

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's Signal Corps to become its own service in 1947. The Air Force mission set has expanded significantly over the years. Initially, there were four major components—Strategic Air Command (SAC); Tactical Air Command (TAC); Air Defense Command (ADC); and Air Mobility Command (AMC)—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 service's impact and mission set.

Today, the Air Force focuses on five primary 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 even greater stress on the resources for which the Air Force is forced to compete in an incredibly strained 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

During testimony before the Senate Armed Services Committee in June 2017, Secretary of the Air Force Heather Wilson and Air Force Chief of Staff General David Goldfein stated that “the Air Force is too small for the mission demanded of it and it is unlikely that the need for air and space power will diminish significantly in the coming decade.”² Unfortunately, the funding available has not allowed this “too small” service to execute an acquisition program to reverse the downward spiral of aircraft availability, nor has it supported enough time in the air for pilots to sustain much more than a marginal level of readiness.

Sequestration has forced the Air Force Chief of Staff 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. Five years of sequestration has had many detrimental effects on the ability of the service 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 the trades among capability, capacity, and readiness failed to keep pace with demands on the service. When funding did arrive, it was pursuant to continuing resolutions adopted well into the year of execution, making any real form of strategic planning impossible.³

The Trump Administration has proposed a budget for fiscal year (FY) 2018 that would begin to turn the corner in each of the three bins

with a budget of \$183 billion (base budget plus overseas contingency operations or OCO).⁴ If executed in its current form, it would allow the Air Force to bring on an additional 4,100 active-duty personnel, fund the flying hour program (FHP) to the maximum executable level of 91 percent, and increase full-spectrum training/operational readiness accounts to \$1.5 billion.⁵ While this Administration appears more willing to put pressure on Congress to execute the President's budget, it is by no means certain that Congress will do so.

If the House and Senate were able to meet or exceed the funding levels in the President's budget, they would enable the Air Force to reverse several trends in capacity, capability, and readiness, all three of which are under stress.

Capacity

The trade-off 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 The USAF is “the smallest and oldest it has ever been,” and as the demand for air power continues to increase, capacity will continue to limit capability.⁷ Unlike some of the other services, the Air Force did not expand in numbers during the post-9/11 buildup.⁸ Rather, it became smaller as programmed retirement dates for older aircraft were not offset with 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.

The Air Force's capacity in terms of number of aircraft has been on a constant downward slope since 1952,⁹ and the number will drop again from 5,517 aircraft in 2017 to 5,416 in 2018.¹⁰ As Air Force officials testified in 2017:

[A]dversaries are modernizing and innovating faster than we are, putting at risk America's technological advantage in air and space.... Before 1991, the Air Force bought

approximately 510 aircraft per year. In the past 20 years, we have averaged only 96 per year. Today, the average age of our aircraft is over 27 years.¹¹

This reduction in capacity is expected to continue because of ongoing budgetary pressure. Under spending caps mandated by the Budget Control Act of 2011 (BCA), the Air Force has shrunk from 70 combat-coded¹² active-duty fighter squadrons during Desert Storm¹³ to just 55 across the whole of the active-duty, guard, and reserve force.¹⁴ Only 32 of those are active duty.¹⁵

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.¹⁶ More recently, the service acknowledged that it could reduce the requirement by 100 fighters by assuming more risk.¹⁷ Of the 5,416 manned and unmanned aircraft in the USAF's inventory, 1,308 are active-duty fighters, 915 of which are combat-coded aircraft (aircraft not associated with operational testing, evaluation, or training of replacement pilots).¹⁸ Constrained funding levels will continue to deepen the shortage of fighters and readiness levels, degrading vital air operations as well as operational testing and training expertise.

Capability

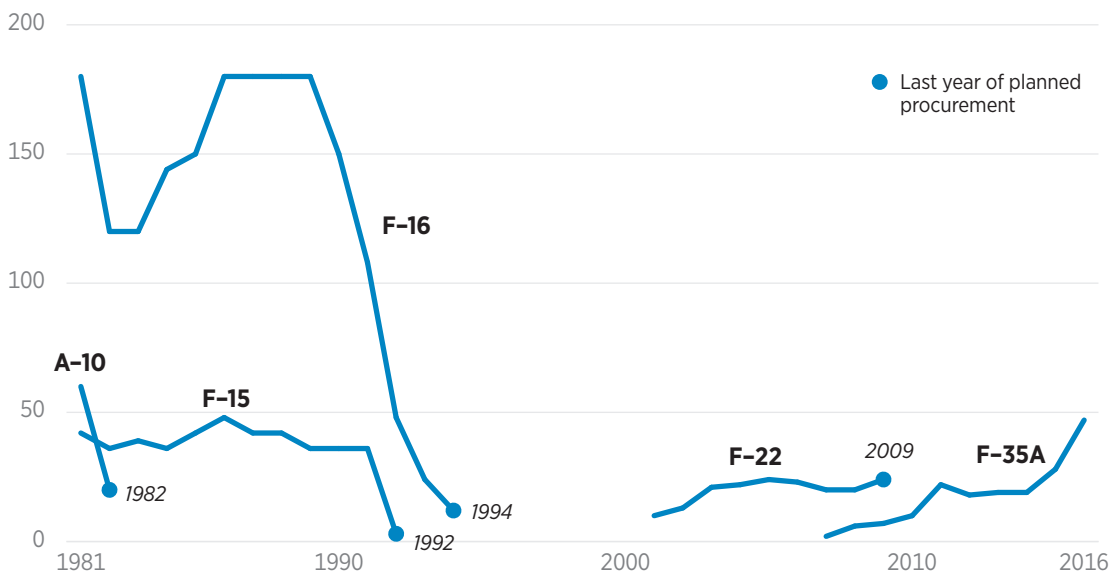
Reductions in funding brought about by the BCA and other budget constraints have forced the Air Force to prioritize future capability over capacity. This strategy centers on the idea of developing and maintaining a capable force that can win against advanced fighters and surface-to-air missile systems that are being developed by top-tier potential adversaries like China and Russia. The only way the Air Force can sustain that technological edge in the current budget environment is by reducing its fleet of aircraft that are moving toward obsolescence.

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

Lack of Procurement Has Led to Aging Aircraft Fleets

The U.S. military currently maintains several fighter aircraft fleets that were last purchased decades ago. In 1990, the average age of a fighter aircraft was 11 years. Today, it is 24 years.

NUMBER OF AIRCRAFT PROCURED ANNUALLY, BY AIR FORCE FLEET



SOURCES: Congressional Budget Office, "Total Quantities and Unit Procurement Cost Tables: 1974-1995," <https://www.cbo.gov/sites/default/files/103rd-congress-1993-1994/reports/94doc02b.pdf> (accessed June 27, 2017); U.S. Department of Defense, "Selected Acquisition Report: F-22," December 31, 2010, http://www.globalsecurity.org/military/library/budget/fy2010/sar/f-22_sar_25-dec-2010.pdf (accessed June 27, 2017); and U.S. Department of Defense, "Selected Acquisition Report: F-35 Joint Strike Fighter Aircraft (F-35)," December 2015, <https://fas.org/man/eprint/F35-sar-2016.pdf> (accessed June 27, 2017).

heritage.org

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 27 years,¹⁹ and some fleets, such as the B-52 bomber, average 55 years.²⁰ Although service life extension programs (SLEPs) can lengthen the useful life of airframes, their dated avionics become increasingly expensive to maintain. That added expense consumes funding and reduces the amount the services have available to invest in modernization, which is critical to ensuring future capability.

The average age of the F-15C fleet is over 33 years, leaving less than 10 percent of its useful service life remaining.²¹ That same fleet comprises 57 percent of USAF air superiority platforms—a fleet reduced in size by 10 aircraft (8 percent) in 2017.²² The fleet of F-16Cs are, on average, 26 years old,²³ and the service has used up nearly 80 percent of its expected life span. KC-135s comprise 63 percent of the Air Force's tankers and are over 55 years old on average.²⁴ Air Force officials have testified that "before 1991, the Air Force bought approximately 510 aircraft per year. In the past 20 years, we have averaged only 96 per year."²⁵

The Air Force's ISR and lift capabilities face similar problems in specific areas that affect both capability and capacity. Of total ISR aircraft, 79 percent are now unmanned aerial vehicles (UAVs).²⁶ Even here, however, the numbers fell from 371 to 256²⁷ with the retirement of the MQ-1 Predator.²⁸ The RQ-4 Global Hawk is 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 34 years old on average.²⁹ The E-8 Joint Surveillance and Target Attack Radar System (Joint-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.

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 continued to structure its budget in FY 2017 to preserve funding for its three top acquisition priorities: the F-35A Joint Strike Fighter, the KC-46A Pegasus refueling aircraft, and the Long Range Strike-Bomber.³⁰

The Air Force's number one priority continues to be the F-35A. It is the next-generation fighter scheduled to replace all legacy multirole and close air support aircraft. The rationale for a program of record of 1,763 aircraft to replace the 1,303 legacy fighters currently in the Air Force inventory has never been fully justified.³¹ This has led to speculation that, at least in part, it may be an attempt to offset the Defense Department's draconian reduction of the original plan to purchase an F-22A program of record of 750 aircraft³² to a final program of record of just 187.³³ Even so, The Heritage Foundation's analysis finds a requirement for 1,260 total F-35As.³⁴

The Active Air Force currently has just 106 F-15Cs left in its fleet, and 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, 159 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.³⁵ 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,³⁶ enabling it to augment the F-22A in many scenarios.³⁷

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 162 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 (99 of 169) of the mission fleet of F-22As are currently available.³⁸

As with the other Joint Strike Fighter variants, the F-35A has experienced a host of developmental problems that have caused its initial operating capability (IOC) date to be pushed from 2013 to 2016. This system of systems relies heavily on software, and the currently fielded version (3I) delivers about 90 percent of the code required to deliver full warfighting capability. The "3F" version of the fighter's software that will enable full operating capability (FOC) will be fielded by the end of the third quarter of 2017, half a year later than planned.³⁹ Given the age of the aircraft that the F-35A will be replacing, every slip in the Lightning II's program will necessarily affect U.S. warfighting capability. Nevertheless, experienced fighter pilots now flying the jet have a great deal of confidence in their new fighter,⁴⁰ and this program appears to be gaining traction.

A second top priority for the USAF is the KC-46A air refueling tanker aircraft. Though the KC-46 has experienced a series of delays, it reached a milestone in August 2016 that enabled low-rate initial production.⁴¹ The Air Force awarded the contract for 19 initial aircraft in August 2016 and has programmed delivery of 70 aircraft by FY 2020.⁴² 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.”⁴³

The third major USAF priority from an acquisition perspective is the B-21 Raider, formerly called the Long-Range Strike Bomber. 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 a Preliminary Design Review. The Air Force is committed to a fleet size of 100 B-21s⁴⁴ at an average cost of \$564 million per plane.⁴⁵

The B-21 is programmed to begin replacing portions of the B-52 and B-1B fleets by the mid-2020s.⁴⁶ The Air Force has 62 B-1s in the inventory, 32 of which are undergoing an Integrated Battle Station upgrade that will provide enhanced situational awareness and precision engagement capabilities, and the entire fleet is undergoing a SLEP to restore all 289 B-1 engines to their original specifications. At least some of these bombers are programmed to remain in service through 2040.⁴⁷

The Air Force also 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. These 20 stealth bombers will be in service for the foreseeable future.

Modernization efforts are also underway for the B-52. The jet entered service in the 1960s and will remain in the inventory through 2050.

The capacity of the Air Force's bomber fleet has fallen from 290 aircraft in 1991 to 156 B-1s, B-2s, and B-52s today. The current number is insufficient to meet Defense Planning Guidance and nuclear guidance while sustaining current operational demands and maintaining training and readiness capacity.⁴⁸

The Air Force's strategy of capability over capacity is encumbered by the requirement to sustain ongoing combat operations in Afghanistan, Iraq, and Syria. In a budget-constrained environment, the need to sustain these ongoing efforts while modernizing an outdated fleet of aircraft for operations in contested environments means that funding has to be pulled from other areas, adversely affecting readiness.

Readiness

During testimony before the Senate Armed Services Committee in June 2017, the Secretary of the Air Force and the Air Force Chief of Staff warned that the USAF is at its “lowest state of full spectrum readiness in our history,”⁴⁹ and there is an abundance of ancillary evidence to support that statement.

Full-spectrum operations include the seamless conduct of nuclear deterrence operations, continued support of counterterrorist operations, and readiness for potential conflict with a near-peer competitor. During testimony before the House Armed Services Committee in July 2016, Major General Scott West, Director of Current Operations, Deputy Chief of Staff for Operations, stated that the Air Force was “able to conduct nuclear deterrence operations and support [counterterrorist] operations,” but that operating “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.”⁵⁰

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

1. Flying Hour Program (FHP), which includes funding sortie production;
2. Critical Skills Availability (pilot/maintenance specialty level training);
3. Weapons System Sustainment (aircraft availability production);

TABLE 4

Air Force: Only Four of 32 Combat-Coded Fighter Squadrons Fully Mission Capable

SORTS Score	Resource/ Training Level	Mission Capability	Active Duty Units Meeting Capability Threshold
C1	90%–100%	Can execute all wartime missions	4 of 32
C2	70%–89%	Can execute most wartime missions	Less than 18 of 32
C3	55%–69%	Can execute portions of wartime missions	Up to 32 of 32
C4	0%–54%	Needs more resources before it can execute its mission	Up to 32 of 32

SOURCE: R. Derek Trunkey, “Implications of the Department of Defense Readiness Reporting System,” Congressional Budget Office *Working Paper* No. 2013-03, May 2013, http://www.cbo.gov/sites/default/files/cbofiles/attachments/44127_DefenseReadiness.pdf (accessed April 11, 2017).

 heritage.org

- 4. Training Resource Availability (funding for ranges, live/virtual construct); and
- 5. 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) has limited the ability of the Air Force to generate sorties. The Air Force was short 3,400 aircraft maintainers at the close of 2016,⁵¹ and this shortfall has reduced flying hours to the point where fighter pilots who once averaged over 200 hours per year were fortunate to fly 120 hours in 2014.⁵² In 2015, the average rose to 150 hours through combat deployments to Iraq, Afghanistan, and Syria, but the air threat there is benign, the low-threat employment is relatively undemanding, and no high-threat training is allowed. When they return home, those same pilots have to rehone their primary mission skill sets, often averaging less than one sortie a week.⁵³

During his confirmation hearing for the position of 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” high-threat, high-intensity combat.⁵⁴

In testimony before the Senate Armed Services Committee on March 29, 2017, Lieutenant General Mark Nowland, Air Force Deputy Chief of Staff for Operations, told lawmakers that only four of the Air Force’s 55 total (Active, Reserve, and National Guard) fighter squadrons are at the very highest levels of readiness. Fewer than half are in the top two readiness tiers.⁵⁵

General Nowland’s reference to levels of readiness is based on the formal Department of Defense grading system for readiness, known as the Status of Resources and Training System (SORTS). SORTS assesses personnel, supply, equipment, and training levels to make a comprehensive capability assessment of fighting units. A C1 designation is the highest level and is given to units that can fully carry out their wartime mission. C2 units can carry out “most” of their wartime missions, C3 units can carry out portions of their wartime missions, and C4 units need additional resources and/or training to execute their missions successfully. Organizations with a C1 or C2 score are the only ones that are considered to be combat-ready.⁵⁶

When General Nowland said that only four squadrons are at the highest level of readiness, he presumably meant that those squadrons are C1. Taken in conjunction with the Chief of Staff's acknowledgement that less than 50 percent are ready for full-spectrum combat, this means that as many as 17 and as few as four fighter squadrons are ready to go to war with a near-peer competitor.

The current state of Air Force fighter readiness includes 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 not witnessed by the Air Force since the Carter Administration.

The flight hour program is limited by combat deployments and low sortie generation rates, but the Air Force has funded it to what it assesses to be the maximum executable level of 91 percent in the FY 2018 budget request.

Weapons System Sustainment. Near-constant deployments and a shortage of maintenance personnel have severely limited aircraft availability and sortie production. While maintenance manning shortfalls are expected to begin recovering during the coming year, it will take many years to develop the experience lost over the past five years. The shortage has driven and will continue to drive aircraft utilization rates (the number of times a jet is flown each month) well below those witnessed during the hollow force of the late 1970s.

Those numbers also affect retention of fighter pilots. Lieutenant General Gina M. Grosso, Air Force Deputy Chief of Staff for Manpower, Personnel, and Services, detailed this shortfall in testimony before a subcommittee of the House Armed Services Committee on March 29, 2017:

At the end of FY 2016 the total force including active, reserve, and guard components was short 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). Unfortunately, our greatest concern is [that] the active fighter pilot shortage is projected [to] exceed 1,000 by the end of FY 2017.⁵⁷

Training Resource Availability. In order to prepare for full-spectrum combat in peacetime, pilots require the opportunity to engage regularly in high-end air-to-air and surface-to-air missile platforms and simulators. The two effective methods for giving aircrew the repetitions they need to sharpen these perishable skills are through live, large-force exercises over well-equipped ranges or through a live/virtual construct.

The three exercises/ranges that have the airspace and assets required for live high-threat training are the Red and Green Flag exercises at Nellis Air Force Base, Nevada, and Elmendorf Air Force Base, Alaska. The Air Force funded 16 of these large-force exercises in 2016 and 2017 and has budgeted for the same number in FY 2018.⁵⁸

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, nor are they considered replacements for actual flying time by the pilots themselves.⁵⁹ The FY 2018 budget requests a total increase of \$1.5 billion to further each of these efforts.⁶⁰

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 President's FY 2018 budget request is 1:2 dwell or better at home for 94 percent of the deployers; 96 percent of National Guard deployers achieve a 1:5 dwell or better, and Reservists average 97 percent. On paper, these look reasonably healthy, but several facts are not immediately evident from the numbers. The major deployments do not include shorter-term dispatch to schools, exercises, and other non-elective temporary duty (TDY) assignments. For some career specialties, personnel are in such high demand that they generally do not come close to the target dwell time.

One last 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 are being used faster than they can be replaced, and air-to-surface weapons that offer stand-off, direct attack, and penetrators are short of current inventory objectives.⁶¹ 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,⁶² particularly highly contested ones.

The Air Force has rapidly been depleting its wartime inventory levels of precision-guided munitions. Over 50,000 missiles and bomb-related munitions have been used since August 2014,⁶³ significantly drawing down stockpiles, and the rate of expenditure has only grown with time. 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.⁶⁴

Space. Although the classified nature of deployed space assets and their capabilities makes any assessment of this mission area challenging, the constellation of ISR, navigation, and communication satellites available to the United States is arguably unrivaled by that of any other nation-state. It is an array that 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 also facilitated an environment of overreliance on the domain and underappreciation of the vulnerabilities of its capabilities.⁶⁵ Some space assets represent nearly single-point failures in which a loss caused by a system failure or

an attack could cripple a linchpin capability. Because of U.S. dominance of space and nearly complete reliance on space-based assets for everything from targeting to weapons guidance, other state actors have every incentive to target those assets.⁶⁶

An adversary will capture and hold the initiative by leveraging surprise and every asymmetric advantage it possesses while denying those warfighting elements to its opponents. Since Operation Desert Storm, the world, including every one of America's near-peer competitors, has 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-guide munitions (PGMs).⁶⁷

China and Russia are now investing heavily in ground-based anti-satellite (ASAT) missiles,⁶⁸ orbital ASAT programs that can deliver a kinetic blow,⁶⁹ or co-orbital robotic interference to alter signals, mask denial efforts, or even pull adversary satellites out of orbit.⁷⁰ If a near-peer competitor were able to degrade regional GPS signals or blind GPS receivers, it could neutralize the PGMs the U.S. relies on to conduct virtually every aspect of its kinetic strike capability.

As General Thomas Hyten, head of Air Force Space Command, has clearly indicated, the vulnerability of the U.S. space constellation lies in its design.⁷¹ 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 find, fix, and destroy targets precisely, space will remain a dominant but incredibly vulnerable domain for the U.S. Air Force.

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 2017 Level:** 915 fighter aircraft.

This number is 244 fighters below the *2017 Index* number of 1,159, which was based on total active-duty fighters minus Air Education and Training Command fighter numbers.⁷² Several squadrons that should not have been included in the original total within Air Combat Command have been removed from the total.⁷³

Based on a pure count of combat-coded fighter/attack platforms that have achieved IOC, the USAF currently is at 76 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 123 aircraft that have entered the USAF inventory to date⁷⁴ are only IOC and do not yet field many of the capabilities that would constitute full-spectrum readiness.

The 915 figure yields a capacity level well within the methodology's range of "marginal," but aircraft require pilots to fly them and maintainers to launch, recover, and fix them. With a fighter pilot shortage approaching 1,000 and a maintenance shortfall of over 3,000 personnel, the ability of the Air Force to meet wartime manning requirements for fighter cockpits, as well as enough maintenance personnel to repair, refuel, and rearm aircraft in line with wartime sortie requirements, continues to wane. These factors, coupled with the lack of funding for a sufficient supply of spare parts, have reduced the capacity for employment from a *2017 Index*

assessment of "strong" to a *2018 Index* assessment of "marginal." As noted above, given personnel shortfalls, the Air Force capacity score is therefore trending toward "weak."

Capability Score: Marginal

The Air Force's capability score is "marginal," a 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 *2017 Index*'s assessment. However, the F-35 program has begun to show signs of strength, and the Air Force has made progress toward effective replacement of legacy aircraft.

Readiness Score: Marginal

The Air Force scores "marginal" trending downward in readiness in the *2018 Index*, the same overall grade that it received in the *2017 Index*. This assessment is based primarily on 47 fighter pilot interviews, testimony of senior leaders, and follow-on analysis of the Air Force's ability to meet full-spectrum readiness requirements in 2017.⁷⁵ 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 readiness since 2003, and implementation of BCA-imposed budget cuts in FY 2013 only exacerbated the problem. Similar to the other services, the Air Force was able to make up some of its readiness shortfalls under the FY 2016 budget, but given its poor readiness assessment, much more improvement is required.

The Air Force's current deficits in both pilot and maintainer manpower are also very troubling indicators for readiness. They will strain the service in the immediate term and, if not reversed, could lead to broader readiness challenges in the 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 "marginal."

While the overall score remains the same as its score in the *2017 Index*, it has trended downward, largely because of a drop in the USAF’s “capacity” score for a second consecutive year. The shortage of pilots and maintainers

also continues to affect the ability of the Air Force to generate the amount of combat air power that would be needed to meet war-time requirements.

U.S. Military Power: Air Force

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

Endnotes

1. The Honorable Michael B. Donley, Secretary of the Air Force, and General Mark A. Welsh III, Chief of Staff, United States Air Force, "Fiscal Year 2014 Air Force Posture Statement" before the Committee on Armed Services, U.S. House of Representatives, April 12, 2013, p. 2, <http://www.dtic.mil/dtic/tr/fulltext/u2/a584783.pdf> (accessed August 26, 2016).
2. The Honorable Heather A. Wilson, Secretary of the Air Force, and General David L. Goldfein, Chief of Staff, United States Air Force, statement on "Air Force Budget Posture," before the Committee on Armed Services, U.S. Senate, June 6, 2017, p. 2, <https://www.armed-services.senate.gov/hearings/17-06-06-posture-of-the-department-of-the-air-force> (accessed July 29, 2017); Congressional Quarterly, "Senate Armed Services Committee Holds Hearing on Posture of the Department of the Air Force," CQ Congressional Transcripts, June 6, 2017, <http://www.cq.com/doc/congressionaltranscripts-5116113?3> (accessed July 25, 2017).
3. General David Goldfein, U.S. Air Force, "Rebuilding Air Force Readiness," remarks at The Heritage Foundation, Washington, D.C., April 12, 2017, <http://www.heritage.org/defense/event/rebuilding-air-force-readiness>.
4. U.S. Department of Defense, Secretary of the Air Force, Office of Financial Management and Budget (SAF/FMB), *United States Air Force Fiscal Year 2018 Budget Overview*, May 2017, p. 15, <http://www.saffm.hq.af.mil/LinkClick.aspx?fileticket=m3vZOmFR368%3d&portalid=84> (accessed August 6, 2017).
5. U.S. Department of Defense, Office of the Under Secretary (Comptroller)/Chief Financial Officer, *United States Department of Defense Fiscal Year 2018 Budget Request: Defense Budget Overview*, May 2017, p. 2-10, http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2018/fy2018_Budget_Request_Overview_Book.pdf (accessed July 29, 2017).
6. *Ibid.*, p. 2-9.
7. The Honorable Deborah Lee James, Secretary of the Air Force, and General Mark A. Welsh III, USAF Chief of Staff, statement on "Fiscal Year 2016 Air Force Posture" before the Subcommittee on Defense, Committee on Appropriations, U.S. Senate, February 25, 2015, pp. 9, 12, and 19, [http://www.appropriations.senate.gov/imo/media/doc/hearings/FY16%20Air%20Force%20Posture%20Statement%20\(Final\)%20022515.pdf](http://www.appropriations.senate.gov/imo/media/doc/hearings/FY16%20Air%20Force%20Posture%20Statement%20(Final)%20022515.pdf) (accessed July 29, 2017).
8. The Honorable Deborah Lee James, Secretary of the Air Force, and General Mark A. Welsh III, Chief of Staff of the Air Force, statement on "Air Force Posture" before the Committee on Armed Services, U.S. House of Representatives, March 16, 2016, pp. 7-8, <http://docs.house.gov/meetings/AS/AS00/20160316/104662/HHRG-114-AS00-Bio-JamesD-20160316.pdf> (accessed July 25, 2017).
9. Technological advances in aircraft materials and structure greatly extended the service life of USAF equipment. As a result, the USAF was able to sustain its force structure while procuring fewer aircraft. See Colonel James C. Ruehrmund Jr. and Christopher J. Bowie, *Arsenal of Airpower: USAF Aircraft Inventory 1950-2009*, Mitchell Institute for Airpower Studies, November 2010, p. 8, <http://higherlogicdownload.s3.amazonaws.com/AFA/6379b747-7730-4f82-9b45-alc80d6c8fdb/UploadedImages/Mitchell%20Publications/Arsenal%20of%20Airpower.pdf> (accessed July 25, 2017).
10. U.S. Department of Defense, Secretary of the Air Force, Office of Financial Management and Budget (SAF/FMB), *United States Air Force Fiscal Year 2018 Budget Overview*, p. 15.
11. Wilson and Goldfein, statement on "Air Force Budget Posture," June 6, 2017, p. 2.
12. Combat-coded aircraft and related squadrons are aircraft and units assigned a wartime mission. 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. See Report No. 112-329, *National Defense Authorization Act for Fiscal Year 2012*, Conference Report to Accompany H.R. 1540, U.S. House of Representatives, 112th Cong, 1st Sess., December 12, 2011, p. 25, <https://www.gpo.gov/fdsys/pkg/CRPT-112hrpt329/pdf/CRPT-112hrpt329-pt1.pdf> (accessed August 6, 2017).
13. "The Air Force in Facts and Figures," U.S. Air Force Almanac 1996, *Air Force Magazine*, Vol. 79, No. 5 (May 1996), p. 59, http://www.airforcemag.com/MagazineArchive/Magazine%20Documents/1996/May%201996/0596facts_figures.pdf (accessed August 6, 2017). The Air Force uses a variety of categorizations to describe or refer to its inventory of aircraft and units. This can make assessing Air Force capacity a challenge.
14. Wilson and Goldfein, statement on "Air Force Budget Posture," June 6, 2017, p. 2.
15. International Institute for Strategic Studies, *The Military Balance 2017: The Annual Assessment of Global Military Capabilities and Defence Economics* (London: Routledge, 2017) pp. 53-54. The 32 combat-coded fighter squadrons are the active-duty F-22A, F-15C/D, F-15E, F-16C/D, A-10C, and F-35A squadrons listed for Air Combat Command, Pacific Air Forces, and United States Air Forces Europe.
16. William A. LaPlante, Assistant Secretary of the Air Force (Acquisition); Lieutenant General James M. "Mike" Holmes, Deputy Chief of Staff (Strategic Plans and Requirements); and Lieutenant General Tod D. Wolters, Deputy Chief of Staff (Operations), statement on "Fiscal Year 2016 Air Force, Force Structure and Modernization Programs" before the Subcommittee on Airland Forces, Committee on Armed Services, U.S. Senate, March 19, 2015, p. 8, http://www.armed-services.senate.gov/imo/media/doc/LaPlante_Holmes_Wolters_03-19-15.pdf (accessed August 6, 2017).

17. Ibid.
18. The numbers for total aircraft inventory (TAI) and combat-coded aircraft for the active-duty Air Force were derived through review of U.S. Department of Defense, Secretary of the Air Force, Office of Financial Management and Budget (SAF/FMB), *United States Air Force Fiscal Year 2018 Budget Overview*, and International Institute for Strategic Studies, *The Military Balance 2017: The Annual Assessment of Global Military Capabilities and Defence Economics* (London: Routledge, 2017), pp. 53–55. Where the two publications were in conflict with respect to TAI, the SAF/FMB numbers were adopted. Neither document specifies the number of active-duty combat-coded aircraft. That number was derived by tallying the total number of fighters by type and dividing that number by the total number of active-duty squadrons flying that type of aircraft. The number and type of aircraft associated with weapons squadrons, adversary tactics, test, operational test and evaluation, and other units are not standard/determinable and could not be accessed. The associated error is minimized by totaling all like fighter aircraft (F-16, F-15C, etc.), dividing them by the total number of squadrons flying that aircraft, and spreading the error equally across all combat-coded fighter and training units. Fighters associated with non-fighter training unit (FTU) squadrons were counted as combat-coded.
19. Wilson and Goldfein, statement on “Air Force Budget Posture,” June 6, 2017, p. 2.
20. “The Air Force in Facts and Figures,” U.S. Air Force Almanac 2016, *Air Force Magazine*, Vol. 99, No. 5 (May 2016), p. 37, <http://secure.afa.org/joinafa/AFMag0516/files/downloads/attachments/0516fullissue.pdf> (accessed August 7, 2017). Age posted is “as of September 30, 2015.” Ten months were added because of the delay between publication of the Air Force Almanac and this *Index*.
21. Ibid.
22. Comparison made between U.S. Department of Defense, Secretary of the Air Force, Office of Financial Management and Budget (SAF/FMB), *United States Air Force Fiscal Year 2018 Budget Overview*, p. 46, and International Institute for Strategic Studies, *The Military Balance 2017*, pp. 53–55.
23. “The Air Force in Facts and Figures,” May 2016, p. 37. Age posted is “as of September, 30 2015.” Ten months were added because of the delay between publication of the Air Force Almanac and this *Index*.
24. Ibid.
25. Wilson and Goldfein, statement on “Air Force Budget Posture,” June 6, 2017, p. 2.
26. Comparison made between U.S. Department of Defense, Secretary of the Air Force, Office of Financial Management and Budget (SAF/FMB), *United States Air Force Fiscal Year 2018 Budget Overview*, p. 46, and International Institute for Strategic Studies, *The Military Balance 2017*, pp. 53–55.
27. U.S. Department of Defense, Secretary of the Air Force, Office of Financial Management and Budget (SAF/FMB), *United States Air Force Fiscal Year 2018 Budget Overview*, p. 46.
28. Comparison made between U.S. Department of Defense, Secretary of the Air Force, Office of Financial Management and Budget (SAF/FMB), *United States Air Force Fiscal Year 2018 Budget Overview*, p. 46, and International Institute for Strategic Studies, *The Military Balance 2017*, pp. 53–55.
29. “The Air Force in Facts and Figures,” May 2016, p. 37. Age posted is “as of September 30, 2015.” Twenty-two months were added because of the delay between publication of the Air Force Almanac and this *Index*.
30. Wilson and Goldfein, statement on “Air Force Budget Posture,” June 6, 2017, p. 13.
31. Colonel Michael W. Pietrucha, U.S. Air Force, “The Comanche and the Albatross: About Our Neck Was Hung,” *Air & Space Power Journal*, May–June 2014, pp. 133–156, <http://www.dtic.mil/docs/citations/ADA602171> (accessed July 26, 2017).
32. Jeremiah Gertler, “Air Force F-22 Fighter Program,” Congressional Research Service *Report for Congress*, July 11, 2013, p. 7, <https://www.fas.org/sgp/crs/weapons/RL31673.pdf> (accessed July 26, 2017).
33. Jeremiah Gertler, “F-35 Joint Strike Fighter (JSF) Program,” Congressional Research Service *Report for Members and Committees of Congress*, April 29, 2014, p. 2, <http://fas.org/sgp/crs/weapons/RL30563.pdf> (accessed July 26, 2017).
34. Thomas W. Spoehr and Rachel Zissimos, eds., “Preventing a Defense Crisis: The 2018 National Defense Authorization Act *Must* Begin to Restore U.S. Military Strength,” Heritage Foundation *Backgrounders* No. 3205, March 29, 2017, p. 8, <http://www.heritage.org/sites/default/files/2017-03/BG3205.pdf>.
35. Gertler, “Air Force F-22 Fighter Program,” p. 7.
36. John Venable, “Independent Capability Assessment of the U.S Air Force Reveals Readiness Level Below Carter Administration Hollow Force,” Heritage Foundation *Backgrounders* No. 3208, April 17, 2017, p. 2, <http://www.heritage.org/sites/default/files/2017-04/BG3208.pdf> (accessed August 8, 2017).
37. Dave Majumdar, “Can the F-35 Win a Dogfight?” *War Is Boring*, December 17, 2013, p. 1, <https://warisboring.com/can-the-f-35-win-a-dogfight-95462ccd6745#5pvpajaos> (accessed July 26, 2017).

38. James Drew, "F-22 Raptor Retrofit to Take Longer, but Availability Hits 63%," *FlightGlobal*, July 6, 2015, <http://www.flightglobal.com/news/articles/f-22-raptor-retrofit-to-take-longer-but-availability-hits-414341/> (accessed August 6, 2017).
39. Kris Osborn, "Air Force: F-35 3F Software Drop Challenges Resolved," *Defense Systems*, May 17, 2017, <https://defensesystems.com/articles/2017/05/17/f35.aspx> (accessed July 26, 2017); Lara Seligman, "F-35 Full Combat Capability Will Be Four Months Late," *Defense News*, March 23, 2016, <http://www.defensenews.com/story/defense/air-space/2016/03/23/f-35-full-combat-capability-four-months-late/82187648/> (accessed August 6, 2017).
40. John Venable, "Operational Assessment of the F-35A Argues for Full Program Procurement and Concurrent Development Process," Heritage Foundation *Backgrounder* No. 3140, August 4, 2016, pp. 8 and 10, <http://www.heritage.org/defense/report/operational-assessment-the-f-35a-argues-full-program-procurement-and-concurrent> (accessed August 7, 2017).
41. Aaron Mehta, "KC-46 Tanker Cleared for Production," *Defense News*, August 12, 2016, <http://www.defensenews.com/training-sim/2016/08/12/kc-46-tanker-cleared-for-production/> (accessed July 26, 2017).
42. Colin Clark, "Boeing Wins \$2.8B for KC-4 Tanker Low Rate Production," *Breaking Defense*, August, 18, 2016, <http://breakingdefense.com/2016/08/boeing-wins-2-5b-for-kc-46-tanker-low-rate-production/> (accessed July 26, 2017); U.S. Department of Defense, Office of the Under Secretary of Defense (Comptroller)/Chief Financial Officer, *United States Department of Defense Fiscal Year 2016 Budget Request: Overview*, February 2015, p. 8-17, http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2016/FY2016_Budget_Request_Overview_Book.pdf (accessed August 6, 2017).
43. Lieutenant General Arnold W. Bunch, Jr., Military Deputy, Office of the Assistant Secretary of the Air Force (Acquisition); Lieutenant General Jerry D. Harris, Deputy Chief of Staff (Strategic Plans and Requirements); and Major General Scott A. Vander Hamm, Assistant Deputy Chief of Staff (Operations), statement on "Air Force Bomber/Tanker/Airlift Acquisition Programs" before the Subcommittee on Seapower and Projection Forces, Committee on Armed Services, U.S. House of Representatives, May 25, 2017, p. 10, <http://docs.house.gov/meetings/AS/AS28/20170525/106013/HHRG-115-AS28-Wstate-BunchA-20170525.pdf> (accessed August 6, 2017).
44. *Ibid.*
45. Lieutenant General James M. "Mike" Holmes, USAF Deputy Chief of Staff (Strategic Plans and Requirements), and Lieutenant General Arnold W. Bunch, Jr., USAF, Military Deputy, Office of the Assistant Secretary of the Air Force (Acquisition), "Subject: Hearing on Air Force Bomber/Tanker/Airlift Acquisition Programs—HASC Seapower and Projection Forces," statement before the Subcommittee on Seapower and Projection Forces, Committee on Armed Services, U.S. House of Representatives, March 1, 2016, p. 4, <http://docs.house.gov/meetings/AS/AS28/20160301/104353/HHRG-114-AS28-Wstate-BunchA-20160301.pdf> (accessed August 26, 2016).
46. *Ibid.*, p. 4.
47. *Ibid.*, p. 5.
48. Lieutenant General Jerry "JD" Harris, Jr., Deputy Chief of Staff (Strategic, Plans, Programs and Requirements); Lieutenant General Arnold W. Bunch, Jr., Military Deputy, Office of the Assistant Secretary of the Air Force (Acquisition); and Lieutenant General Mark C. Nowland, Deputy Chief of Staff (Operations), statement on "Air Force, Force Structure and Modernization Programs" before the Subcommittee on Airland Forces, Committee on Armed Services, U.S. Senate, March 29, 2017, https://www.armed-services.senate.gov/imo/media/doc/Harris-Bunch-Nowland_03-29-17.pdf (accessed August 6, 2017).
49. Wilson and Goldfein, statement on "Air Force Budget Posture," June 6, 2017, p. 3.
50. Major General Scott West, Director of Current Operations, Deputy Chief of Staff for Operations, Headquarters, U.S. Air Force, statement on "Military Aviation Readiness and Safety" before the Subcommittee on Readiness, Committee on Armed Services, U.S. House of Representatives, July 6, 2016, <http://docs.house.gov/meetings/AS/AS03/20160706/105159/HHRG-114-AS03-Wstate-WestS-20160706.pdf> (accessed August 6, 2017).
51. 2016 maintainer shortage statistic provided by Headquarters Air Force Deputy Chief of Staff for Logistics, Engineering, and Force Protection (HAF A4) on April 13, 2017.
52. Julian E. Barnes, "Warning Sounded on Cuts to Pilot Training," *The Wall Street Journal*, December 19, 2013, <http://www.wsj.com/articles/SB10001424052702304773104579268651994849572> (accessed July 26, 2017).
53. Scott Maucione, "Air Force Puts a Number on Maintenance Staffing Deficit," *Federal News Radio*, June 16, 2016, <http://federalnewsradio.com/defense/2016/06/air-force-puts-number-maintenance-staffing-deficit/> (accessed July 26, 2017).
54. *Hearing to Consider the Nomination of General David L. Goldfein, USAF, for Reappointment to the Grade of General and to Be Chief of Staff, United States Air Force*, Committee on Armed Services, U.S. Senate, June 16, 2016, "Advance Policy Questions," pp. 7-8, http://www.armed-services.senate.gov/hearings/16-06-16-nomination_-goldfein (accessed August 30, 2016).

55. Courtney Albion, "Air Force: 1,900 Fighter Jets Is Low-end Requirement; Service Likely Needs About 2,100," *Inside Defense*, March 30, 2017, <https://insidedefense.com/daily-news/air-force-1900-fighter-jets-low-end-requirement-service-likely-needs-about-2100> (accessed August 6, 2017).
56. R. Derek Trunkey, "Implications of the Department of Defense Readiness Reporting System," Congressional Budget Office *Working Paper* 2013-03, May 2013, pp. 5 and 11, https://www.cbo.gov/sites/default/files/113th-congress-2013-2014/workingpaper/44127_DefenseReadiness_1.pdf (accessed August 6, 2017).
57. Lieutenant General Gina M. Grosso, Deputy Chief of Staff Manpower, Personnel and Services, U.S. Air Force, statement on "Military Pilot Shortage" before the Subcommittee on Readiness, Committee on Armed Services, U.S. House of Representatives, March 29, 2017, p. 2, <http://docs.house.gov/meetings/AS/AS02/20170329/105795/HHRG-115-AS02-Wstate-GrossoG-20170329.pdf>, (accessed July 26, 2017).
58. U.S. Department of Defense, Office of the Under Secretary (Comptroller)/Chief Financial Officer, *United States Department of Defense Fiscal Year 2018 Budget Request: Defense Budget Overview*, p. 2-11.
59. Venable, "Independent Capability Assessment of the U.S. Air Force Reveals Readiness Level Below Carter Administration Hollow Force," p. 4.
60. U.S. Department of Defense, Office of the Under Secretary (Comptroller)/Chief Financial Officer, *United States Department of Defense Fiscal Year 2018 Budget Request: Defense Budget Overview*, p. 2-11.
61. LaPlante, Holmes, and Wolters, statement on "Fiscal Year 2016 Air Force, Force Structure and Modernization Programs," p. 16.
62. *Ibid.*, p. 17.
63. U.S. Department of Defense, Secretary of the Air Force, Office of Financial Management and Budget (SAF/FMB), *United States Air Force Fiscal Year 2018 Budget Overview*, p. 4.
64. Bunch, Harris, and Vander Hamm, statement on "Air Force Bomber/Tanker/Airlift Acquisition Programs," p. 14.
65. U.S. Air Force Space Command, "Hyten Announces Space Enterprise Vision," April 13, 2016, <http://www.af.mil/News/Article-Display/Article/719941/hyten-announces-space-enterprise-vision/> (accessed August 6, 2017).
66. Colin Clark, "Space Command Readies for War with 'Space Enterprise Vision,'" *Breaking Defense*, June 20, 2016, <http://breakingdefense.com/2016/06/space-command-readies-for-war-with-space-enterprise-vision/> (accessed July 26, 2017).
67. Venable, "Independent Capability Assessment of the U.S. Air Force Reveals Readiness Level Below Carter Administration Hollow Force," p. 10.
68. Bill Gertz, "China Tests Anti-Satellite Missile," *The Washington Free Beacon*, November 9, 2015, <http://freebeacon.com/national-security/china-tests-anti-satellite-missile/> (accessed July 26, 2017).
69. Weston Williams, "Russia Launches Anti-Satellite Weapon: A New Warfront in Space?" *The Christian Science Monitor*, December 22, 2016, <http://www.csmonitor.com/USA/Military/2016/1222/Russia-launches-anti-satellite-weapon-A-new-warfront-in-space> (accessed April 11, 2017).
70. Brid-Aine Parnell, "MYSTERY Russian Satellite: ORBITAL WEAPON? Sat GOBBLER? What?" *The Register*, November 18, 2014, http://www.theregister.co.uk/2014/11/18/russia_secret_satellite_kosmos_2499/ (accessed August 6, 2017).
71. U.S. Air Force Space Command, "Hyten Announces Space Enterprise Vision."
72. International Institute for Strategic Studies, *The Military Balance 2016: The Annual Assessment of Global Military Capabilities and Defence Economics* (London: Routledge, 2016), pp. 46–48.
73. See note 18, *supra*. This number represents total Active component, combat-coded fighters. This *Index* considers requirements such as aircraft that are needed to perform Operation Noble Eagle (ONE), an ongoing mission to defend American airspace. Details regarding ONE are limited and largely unavailable to the public. Because the exact number of Active component fighter aircraft participating in ONE is unknown, fighters that may be tasked with the ONE mission are not counted in this total.
74. U.S. Department of Defense, Secretary of the Air Force, Office of Financial Management and Budget (SAF/FMB), *United States Air Force Fiscal Year 2018 Budget Overview*, p. 46.
75. Venable, "Independent Capability Assessment of the U.S. Air Force Reveals Readiness Level Below Carter Administration Hollow Force."