U.S. Air Force

The U.S. Air Force (USAF) is the youngest of the four branches of the U.S. military, having been born out of the Army Signal Corps to become its own service in 1947. The USAF's mission set has expanded significantly over the years, and this is reflected in the organizational changes in its structure. Initially, Air Force operations were divided among four major components—Strategic Air Command, Tactical Air Command, Air Defense Command, and Military Air Transport Service—that collectively reflected the "fly, fight, and win" nature of the service. Space's rise to prominence began in the early 1950s, and with it came a host of faculties that would help to expand the impact (and mission set) of this service.

Today, the Air Force focuses on five principal missions:

- Air and space superiority;
- Intelligence, surveillance, and reconnaissance (ISR);
- Mobility and lift;
- Global strike; and
- Command and control (C2).

These missions, while all necessary, put an even greater squeeze on the resources available to the Air Force in an incredibly strained and competitive fiscal environment. Using the 2012 Defense Strategic Guidance (DSG) as its framework for determining investment priorities and posture, the Air Force intentionally traded size for quality by aiming to be a "smaller, but superb, force that maintains the agility, flexibility, and readiness to engage a full range of contingencies and threats."[1]

There can be no doubt that the Air Force has become smaller. Testifying before the Senate Armed Services Committee in 2017, Secretary of the Air Force Heather Wilson and Air Force Chief of Staff General David Goldfein stated flatly that the Air Force "is too small for the missions demanded of it." Even with its reduced size, the funding available through fiscal year (FY) 2017 did not allow the service to acquire enough aircraft to reverse the downward spiral of aircraft availability or the level of flying time that pilots need to sustain more than a marginal level of readiness.[2] Appearing before the same committee in 2018, Secretary Wilson and General Goldfein testified that "[t]he projected mismatch between demand and available resources has widened."[3]

Sequestration has forced General Goldfein to make strategic trades in capability, capacity, and readiness to meet the current operational demands of the war on terrorism and prepare for the future. Budgetary uncertainty over the five years of sequestration has had many detrimental effects on the USAF's ability to sustain the war on terrorism, remain ready for a full-spectrum war, and modernize its aging fleet of aircraft. Presidential budgets during the sequestration years of the Obama Administration always proved aspirational, and those trades among capability, capacity, and readiness failed to keep pace with the demands placed on the service. When funding did arrive, it was through continuing resolutions well into

the year of execution, which prevented any real form of strategic planning.[4]

The Obama Administration's FY 2017 budget would have continued that decline if Congress had not delivered a $5.6 billion topline increase through a request for additional appropriations that was approved in the spring of 2018. The additional appropriations allowed the Air Force to bring on an additional 4,000 active-duty personnel and fully fund its flying hour program, arresting the decline in people, equipment, and training.[5] The President's budget will increase the Air Force topline from $132.2 billion in FY 2017 to $146.3 billion in FY 2018 and $156.2 in FY 2019. Used prudently, these funding levels will enable the Air Force to reverse downward trends in capacity, capability, and readiness, all three of which are under stress.

Capacity

The tradeoff in capacity has seen near-term reductions in lift, command and control, and fourth-generation fighter aircraft to ensure that the Air Force's top three modernization programs—the F-35A, Long-Range Strike Bomber (LRS-B), and KC-46A—are preserved.[6] Unlike some of the other services, the Air Force did not expand in numbers during the post-9/11 buildup. Rather, it got smaller as programmed retirement dates for older aircraft were not offset by programmed retirements. Successive delays in F-35 and KC-46 development have carried over into production, leaving both fighter and tanker fleets short of the ready numbers required to train for and execute their respective missions.

Air Force capacity in terms of the number of aircraft had been on a constant downward slope since 1952.[7] The President's budget for FY 2018 had projected a decrease from 5,517 aircraft in 2017 to 5,416 in 2018,[8] but over the course of the year, the inventory slipped to 5,373. The President's budget for FY 2019 ends the slide and adds 53 aircraft to the roster for a projected total of 5,426 at the end of FY 2019.[9] Totals for specific platforms can be found in Table 7.

Adversaries are modernizing and innovating faster than the Air Force is, jeopardizing America's technological advantage in air and space. Before 1991, the Air Force bought approximately 510 aircraft per year. Over the past 20 years, it has acquired an average of only 96 new aircraft per year. Today, the average age of our aircraft is over 28 years, yet the Air Force—even with the budget increases for FY 2018 and FY 2019—has no plans to raise the acquisition rates for the F-35 or KC-46 to buy down that average.[10] The decades-long trend of steadily declining aircraft numbers, coupled with the fleet's ever-growing average age, may be lulling senior leaders into the belief that the service can be fixed sometime in the future, but the numbers tell a different story.

The combination of downsizing following the end of the Cold War and Budget Control Act of 2011 (BCA) spending caps has caused the Air Force to shrink from 70 combat-coded[11] active-duty fighter squadrons during Desert Storm[12] to just 55 across the whole of the active-duty, guard, and reserve force today. Only 32 of those squadrons are part of the active-duty Air Force.[13]

For the purpose of assessing capacity and readiness, this *Index* refers to combat-coded aircraft and units maintained within the Active component of the U.S. Air Force. "Combat-coded" aircraft and related squadrons are aircraft and units assigned a wartime mission. The numbers exclude units and aircraft assigned to training, operational test and evaluation, and other missions. The software and munitions carriage/delivery capability of aircraft in these units renders them incompatible with or less survivable than combat-coded versions of the same aircraft. For example, all F-35As may appear to be ready for combat, but training wings and test and evaluation jets have hardware and software limitations that would severely limit their utility in combat. While those jets may be slated for upgrades, hardware updates sideline jets for several months to manifest, and training wings and certain test organizations will be the last to receive those upgrades.

TABLE 7

Total Active-Duty Aircraft Inventory

	2016	2017	2018	End 2019 Total
A-10	143	143	143	143
AC-130J	29	28	35	41
B-1	61	62	62	62
B-2	20	20	20	20
B-52	58	58	58	58
C-130H	13	4	3	0
C-130J	85	94	104	105
C-5	36	33	36	36
C-12	28	28	28	28
C-17	170	147	154	146
C-20	5	0	—	0
C-21	17	17	19	19
C-32	4	4	4	4
C-37	12	12	12	12
C-40	4	4	4	4
CV-22	49	50	50	50
E-3	31	31	31	31
E-4	4	4	4	4
E-9	2	2	2	2
E-11A	—	—	4	4
EC-130H	14	14	14	13
F-15	317	313	316	316
F-16	570	570	557	548
F-22	165	166	166	166
F-35	102	123	161	212
HC-130J	19	19	19	23
HC-130N	2	2	0	0
HH-60	78	86	82	89
KC-10	59	59	59	53*
KC-135	156	155	147	146*
KC-46	11	16	28	34*
MC-130H	13	16	16	15
MC-130J	35	37	37	41
MQ-9	228	225	220	228
NC-135	1	1	1	1
OC-135	2	2	2	2
RC-135	22	22	22	22
RQ-4	7	33	36	36
T-1	178	178	178	178
T-6	445	445	444	444
T-38	506	505	504	504
T-41	4	4	3	3
T-51	3	3	3	3
T-53	25	24	24	24
TC-135	3	3	3	3
TG-15	5	5	5	5
TG-16	19	19	19	19
TH-1	28	28	28	28
TU-2	5	5	5	4
U-2	27	27	27	26
UH-1	68	68	68	68
UV-18B	3	3	3	3
VC-25	2	2	2	2
WC-135	2	2	2	2

* FY 2019 total numbers are contingent upon acquisition of six KC-46 aircraft.
SOURCE: Headquarters U.S. Air Force response to query by The Heritage Foundation.

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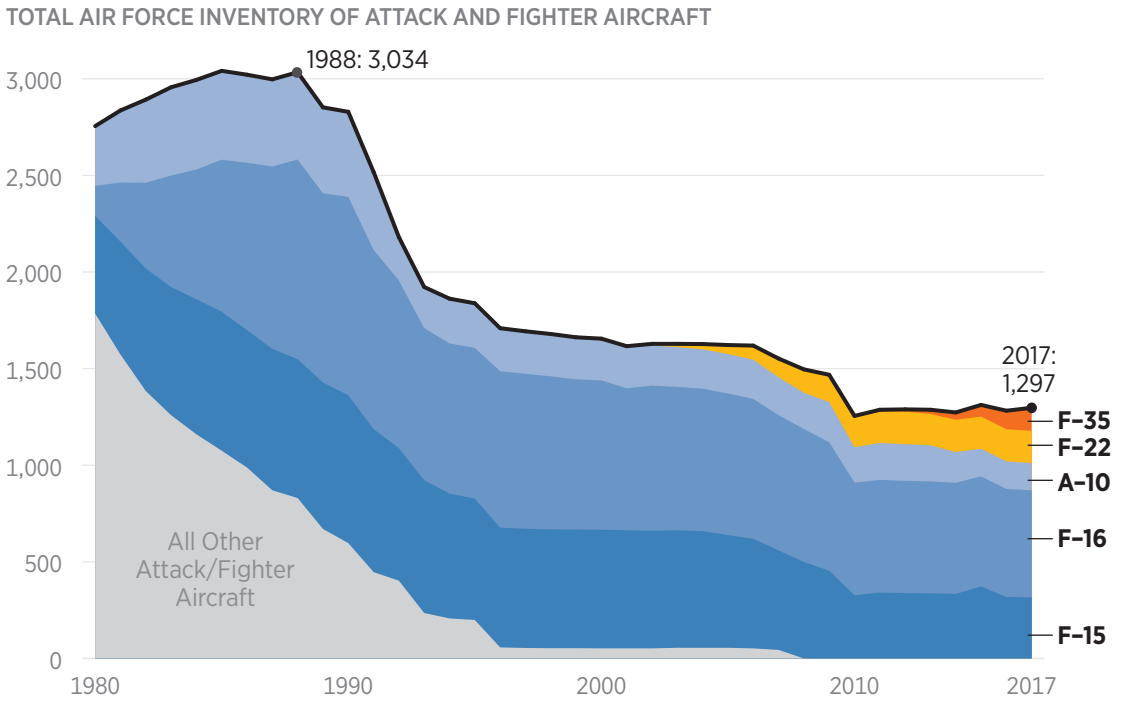
CHART 14

Air Force Attack and Fighter Aircraft

Total aircraft inventory (including training and replacement aircraft) has declined by 57 percent over 30 years. Although two new aircraft have been added to the inventory in the past two decades, their procurement rates have barely offset the retirement of legacy systems.



NOTE: These figures differ slightly from figures found elsewhere in this *Index*. The *Index* only assesses combat-coded aircraft (capable of executing operational missions).

SOURCES:

- Pre–1996: James C. Ruehrmund Jr. and Christopher J. Bowie, "Arsenal of Airpower: USAF Aircraft Inventory 1950–2009," The Mitchell Institute, November 2010, https://higherlogicdownload.s3.amazonaws.com/AFA/6379b747-7730-4f82-9b45-a1c80d6c8fdb/UploadedImages/Mitchell%20Publications/Arsenal%20of%20Airpower.pdf (accessed August 6, 2018).
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The Heritage *Index of U.S. Military Strength* assesses that a force of 1,200 fighter aircraft is required to execute a two–major regional contingency (two-MRC) strategy, a number that is also reflected in a 2011 study conducted by the Air Force.[14] In 2015, pressured by a third year of budget caps dictated by the BCA, the service acknowledged that it could reduce the 1,200 fighter requirement by 100 jets by assuming more risk.[15]

Of the 5,426 manned and unmanned aircraft projected to be in the USAF's inventory at the end of FY 2019, 1,385 are active-duty fighters, and 924 of these are combat-coded aircraft.[16] This number includes all active-duty backup inventory aircraft as well as attrition reserve spares.[17]

The number of fighters and fighter squadrons available to deploy to contingency

TABLE 8

Precision Munitions Expenditures and Acquisitions

NUMBER OF MUNITIONS

	Expended FY 2017	Expended FY 2018 (est.)	FY 2019 Acquisitions
JDAM	21,628	5,462	36,000
HELLFIRE	2,990	2,110	4,354
SDB-I	2,871*	749*	6,853
SDB-II			510
APKWS	0	0	7,279
JASSM-ER	0	19*	360
LGB	1,660	276	0
TOTAL	**29,149**	**8,597**	**56,105**

* Figures not broken out.
SOURCE: Headquarters U.S. Air Force response to query by The Heritage Foundation.

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operations does not just affect wartime readiness; it also affects retention. The constant churn of overseas deployments and stateside temporary duty (TDY) assignments is one of the primary reasons cited by pilots for separating from the service. The only two ways to solve that problem are to decrease operational tempo and/or increase capacity. When the order to deploy assets comes from the President, the Air Force must answer that call with assets capable of executing the mission no matter what the effects on morale or retention might be, which means that reducing operational tempo is not an option for Air force leadership. This leaves increasing capacity as the only fix, and that option has not been brought up as a possibility by the Chief of Staff, much less through actual Air Force budgetary commitment.

The funding that facilitated the Reagan build-up of the 1980s was available for just a few years, and the assets acquired during that period are now aging out. Even the most stalwart defense hawks are forecasting an end to the current defense plus-up in FY 2020, and unless Congress intervenes, the opportunity to increase capacity beyond its current marginal level may be lost.

Capacity also relies on the stockpile of available munitions and the production capacity of the munitions industry. The actual number of munitions within the U.S. stockpile is classified, but there are indicators that render an assessment of the overall health of this vital area. The inventory for precision-guided munitions (PGM) has been severely stressed by nearly 17 years of sustained combat operations and budget actions that limited the service's ability to procure replacements and increase stockpiles. In 2017, the Air Force alone expended 29,149 precision-guided munitions. While Overseas Contingency Operations (OCO) funding has provided some relief, there is typically a delay of 24–36 months between conclusion of a contract and delivery of these weapons, which means that munitions are often replaced three years after they were expended.

During the past three years, however, funding has improved significantly, and the preferred munitions are starting to recover to pre-war levels.[18] Table 8 depicts recent expenditures as well as inventory replenishments.

Capability

The risk assumed with a marginal level of capacity has placed an ever-growing burden on the capability of the assets within the Air Force portfolio. The ensuing capability-over-capacity

strategy centers on the idea of developing and maintaining a *more*-capable force that can win against advanced fighters and surface-to-air missile systems now being developed by top-tier potential adversaries like China and Russia that are also increasing their capacity.

Any assessment of capability includes not only the incorporation of advanced technologies, but also the overall health of the inventory. Most aircraft have programmed life spans of 20 to 30 years, based on a programmed level of annual flying hours. The bending and flexing of airframes over time in the air generates predictable levels of stress and metal fatigue. The average age of Air Force aircraft is 28 years, and some fleets, such as the B-52 bomber, average 56 years. In addition, KC-135s comprise 87 percent of the Air Force's tankers and are over 56 years old on average, and the average age of the F-15C fleet is over 34 years, leaving less than 8 percent of its useful service life remaining.[19] That same fleet comprises 44 percent of USAF air superiority platforms.[20] An unknown number of F-15s will likely receive airframe modifications through service life extension programs (SLEPs) that will keep them in service at least through 2030.

The fleet of F-16Cs are 27 years old on average,[21] and the service has used up nearly 82 percent of its expected life span. The Air Force recently announced its intent to extend the service lives of 300 F-16s with a plan to keep those jets flying through 2050.[22] Although SLEPs can lengthen the useful life of airframes, the dated avionics of those airframes become increasingly expensive to maintain. Those modifications are costly, and the added expense consumes available funding and reduces the amount the services have to invest in modernization, which is critical to ensuring future capability.

The Air Force's ISR and lift capabilities face similar problems in specific areas that affect both capability and capacity. The majority of the Air Force's ISR aircraft are now unmanned aerial vehicles (UAVs),[23] but even here the numbers fell in 2018 from 371[24] to 220 with the complete retirement of the MQ-1 Predator weapons system.[25] The RQ-4 Global Hawk is certainly one of the more reliable of those platforms, but gross weight restrictions limit the number of sensors that it can carry, and the warfighter still needs the capability of the U-2, which is now 35 years old on average with no scheduled retirement currently on the books.[26]

The E-8 Joint Surveillance Target Attack Radar System (J-STARS) and the RC-135 Rivet Joint are critical ISR platforms, and each was built on the Boeing 707 platform, the last one of which was constructed in 1979. The reliability of the Air Force fleet is at risk because of the challenges linked to aircraft age and flight hours, and the fleet needs to be modernized. In the 2019 NDAA, Congress elected not to recapitalize the J-STARS fleet, in line with the service's belief that that platform could not survive in a modern high-threat environment. In its stead, the Air Force is working on an incremental approach for a J-STARS replacement that focuses on advanced and disaggregated sensors, along with enhanced and hardened communications links. The Air Force refers to this solution as the Advanced Battle Management System, envisioned as an all-encompassing approach to both airborne and ground Battle Management Command and Control (BMC2) that is designed to allow the Air Force to fight and support joint and coalition partners in the high-end fight of tomorrow.[27]

A service's investment in modernization ensures that future capability remains healthy. Investment programs aim not only to procure enough to fill current capacity requirements, but also to advance future capabilities with advanced technology. The Air Force's number one priority remains the F-35A. It is the next-generation fighter scheduled to replace all legacy multirole and close air support aircraft. The rationale for the Air Force's program of record of 1,763 aircraft is to replace every F-117, F-16, and A-10 aircraft on a one for one basis.[28] The Defense Department made draconian cuts in the original plan to purchase 750 F-22A program of record aircraft,[29] reducing it to a final program of record of just 183 total active, guard, and reserve fighters.[30] Even so,

Heritage Foundation experts find a requirement for 1,200 combat-coded fighters, and given the service's intent to retain hundreds of fourth-generation fighters in its fleet for the foreseeable future, the programmed purchase of F-35As should be reduced to 1,260 aircraft.[31]

The Active Air Force currently has just 96 F-15Cs left in its fleet, and the concerns about what platform will fill this role when the F-15C is retired have now manifested into a significant gap. Even with their superior technology, 166 combat-coded F-22As from the active and guard inventory would be unable to fulfill the wartime requirement for air superiority fighters for even a single major regional contingency.[32] The F-35A's multirole design favors the air-to-ground mission, but its fifth-generation faculties will allow it also to be dominant in an air-to-air role,[33] which will allow it to augment the F-22A in many scenarios.[34]

Fulfilling the operational need for air superiority fighters will be further strained in the near term because the F-22 retrofit—a mix of structural alterations to the fleet of aircraft needed for the airframe to reach its promised service life—has been forecasted to run through 2021. As a result of the retrofit, only 62 percent (103 of 166) of the active duty mission fleet of F-22As are currently available.[35]

As with the other Joint Strike Fighter variants, the F-35A has experienced a host of developmental problems that resulted in its initial operating capability (IOC) date being pushed from 2013 to 2016. This system of systems relies heavily on software, and the 3F software that enables full operating capability (FOC) is currently being fielded.[36] The updated software and required hardware modifications are already incorporated in jets coming off the production line.[37] The F-35 has endured several delays and controversies, but experienced fighter pilots now flying the jet have a great deal of confidence in their new fighter.[38]

A second top priority for the USAF is the KC-46A air refueling tanker aircraft. Although the KC-46 has experienced a series of delays, it reached a milestone in August 2016 that enabled low-rate initial production.[39] The Air Force awarded the contract for 19 initial aircraft in August 2016 and has programmed delivery of 70 aircraft by FY 2020.[40] It expects to have all 179 of these new tankers in service by 2028. The Pegasus "will replace less than half of the current tanker fleet and will leave the Air Force with over 200 aging KC-135s awaiting recapitalization."[41]

The third major priority for the USAF from an acquisition perspective is the B-21 Raider, formerly called the Long-Range Strike Bomber (LSRB). As of May 2017, the capacity of the Air Force bomber fleet had fallen from 290 aircraft in 1991 to 156 B-1s, B-2s, and B-52s, and "[t]he current number [was] insufficient to meet Defense Planning Guidance and nuclear guidance while sustaining current operational demands and maintaining sufficient training and readiness capacity."[42]

The USAF awarded Northrop Grumman the B-21 contract to build the Engineering and Manufacturing Development (EMD) phase, which includes associated training and support systems and initial production lots. The program completed an Integrated Baseline Review for the overall B-21 development effort, as well as the jet's Preliminary Design Review. The Air Force is committed to a minimum of 100 B-21s at an average cost of $564 million per plane.[43]

With the budget deal that was reached for FY 2018 and FY 2019, the Secretary of the Air Force announced the service's intent to retire all B-1s and B-2s and sustain a fleet comprised of 100 B-21s and 71 B-52s.[44]

The B-21 is programmed to begin replacing portions of the B-52 and B-1B fleets by the mid-2020s.[45] In the interim, the Air Force continues to execute a SLEP on the entire fleet of 62 B-1s in the inventory to restore all 289 B-1 engines to their original specifications. The Air Force plans to modernize the B-2's Defense Management System, Stores Management Operational Flight Program, and Common Very-Low-Frequency/Low Frequency Receiver Program to ensure that this penetrating bomber remains viable in highly contested environments, keeping it fully viable until it is replaced by the B-21.

Modernization efforts are also underway for the B-52. The FY 2018 budget funds the re-engineering of this fleet. The jet was designed in the 1950s. The current fleet entered service in the 1960s and will remain in the inventory through 2050.

The Air Force's strategy of capability over capacity is encumbered by the requirement to sustain ongoing combat operations in Afghanistan, Iraq, and Syria. While operations are down in Syria and Iraq, they are likely to accelerate in Afghanistan during the next two years.

Readiness

During testimony before the Senate Armed Services Committee in 2017, the Secretary of the Air Force and the Chief of Staff informed Congress that "[w]e are at our lowest state of full spectrum readiness in our history."[46] While the Department of Defense has seemingly stifled open conversations or testimony about readiness, there are plenty of facts and ancillary evidence to support a conclusion that their statement and other 2017 general officer testimony still apply in 2018.

Full-spectrum operations include the seamless conduct of nuclear deterrence operations, continued support of counterterrorism (CT) operations, and readiness for potential conflict with a near-peer competitor. During testimony before the House Armed Services Committee Subcommittee on Readiness, Major General Scott West informed Congress that the Air Force was "able to conduct nuclear deterrence operations and support CT operations, [but] operations against a near-peer competitor would require a significant amount of training" because readiness is out of balance "at a time when the Air Force is small, old, and heavily tasked."[47]

The Air Force used five areas or "levers" of readiness to inform the FY 2018 budget request:

- Flying Hour Program (FHP), which includes funding sortie production;
- Critical Skills Availability (Pilot/Maintenance specialty level training);
- Weapons System Sustainment (Aircraft availability production);
- Training Resource Availability (Funding for Ranges, Live/Virtual Construct);
- Deploy to Dwell (Funding for force capacity to meet current taskings).

Flying Hour Program and Critical Skills Availability. A shortage of aircraft maintenance personnel (maintainers) limited the ability of the Air Force to generate sorties through 2017. The Air Force was short 3,400 aircraft maintainers at the close of 2016,[48] and senior leaders cited this shortfall as the principal reason why fighter pilots who once averaged over 200 hours per year were fortunate to fly 120 hours in 2014.[49] The average was said to have risen above 150 hours a year in 2017,[50] but data provided by the Air Force organization charged with tracking these details revealed that fighter pilots received an average of 11.8 hours per month in 2017, and the average has fallen to just 11.6 hours per month for the first five months of 2018. Pilots are flying less than seven sorties per month, less than two times a week on average. If that rate holds for the rest of the year, pilots will receive just 139 hours in 2018.

F-35A pilots received the lowest number of hours and sorties of any other major weapons system in the fighter community, averaging just 6.3 hours and 6.3 sorties per month—an annualized rate of just 76 hours and 76 sorties per year.[51] These low sortie rates are happening in spite of the fact that maintenance manning levels have almost fully recovered from the shortfalls suffered in previous years.

In June 2016, responding to written questions posed as part of the hearing on his confirmation as Chief of Staff of the Air Force, General David Goldfein stated that his service could not surge enough combat-ready forces to execute a single MRC and still meet the remaining demand for global combat-ready forces. He went on to say that less than 50 percent of combat units are ready for "full spectrum"

TABLE 9

Maintenance Skill Level Manning

Skill Level	Authorized Level	Actual Manning	Manning Percentage
3–Level (Apprentice)	14,525	17,331	119%
5–Level (Journeyman)	16,857	16,225	91%
7–Level (Craftsman)	33,492	32,152	96%

NOTE: Figures are current as of June 2018.
SOURCE: Headquarters U.S. Air Force response to query by The Heritage Foundation.

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(high-threat, high-intensity) combat.[52] Nearly a year later, on March 29, 2017, Lieutenant General Mark Nowland, Air Force Deputy Chief of Staff for Operations, testified that only four of the Air Force's 55 total (Active, Reserve, and National Guard) fighter squadrons were at the very highest levels of readiness and that fewer than half were in the top two readiness tiers.[53] There is no evidence of any real improvement since then.

The current state of Air Force fighter readiness has many intangibles, but the things that can be measured such as average sortie per aircraft/month and total flying time point to a readiness level that has not improved over 2017. These sortie/hour rates remain below those of the hollow force experienced during the Carter Administration in the late 1970s.

Weapons System Sustainment. Nearly constant deployments and a shortage of maintenance personnel have severely limited aircraft availability and sortie production. Maintenance manning shortfalls have almost fully recovered from the previous year, but manning for pilots has continued to fall.

On March 29, 2017, Lieutenant General Gina M. Grosso, Air Force Deputy Chief of Staff for Manpower, Personnel, and Services, testified that at the end of FY 2016, the Air Force had a shortfall of 1,555 pilots across all mission areas (608 active, 653 guard, 294 reserve). Of this amount, the total force was short 1,211 fighter pilots (873 active, 272 guard, 66 reserve).[54] The numbers continued to fall, and at the end of FY 2017, the Air Force was short more than 2,000 pilots, of which 1,300 are empty fighter pilot billets across the Total Force (All Active/Guard/Reserve requirements). Although the Air Force no longer breaks these numbers out by Active Guard and Reserve, the total pilot shortfall has grown by 29 percent, and 9 percent for the fighter community over the previous year.[55]

The pipeline for pilots is also suffering. After a rash of hypoxia incidents, the Air Force grounded its fleet of T-6 trainers, effectively shutting down the pilot training pipeline for a month in February 2018.[56] The Air Force had projected that it would graduate 1,200 pilots in 2018, but the grounding will reduce that number by at least 82 for a total of 1,118 pilots in 2018.[57] The projections for 2019 increase pilot production to 1,300. However, both numbers rely on a 100 percent graduation rate for every pilot training class. In 2016, the rate was 93 percent, and in 2017, the rate was 98 percent,[58] but the expectation for 100 percent graduation means that the quality of those respective year groups will be even lower.

Training Resource Availability (Funding for Ranges, Live/Virtual Construct). To prepare for full-spectrum combat in peacetime, pilots require the opportunity to engage high-end air-to-air and surface-to-air missile platforms and simulators on a regular basis. The two effective methods for giving aircrew the repetitions they need to sharpen these perishable skills are live, large force exercises (LFEs) over well-equipped ranges or a live/virtual construct.

The three exercises/ranges that have the airspace and assets required for a live high-threat training are the Red Flag exercises at Nellis Air Force Base, Nevada, and Elmendorf Air Force Base, Alaska. The Air Force funded seven of these large force exercises in 2018,[59] and the same number will be executed in FY 2019.[60]

The live/virtual construct attempts to fill the gaps between deployments to Nellis and Elmendorf through networked simulators as well as plug-and-play simulations that feed a virtual scenario and the accompanying threats into the software/cockpit displays of fighters flying "local" missions out of their home airfields. While these systems show genuine progress, the number of opportunities offered does not offset the drought in sorties, and the pilots themselves do not regard them as replacements for actual flying time.[61]

Deploy to Dwell. The last of the five Air Force levers or areas of readiness is the deploy-to-dwell ratio. The projected dwell time for active-duty personnel in the FY 2019 President's budget request is 1:2 dwell (or better) for active-duty members and a 1:5 dwell (or better) for Guard and Reserve personnel. On paper, these look healthy enough, but the major deployments do not include shorter-term dispatch to schools, exercises, and other non-elective temporary duty assignments, and those career specialties that find themselves in the 3 percent to 4 percent that do not meet the established goals for dwell are in such great demand that they generally do not even come close to the target dwell.

Wartime Readiness Materials. An additional consideration in assessing Air Force readiness is the availability of wartime readiness materials (WRM) like munitions. Funding limitations have not allowed restocking of all WRM accounts. Munitions have been used faster than they have been replaced. While programmed purchases for 2019 will begin to reverse that trend, the air-to-surface weapons that offer stand-off, direct attack, and penetrators are short of current inventory objectives.[62] The concurrent shortage of air-to-air weapons could lead to an increase in the time needed to gain and maintain air superiority in future environments,[63] particularly highly contested ones.

The Air Force has rapidly been depleting its wartime inventory levels of precision-guided munitions. Over 87,000 missiles and bomb-related munitions have been used since August 2014,[64] significantly drawing down stockpiles, and the rate of expenditure has only grown with time. Even with the current buy plan for 2018 and 2019, absent sustained and increased funding, the ongoing depletion of our munition stockpiles will continue to reduce Air Force readiness and jeopardize America's ability to meet its national security objectives.[65]

Space. The classified nature of deployed space assets and their capabilities makes any assessment of this mission area challenging. That said, the United States constellation of ISR, navigation, and communication satellites is arguably unrivaled by any other nation-state. This array allows the Air Force and its sister services to find, fix, and target virtually any terrestrial or sea-based threat anywhere, anytime.

Unfortunately, the United States' historically unchecked dominance in space has facilitated an environment of overreliance on the domain and an underappreciation of the vulnerabilities of its capabilities.[66] Some space assets represent nearly single-point failures in which a loss caused by either a system failure or an attack could cripple a linchpin capability. Because of U.S. dominance of and nearly complete reliance on assets based in space for everything from targeting to weapons guidance, other state actors have every incentive to target those assets.[67]

Adversaries will capture and hold the initiative by leveraging surprise and every asymmetric advantage that they possess while denying those warfighting elements to their opponents. Since Operation Desert Storm, the world and every American near-peer competitor therein have watched the United States employ satellite-enabled precision targeting to profound effect on the battlefield. That ability depends almost entirely on the kinetic end of the strike system: precision-guided munitions.[68]

China and Russia are investing heavily in ground-based anti-satellite (ASAT) missiles;[69] orbital ASAT programs that can deliver a kinetic blow;[70] or co-orbital robotic interference to alter signals, mask denial efforts, or even pull adversary satellites out of orbit.[71] If near-peer competitors were able to degrade regional GPS signals or blind GPS receivers, they could neutralize the PGMs that the U.S. uses to conduct virtually every aspect of its kinetic strike capability.

As General John Hyten, former Commander of Air Force Space Command, has clearly indicated, the vulnerability of the U.S. space constellation is in its design.[72] Every satellite we currently rely on costs millions of dollars and takes years to design, build, and launch into orbit. Until the Air Force shortens that time span or diversifies its ability to precisely find, fix, and destroy targets, space will remain both a dominant and an incredibly vulnerable domain for the U.S. Air Force.

The omnibus appropriations deal reached in March 2018 included funding for the Air Force to increase the unclassified budget for space combat operations and space procurement over FY 2017 levels[73] by a total of 34 percent in FY 2018 and 23 percent for FY 2019.[74] While there certainly are increases for Air Force space assets in the classified funding streams, these are substantial increases that will allow this service to increase both the capability and survivability of U.S. Air Force satellite constellations.

Scoring the U.S. Air Force

Capacity Score: Marginal

One of the key elements of combat power in the U.S. Air Force is its fleet of fighter aircraft. In responding to major combat engagements since World War II, the Air Force has deployed an average of 28 fighter squadrons, based on an average of 18 aircraft per fighter squadron. That equates to a requirement of 500 active component fighter aircraft to execute one MRC. Based on government force-sizing documents that count fighter aircraft, squadrons, or wings, an average of 55 squadrons (990 aircraft) is required to field a two-MRC–capable force (rounded up to 1,000 fighter aircraft to simplify the numbers). This *Index* looks for 1,200 active fighter aircraft to account for the 20 percent reserve necessary when considering availability for deployment and the risk of employing 100 percent of fighters at any one time.

- **Two-MRC Level:** 1,200 fighter aircraft.
- **Actual 2018 Level:** 924 fighter aircraft.

Based on a pure count of combat-coded fighter/attack platforms that have achieved IOC, the USAF currently is at 77 percent of the two-MRC benchmark, and even that low number should be taken with a few caveats. The F-35 will become a highly advanced and capable multirole platform, but the 210 aircraft that have entered the USAF inventory to date[75] are only IOC and do not yet field many of the capabilities that would constitute full-spectrum readiness.

The 924 figure yields a capacity level well within the methodology's range of "marginal." Aircraft require pilots to fly them and maintainers to launch, recover, and fix them. With a fighter pilot shortage of over 1,200, the ability of the Air Force to meet the wartime manning requirements for fighter cockpits continues to wane. Those factors, coupled with the dismally low flying hours that those pilots are receiving, has kept the rating at "marginal." As noted, given shortfalls in personnel and flying time, the Air Force capacity score continues to trend toward "weak."

Capability Score: Marginal

The Air Force's capability score is "marginal," the result of being scored "strong" in "Size of Modernization Program," "marginal"

for "Age of Equipment" and "Health of Modernization Programs," but "weak" for "Capability of Equipment." These scores have not changed from the *2018 Index*'s assessment. However, with new F-35 and KC-46 aircraft continuing to roll off their respective production lines, the Air Force should slowly begin to turn this corner.

Readiness Score: Weak

The Air Force scores "weak" in readiness in the *2019 Index*, a grade lower than it received in the *2018 Index*. The Air Force's growing deficit of pilots and a systemic drought of sorties and flying hours for those pilots since 2012 are the principal reasons for the drop in this assessment.[76] The Air Force should be prepared to respond quickly to an emergent crisis and retain full readiness of its combat airpower, but it has been suffering from degraded high-end combat readiness since 2003, and implementation of BCA-imposed budget cuts in FY 2012 cut flying hours and sortie rates to the bone.

Fighter pilots should receive an average of three sorties a week and 200 hours a year to have the skill sets to survive in combat but have averaged less than two sorties a week and 150 hours of flight time a year for the past five years. Even with the greatly improved maintenance manning/experience levels and the increased funding for FY 2018, there has been no improvement. This fact and the ever-growing exodus of experienced pilots from the ranks of the active-duty force are very troubling indicators. Both factors have already strained the service and, unless reversed in the near term, will lead to a death spiral for both retention and readiness challenges in the very near future.

Overall U.S. Air Force Score: Marginal

The Air Force is scored as "marginal" overall. This is an unweighted average of its capacity score of "marginal," capability score of "marginal," and readiness score of "weak." This score has trended downward since the *2018 Index* largely because of two factors: a drop in "capacity" that has not effectively changed and a readiness score of "weak." The shortage of pilots and flying time for those pilots degrades the ability of the Air Force to generate the amount and quality of combat air power that would be needed to meet wartime requirements. While the Air Force could eventually win a single major regional contingency in any theater, the attrition rates would be significantly higher than those sustained by a ready, well-trained force.

U.S. Military Power: Air Force

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity			✓		
Capability			✓		
Readiness		✓			
OVERALL			✓		

Strategic Bomber

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
B-52 Inventory: **58** Fleet age: **56** Date: **1955** The B-52, the oldest of the bombers, can provide global strike capabilities with conventional or nuclear payloads, although it largely has made up the core of the strategic bomber force. The aircraft entered service in 1955 and was in production until 1962.	1		The B-21 is intended to replace the Air Force bomber fleet. Initial conventional capability is enhanced for the mid-2020s. The program completed primary design review in early 2017.		
B-1 Inventory: **61** Fleet age: **30** Date: **1986** The B-1, originally designed to carry nuclear weapons, was reconfigured for conventional weapons in the early 1990s. The program entered service in 1986 and completed production in 1988. The B-1B will remain in service until 2040.	3	1			
B-2 Inventory: **20** Fleet age: **23** Date: **1997** The B-2 bomber provides the USAF with global strike capabilities. It can carry both nuclear and conventional payloads. Initially deployed in 1997, the aircraft communication modules are being upgraded. It is expected to remain in service until 2058.	4				

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

AIR FORCE SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2018 ■ Pending

Ground Attack/Multi-Role Aircraft

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
A-10 Thunderbolt II Inventory: **141** Fleet age: **36** Date: **1977** The A-10 is the only USAF platform designed primarily for close air support, which it provides usng a variety of conventional munitions. The USAF has proposed retiring the aircraft earlier than the planned 2028 date for budget reasons.	2	1	**F-35A** Timeline: **2007–2038** The F-35A is the Air Force variant of the Joint Strike Fighter program, a multirole fixed-wing aircraft. It is currently in early stages of production. The program has faced many issues including a Nunn–McCurdy cost breach during development, grounding due to engine problems, and software development problems. The F-35A achieved IOC on August 2, 2016. **PROCUREMENT** 234 1,529 **SPENDING** *($ millions)* $132,461 $273,670	5	1
F-16 Inventory: **570** Fleet age: **27** Date: **1978** The F-16 is a multirole aircraft that was built between 1976 and 1999. It has received various upgrade blocks over that time. The aircraft was expected to last about 30 years.	2	1			
F-35A Inventory: **122** Fleet age: **2.6** Date: **2016** See Ground Attack Modernization Program entry. The USAF has received a small portion of a projected 1,763 total aircraft for the program.	5				

Fighter Aircraft

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
F-15 Inventory: **317** Fleet age: **30** Date: **1979** The F-15 is a legacy fighter that performs air superiority missions. It is no longer in production. The newer F-15E Strike Eagle variant is to operate until 2025 to supplement the F-22.	1	2	None		
F-22 Inventory: **166** Fleet age: **10** Date: **2005** The F-22 is the preeminent air superiority fighter aircraft. The stealth aircraft completed production in 2009 after a dramatic cut of its overall order from 750 to 187. It is currently being modified.	5				

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

AIR FORCE SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2018 ■ Pending

Tanker

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
KC-10 Inventory: **59** Fleet age: **33** Date: **1981** An aerial refueling tanker supporting the USAF's Mobility and Lift mission, the KC-10 was deployed in 1981. The aircraft was purchased to increase the number of tankers available, which the Air Force posited did not meet current requirements. The aircraft is no longer in production, but is planned to remain in inventory until 2040.	3		**KC-46** Timeline: **2015–2027** The KC-46 is meant to replace the KC-135. The program entered low rate initial production in August 2016 after having been delayed by a year due to "design changes and late parts." The first delivery is anticipated in October 2018. **PROCUREMENT** 55 124 **SPENDING** *($ millions)* $15,712 $28,106	1	3
KC-135 Inventory: **156** Fleet age: **57** Date: **1956** The KC-135 supports the mobility and lift mission by providing the joint force aerial refueling capability. The KC-135 makes up the bulk of the aerial refueling capability. The aircraft was initially deployed in 1956, completing production in 1965. The aircraft has undergone several modifications, mainly engine upgrades to improve reliability. It is expected to be in service until 2040, but excessive usage has created many reliability issues due to problems from wear and tear, such as corrosion and fuel bladder leaks.	1	1			

Heavy Lift

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
C–5M Inventory: **35** Fleet age: **30** Date: **1970** The C-5 is the USAF's largest mobility and lift aircraft, enabling it to transport a greater amount of cargo (270,000 pounds) compared with other transport aircraft. Originally deployed in 1970, the aircraft has undergone three modification cycles. The latest started in 2009 to upgrade the platform to a C-5M. Funding is now completed for the modernization program.	2	5	None		

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

AIR FORCE SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2018 ■ Pending

Heavy Lift

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
C-17 Inventory: **162** Fleet age: **14** Date: **1993** The C-17 is a large fixed-wing transport aircraft in support of USAF's mobility and lift mission. The aircraft can lift 170,900 pounds and land on short runways. The aircraft entered service in 1995. The program was expanded from 120 aircraft to 223 aircraft. The procurement program for the C-17 was recently completed. The aircraft was originally planned to last 30 years, but more frequent usage may shorten that life span.	3	5	None		

Medium Lift

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
C-130J Inventory: **87** Fleet age: **8.8** Date: **1956** The C-130J aircraft supports the USAF's tactical mobility and lift capability. Unlike the other transport aircraft, the C-130s can land on rough dirt strips. It can carry about 42,000 pounds and is expected to last 25 years. The air force active component completed transition to the C-130J in October 2017.	5	5	**C-130J** Timeline: **1994–2023** The program provides the Air Force with an upgraded medium-lift capability. The C-130J can lift over 40,000 pounds of cargo. The frame supports various other types of aircraft, such as the USMC tanker KC-130J. There are few issues with the current acquisition of C-130Js. **PROCUREMENT** 168 2 **SPENDING** *($ millions)* $14,124 $110	4	4

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

AIR FORCE SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2018 ■ Pending

Intelligence, Surveillance, and Reconnaissance (ISR)

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
RQ-4 Global Hawk Inventory: **29** Fleet age: **6.6** Date: **2011** The RQ-4 is an unmanned aerial vehicle (UAV) that supports the USAF's ISR mission. Unlike the MQ-1 or MQ-9, the RQ-4 is a high-altitude, long-endurance (HALE) UAV, which in addition to higher altitude has a longer range than medium-altitude, long-endurance (MALE) UAVs.	4	4	None		
MQ-9 A/B Inventory: **200** Fleet age: **4.4** Date: **2007** The MQ-9 Reaper replaced the MQ-1 Predator to fulfill the USAF's ISR mission. The UAV is in production. The expected life span of the MQ-9 is 20 years.	4		**MQ-9** Timeline: **2002–2017** The MQ-9 is in production. It has experienced delays due to manufacturing and testing problems. The Air Force continues to increase planned acquistion objectives for the MQ-9. **PROCUREMENT** 363 / 73 **SPENDING** *($ millions)* $8,947 / $4,215	5	3
RC-135 Rivet Joint Inventory: **22** Fleet age: **54** Date: **1964** The RC-135 is a manned ISR aircraft. It was originally fielded in 1964. The Air Force plans to keep the system in service through 2018.	1		None		
U-2 Inventory: **27** Fleet age: **34** Date: **1956** Initially deployed in 1956, this manned ISR aircraft can operate at high altitudes and long ranges. The U-2 has undergone a series of modification programs since 1967 to extend the life of the aircraft.	3				

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

AIR FORCE SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2018 ■ Pending

Command and Control

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
E-3 AWACS Inventory: **31** Fleet age: **39** Date: **1978** The E-3 is an airborne warning and control system (AWACS) that provides USAF with command and control and battle management capabilities. The aircraft entered service in 1978. No longer in production, the current inventory is undergoing modifications to upgrade computing systems. The fleet is currently intended to remain in service until 2025.	1	2	None		
E-8 JSTARS Inventory: **16** Fleet age: **17** Date: **1997** The E-8 is a newer command and control aircraft that provides battle management and C4ISR capabilities, mainly by providing ground surveillance to various air and ground commanders in theater. The aircraft first entered service in 1997 and is not currently in production. The Air Force plans to retire the JSTARs in the early 2030s.	2				

SOURCE: Heritage Foundation research using data from government documents and websites. See also Dakota L. Wood, ed., *2018 Index of U.S. Military Strength* (Washington, DC: The Heritage Foundation, 2018), http://index.heritage.org/militarystrength/.

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

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