Bomb: length 5.75 ft, wingspan 5.6 ft, diameter 7 in.
Performance: Near-precision capability at standoff range up to 46 miles.
Guidance: Tri-mode seeker millimeter-wave radar, uncooled IIR, and digital semi-active laser.
Warhead: 250-lb class penetrating blast fragmentation munition.
Integration: Planned: A-10, AC-130W/J, B-1, B-2, B-52, F-15E, F-16, F-22, F-35, MQ-9.

Photo: USAF

GBU-43 MASSIVE ORDNANCE AIR BLAST (MOAB) BOMB

Massive guided bomb

Brief: MOAB is the largest satellite-guided, air-delivered weapon ever employed. It is designed for use against large area, or deeply buried targets, or targets in tunnels or caves. The conventional HE bomb is GPS guided, with fins and inertial gyro for pitch and roll. It was developed by the Air Force Research Laboratory Munitions Directorate at Eglin in only nine weeks to be available for the 2003 Iraq campaign. The weapon was designated Massive Ordnance Air Blast (MOAB) but is unofficially known as "Mother of All Bombs." The weapon is designed for deployment from the ramp of an MC-130 without a parachute. A total of 18,700 lb of the weapon's 21,000-lb weight is attributed to BLU-120/B warhead. It was used operationally for the first time in April 2017 against an ISIS-occupied cave complex in Afghanistan.

Contractor: AFRL, Dynetics.
First Flight: March 11, 2003.
IOC: April 2003.
Active Variant:
▪ GBU-43/B. GPS guided 21,000-lb bomb.
Guidance: GPS/INS.
Warhead: BLU-120/B 18,700-lb HE.
Dimensions: Length 30 ft, diameter 3.3 ft.
Integration: MC-130H.

Photo: MSgt. Caycee Watson/ANG

GBU-54 LASER JOINT DIRECT ATTACK MUNITION (LJDAM)

Air-to-surface guided bomb

Brief: LJDAM is a GPS/INS guided, autonomous, all-weather attack weapons for use against fixed and moving targets. It is a joint USAF-Navy development that combines a laser guidance kit with the GPS/INS-based navigation of the existing GBU-38 JDAM. The current LJDAM is a dual-mode 500-lb guided weapon capable of attacking moving targets with precision. It was developed as an urgent operational need, and testing was completed in less than 17 months. It was first delivered in May 2008 and deployed in combat in Iraq three months later. Boeing is also developing GBU-31 and GBU-32 variants.

Contractor: Boeing.
First Flight: 2005.
IOC: 2008.
Active Variant:
▪ GBU-54 Laser JDAM. Laser/GPS/INS guided 500-lb bomb.
Dimensions: Length (with JDAM and warhead) approx 8 ft.
Performance: Range up to 15 miles.
Guidance: GPS/INS with laser.
Warhead: Mk 82 500-lb munition.
Integration: F-15E, F-16.

GBU-57 MASSIVE ORDNANCE PENETRATOR

Massive PGM

Photo: USAF

Brief: MOP is a GPS-guided, earth-penetrating strike weapon for use against hard and deeply buried targets. It was developed and tested through a USAF and Defense Threat Reduction Agency partnership in 2004, and is now managed by AFGSC. Flight testing was conducted from 2008 to 2010, when the program transitioned to USAF. A B-2 successfully test-dropped the GBU-57 in 2014, 2015, and 2016. Several B-2s completed a total of four test drops at White Sands Missile Range, N.M., in 2017 validating the effectiveness of mods made under the Enhanced Threat Response IV upgrade. MOP proved effective, clearing the way for potential early fielding, though the Air Force's recommendation is classified. The service is currently validating requirements to expand the weapon's capabilities further. USAF issued a $20.9 million contract in FY18 to procure an undisclosed number of additional GBU-57 for delivery through July 2020.

Contractor: Boeing.

First Flight: Classified.
IOC: 2011.
Operator: AFGSC.
Active Variant:
• GBU-57B. GPS-guided 30,000-lb penetrating weapon.
Guidance: GPS.
Warhead: 5,740-lb HE.
Dimensions: length 20.5 ft, diameter 31.5 in.
Integration: B-2A (tests also conducted on the B-52).

SATELLITE SYSTEMS

Illustration: USAF

ADVANCED EXTREMELY HIGH FREQUENCY (AEHF) SATELLITE SYSTEM

Communications

Brief: AEHF provides global, secure, protected, and jam-resistant military communications. It is replacing existing Milstar satellites and operates at a much higher capacity and data rate. It offers secure, anti-jam tactical and strategic communications around the world. AEHF uses cross-linked satellites, eliminating the need for ground relay stations. The program is a collaboration with Canada, the Netherlands, and the United Kingdom. Launch of SV-4 was originally slated for Oct. 17, 2017, but an issue with the system's power regulator prompted USAF to delay launch a year to enable a hardware fix. Successful launch of SV-4 on Oct 17, 2018, paves the way for full operational capability. SV-5 is slated for launch June 27, 2019, and SV-6 is planned for launch in 2020.

Contractor: Lockheed Martin, Northrop Grumman.
Operator/Location: AFSPC; Schriever AFB, Colo.
First Launch: August 2010.
IOC: 2015.
Design Life: 14 yr.
Launch Vehicle: Atlas V.
Constellation: Four.
Active Satellites:
• AEHF SV-1. Launched in 2010, on orbit and operational.
• AEHF SV-2. Launched in 2012, on orbit and operational.
• AEHF SV-3. Launched in 2013, on orbit and operational.
• AEHF SV-4. Launched in 2018, on orbit, in testing.
Dimensions: Length 31 ft, width 98 ft (with full solar array extension).
Weight: 13,400 lb.
Performance: 24-hr low, medium, and extended data rate connectivity from 65 north to 65 south latitude worldwide.
Orbit Altitude: Geosynchronous at 22,000+ miles.
Power: Solar arrays generating 20,000 watts.

Illustration: USAF

DEFENSE METEOROLOGICAL SATELLITE PROGRAM (DMSP)

Space and Earth environmental data collection

Brief: DMSP is tasked with environmental data collection for worldwide, military weather forecasting. It provides timely and high-quality weather information to strategic and tactical combat units worldwide. DMSP uses operational linescan sensor to image cloud cover in visible and thermal IR and analyze cloud patterns. It is equipped with microwave imagers and sounders and a suite of space environment sensors that provide critical land, sea, and space environment data. Block 5D-3 improved spacecraft bus and sensors for longer and more capable missions. Six operational DMSP satellites now survey the entire Earth four times a day. The oldest operational satellite, DMSP-13, suffered an apparent electrical short and exploded, creating a cloud of debris in space in 2015. DMSP-19 most recently launched in 2014. The vehicle subsequently suffered a power failure in early 2016, rendering it uncontrollable. Data from the craft remains usable until its orbit decays. Congress canceled the DMSP program before the final spacecraft (DMSP-20) could be launched. DMSP-20 was stored awaiting a launch decision to replace DMSP-19. DMSP-17 ultimately assumed the failed satellite's coverage and DMSP-20 went on permanent display at Los Angeles AFB, Calif. USAF is considering requirements for a follow-on system. The service awarded Ball Aerospace a $255.4 million development contract for the Weather System Follow-On-Microwave (WSF-M) as an eventual replacement for DMSP in November 2018.

Contractor: Lockheed Martin, Northrop Grumman.
Operator/Location: National Oceanic and Atmospheric Administration; NOAA Operations Facility, Suitland, Md.
First Launch: May 23, 1962.
IOC: 1965.
Design Life: Five yr (Block 5D-3).
Launch Vehicle: Delta IV; Atlas V.
Constellation: Five low Earth orbit (LEO).
Active Satellites:
• Block 5D-2. Launched 1982 to 1997; one active (DMSP-14).
• Block 5D-3. Improved spacecraft bus and sensors for longer, more capable missions.
Dimensions: Length 25 ft (with array deployed), width 4 ft.
Weight: 2,545 lb, incl 772-lb sensor; 2,270 lb with 592-lb sensor payload.
Performance: Polar orbits; covers Earth in about 6 hr; primary sensor scans 1,800-mile-wide area.
Orbit Altitude: Approx 527 miles.
Power: Solar arrays generating 1,200-1,300 watts.

Illustration: USAF

DEFENSE SATELLITE COMMUNICATIONS SYSTEM (DSCS)

Communications

Brief: DSCS provides high-priority wartime and strategic SHF communications between high-level leadership and deployed forces and ships worldwide. Satellites enable high-data rate, secure, nuclear-hardened, jam-resistant military comms. In addition to joint service command and control, interagency users include the National Command Authority, White House Communications Agency, and Diplomatic Telecommunications Service. The last of 14 DSCS IIIs launched in 2003. AFSPC inactivated its two oldest DSCS satellites, B-12 in July 2014 and DSCS-10 in June 2015. B-12 exceeded its designed lifespan by 12 years. The final four DSCS satellites received SLEP before launch, providing higher power amplifiers, more sensitive receivers, and increased antenna connection options. The satellites also carry a single channel transponder to disseminate emergency action and force direction messages to nuclear-capable forces. WGS began augmenting DSCS in 2007 and will gradually replace the constellation.

Contractor: Lockheed Martin.
Operator/Location: AFSPC; Schriever AFB, Colo.
First Launch: DSCS II 1971; DSCS III 1982; DSCS III/SLEP 2000.
IOC: Dec. 13, 1978 (DSCS II).

Design Life: 10 yr (III).
Launch Vehicle: Atlas II, NSSL, Space Shuttle Atlantis (two satellites, 1985).
Constellation: Five (III); 14 deployed/six operational.
Active Satellites:
- DSCS III. Current base on orbit variant.
- DSCS III. SLEP. Upgrade configuration of last four satellites launched.

Dimensions: Rectangular body 6 x 6 x 7 ft, 38-ft span with solar arrays deployed.
Weight: 2,580 lb; 2,716 lb (SLEP).
Performance: Employs six independent SHF transponder channels for secure voice and high-rate data communications.
Orbit Altitude: 22,000+ miles in geosynchronous orbit.
Power: Solar arrays generating 1,269 watts, decreasing to 980 watts after 10 yr; 1,500 watts (SLEP).

Illustration: DOD

DEFENSE SUPPORT PROGRAM (DSP)

Strategic and tactical launch detection

Brief: DSP provides ballistic missile early warning and is a key part of North American and theater early warning systems. It is capable of detecting missile launches and nuclear detonations and was initially meant to watch the Soviet military. It was used extensively in the 1991 Gulf War to detect Iraqi theater missile launches against coalition forces and allies in the region. The 23rd and final DSP satellite launched in December 2007. Block 5 is the latest variant and is more survivable than predecessors. It includes a medium wavelength IR sensor for more mission utility and accommodates 6,000 detectors. Nine Block 5 satellites were deployed between 1989 and 2007. Control of the constellation was consolidated to the new Block 10 Mission Control Station at Buckley in early 2016. SBIRS is integrated with DSP, augments its role, and is designed to eventually replace the constellation on orbit.

Contractor: Northrop Grumman (formerly TRW), Aerojet.
Operator/Location: AFSPC; Buckley AFB, Colo.
First Launch: November 1970.
IOC: Circa 1972.
Design Life: Three-year requirement and five-year goal.
Launch Vehicle: Titan IV with inertial upper stage; Delta IV Heavy NSSL.
Constellation: 23 deployed/five operational.
Active Satellites:
- Block 5. Most current on-orbit version.

Dimensions: Diameter 22 ft, height 32.8 ft, with paddles deployed.
Weight: Approx 5,200 lb.
Performance: Uses IR sensors to sense heat from missile and booster plumes against Earth's background.
Orbit Altitude: Geosynchronous at 22,000+ miles.
Power: Solar arrays generating 1,485 watts.

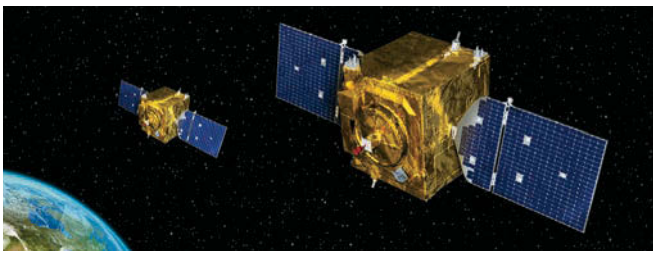

Illustration: USAF

GEOSYNCHRONOUS SPACE SITUATIONAL AWARENESS PROGRAM (GSSAP)

Situational awareness/orbital tracking

Brief: GSSAP supplies space-based tracking and characterization of manmade objects in geosynchronous orbit, aiding safety and enabling avoidance. They are the "neighborhood watch" satellites augmenting the legacy Space Based Space Surveillance (SBSS) system. SBSS tracks and classifies manmade objects in low Earth orbit, and GSSAP extends this coverage to geosynchronous orbit. The satellites themselves operate in near-geosynchronous orbit to effectively monitor objects and aid in preventing collisions in space. GSSAP carries EO/IR sensors and are able to maneuver to observe objects at close range. They can track objects without the weather and atmospheric disruptions that affect ground-based systems. Two GSSAP satellites were launched in 2014 and attained IOC in 2015. Two more replenishment satellites launched Aug. 19, 2016, and became operational Sept. 12, 2017. Construction of a fifth and sixth satellite is underway for launch aboard the AFSPC-8 mission planned for 2020.

Contractor: Orbital ATK.
Operator/Location: AFSPC; Schriever AFB, Colo.
First Launch: July 28, 2014.
IOC: Sept. 29, 2015.
Launch Vehicle: Delta IV.
Constellation: Four spacecraft.
Active Satellites:
- GSSAP 1. Launched in 2014; on orbit, active.
- GSSAP 2. Launched in 2014, on orbit, active.
- GSSAP 3. Launched in 2016, on orbit, active.
- GSSAP 4. Launched in 2016, on orbit, active.

Orbit Altitude: 22,300 miles, above geosynchronous.
Power: Solar panels.

Illustration: DOD

GLOBAL POSITIONING SYSTEM (GPS)

Worldwide navigation, timing, and velocity data

Brief: GPS supplies space-based military and civil radio-positioning for geolocation, navigation, and timing. It is a fundamental enabler of precision bombing, CSAR, mapping, and rendezvous. It provides accurate and uninterrupted 3-D (latitude, longitude, and altitude) position, velocity, and time data. GPS Block IIA first launched in 1990. The Air Force decommissioned the final Block IIA, launched to replace original GPS Block I series in 2016. GPS Block IIR and IIR-M (modernized) included 21 vehicles launched between 2005 and 2009. Modernization upgrades included two new signals, enhanced encryption, anti-jamming capabilities, and a second civil signal. GPS Block IIF is a follow-on to IIR-M. Upgrades include extended design life, faster processors, and improved anti-jam and accuracy, with a new military signal and a second and third dedicated civil signal. The last of 12 GPS IIF satellites launched from Cape Canaveral on Feb. 5, 2016. The next generation GPS Block IIIA, currently in production, is expected to improve accuracy, availability, integrity, and resistance to jamming. The newest satellites will add capabilities including nuclear detonation detection and search and rescue. SpaceX was awarded its first National Security Space contract to launch the second GPS IIIA on its Falcon 9 booster in May 2018. USAF recently contracted Lockheed Martin to build GPS IIIA vehicles nine and 10 for expected launch in 2022. USAF awarded three companies production readiness contracts for vehicle 11 and is looking to competitively award a 22-satellite production contract (with added capability) to a single bidder. A reserve Block IIA satellite launched in 1993 was reactivated on March 3, 2018, to replace an unusable Block IIR satellite launched in 2001. The first GPS III satellite dubbed "Vespucci" successfully launched on Dec. 23, 2018, and is undergoing on-orbit checks. Three additional satellites are slated for launch through 2020. Planned improvements include a steerable, high-power anti-jam capability.

Contractor: Boeing (II, IIA, IIF), Lockheed Martin (IIR, IIR-M, IIIA).
Operator/Location: AFSPC; Schriever AFB, Colo.
First Launch: Feb. 22, 1978.
IOC: Dec. 9, 1993.
Design Life: 7.5 yr (II/IIA); 7.5 yr (IIR/IIR-M); 12 yr (IIF); 15 yr (IIIA).
Launch Vehicle: Delta II, Delta IV, Falcon 9 (planned).
Constellation: 31 spacecraft (not including decommissioned or on-orbit spares).
Active Satellites:
- GPS Block IIA. Launched 1990 to 1997. One reactivated in 2018.
- GPS Block IIR. Launched 1997 to 2004; 11 active.
- GPS Block IIR-M. Launched in 2005 to 2009; seven active.
- GPS Block IIF. Launched in 2010 to 2016; 12 active.
- GPS Block IIIA/IIIF. New generation launched in 2018; one in on-orbit checkout.

Dimensions: (IIR/IIR-M) 5 x 6.3 x 6.25 ft, span incl solar panels 38 ft; (IIF) 9.6 x 6.5 x 12.9 ft, span incl solar panels 43.1 ft.
Weight: On orbit, 2,370 lb (IIR/IIR-M); 3,439 lb (IIF).
Performance: Orbits the Earth every 12 hr, emitting continuous signals, providing time to within one-millionth of a second, velocity within a fraction of a mile per hour, and location to within a few feet.
Orbit Altitude: 10,988 miles.
Power: Solar panels generating 700 watts (II/IIA); 1,136 watts (IIR/IIR-M); up to 2,900 watts (IIF).

Illustration: USAF

MILSTAR SATELLITE COMMUNICATIONS SYSTEM (MILSTAR)

Communications

Brief: Milstar is the joint-service backbone of strategic-tactical DOD communications. It provides encrypted, secure, anti-jam communications around the world and uses cross-linked satellites, eliminating the need for ground relay stations. Block I satellites incorporate a low data rate payload capable of transmitting 75-2,400 bps over 192 EHF channels. Block II satellites carry both the low data rate payload and a medium data rate payload capable of transmitting 4,800 bps to 1.5 Mbps over 32 channels, allowing larger data to be passed more quickly. Interoperable terminals allow third-party land/sea-based units to upload data in real time to cruise missiles or other compatible weapons. Milstar provides continuous coverage between 65 degrees north, and 65 degrees south latitude. The systems utilize multiple-redundant command and control for high survivability. The last of six satellites launched in 2003. AEHF will eventually replace Milstar as DOD's primary satcom and is fully back-compatible with Milstar.

Contractor: Lockheed Martin, Boeing, Northrop Grumman (formerly TRW).
Operator/Location: AFSPC; Schriever AFB, Colo.
First Launch: Feb. 7, 1994.
IOC: July 1997 (Milstar I).
Design Life: 10 yr.
Launch Vehicle: Titan IV/Centaur.
Constellation: Five: two Milstar I; three Milstar II.
Active Satellites:
- Block I. Milstar I satellites launched 1994-95.
- Block II. Milstar II satellites launched 1999-2003.

Dimensions: Length 51 ft, width 116 ft with full solar array extension.
Weight: 10,000 lb.
Performance: Milstar I sats have low data rate (LDR) payload, transmitting 75 to 2,500 bps of data over 192 channels in EHF range; Milstar II sats have both LDR and medium data rate (MDR) payloads, transmitting 4,800 bps to 1.5 Mbps over 32 channels.
Orbit Altitude: Geosynchronous at 22,000+ miles.
Power: Solar arrays generating 8,000 watts.
Orbit Altitude: Geosynchronous at 22,000+ miles.
Power: Solar arrays generating 1,485 watts.

Illustration: Lockheed Martin

SPACE BASED INFRARED SYSTEM (SBIRS)

Space-based surveillance/missile warning

Brief: SBIRS provides advanced space surveillance and missile warning, battlespace characterization, and technical intelligence gathering. It is the follow-on to the Defense Support Program satellite. The system includes IR sensor payloads on host satellites in highly elliptical orbit (HEO), two IR sensors each on dedicated satellites in geosynchronous Earth orbit (GEO), and ground assets. The HEO sensor detects launch of submarine-launched ballistic missiles (SLBMs) from the North Pole region and can be tasked for other IR detection missions. GEO scanning IR sensor performs the strategic missile warning mission, global technical intelligence, and initial phase for the strategic missile defense mission, providing two times the revisit rate and three times the sensitivity of DSP. USAF announced plans to allow civil use of SBIRS data to aid weather prediction, Arctic ice monitoring, and wildfire tracking. GEO-3 launched into orbit Jan. 20, 2017, after delays to validate the performance of its liquid apogee engine. GEO-4 launched on Jan. 19, 2018. GEO-5 and GEO-6 will be based on a modernized spacecraft and will be launched earlier than planned, in 2021 and 2022 respectively. These satellites will replace the oldest two on orbit. USAF canceled the final two GEO satellites and is shifting funds to the Evolved Space Based Infrared Systems (E-SBIRS).

Contractor: Lockheed Martin, Northrop Grumman.
Operator/Location: AFSPC; Buckley AFB, Colo.
First Launch: GEO 1, May 2011.
IOC: HEO 1, Dec. 5, 2008. (Increment 1, Dec. 8, 2001).
Launch Vehicle: Atlas V (GEO). Planned: Delta, Falcon 9.
Constellation: Four GEO sats, three HEO sensors (hosted).
Active Satellites/Payloads:
- SBIRS HEO-1. Payload operational in 2008; active.
- SBIRS HEO-2. Payload operational in 2009; active.
- SBIRS HEO-3. Payload operational in 2015; active.
- SBIRS GEO-1. Launched in 2011; active.
- SBIRS GEO-2. Launched in 2013; active.
- SBIRS GEO-3. Launched in 2017; active.
- SBIRS GEO-4. Launched in 2018; active.

Dimensions: 7 x 6.3 x 19.7 ft (GEO).
Weight: 5,603 lb (GEO on orbit).
Orbit Altitude: Geosynchronous and high elliptical.
Power: Solar array, 2,435 watts (GEO), batteries.

Illustration: Boeing

SPACE BASED SPACE SURVEILLANCE (SBSS)

Orbital surveillance and object identification

Brief: SBSS is designed to track, characterize, measure, and collect optical signatures of Earth-orbiting objects including space vehicles and debris.

The Missile Defense Agency originally launched SBSS as a technology demonstrator to classify and track ballistic missiles in mid-course flight, before handing it over to AFSPC in 2011. SBSS primarily uses a trainable, ground-controlled Space-Based Visible Sensor to track targets without repositioning. Potential high-end and even kinetic space threats from China and Russia have pushed orbital domain awareness to the top of AFSPC's priority list. AFSPC is working to extend SBSS service life and task one of its experimental Operationally Responsive Space satellites to cover a four-year gap in coverage before it can launch a follow-on spacecraft in 2021. ORS-5 launched Aug. 26, 2017, and is equipped with an optical sensor to provide rapid, continuous scanning to detect movement in geosynchronous orbit. SBSS works in concert with an array of networked, ground-based sensors including the Space Fence wide area search and surveillance system under construction on Kwajalein Atoll in the Marshall Islands.

Contractor: Boeing (system integration, ground segment, operations, and sustainment), Ball Aerospace (satellite).
Operator/Location: AFSPC; Schriever AFB, Colo.
First Launch: Sept. 25, 2010.
IOC: Aug. 17, 2012.
Design Life: Seven yr.
Launch Vehicle: Minotaur IV.
Constellation: One LEO satellite; one LEO augmentation satellite.
Active Satellites:
- SBSS Block 10. Launched in 2010; active.
- ORS-5. Experimental satellite launched in 2017 to augment SBSS; active.

Dimensions: Height approx 10 ft; 10 x 3.2 ft, plus solar panels.
Weight: Approx 2,273 lb.
Orbit Altitude: 390 miles, sun-synchronous orbit.
Power: Solar arrays and batteries generating 750 watts.

WIDEBAND GLOBAL SATCOM (WGS) SATELLITE

Communications

Photo: Courtesy

Brief: WGS provides worldwide high-capacity communications for deployed air, land, and sea forces. The system is designed to augment and then replace DSCS X-band frequency service. It also augments the one-way Global Broadcast Service Joint Program Ka-band frequency capabilities and provides a new high-capacity two-way Ka-band frequency service. Block I includes: SV-1 (Pacific region), SV-2 (Middle East), and SV-3 (Europe and Africa). Block II satellites are modified to better support the airborne ISR mission and include: SV-4 (Indian Ocean) and SV-5 and SV-6, purchased by Australia in 2013. The US is partnering with Canada, Denmark, Luxembourg, the Netherlands, and New Zealand on Block II follow-on sats SV-7 to SV-10. USAF recently contracted industry to develop anti-jamming capability for tactical users and is reviewing alternatives to eventually replenish the constellation with three additional satellites or develop a follow-on system. SV-10 successfully launched on March 15, 2019.

Contractor: Boeing.
Operator/Location: AFSPC; Schriever AFB, Colo.
First Launch: October 2007.
IOC: April 16, 2008.
Design Life: 14 yr.
Launch Vehicle: Atlas V, Delta IV.
Constellation: Seven satellites.
Active Satellites:
- SV-1. Block I, launched in 2007; active.
- SV-2. Block I, launched in 2009; active.
- SV-3. Block I, launched in 2009; active.
- SV-4. Block II, launched in 2009; active.
- SV-5. Block II, launched in 2013; active.
- SV-6. Block II, launched in 2013; active.
- SV-7. Block II follow-on, launched in 2015; active.
- SV-8. Block II follow-on, launched in 2016; active.
- SV-9. Block II follow-on, launched in 2017; active.

Dimensions: Based on Boeing 702 Bus.
Weight: 13,000 lb at launch.
Performance: Approx 10 times the capability of a DSCS satellite.
Orbit Altitude: Geosynchronous at 22,000+ miles.
Power: Solar arrays generating 9,934 watts.

Photo: Boeing

X-37B ORBITAL TEST VEHICLE

Orbital test

Brief: X-37B is an unmanned experimental Orbital Test Vehicle (OTV) aimed at developing and maturing a reusable space-launch capability and conducting classified, extended on-orbit missions/experiments. NASA launched the X-37 program in 1999, with the intention of building two demonstrators to validate technologies for both launch/on-orbit flight, and reentry/landing. Only the Approach and Landing Test Vehicle (ALTV) was built before NASA handed over the program to DARPA, which completed ALTV captive-carry/drop testing with the subscale X-40A in 2006. The X-37B is based on NASA's notional OTV and is boosted into low Earth orbit atop a standard Atlas V launch vehicle for long-endurance space missions. The vehicle autonomously re-enters the atmosphere upon command from a ground control station, and it recovers conventionally to the runway. X-37 launches from Cape Canaveral and lands at either Cape Canaveral or Vandenberg. Development includes advanced guidance, navigation and controls, avionics, thermal-resistant materials, propulsion, and autonomous control systems. The program's two test vehicles have successfully completed four orbital missions. The first mission (OTV-1) launched in 2010 and remained on orbit 224 days. The OTV-2 and OTV-3 missions launched in 2011 and 2012, and remained on orbit 468 days and 674 days, respectively. The OTV-4 mission remained aloft for 718 days and made the craft's first landing at Cape Canaveral on March 25, 2017. The OTV-5 mission marked the type's first launch atop a SpaceX Falcon 9 on Sept. 7, 2017.

Contractor: Boeing.
Operator: AFSPC.
First Launch: April 22, 2010.
IOC: N/A.
Launch Vehicle: Atlas V, Falcon 9.
Production: Two.
Inventory: Two.
Operational Location: Cape Canaveral AFS, Fla. (launch/landing); Vandenberg AFB, Calif. (landing).
Active Variant:
- X-37B. DARPA/USAF-developed Orbital Test Vehicles.

Dimensions: Span 14 ft, length 29.25 ft, height 9.5 ft.
Weight: 11,000 lb at launch.
Propulsion: Single liquid-propellant rocket motor.
Endurance: 718+ days on orbit.
Orbit Altitude: Low-Earth Orbit (LEO) at 110-500 miles.
Power: Gallium arsenide solar cells with lithium-ion batteries.

Aaron M. U. Church is a freelance aviation writer and Active Duty officer stationed at Yokota AB, Japan. He is a former *Air Force Magazine* senior editor.

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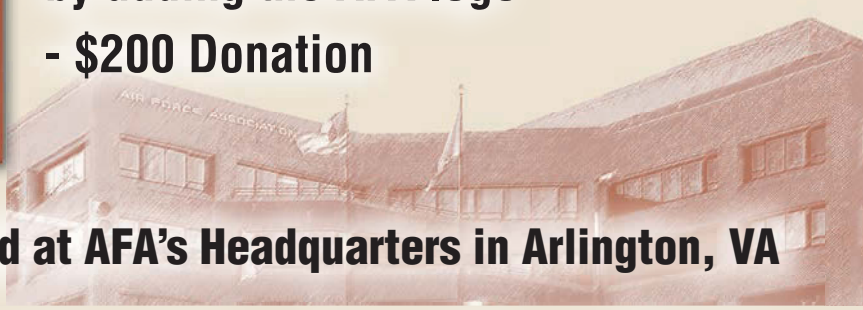

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Team B Tackles the CIA

The Pentagon and Cold War hard-liners did not trust the national intelligence estimates.

Photo: CIA

A Soviet SCARP ICBM (SS-9) in a Red Square parade in Moscow marking the 53rd anniversary of the Bolshevic Revolution on Nov. 7, 1970.

By John T. Correll

As the Cold War built toward its peak in the 1960s and into the 1970s, the US Central Intelligence Agency was remarkably mild in its assessments of the strategic plans and intentions of the Soviet Union.

The CIA's National Intelligence Estimate of Sept. 19, 1962, said the Russians were not likely to introduce missiles into Cuba. That was four days after the first missiles had arrived there.

In October 1964, the NIE said, "We do not believe that the USSR aims at matching the US in numbers of intercontinental delivery vehicles," adding that circumstances appeared "to have ruled out this option."

The Department of Defense, and particularly the Air Force, disagreed with the CIA estimates, believing them to understate both the goals and the capabilities of the USSR.

Between 1965 and 1970, the number of Soviet ICBMs grew from 224 to 1,440, while the size of the US missile fleet remained essentially level. The Soviets also introduced the huge SS-9, twice as large as the US Minuteman and for which the only plausible targets were Minuteman silos.

"We do not believe that the USSR aims at matching the US in numbers of intercontinental delivery vehicles."
—the National Intelligence Estimate of 1964

Concurrently, the NIEs found that it was "highly unlikely" the Soviets would "try for strategic superiority" (1969 estimate); that the Soviets sought only "strategic parity with the US" (1970); and that "the USSR has concluded that the attainment of clear superiority in strategic weapons ... is not now feasible" (1972).

In 1976, Drew Middleton of *The New York Times* pointed out that "the Russians have developed and produced four new ICBMs" while the US was still "talking in conceptual terms" about its proposed new missile, the MX.

Among those alarmed by the direction of the NIEs was the President's Foreign Intelligence Advisory Board. In 1976, the PFIAB—prominent public figures from business, government, and politics—persuaded new President Gerald R. Ford and the new director of Central Intelligence, George H. W. Bush, to order an independent parallel assessment.

Photo: CIA

President Gerald Ford (center) with his new CIA chief George H. W. Bush (r) in 1976. That year, prominent public figures from business and government persuaded Ford to perform an independent analysis of Soviet strategic nuclear objectives.

The most significant part of the effort was analysis of Soviet strategic objectives by "Team B," headed by Harvard professor Richard Pipes. These findings were presented alongside those of the regular CIA analysts, who were designated "Team A."

The Team B report was top secret until 1992, but the gist of it leaked to the press. It said the USSR sought strategic superiority, not parity or defensive deterrence. It further said the CIA was wrong about Soviet intentions and motives, underestimated the Soviet threat, and based its evaluations mainly on assumptions rather than on what the Russians actually did and said.

Critics vehemently attacked the report—which most of them had not seen—as erroneous and harmful. One CIA analyst described Team B as "howling right-wingers" and the *Washington Post* called it a "kangaroo court."

Whatever it was, Team B's arguments so overwhelmed the weak Team A presentation that the CIA revised its position. Pipes called the ensuing NIE "the first realistic assessment of Soviet strategic intentions" presented to the PIAB.

The controversy continued for years. Even after the Cold War ended in 1991, the exchange rolled on with both sides claiming validation from events and developments.

TEAM B ENTERS

The Team B drama played out against the political backdrop of arms control. In the middle 1960s, the United States abandoned its position of strategic superiority, canceled weapons programs, imposed a ceiling on missile and bomber forces, and sought parity with the Soviet Union. In 1969, the objective of détente—the relaxation of tension—was adopted, with the planning principle of "strategic sufficiency."

Credibility of this policy depended on faith that the Russians would respond in the same spirit and with similar objectives. The conviction that they would do so was a staple of the NIEs.

The important thing, in the opinion of the minimizers, was that the US not try to gain strategic superiority. In a widely noted essay, "Apes on a Treadmill," theorist Paul C. Warnke argued that the Russians were engaged in the arms race because they were following the US example. To break the "monkey-see, monkey-do phenomenon," Warnke said, "we can be first off the treadmill."

Even national security adviser Henry Kissinger—who practically invented détente—noted that the CIA analysts "reflected the most liberal school of thought in the government." In 1971, Kissinger warned President Richard M. Nixon of "serious defects" in discussion of Soviet purposes and objectives in the NIE.

The question, as posed by Middleton in *The New York Times,* was "Why are the Russians steadily increasing their combat power during a time of supposed détente in Europe?"

The CIA in 1975 managed to head off a proposal by the PFIAB for an independent assessment parallel to the NIE, but when the suggestion was repeated in 1976, President Ford and CIA Director Bush agreed to it.

"Team B," as it was called, consisted of three groups. There was a panel on air defense and another one on missile accuracy, but the important one was the third group, assigned to examine Soviet strategic objectives. Virtually all subsequent mention of Team B in the news media and elsewhere refers to this group—scholars, former ambassadors, and retired generals with deep experience in Soviet affairs, headed by the formidable Pipes, the foremost US historian of Russia and the Soviet Union.

The group did not have much time to work. Its first meeting was in late August, and its report was due in November. Its charter was specific. As Pipes said later, "No attempt has been made in this report to arrive at anything like a net assessment: US capabilities are not touched upon except to give perspective to certain Soviet programs. The report concentrates on what it is the Russians are striving for, without trying to assess their chances of success."

Photo: White House via National Archives

President Jimmy Carter's national security adviser, Zbigniew Brzezinski (l) and Secretary of Defense Harold Brown (r) meet in the White House in 1977. Brown sounded much like Team B when he said Russia continued to build its arsenal even if the US did not.

ENGAGEMENT

Teams A and B exchanged drafts but did not meet in person until Nov. 5. The Team A chief, a seasoned analyst, entrusted the opening confrontation to a junior staff member. According to Pipes, "The champion of Team A had barely begun his criticism of Team B's effort—delivered in a condescending tone—when a member of Team B fired a question" that stopped him in his tracks.

By all accounts, the CIA analysts were completely outgunned, especially by Pipes and Paul Nitze, whose distinguished government service dated back to World War II. "We were overmatched," a Team A member said. "People like Nitze ate us for lunch."

The two teams presented their findings to the PFIAB on Dec. 2. "I listened with mounting disbelief as Team A advanced an estimate that in all essential points agreed with Team B's position," Pipes said.

That was reflected in the new National Intelligence Estimate on Dec. 21. In his cover letter, Bush said that, "this estimate presents a starker appreciation of Soviet strategic capabilities and objectives" than previous NIEs had done.

This NIE said that the "ultimate goal" of the Soviet Union was "achieving a dominant position over the West, particularly the United States." It acknowledged that "Soviet military doctrine calls for capabilities to fight, survive, and win a nuclear war." It said the Soviets regarded détente "as a framework for nurturing changes favorable to Soviet interest."

Meanwhile, the story was loose in the press. An article by William Beecher in the *Boston Globe* Dec. 17 described the Team B report as "the most devastating indictment ever made of the CIA's Board of Intelligence Estimates." Both sides denied responsibility for the leak.

The *Washington Post* on Dec. 26 quoted "high-ranking officials" of the CIA who said the new national estimate was "more somber than any in more than a decade." Bush, interviewed for the article, declined to discuss the substance of the estimate but he confirmed that a shift in the assessment had occurred as a result of "competitive analysis."

TEAM B'S REPORT

Pipes proposed declassifying the Team B report. The CIA refused. The document was not released until October 1992, when the CIA, without any public announcement, posted a copy in the National Archives.

The principal finding was that the NIEs through 1975 had "substantially misperceived the motivations behind Soviet strategic programs and thereby tended consistently to underestimate their intensity, scope, and implicit threat."

Team B said that "neither nuclear stability nor strategic sufficiency nor 'parity' play any role in Soviet military thinking" and that since the 1960s, "an intensified military effort has been underway designed to provide the Soviet Union with nuclear, as well as conventional, superiority."

Turning to the run of CIA analyses, the report said, "the NIEs either gloss over in silence the question of Soviet strategic objectives or else treat the matter in a perfunctory manner."

The main reason for this was that "drafters of the NIEs have fallen into the habit of injecting into key judgments of the executive summaries assessments based on 'mirror imaging,' i.e., the attribution to Soviet decision-makers of such forms of behavior as might be expected from their US counterparts under analogous circumstances."

In addition, "on some occasions the drafters of the NIE display an evident inclination to minimize the Soviet strategic buildup because of its implications for détente, SAL [Strategic Arms Limitation] negotiations, congressional sentiments, as well as for certain US forces."

Only a small number of persons had seen the report in 1977, but that did not impede comment on it. "The story broke at the very time the Ford administration was about to vacate the White House," Pipes said. "Journalists, and following them, some legislators, hastened to interpret Team B as nothing but a crude political ploy."

The *Washington Post* described Team B as "supposedly experienced professionals" who put undue pressure on Team A. Pipes responded with a letter saying, "You cannot have it

Photo: White House via National Archives

President Ronald Reagan and Soviet Premier Mikhail Gorbachev (seated l to r) met for the first time in Geneva, Switzerland, to hold talks on diplomatic relations and the arms race. Reagan was among those who believed Team B's assessments of the Soviet threat.

both ways: imply that we are incompetent and at the same time blame us for allegedly overwhelming CIA analysts with the weight of our prestige and reputation."

CARTER JUGGLES THE ISSUE

The incoming Carter administration, committed to arms control, was caught by surprise and juggled the issue. Reacting in January 1977 to news of the Team B report, President-elect Jimmy Carter said the United States remained stronger than the USSR—which was not a point the report had addressed.

Paul Warnke, nominated to head the Arms Control and Disarmament Agency, acknowledged in his confirmation hearings that it was "possible" the Russians were seeking strategic superiority, marking some distance from his "Apes on a Treadmill" concept.

Carter and his new CIA Director, Stansfield Turner, abolished the PFIAB in May 1977. (Ronald Reagan reinstated it when he became president.) On Turner's watch, the NIEs reverted to describing the Soviet position as one of "approximate nuclear parity" and mutual deterrence.

In the spring of 1977, the Senate Subcommittee on Collection, Production, and Quality of Intelligence made an investigation of sorts of the Team B affair. The sole source of information was the CIA. Team B's perspective was added to the consideration only after Pipes complained to the subcommittee chairman. The subcommittee declared it would make "no attempt to judge which group's estimates concerning the USSR are correct."

By then, the Soviets were fielding ICBMs with improved capabilities and had begun to deploy the SS-20 intermediate-range missile, which could reach all of the capitals of NATO Europe within five minutes.

Carter's best strategic thinker, Secretary of Defense Harold Brown, sounded much like Team B. "When we build, they build," he said. "When we stop building, they nevertheless continue to build."

Team B's conclusions were taken up and advanced by a group of conservatives called the Committee on the Present Danger. Pipes and Nitze were members, as were Eugene Rostow, Jeane J. Kirkpatrick, George Schultz, and Clare Booth Luce. As *The New York Times* noted, the "best known and most influential" member was presidential candidate Ronald Reagan.

They were joined in their views by the "neocons"—or neoconservatives—former liberals, hawkish on defense, such as editors Norman Podhoretz at *Commentary* and Irving Kristol at *The Public Interest,* as well as Paul Wolfowitz and Richard Perle, disciples of Sen. Henry M. "Scoop" Jackson (D-Wash.).

THE REAGAN REVERSAL

President Reagan, at his first press conference, revoked détente. Responding to a question, he said that "so far, détente's been a one-way street that the Soviet Union has used to pursue its own aims."

For the first time in more than 20 years, it was again US policy to roll back the Soviet advance. National Security Decision Directive 32 said that the basic objective was "to contain and reverse the expansion of Soviet control and military presence throughout the world."

A number of people from the Committee on the Present Danger joined the new administration. Pipes took leave from Harvard to be director of Eastern Europe and Soviet Affairs on the National Security Council.

The end of the Cold War approached with the declaration by Soviet General Secretary Mikhail Gorbachev of glasnost ("openness") reforms in 1985 and perestroika ("restructuring") in 1987. In December 1991, the Soviet Union ceased to exist.

There was (and still is) fundamental disagreement about why this happened. Hard-liners give considerable credit to Reagan-era policies that forced the Soviets into a diversion of resources they could not sustain. The opposite view holds that Reagan had nothing to do with it. The Russians recognized the failure of their flawed system and saw that they would be better off without an arms race.

The weakness of that position, Pipes said, was that it did not account for "the emergence of a Soviet soft-liner in the midst

Critics of Team B pointed to the prediction that the Soviets may have had as many as 500 Tu-22M Backfire bombers by 1984. They only had 235 by that date—but eventually reached an inventory of 497.

Photo: DOD via National Archives

of the most hard line of all American administrations" or why the USSR had "behaved more, rather than less, aggressively during the era of détente. The theory also fails to show why the Politburo chose, in response to Reagan's anti-communism, a man committed to perestroika and disarmament."

CRITICS RESURGENT

Public release of the Team B report in 1992 was followed by renewed determination to discredit it. The two leading voices were Anne Hessing Cahn, an arms control official in the Carter administration, and Raymond L. Garthoff, a former US ambassador to Bulgaria, who wrote NIEs at the CIA between 1957 and 1961.

"For Team B, it wasn't a question of whether the Russians were coming," Cahn said in 1993. "They were here. (And probably working at the CIA!)." According to Cahn, exaggeration of the Soviet menace led to "a trillion-dollar military buildup. As a result, we neglected our schools and cities, our health-care system, our roads and bridges, and parks."

However, in her 1998 book, *Killing Détente,* Cahn admitted that, "during the heyday of détente, American power weakened while that of the Soviet Union grew."

Garthoff, commissioned by the CIA to write a post-Cold War assessment of the Team B affair, said the whole exercise had been "ill-conceived and disappointing" and that "virtually all of Team B's criticisms proved to be wrong."

Similar commentaries carried forward into the 21st century. In 2003, columnist Michael Lind—who bills himself as a former neocon—said "the hysterical Chicken Littles of Team B should have been discredited." In 2014, Lind charged that "Team B's conclusions were wildly off the mark."

Curiously, all of the critics choose the same example to illustrate the irresponsibility of Team B. "When Team B looked at 'hard' data, everywhere it saw the worst case," Cahn said. "It reported, for instance, that the Backfire bomber 'probably will be produced in substantial numbers, with perhaps 500 aircraft off the line by early 1984.' (In fact, the Soviets had 235 in 1984.)" Garthoff, Lind, and others focus on the same accusation in almost the same words.

Apparently, this 265-airplane gap in 1984 was the worst error they could find. To put it in some perspective, the NIE in 1964—which was treated gently by the critics—forecast a Soviet ICBM force of 400 to 700 by 1984, whereas the actual number in 1984 was 1,440. As a historical footnote, Backfire medium-bomber production eventually reached 497, although it took a considerable time to get there.

CLUES FROM THE OTHER SIDE

In 1977, Stephen Rosenfeld of the *Washington Post* joined in the attack on Team B, accusing Pipes of "rank hysteria in scholarly garb" and "worst-case alarmism." Rosenfeld revisited his conclusions in 1995 in an article, "The Hard-Liners Had It Right," which drew on newly released Soviet documents.

"The archives of the former Soviet Union are opening" and "making necessary a rethinking on the part of those who turn out to have had it wrong before," Rosenfeld said. The documents "pretty much confirm the approach long attributed to the political and academic right."

In *Memoirs,* published in 1995, Gorbachev said, "the arms race continued, gaining momentum even after achieving military and strategic parity with the United States of America." He added to this in another volume, *On My Country and the World,* in 2000.

In some years, Gorbachev said, Soviet military expenditures "reached 25 to 30 percent of our gross national product—that is, five or six times greater than analogous spending in the United States and the European NATO countries."

Directly addressing the main proposition from Team B, Gorbachev said that the Soviet military objective had been "military supremacy relative to any possible opponent." ✪

John T. Correll *was editor in chief of* Air Force Magazine *for 18 years and is a frequent contributor. His most recent article, "POTUS Flies," appeared in the May issue.*

AFA EMERGING LEADERS

By Rachel Cox

Mitzi J. Morrison

Home State: Texas
Chapter: Donnelly Chapter (Texas)
Joined AFA: 2016
AFA Awards: Chapter Teacher of the Year, Medal of Freedom, AFA Medal of Merit
Occupation: Director and Founder of Graham Robotics Academy
Education: B.S., Business, West Texas A&M University

Courtesy photo

Mitzi Morrison in front of a STEM display.

How did you first hear of AFA?
Texas State AFA President Mike Winslow invited me to join and become involved in the organization.

Why did you join AFA?
I joined because AFA supports Science, Technology, Engineering, and Math education programs like the Robotics Academy. As an educator, I need support in funding, advice, and information on the latest trends in STEM. An alliance between airmen and educators is very beneficial to my program, and Mike Winslow's support of the program through advising and teaching classes motivates my students to choose STEM careers. Additionally, I have two sons-in-law in the Air Force. My youngest daughter, Kristen, is married to SSgt. Mathew R. Beaton, stationed at JB Andrews, Md. My oldest daughter, Danielle, is married to Capt. Sean T. Conrad, stationed at Hurlburt Field, Fla.

What do you enjoy most about your AFA membership?
I am grateful to work with the men and women who serve in the organization. I have met so many incredible people that have inspired me. They have insights that kindle a creative spirit in me. Being connected to AFA through the relationships that have come my way has proven that serving others leads to success.

What is your favorite AFA program, event, or project?
The demand for cybersecurity is growing every year, and the national program that best addresses that need is CyberPatriot. This program creates paths to STEM careers by teaching a security mindset, software coding, and effective communication skills. These qualities lead to the next generation of cyber-skilled experts.

How has AFA helped you?
As an educator, AFA has provided me with advisers, mentors, and curriculum resources, including STEM kits that teach aerospace concepts. People who work in the aerospace industry are on the frontiers of technology advances. Their approach to research and development teaches how to work in the present—but think in the future.

How do we build awareness about AFA?
What should we pay attention to and how should we teach the next generation? The key is to "show me, teach me, lead me," which is the central way to transform the coming generation. AFA needs to introduce space science curriculum at the elementary levels designed to give students essential skills in the shortest possible time and highest rate of retention. This would reinforce that AFA is the leading influence developing technical knowledge in the space age.

Robin L. Thompson

Home State: Virginia
Chapter: Roanoke Chapter (Va.)
Joined AFA: 1984
AFA Awards: State President's Award, Chapter Member of the Year 2009 and 2018
Military Service: 6 years, Active Duty
Occupation: Owner, Virginia Outpost, LLC
Education: B.A., Criminology, University of Minnesota; M.S., Criminal Justice, Minot State University; D.M., Organizational Leadership, University of Phoenix

Courtesy photo

Robin Thompson speaking at an AFA event.

How did you first hear about AFA?
I heard about AFA back in Air Force ROTC.

Why did you join AFA?
I initially joined AFA as a member of Arnold Air Society and because it was the thing to do on Active Duty.

What do you enjoy most about your AFA membership?
I have two favorite things about AFA membership. I value the opportunities to continue furthering the Air Force mission, as well as the camaraderie of the people in AFA.

What is your favorite AFA program, event, or project?
I am currently developing a drone competition in my chapter area, and I would love to build and expand it to the caliber of CyberPatriot and StellarXplorers.

How has AFA helped you?
AFA continues to give me leadership opportunities so I can help other people hone their own leadership abilities.

How do we build awareness about AFA?
We can spread awareness of AFA through word of mouth. We gain a lot by being motivated and excited members ourselves and sharing our excitement with others.

AFA began an Emerging Leaders Program in 2013 as an avenue to secure AFA's future. The purpose of the program is to identify, motivate, develop, and encourage emerging leaders to serve actively in AFA by providing hands-on experience and unique insights into how AFA operates and is governed. Emerging Leaders volunteer for a year. With guidance from a mentor, they participate on a national-level council, attend national leader orientations, and serve as National Convention delegates.

Talking Points: Advocacy-At-A-Glance

Mark Tarpley leader of AFA's Field Council Advocacy Committee.

Air Force Association members have a new tool to help them share current issues and advocate for airpower: A series of issue-by-issue communications cards that capture the key details of AFA positions.

AFA's Field Council Advocacy Subcommittee is led by AFA National Director Mark L. Tarpley, chairman of the Advocacy Integrated Product Team. "AFA members told us in a survey last year that advocacy was their No. 1 issue," Tarpley said. "These Elevator Speech Cards can really help. They'll provide short and targeted talking points the AFA Field can use in discussions with elected officials, their staffs, and other community influencers."

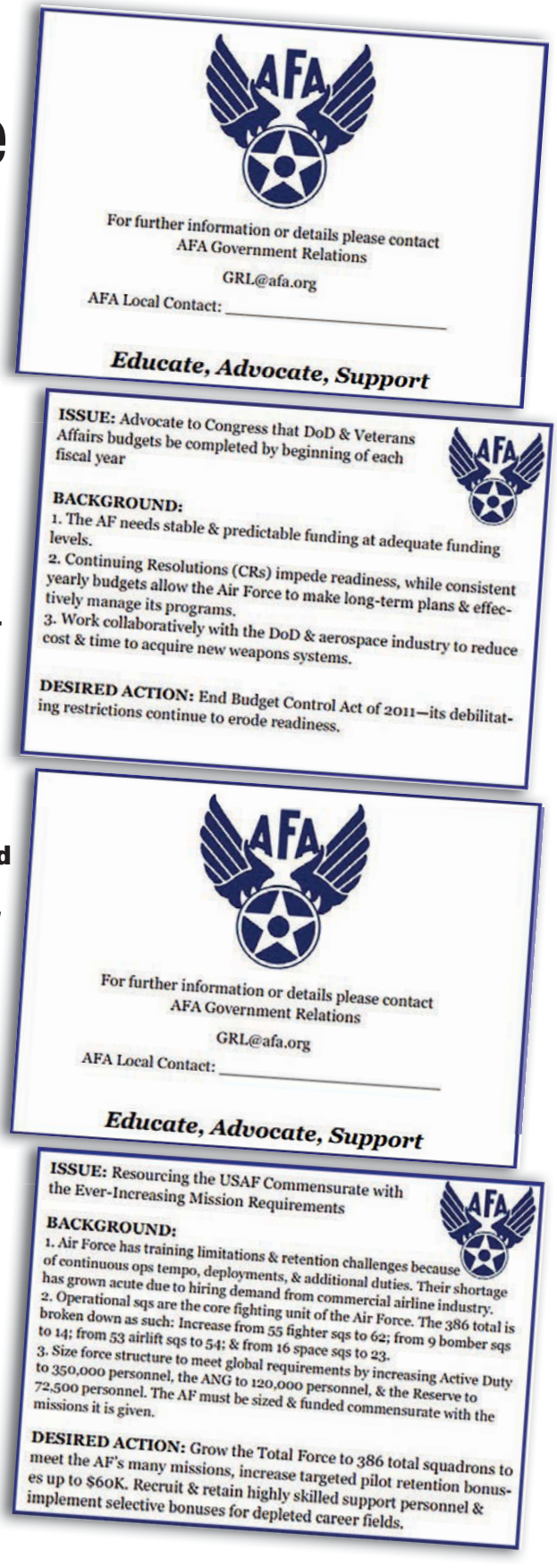
Advocacy IPT team members Gabrielle Kearney and Mary Anne Thompson are the principal authors who did the real work to develop these cards. Chair of AFA Field Council's Advocacy Subcommittee, Randy Witt, was the first to use them.

The cards capture AFA's Top Issues as outlined by AFA Senior Director of Government Relations Keith Zuegel, the same document that guides his advocacy efforts on Capitol Hill.

"This is a great way to get familiar with the issues," Zuegel said. "With these, you can confidently discuss these concerns when you have the chance, and even leave them behind as useful talking points to whoever you're talking with."

Zuegel said AFA's top advocacy goal is ensuring the Air Force receives stable and predictable funding. That's important not just for new airplanes and equipment, but also for the programs that directly support airmen and their families—pay, bonuses, retirement, Tricare, housing, and more. "Constant reinforcement is needed to keep top AFA issues front of mind for elected officials to drive home the importance of these priorities," Zuegel said. Download your Advocacy Cards today at www.afa.org/advocacy-cards.

"The principal authors who did the real work to develop these were Gabrielle Kearney and Mary Anne Thompson."
—Mark Tarpley



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1/Gen. Wilbur Creech. 2/An MQ-9 Reaper over Creech Air Force Base, Nev. 3/Creech as an early member of the Thunderbirds.

CREECH

The Savior

The man whose name graces Creech AFB, Nev., was described upon his death in 2003 as "a leader, visionary, warrior, and mentor."

Gen. W. L. Creech was so described by Gen. John P. Jumper, Air Force Chief of Staff, who flatly declared that Creech "transformed the way the Air Force conducts warfare."

Creech had a glittering career—280 combat missions, 22 decorations for valor, 524 flights in the Thunderbird and Skyblazer demo teams, and twice a wing commander in Cold War Europe.

Yet his greatest triumph was transforming Tactical Air Command from post-Vietnam basket case into the sword of Desert Storm.

Wilbur Lyman Creech—he went by "Bill"—came out of high school in 1944 and enlisted in the US Army. In 1948, he entered the aviation cadet program and received his wings in 1949.

Young Creech flew 103 F-80 combat missions in the Korean War. His second war was in Southeast Asia in the late 1960s; there, he flew 177 F-100 combat missions.

Wherever he went, Creech won plaudits—as flight training commander, aerial demonstration leader, foreign air force adviser, Fighter Weapons School leader, and more.

He was determined. He worked for 16 years toward his college degree, graduating from the University of Maryland in 1960 at age 33.

It was his time leading Tactical Air Command—May 1978 through September 1984—that was truly momentous.

In the austere post-Vietnam years, TAC was languishing. Poorly maintained fighters were rated combat-unready. TAC's pilots got few flight hours. The aircraft accident rate was high. Pilots and technicians were leaving the force in huge numbers.

Photos: USAF; SrA. Cory Payne; Courtesy

Creech brought a new theory, decentralization, and a new management policy—combining operators, maintainers, and suppliers into squadron-level teams. The goal: Empower smaller units to make decisions about how to best get the job done.

It worked. By the time Creech left TAC, readiness rates for aircraft were up, and the accident rate was down. TAC pilots were flying sufficient hours. Retention soared. Creech also lifted TAC by:

■ Shepherding into the force F-15, F-16, F-15E, and F-117 fighters, as well as the AMRAAM and LANTIRN night-targeting system.

■ Introducing new tactics, such as defeating air defenses with radar jamming, standoff missiles, and stealth.

■ Developing new leaders. Gen. Ronald R. Fogleman, a former CSAF, said, "Creech educated the next two generations of four-stars."

Just before Desert Storm, then-CSAF Gen. Merrill A. McPeak wrote to Creech: "We need to recognize that we are beholden to you, because you really built this magnificent Air Force we have today."

In 2005, the Air Force renamed Indian Springs AF Auxiliary Field, Nev., to honor the late general. Creech Air Force Base is home to the 432nd Wing and 432nd Air Expeditionary Wing, an MQ-9 Reaper outfit. It is the command and control center for UAV missions worldwide. ✪

WILBUR LYMAN CREECH

Born: March 30, 1927, Argyle, Mo.
Died: Aug. 26, 2003, Henderson, Nev.
College: University of Maryland, College Park, Md. (B.S. 1960)
Occupation: US military officer
Service: US Army (1944-47); US Air Force (1947-85)
Era: Postwar
Years of Service: 1944-85
Combat Zones: Korean War, Vietnam War
Final Grade: General
Honors: Distinguished Service Medal (2); Silver Star, Legion of Merit (3); Distinguished Flying Cross (4); Air Medal (15); Air Force Commendation Medal (3); Army Commendation Medal; Presidential Unit Citation; Air Force Outstanding Unit Award (2); American Campaign Medal; World War II Victory Medal; Army of Occupation Medal; National Defense Service Medal (2); Korean Service Medal (10); Armed Forces Expeditionary Medal; Vietnam Service Medal (4); ROK Presidential Unit Citation; United Nations Korea Medal; RVN Campaign Medal; Vietnam Air Service Medal; Grand Cross of Aeronautical Merit (Spain); Korean Order of National Security Merit

CREECH AIR FORCE BASE

State: Nevada
Nearest City: Indian Springs
Area: 3.6 sq mi / 2,300 acres
Status: Open, operational
Opened as Indian Springs Airport: March 1942
Renamed Indian Springs Army Airfield: February 1943
Inactivated: January 1947
Reactivated as Indian Springs AFB: January 1949
Renamed Indian Springs Air Force Auxiliary Field: April 13, 1964
Renamed Creech AFB: June 20, 2005
Current owner: Air Combat Command
Former owners: USAAF Training Command (1942), Air Training Command (1948), Air Research and Development Command (1952), Tactical Air Command (1961), Air Combat Command (1992)

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