

U.S. Air Force

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The U.S. Air Force (USAF), originally part of the Army Signal Corps, became a separate service in 1947, and its mission has expanded significantly over the years. Initially, 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 Air Force’s “fly, fight, and win” nature. Space’s rise to prominence in the early 1950s brought a host of faculties that would expand the service’s portfolio and increase its capabilities in the mission areas of intelligence, surveillance, and reconnaissance (ISR) and command and control (C2). Together, the addition of the Space Force as the fifth uniformed service within the Department of Defense (DOD) and the onset of the global SARS-CoV-2 (COVID-19) pandemic have had a notable impact on the Air Force in the year since the *2021 Index of Military Strength* was published.

With the birth of the Space Force in December 2019,¹ the Air Force began to move its space portfolio of assets and personnel to the new service. This change will affect at least three mission areas: air and space superiority, ISR, and C2. Each of these mission areas was born from air-breathing assets, and while the loss of the space portfolio will reduce the service’s inherent capabilities, they will remain within the Department of the Air Force (DAF) and allow the Air Force to focus the weight of its efforts on the core missions in the air and cyber domains.

Today’s Air Force has five principal missions:

- Air superiority (space superiority is now the responsibility of the Space Force);
- Intelligence, surveillance, and reconnaissance;
- Mobility and lift;
- Global strike; and
- Command and control.

The summer of 2021 finds the Air Force, like the rest of DOD, recovering from the effects of COVID-19. Recruiting and other training pipelines like pilot training have slowed considerably, and this has affected accessions. The service’s ability to generate sorties and flying hours for training has reached near-historic lows with equally grim readiness levels. All of this comes on the heels of reductions in force size and a drought in readiness from which the Air Force has been trying to recover for the past several years.

The pandemic’s impact on the economy has reduced external hiring opportunities, particularly with the airlines, and this has helped to mitigate the separation from the Air Force of the most experienced airmen in critically manned areas.² However, because the COVID-19 vaccine’s distribution is now widespread and the economic recovery is underway, it could well become harder to retain trained personnel.

Unlike some of the other services, the Air Force did not grow larger during the post-9/11 buildup. Instead, it grew smaller as acquisitions of new aircraft failed to offset programmed retirements of older aircraft. Following the sequestration debacle in 2012, the Air Force began to trade size for quality.³ Presidential defense budgets from 2012 through 2017 during the Obama Administration proved merely aspirational, and as the service sustained the war on terrorism, it struggled also to sustain the type of readiness required to employ in a major regional contingency (MRC) against a near-peer threat.

The Air Force was forced to make strategic trades in capability, capacity, and readiness to meet the operational demands of the war on terrorism and develop the force it needed for the future. The collective effects left the Air Force of 2016 with just 55 total force fighter squadrons, and the readiness levels within those organizations were very low. Just four of the Air Force's 32 active-duty fighter squadrons were ready for conflict with a near-peer competitor, and just 14 others were considered ready even for low-threat combat operations.⁴

Recognizing the threat from a rising China and resurgent Russia, the 2018 National Defense Strategy (NDS) directed the services to prepare for a large-scale, high-intensity conventional conflict with a peer adversary.⁵ Later that same year, the Air Force released "The Air Force We Need" (TAFWN), a study of the capacity it would need to fight and help the U.S. win such a war. Based on thousands of war-game simulations, the study found that the service needed to grow by 25 percent, from 312 to 386 squadrons, to execute that strategy. That growth included one additional airlift squadron and seven additional fighter, five additional bomber, and 14 additional tanker squadrons.⁶ That equates to an additional 182 fighter, 50 bomber, 210 air refueling, and 15 airlift platforms.⁷ During the same period, the service's most senior leaders conveyed the need for more time in the air for its aircrews,⁸ and these collective demands required a bigger budget.

In a series of speeches in 2018, Air Force Secretary Heather Wilson and Air Force Chief of Staff General David Goldfein highlighted the shortfall and the need for more funding to increase the service's capacity with next-generation platforms: in other words, to buy all-new-design aircraft rather than continuing to purchase aircraft that have been in production since the 1980s and 1990s.⁹ To meet that requirement, the Trump Administration increased DAF funding by 31 percent from 2017 to 2021.¹⁰

Considering this shortfall, one might assume that the Air Force increased its procurement budget and accelerated acquisition of fifth-generation offensive platforms and next-generation tanker aircraft during that period by a substantial margin. However, funding for aircraft procurement remained relatively flat, growing from \$22.4 billion in fiscal year (FY) 2017 to just \$25.6 billion in FY 2022—a rate of growth that did not keep up with inflation. The budget for procurement fell from \$28.4 billion in FY 2021 to \$25.6 billion in FY 2022, a straight decrease of 11 percent but, accounting for inflation, a loss of buying power that approaches 14 percent.

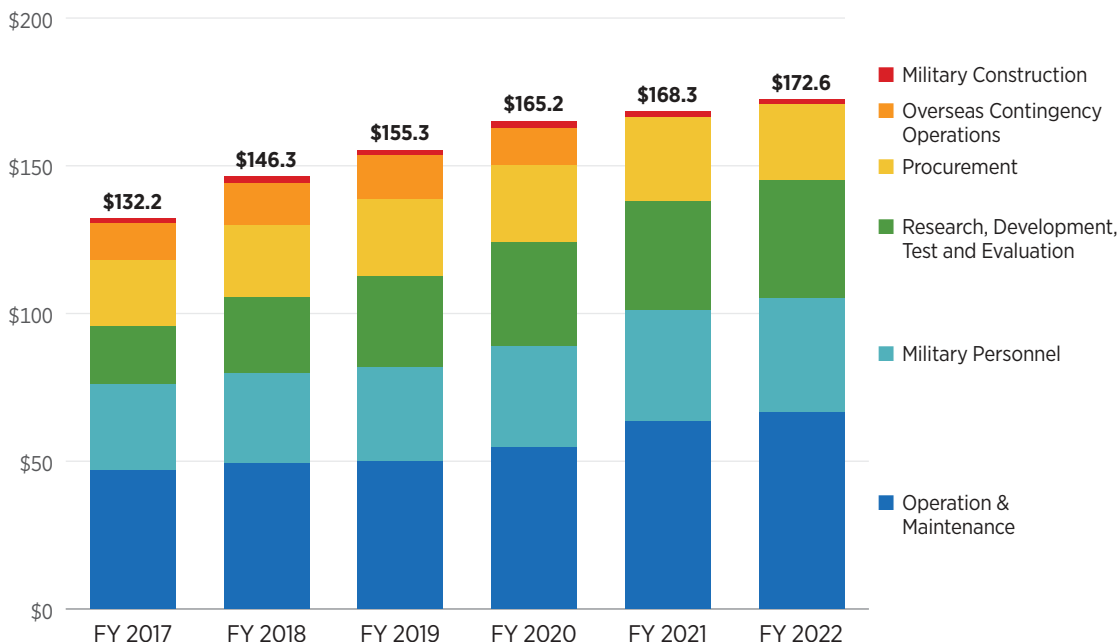
The budget for research, development, test and evaluation (RDT&E), on the other hand, has more than doubled since FY 2017, growing from \$20.5 billion in FY 2017 to \$40.1 billion in FY 2022, and now exceeds procurement by more than 50 percent.¹¹ Much of that funding was used to develop and field the digital backbone for the Airborne Battle Management System (ABMS) to help move information to the warfighter, process targets, and optimize their engagement.

Capacity

At the height of the Cold War buildup in 1987, the active-duty Air Force had an inventory of 3,082 fighter, 331 bomber, 576 air refueling, and 331 strategic airlift platforms. When the strategic reserve assets within the Air National Guard (Guard) and Air Force Reserve (Reserve) are added, the 1987 totals were 4,468 fighter, 331 bomber, 704 air refueling, and 362

Air Force Budgets, 2017–2022

IN BILLIONS OF U.S. DOLLARS



NOTE: FY 2022 figures are proposed.

SOURCES: Extracted from U.S. Air Force budget summaries for the years 2017 through 2021. For example: Table 1, “Air Force Budget Highlights Summary,” in U.S. Department of the Air Force, *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 17, 2021), and Table 1, “Department of the Air Force Budget Summary,” in U.S. Department of the Air Force, *Department of the Air Force FY 2021 Budget Overview*, p. 2, https://www.saffm.hq.af.mil/Portals/84/documents/FY21/SUPPORT_/FY21%20Budget%20Overview_1.pdf?ver=2020-02-10-152806-743 (accessed August 17, 2021).

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strategic airlift platforms. After the fall of the Iron Curtain, the United States shifted from a force-sizing construct centered on great-power competition to one capable of winning two simultaneous or nearly simultaneous MRCs. Those numbers for capacity have been reduced significantly over the years.

It is projected that at the end of FY 2021, the Air Force will have a total aircraft inventory (TAI) of 2,183 fighters, 140 bombers, 512 tankers, and 274 strategic airlift platforms. After just three years of adding to that inventory, the

service returned to the idea of trading capacity for some future gain through RDT&E.¹² In 2021, Chief of Staff General C.Q. Brown announced plans to cut another 137 fighters and 32 tankers from the USAF’s inventory by the end of FY 2022. While the service has not stated where those reductions will be made, it will reduce the TAI to 2,096 fighters, 140 bombers, 483 tankers, and 274 by the end of FY 2022.¹³ The Air Force will have a total force that equates to 47 percent of the fighter and bomber assets and 69 percent of the tanker and airlift assets that

it possessed the last time the United States was prepared to fight a peer competitor.

The idea that aircraft production lines will somehow surge to come to the rescue in a peer-level crisis may seem plausible to some,¹⁴ but even if Congress were to throw an unlimited amount of funding at production lines, there would not likely be enough time to bring new fighters into the force to meet the 2018 NDS's scenario and timing requirements.¹⁵

The *Index of U.S. Military Strength* uses “combat-coded” fighter aircraft within the active component of the U.S. Air Force to assess capacity. Combat-coded aircraft and related squadrons are aircraft and units with an assigned wartime mission, which means that those numbers exclude units and aircraft assigned to training, operational test and evaluation (OT&E), and other missions.

The software and munitions carriage and delivery capability of aircraft in non-combat-coded units renders them incompatible with and/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 curtail their utility and effectiveness in combat. While those jets could be slated for upgrades, hardware updates sideline jets for several months, and training wings and certain test organizations are generally the last to receive those upgrades.

Of the 5,504 manned and unmanned aircraft projected to be in the USAF's inventory at the end of FY 2021, 1,482 are active-duty fighters, and 983 of those are combat-coded aircraft.¹⁶ It is important to separate the active-duty fighters and units from the strategic reserve because it would take several months to get elements of the latter up to manning and readiness levels that allowed their first elements to deploy. Unfortunately, there are other factors that also affect the number of fighters the service could actually employ in combat.

Most squadrons will have to pack up and deploy several thousand miles to be able to fight. Because of the additional wartime manning

requirements and the fact that most squadrons have several jets that are in disrepair at any given time, it takes the resources of approximately three active-duty squadrons to deploy two combat-capable fighter units forward.¹⁷ That effectively reduces the total number of active-duty, combat-coded fighters to 649 jets.

The strategic reserve has 518 fighters, of which 419 are combat coded. Because of the additional manning requirements and the fact that Guard and Reserve units generally have just one squadron at each location, it takes two squadrons to deploy one combat-capable unit forward.¹⁸ In terms of capacity, this means that 649 active-duty and 210 strategic reserve fighters, for a total of 859 combat-coded fighters, could be deployed into combat, leaving virtually nothing in reserve.

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 make it possible to assess the overall health of this vital area. The inventory for precision-guided munitions (PGM) was severely stressed by nearly 18 years of sustained combat operations and budget actions that limited the service's ability to procure replacements and increase stockpiles. From 2017 through 2021, funding for munitions was significant, and the service, believing the inventory is now sufficiently restocked, has reduced the number of PGMs it will acquire to a total of 8,365 munitions in FY 2022.

However, even though the munitions stockpile may have returned to a level capable of supporting a surge in expenditures associated with a conflict similar to the one in which the U.S. has been engaged for the past 19-plus years, it would not likely support a peer-level fight that lasts more than a few weeks. Typically, there is a delay of 24–36 months between funding and delivery of additional munitions, and while the potential exists for a rapid expansion of production, it is hard to envision how such an expansion could be rapid enough to exceed demand before the stockpile is depleted. (See Table 5).

TABLE 5

Precision-Guided Munitions Expenditures and Programmed Acquisitions

TOTAL MUNITIONS EXPENDED

	FY 2017	FY 2018	FY 2019	FY 2020	FY2021*
JDAM	30,664	5,462	7,354	4,004	4,500
HELLFIRE	1,536	2,110	2,449	1,019	1,250
SDB-I/II	4,507	749	1,289	397	300
APKWS	Unknown	Unknown	Unknown	Unknown	Unknown
JASSM-ER	360	19	16	10	16
LGB	276	373	106	6,078	6,000
ARRW**	n/a	n/a	n/a	n/a	n/a
Total	38,092	9,462	11,963	11,508	12,066

TOTAL MUNITIONS ACQUIRED

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022*
JDAM	35,106	36,000	25,000	16,800	1,919
HELLFIRE	3,629	3,734	3,859	4,517	1,176
SDB-I/II	7,312	6,254	8,253	3,205	1,983
APKWS	10,621	6879	15,642	3,946	2,750
JASSM-ER	360	360	390	400	525
LGB	0	0	0	0	0
ARRW**	n/a	n/a	n/a	n/a	12
Total	57,777	53,976	53,893	29,617	8,365

* Estimate based on data from President's Budget.

** Air-launched Rapid Response Weapon (ARRW) is a hypersonic, long-range, conventional air-to-surface missile with precision-guided, prompt-strike capability from stand-off ranges.

SOURCES: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force munition levels, May 7, 2021; Table 2, "Department of the Air Force Budget Summary," in U.S. Department of the Air Force, *Department of the Air Force FY 2022 Budget Overview*, p. 12, https://www.saffm.hq.af.mil/Portals/84/documents/FY22/SUPPORT_/FY22%20Budget%20Overview%20Book.pdf?ver=SMbMqD0tqlJNwq2Z0Q4yzA%3d%3d (accessed August 17, 2021); and U.S. Department of the Air Force, *Department of Defense Fiscal Year (FY) 2022 Budget Estimates, Air Force, Justification Book Volume 1 of 1, Procurement of Ammunition, Air Force*, May 2021, pp. Volume 1-7–Volume 1-76, https://www.saffm.hq.af.mil/Portals/84/documents/FY22/PROCUREMENT_/FY22%20DAF%20J-Book%20-%203011%20-%20Ammunition%20Proc.pdf?ver=PaFt7rWf7aiKYJhl-cpv9w%3d%3d (accessed August 17, 2021).

Capability

The risk assumed with capacity has placed an ever-growing burden on the capability of Air Force assets. The ensuing capability-over-capacity strategy centers on the idea of developing and maintaining a *more-capable* force that can win against the advanced fighters and surface-to-air missile systems now being developed by top-tier potential adversaries like China and Russia, which 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 fatigue on everything from metal airframe structures to electrical wiring harnesses.

The average age of Air Force aircraft is 31 years, and some fleets, such as the B-52 bomber, average 60 years. In addition, KC-135s comprise 78 percent of the Air Force's 483 tankers and are more than 59 years old on average. By the end of FY 2022, 71 brand-new KC-46s will make up 15 percent of the tanker inventory, but they will not be capable of refueling aircraft during combat operations—the jet's primary mission—until sometime in FY 2024.¹⁹

The average age of the F-15C fleet is more than 37 years,²⁰ significantly exceeding the programmed service life of a fleet that comprises more than half of USAF air superiority platforms.²¹ The planes in the F-16C/D fleet are almost 31 years old on average,²² and the service has used up nearly 87 percent of their expected life span. In 2018, the Air Force announced its intent to extend the service lives of 300 F-16s through a major service life extension program (SLEP) that will allow those jets to continue to fly through 2050.²³ SLEPs lengthen the useful life of airframes, and these F-16 modifications also include funding for the modernization of avionics within those airframes. These modifications are costly, and the added expense reduces the amount of funding the service has

to invest in modernization, which is critical to ensuring future capability. Even with a SLEP, there is a direct correlation between aircraft age and the maintainability of those platforms. (See Table 6).

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). The Air Force will accept delivery of 19 MQ-9s to its inventory in FY 2022 for a total of 351 Reapers.²⁴ The service lost an RQ-4 to an Iranian missile in 2019 and intends to reduce its inventory by another 21 platforms by the end of FY 2022, leaving it with just 10 of these strategic reconnaissance platforms. These unmanned surveillance aircraft have largely replaced older manned platforms, but not entirely. With an average age of 39 years,²⁵ the U-2, a manned high-altitude reconnaissance aircraft, is still very much in demand and currently has no scheduled retirement date.²⁶

The E-8 Joint Surveillance Target Attack Radar System (J-STARS) and RC-135 Rivet Joint are critical ISR platforms. Each was built on the Boeing 707 platform, and the last one came off the production line 42 years ago. The FY 2020 National Defense Authorization Act directed the Air Force not to retire the E-8 until a replacement system is available. However, the President's FY 2022 budget request includes the retirement of four of those platforms.²⁷

The Air Force is working on an incremental approach for a J-STARS replacement that focuses on advanced and disaggregated sensors (a system of systems) that would require enhanced and hardened communications links. Known as the Advanced Battle Management System (ABMS),²⁸ it is envisioned as an all-encompassing approach to both airborne and ground Battle Management Command and Control (BMC2) that would allow the Air Force to fight and support joint and coalition partners in high-end engagements.²⁹

With respect to air combat, the Active Air Force has just 98 F-15Cs left in its fleet,³⁰ and

TABLE 6

Air Force Total Aircraft Inventory (Page 1 of 3)

FY 2021					MISSION CAPABLE (MC)				FY 2022			
Type	Active Duty	Air National Guard	Air Force Reserve	Total	Average Age in Years	MC Rate FY 2019	MC Rate FY 2020	Change	Average Daily MC Aircraft, FY 2021	Programmed Retirements	Programmed Acquisitions	Total
A010C	143	85	55	281	39	71%	72%	0.80%	202	-42		239
AC130J	26	0	0	26	4	86%	82%	-4.12%	21		4	30
AC130U	6	0	0	6	30	86%	88%	2.38%	5	-6		0
B-1B	61	0	0	44	33	46%	53%	6.58%	23	0		44
B-2A	20	0	0	20	26	60%	62%	1.53%	12			20
B-52H	58	0	18	76	59	66%	61%	-4.73%	46			76
C-130H	2	127	42	141	30	66%	70%	4.49%	99	-13		128
C-130J	109	16	10	146	11	77%	79%	1.98%	115		5	151
C-5M	52			52			61%		31			52
C-17A	146	50	26	222	17	82%	82%	0.07%	183			222
CV022B	52	0	0	52	8	53%	54%	0.75%	28			52
E003B	16	0	0	16	42	74%	66%	-8.61%	11	-4		12
E003C	1	0	0	1	37	73%	77%	3.61%	1			1
E003G	20	0	0	20	40	74%	71%	-3.66%	14			20
E008C	0	16	0	16	20	67%	67%	-0.86%	11	-4		12
EC130H	9	0	0	9	47	73%	67%	-6.29%	6	-2		7
EC130J	0	7	0	7	20	57%	53%	-4.88%	4			7
F015C	86	123	0	209	36	70%	72%	1.85%	150	-36		173

TABLE 6

Air Force Total Aircraft Inventory (Page 2 of 3)

FY 2021					MISSION CAPABLE (MC)				FY 2022			
Type	Active Duty	Air National Guard	Air Force Reserve	Total	Average Age in Years	MC Rate FY 2019	MC Rate FY 2020	Change	Average Daily MC Aircraft, FY 2021	Programmed Retirements	Programmed Acquisitions	Total
F015D	10	14	0	24	36	72%	71%	-1.95%	17	-12		12
F015E	218	0	0	218	28	71%	69%	-2.09%	151			218
F015EX	2			2	0							2
F016C	439	288	49	776	30	73%	74%	0.93%	573	-40		736
F016D	111	44	4	159	30	70%	72%	1.73%	115	-6		153
F022A	166	20	0	186	13	51%	52%	1.41%	97			186
F035A	306	20	0	326	5	62%	76%	14.50%	248		50	376
HC130J	21	12	2	35	6	80%	80%	-0.07%	28		4	39
HC130N	0	3	0	3	26	68%	74%	6.07%	2			3
HH060G	74	18	15	107	30	66%	69%	2.79%	74	-25		82
KC010A	50	0	0	50	36	79%	81%	1.50%	40	-14		36
KC046A	52	12	4	68	2	63%	67%	0.00%	45		3	71
KC135R	122	148	70	340	59	73%	73%	0.40%	248	-18		322
KC135T	30	24	0	54	60	71%	73%	1.99%	39			54
LC130H	0	10	0	10	35	40%	44%	3.42%	4			10
MC130H	16	0	0	16	32	69%	74%	4.95%	12			16
MC130J	44	0	0	44	6	78%	76%	-1.64%	33		11	55
MQ009A	306	24	0	330	7	89%	91%	1.45%	300		21	351

TABLE 6

Air Force Total Aircraft Inventory (Page 3 of 3)

Type	FY 2021				MISSION CAPABLE (MC)			FY 2022		
	Active Duty	Air National Guard	Air Force Reserve	Total	Average Age in Years	MC Rate FY 2019	MC Rate FY 2020	Change	Average Daily MC Aircraft, FY 2021	Total
OC135B	2	0	0	2	58	82%	87%	4.14%	2	0
RC135S	3	0	0	3	58	90%	88%	-2.79%	3	3
RC135U	2	0	0	2	55	91%	87%	-4.57%	2	2
RC135V	8	0	0	8	56	74%	78%	3.90%	6	8
RC135W	9	0	0	9	57	69%	81%	11.51%	7	9
RQ004B	30	0	0	30	9	76%	74%	-2.15%	22	10
T001A	178	0	0	178	26	61%	68%	7.89%	122	178
T038A	59	0	0	59	54	74%	71%	-3.18%	42	59
T038C	445	0	0	445	53	63%	65%	2.35%	291	445
U2	31	0	0	31	29	78%	73%	-5%	23	31

SOURCES: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force mission-capable rates, May 17, 2021; Appendix, "Department of the Air Force Total Aircraft Inventory (TAI)," in U.S. Department of the Air Force, *Department of the Air Force FY 2022 Budget Overview*, p. 50, https://www.saffm.hq.af.mil/Portals/84/documents/FY22/SUPPORT/_FY22%20Budget%20Overview%20Book.pdf?ver=SMbMqD0tqJINwq2Z0Q04yZ%A%3d (accessed August 17, 2021); and International Institute for Strategic Studies, *The Military Balance 2021: The Annual Assessment of Global Military Capabilities and Defence Economics* (London: Routledge, 2021), pp. 56–59.

concerns about what platform will fill this role when the F-15C is retired are fully justified. The Department of Defense planned to purchase 750 F-22A stealth air superiority fighters to replace the F-15C, but draconian cuts in the program of record reduced the acquisition to a total of just 186 F-22As: 166 Active Duty and 20 Air National Guard.³¹

The ability to fulfill the operational need for air superiority fighters will be further strained in the near term because of the F-22's low availability rates and a structural repair program that causes some portion of those jets to be unavailable for operational use. The program had six F-22s off the flight line at any given time³² to make alterations required to extend the airframe's service life to 8,000 hours. That program was completed in late 2020 and will now transition to a 10-year program to refurbish the low-observable coatings on the engine inlets and inspect and overhaul the aircraft's flight control system that will run through 2031.³³

The Air Force's number-one acquisition priority remains the F-35A, the next-generation fighter scheduled to replace all legacy multirole and close air support aircraft. The jet's full operating capability (FOC) was delivered in early 2018.³⁴ The rationale for the Air Force's planned acquisition of 1,763 aircraft is to replace every F-117, F-16, and A-10 aircraft on a one-for-one basis.³⁵ The F-35A's multirole design favors the air-to-ground mission, but its fifth-generation faculties will also be dominant in an air-to-air role, allowing it to augment the F-22A in many scenarios.³⁶

A second top acquisition priority is the KC-46A air refueling tanker. The KC-46 has experienced a series of problems and delays, the most recent of which involves the air refueling system that currently cannot refuel fighters in an operational environment. The Air Force will have 68 KC-46s (44 Active, 12 Guard, and 12 Reserve) by the end of FY 2021 and will receive three more for a total of 71 in FY 2022.³⁷ The program plans to acquire another 108 tankers for a total of 179 by the end of FY 2028. The KC-46 will replace less than

half of the current tanker fleet and will leave the Air Force with over 200 aging KC-135s (already averaging 59 years old) that still need to be recapitalized.³⁸

The third major USAF acquisition priority is the B-21 Raider, formerly called the Long-Range Strike Bomber (LRSB). 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 has 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.³⁹

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.⁴⁰ The B-21 is programmed to begin replacing portions of the B-52 and B-1B fleets by the mid-2020s.⁴¹ In the interim, the Air Force continues to execute a SLEP on the remaining fleet of B-1s in the inventory to restore the bomber's engines to their original specifications. Through 2020, the Air Force sustained a fleet of 61 B-1s, but the state of repair of 17 of those jets has deteriorated to the point where the Air Force will retire them by the end of FY 2021.⁴²

The Air Force had planned to modernize the B-2's Defense Management System but cancelled the plan in 2021 because of a software coding mismatch with its legacy computer system.⁴³ Stores Management Operational Flight Program and Common Very-Low-Frequency/Low Frequency Receiver Program elements will be fielded to ensure that this penetrating bomber remains viable in highly contested environments, keeping it fully mission capable until it is replaced by the B-21.⁴⁴

Modernization efforts for the B-52 are also underway. The jet was designed in the 1950s, and the current fleet entered service in the 1960s. The FY 2018 budget funded the re-engineering of this fleet with upgrades

that will include a new Long-Range Standoff (LRSO) cruise missile, improved radar, new computers, new communication links, and a new suite of electronic warfare countermeasures. The aircraft will remain in the inventory through 2050.⁴⁵

When the Secretary of the Air Force and the Chief of Staff rolled out “The Air Force We Need” in 2018 to expand the number of squadrons from 312 to 386, one of the stated elements of that campaign was to fill the ranks of those new squadrons with only the newest generation of aircraft—F-35s, B-21s, and KC-46s—because of the capabilities that those platforms bring to bear.⁴⁶ Curiously, the Air Force is now acquiring the fourth-generation F-15EX, based primarily on the ill-perceived notion that it will be cheaper to acquire and operate than the F-35A.⁴⁷ The FY 2022 budget funds 12 F-15EXs, and the Air Force has an unfunded request for 12 more. Although the service will certainly increase its numbers with that approach, the F-15EX will not be survivable in the high-threat environment in which deployed assets will be required to fight by the time fielding has been completed. The Air Force is using precious acquisition dollars to buy an aircraft that, by all indicators, will have very limited utility in a conflict with a peer competitor.

Readiness

The 2018 National Defense Strategy’s focus on peer-level war was designed to facilitate a clear and rapid paradigm shift away from the tiered levels of readiness the Air Force had adopted because of years of relentless deployments and funding shortfalls. In a move that would refine the service’s focus on great-power competition as spelled out by the new NDS, Secretary of Defense James Mattis directed the Air Force to increase the mission-capable rates of the F-16, F-22, and F-35 aircraft to 80 percent by the end of September 2019.⁴⁸ The move was designed to make more of an all-too-small fleet of combat aircraft available to deploy in the numbers required to deter or defeat a peer adversary.

Early in 2019, General Goldfein stated that the service would likely not meet the 80 percent mission-capable (MC) threshold directive until 2020, and in the spring of 2020, he made it clear that the threshold was no longer a focus for the Air Force. MC rates are a measure of how much of a certain fleet is “ready to go” at a given time, and the general stated in clear terms that he regarded them as an inaccurate portrayal of the service’s overall health.

Instead of using that historic marker for readiness, the service moved to highlight how deployable the fleet is within a short period of time⁴⁹ and shifted its focus to the number of “force elements” (fighters, bombers, and tankers) that it has across the Air Force and how quickly those forces need to be ready. One of the examples that Goldfein used was the rapid deployment of a “task force” of four B-52s to the Middle East in May 2019.⁵⁰ The bombers, from Barksdale Air Force Base, Louisiana, had two days to deploy and immediately began to fly combat missions even though the B-52 fleet had a mission-capable rate of 65.73 percent at the time. While the ability to prepare and then deploy four of 58 operational bombers rapidly is a capability, it is more in line with responding to a regional contingency than it is with the capacity requirements spelled out in the 2018 NDS.

In the USAF’s FY 2020 posture statement, Secretary Wilson and Chief of Staff Goldfein said that more than 90 percent of the “lead force packages” within the service’s 204 “pacing squadrons” are “ready to ‘fight tonight.’” They went on to say that “pacing squadrons are on track to reach 80% readiness before the end of Fiscal Year 2020.”⁵¹ In the FY 2021 posture statement, however, Goldfein and new Air Force Secretary Barbara Barrett were unable to declare that pacing squadrons had actually achieved that level of readiness, saying only that pacing squadron mission-capable rates had increased and that the Air Force was continuing its efforts to improve MC rates “across all fleets.”⁵²

The definitions for “pacing unit” and “pacing squadrons” are somewhat elusive. Assuming that a pacing squadron is an operational

TABLE 7

Mission-Capable Combat-Coded Fighters in the Active-Duty Air Force

	Combat-Coded Fighters	Average Age in Years	Mission-Capable Rate	Mission-Capable Combat-Coded Fighters
A-10C	117	39	72%	84
F-15C	98	36	72%	71
F-15E	164	28	69%	113
F-16C	336	30	74%	249
F-22A	133	13	52%	69
F-35A	136	4	76%	103
Total	983			689

NOTE: Thirteen months were added because of the difference between the aircraft data capture dates for the 2021 USAF Almanac and publication of this edition of the *Index*.

SOURCES:

- “Air Force & Space Force Almanac 2021,” *Air Force Magazine*, Vol. 104, No. 6 and 7 (June/July 2021), <https://www.airforcemag.com/article/2021-usaf-ussf-almanac-equipment/> (accessed August 17, 2021).
- Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force mission-capable rates, May 17, 2021.

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unit that is fully qualified and ready to execute its primary wartime mission (C1), one is still left wondering what the “lead force packages” within those 204 pacing/mission-ready units are and what the limits on the remaining portions of those units might be. Taken together, these statements imply that only portions of the Air Force’s combat-coded squadrons are currently qualified to execute the unit’s primary wartime mission.

The FY 2022 Air Force posture statement offers no more clarity or assurances of readiness, but it has moved (again) to change the terminology. The simplified, three-phase force-generation model is designed “to more effectively articulate” otherwise undefined “readiness impacts and capacity limits.”⁵³

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.”⁵⁴ In the four years since

their testimony, DOD has stifled open conversation or testimony about readiness, limiting the Air Force’s ability to be forthcoming with open-source readiness indicators. While this makes any assessment of readiness difficult, there are three areas that can support an assessment: MC rates, aircrew training, and deployability.

MC rates are defined as the percentage of a unit’s aircraft that are capable of executing its mission set. Several factors drive MC rates, but two are common to mature systems: manning and operations and maintenance (O&M) funding. Taken together, they dictate the number of sorties and flight hours that units have available for aircrew training. Multiplying the MC rates by the actual number of aircraft within a particular fleet yields the actual operational capacity of that capability.

There are 186 F-22As in the total aircraft inventory, but 28 are dedicated trainers, and

TABLE 8

Air Force Maintenance Manning

Skill Level	Authorized	Assigned	Manning Percentage
3-level (Apprentice)	15,078	15,994	106%
5-level (Journeyman)	36,704	36,151	98%
7-level (Craftsman)	18,443	18,390	100%

SOURCE: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force mission-capable rates, May 17, 2021.

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16 are primary development aircraft inventory (used for testing new equipment). In 2020, the F-22A had an MC rate of 52 percent, which means that there were just 74 F-22As that could be committed to combat at any given time.⁵⁵ The last time the United States was prepared to fight a peer competitor, the Air Force had more than 700 F-15C air superiority fighters with an MC rate of more than 80 percent for that fleet. If just 500 of them were combat coded, more than 400 mission-capable jets were ready to fight the Soviet Union. Although the F-22A is an incredibly capable fighter and 74 F-22s would be a formidable capability against a regional threat, numbers are critical to winning a peer fight, particularly for offensive platforms, and 74 would not be sufficient. For a summary of the mission-capable rates for combat-coded (operational) aircraft of the five fighter weapons systems, see Table 7.

There are 33 operational B-1s in the Lancer fleet,⁵⁶ and with an MC rate of 52.78 percent, 17 are available for combat at any given time during the year. The small size of the B-2 fleet, coupled with its 62.41 percent MC rate, means that, on average, just 12 are combat capable. If the B-52 operational fleet and its mission-capable rate of 60.51 percent are added, just 64 bombers in the Air Force inventory were capable of executing combat missions on any given day in 2020.

Maintenance manning is now healthy across the board (see Table 8), but the pilot

shortage shows no signs of abating. In March 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 Air National Guard, and 294 Reserve. Of that total, the Air Force was short 1,211 fighter pilots: 873 Active, 272 Air National Guard, and 66 Reserve.⁵⁷

The numbers continued to fall, and in the middle of FY 2020, the Air Force was short 2,100 pilots. Today, the total Air Force has a shortfall of 1,925 pilots, and while this is an improvement of 175 pilots over 2020, almost all of that improvement was due to the cessation of airline hiring caused by COVID-19.⁵⁸ The ability of the Air Force to recover from that shortfall will depend on how well the service addresses several major issues, especially the available number of pilot training slots, an area in which it appears that some progress is being made.

In FY 2018, the Air Force graduated 1,200 pilots; it added 1,279 in FY 2019 and projected that 1,480 would graduate in 2020, but the impact of COVID-19 was such that only 1,263 received their wings. The vast majority of candidates who did not graduate washed back and will graduate some time in FY 2021.

Those projected numbers rely on a very high annual graduation rate of approximately 94 percent of the candidates that enter flight

school. According to the data the Air Force provided for the 2021 Index of Military Strength, the graduation rates for 2016, 2017, and 2018 were 93 percent, 98 percent, and 97 percent, respectively.⁵⁹ Those numbers, however, were incorrect, and the actual graduation rates were 96 percent for 2016, 92 percent for 2017, and 93 percent for 2018.⁶⁰

Throughout the pilot shortage, the Air Force has done an excellent job of emphasizing operational manning instead of placing experienced fighter pilots at staffs and schools, but the currency and qualifications of the pilots in operational units are at least as important as manning levels. Although the quality of sorties is admittedly subjective, a healthy rate of three sorties a week and flying hours averaging more than 200 hours a year have been established as “sufficient” over more than six decades of fighter pilot training.⁶¹ In the words of General Bill Creech, “Higher sortie rates mean increased proficiency for our combat aircrews,”⁶² and given the right number of sorties and quality flight time, it takes seven years beyond mission qualification in a fighter for an individual to maximize his potential as a fighter pilot.⁶³

COVID-19’s impact on flying hours hit the Air Force as it was beginning to recover from an 18-year drought in training for combat with a near-peer competitor. Flying hours and sortie rates across all fighter platforms fell to historic lows as the average line combat mission-ready fighter pilot received less than 1.5 sorties a week and 131 hours of flying time that year. That is significantly below the healthy fighter force thresholds of three sorties a week and 200 hours a year per pilot. Moreover, to the extent that the Air Force lacks available aircraft, it will remain unable to train pilots to those thresholds.

As noted, the primary drivers for mission-capable rates are maintenance manning and O&M funding. Maintenance manning has been healthy for more than four years, and FY 2022 O&M funding is 42 percent higher than the funding O&M received for FY 2017. However, flying hours across the fleet of fighters have increased by just 9 percent over that same period, and senior Air Force leaders actually

decreased the flying hour budget for FY 2022 by some 80,000 hours (7 percent).⁶⁴ This calls into question how well maintenance is organized to generate those sorties.

The sortie production recovery that took place at the end of the hollow-force days of the Carter Administration happened while levels of maintenance experience and inventories of spare parts were still low and well before the Reagan Administration’s increase in defense spending.⁶⁵ The maintenance organization that created that turnaround was changed in 1989 to “save money by reducing maintenance staffing, equipment, and base level support,”⁶⁶ which may help to explain the lackluster performance. No matter what the rationale may be, even with robust manpower and funding, flying hours and sortie rates are still short of the levels required for a rapid increase in readiness levels across the fighter force.

Five years of increases in the O&M budget have not translated into a proportionate growth in flight hours or greater readiness levels. Fighter pilots received an average of 13.0 hours per month in 2017, and an incremental O&M budget increase of 16.4 percent over the next three years delivered 12.9 hours per month in 2018 and 14.1 hours per month in 2019—only 8 percent higher than in 2017.⁶⁷ (For data related to flight hours and sorties, see Tables 9 through 14.)

Combat mission-ready pilots generally fly more than average, and those assigned to a combat-coded (operational) unit received just 14.6 hours and 7.5 sorties a month in 2019,⁶⁸ which is an average below two sorties a week when they need three per week to sustain their skills.⁶⁹ The Air Force did its best to fly through the effects of COVID-19, but the pandemic had a devastating effect on hours and sortie rates. The average fighter pilot flew just over one sortie a week for the duration of 2020, which in a high-performance jet reduces competency levels to the point where excellent pilots begin to question the execution of very basic tasks.⁷⁰

It will take several more years of robust training for fighter pilots within fighter squadrons to regain what they lost in 2020 alone.

TABLE 9

Average Hours All Fighter Pilots Received per Month

	2017	2018	2019	2020	Percentage Change, 2019 to 2020
F-22	10.8	10.8	10.5	6.9	-34%
F-35A	10.4	10.4	14.4	10.2	-29%
F-15C	10.5	10.5	11.8	4.8	-59%
F-16C	12.2	12.2	12.1	6.7	-45%
F-15E	18.3	18.3	20.3	13.0	-36%
A-10	15.1	15.1	16.5	12.2	-26%
All Jets	13.0	12.9	14.1	8.7	-38%
Average Hours per Year	155.4	154.6	168.7	104.3	-38%

SOURCE: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force mission-capable rates, May 17, 2021.

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Unfortunately, the Air Force is not moving on that path and will cut 87,479 flying hours from its budget in FY 2022—a reduction of 7 percent.⁷¹

Deployability. Because long-term inspections and depot-level work affect the

availability of support equipment and aircraft, it takes three active-duty squadrons to deploy two squadrons forward. For that reason, up until the end of the Cold War, the Air Force organizational structure was based on a three-squadron wing. On any given day, units

TABLE 10

Average Sorties All Fighter Pilots Received per Month

	2017	2018	2019	2020	Percentage Change, 2019 to 2020
F-22	6.4	6.4	7.1	5.3	-25%
F-35A	6.6	6.6	6.5	5.9	-9%
F-15C	7.0	7.0	6.6	4.5	-32%
F-16C	7.4	7.4	7.3	4.6	-37%
F-15E	7.9	7.9	7.6	6.4	-16%
A-10	7.1	7.1	7.5	5.9	-21%
All Jets	7.2	7.2	7.2	5.3	-26%
Average Sorties per Year	86.5	86.2	86.0	64.0	-26%

SOURCE: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force mission-capable rates, May 17, 2021.

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TABLE 11

Average Hours Line Fighter Pilots Received per Month
in Combat-Coded Squadrons

	2019	2020	Percentage Change
F-22	11.0	7.6	-31%
F-35A	15.4	14.7	-5%
F-15C	11.9	8.9	-25%
F-16C	12.7	8.5	-33%
F-15E	21.7	16.6	-24%
A-10	16.9	14.1	-17%
All Jets	14.6	10.9	-25%
Average Hours per Year	174.7	131.0	-25%

SOURCE: Headquarters U.S. Air Force, response to request for information, May 14, 2021.  heritage.org

have several aircraft that are not flyable because of long-term inspections, deep maintenance, or the need for spare parts. By using aircraft from one of the three squadrons to “plus up” the others, the wing could immediately deploy two full-strength units into combat. The handful of fully flyable jets and pilots left at the home station were then used to train new and

inbound pilots up to mission-ready status so that, among other things, they could replace pilots that were lost during combat.⁷²

Normal, active duty fighter squadron manning levels are based on a ratio of 1.25 aircrew members for every aircraft,⁷³ which means that a unit with 24 assigned aircraft should have 30 line pilots and five supervisor pilots who are

TABLE 12

Average Sorties Line Fighter Pilots Received per Month
in Combat-Coded Squadrons

	2019	2020	Percentage Change
F-22	7.4	5.5	-26%
F-35A	6.7	6.8	1%
F-15C	6.8	5.0	-26%
F-16C	7.6	5.3	-30%
F-15E	8.0	7.2	-10%
A-10	7.7	6.5	-16%
All Jets	7.5	5.9	-21%
Average Sorties per Year	89.9	71.0	-21%

SOURCE: Headquarters U.S. Air Force, response to request for information, May 14, 2021.  heritage.org

TABLE 13

Average Hours All Line Fighter Pilots Received per Month

	2017	2018	2019	2020	Percentage Change, 2019 to 2020
F-22	11.7	12.8	10.9	7.1	-35%
F-35A	10.6	12.4	15.0	10.5	-30%
F-15C	10.5	13.1	11.8	4.6	-61%
F-16C	11.9	15.5	12.5	6.9	-45%
F-15E	19.1	20.3	21.3	6.6	-69%
A-10	16.7	23.0	16.9	12.6	-25%
All Jets	13.2	16.1	14.6	8.9	-39%
Average Hours per Year	159.0	193.0	175.0	107.0	-39%

SOURCE: Headquarters U.S. Air Force, response to request for information, May 14, 2021.

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combat mission ready.⁷⁴ Flight times, sortie rates, mission planning teams, and flight supervision requirements are significantly higher in combat, and to cover those requirements, the manning ratio normally increases to 1.50 pilots per aircraft, or 36 line pilots per squadron. In other words, every squadron deployed to fight requires six more pilots than it has on

its roster.⁷⁵ Pilots from “donor” squadrons can fill those slots for the deploying units.

With the downsizing that has taken place since the end of the Cold War and the reduction in the number of fighter squadrons, the Active Air Force has reduced the number of fighter squadrons to two or even one in many wings. All operational Guard and Reserve

TABLE 14

Average Sorties All Line Fighter Pilots Received per Month

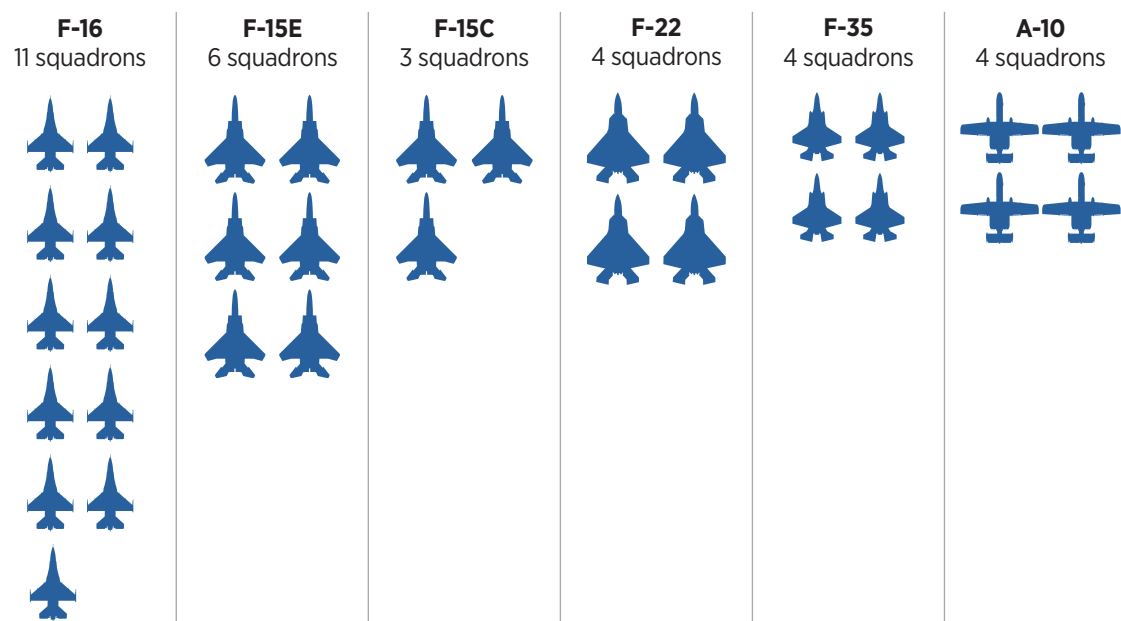
	2017	2018	2019	2020	Percentage Change, 2019 to 2020
F-22	6.3	4.5	7.3	5.5	-25%
F-35A	6.5	7.5	6.6	6.0	-9%
F-15C	7.2	8.4	6.7	4.6	-31%
F-16C	7.3	9.3	7.5	4.7	-37%
F-15E	8.0	8.5	7.9	6.6	-16%
A-10	7.2	9.7	7.7	6.1	-21%
All Jets	7.2	8.3	7.4	5.4	-27%
Average Sorties per Year	86.0	100.0	89.0	65.0	-27%

SOURCE: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force mission-capable rates, May 17, 2021.

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FIGURE 2

Air Force Active-Duty Combat-Coded Fighter Squadrons (32 Total)



SOURCE: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force mission-capable rates, May 17, 2021.

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wings are comprised of a single squadron, which complicates the math behind the total number of deployable fighter squadrons.

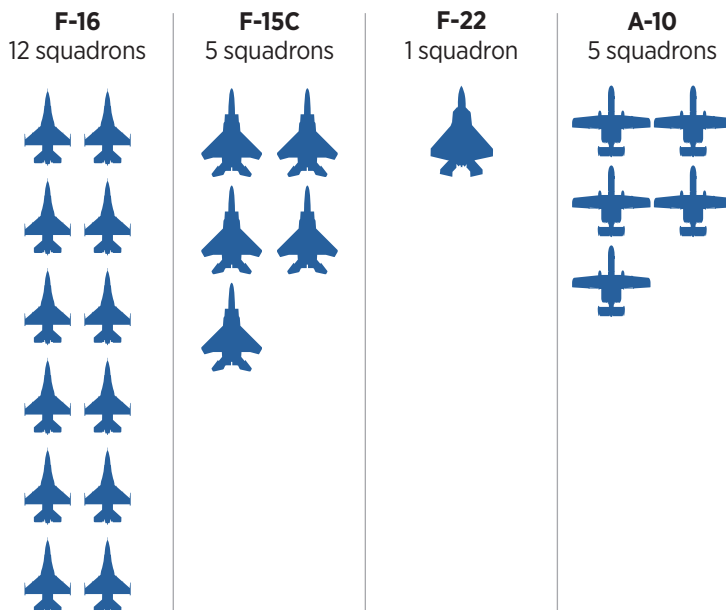
Of the 55 operational fighter squadrons on the Air Force roster, 32 are Active and 23 are Guard or Reserve Units. (See Figures 2 and 3.) Using the notion that it takes three squadrons to get two active-duty ones forward, the airframe disposition of each active-duty wing would allow just 21 active-duty fighter squadron equivalents (24 fighter aircraft each) to deploy to a fight. That equates to 480 active-duty fighters that could deploy to meet a crisis situation, which is well short of the 600 it takes to win a single MRC and means that a war with a peer competitor will draw heavily on our strategic reserve.

Guard and Reserve units face the same manning and deployment challenges that the

active-duty service faces, except that the vast majority of those units have just one fighter squadron per wing, further straining their ability to muster the airframes and manning to meet an emergency deployment.⁷⁶ Planning for low-threat, low-intensity deployments to Operation Iraqi Freedom and Operation Enduring Freedom took this into consideration by mapping deployments out months (often years) in advance of the required movement, allowing pilots to deconflict their civilian work schedules not just for the deployment, but also to get the training and time in the air that they needed to employ successfully in those low-threat combat operations.⁷⁷ Nevertheless, it was common for Guard units to pull pilots from other units to fulfill manning requirements for “rainbow” fighter squadrons,⁷⁸ and in a conflict where there is little time from

FIGURE 3

Air National Guard and Air Force Reserve Combat-Coded Fighter Squadrons (23 Total)



SOURCE: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force mission-capable rates, May 17, 2021.

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warning order to deployment, it would likely take two Guard and Reserve squadrons to enable one to deploy forward.⁷⁹

The average Guard and Reserve fighter squadron has one-third fewer jets than similar active-duty units have. By rainbowing units with similar aircraft, they could muster 12 squadrons as a strategic reserve of 288 fighters that could deploy sometime after the active-duty units deploy. In other words, the service could muster just 768 fighters (480 Active and 288 Guard and Reserve) for a peer-level fight. Unfortunately, the gravity of that mix is not fully understood. The Guard and Reserve numbers are based on airframes alone, but other factors such as manning levels would also limit the number of sorties and the amount of combat power that those fighters could generate continually in a high-end confrontation with a peer competitor.

The declaration in Air Force posture statements for FY 2020 and FY 2021 that lead force packages within the service's 204 pacing squadrons are ready to fight also conveys the fact that only portions of its most capable squadrons have enough mission-capable aircraft and mission-ready aircrews to respond readily to a crisis. Because of the pilot shortage, actual unit manning levels in fighter squadrons are below peacetime requirements (if only slightly), which obviously is not enough to meet the significantly increased demands and the tempo required for combat operations.

The service has already moved the majority of pilots who were in staff or other non-flying billets back to the cockpit in an effort to relieve the manning shortfall. Thus, the only way units can meet wartime manning requirements is by pulling pilots from other “donor” squadrons.

The complications that this involves are significant and call into question the idea that the portions of the 55 fighter squadrons that are unable to deploy immediately in a crisis could be combined to create more combat

power. The vast majority of aircraft and aircrew that are left would be used for homeland defense and to train replacement pilots or as replacement aircraft that are lost through combat attrition.

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 squadron, that equates to a requirement of 500 active component fighter aircraft to execute one MRC. Adding a planning factor of 20 percent for spares and attrition reserves brings the number to 600 aircraft.

As part of its overall assessment of capacity, the 2022 *Index* looks for 1,200 active-duty, combat-coded fighter aircraft to meet the baseline requirement for two MRCs.⁸⁰ That number of fighters lines up well with the fighter requirement from the 2018 TAFWN. The bomber, tanker, and strategic air requirement from that study are also used in this assessment.

- **Two-MRC Fighter—Threshold:** 1,200 combat-coded active-duty fighters / 62 squadrons.
- **Two-MRC Fighter—Actual 2021 Level:** 983 active-duty combat-coded fighters (82 percent) / 55 total force squadrons (88 percent).
- **TAFWN Bomber Squadron—Threshold:** 14 combat-coded bomber squadrons / 140 bombers.
- **TAFWN Bomber Squadron—Actual 2021 Level:** nine combat-coded bomber squadrons (64 percent) / 114 combat-coded bombers (81 percent).

- **TAFWN Tanker Squadron—Threshold:** 54 tanker squadrons / 540 combat-coded tankers.
- **TAFWN Tanker Squadron—Actual 2021 Level:** 39 combat-coded tanker squadrons (72 percent) / 414 combat-coded tankers (76 percent).
- **TAFWN Airlift Squadron—Threshold:** 54 airlift squadrons / 540 combat-coded airlifters.
- **TAFWN Airlift Squadron—Actual 2021 Level:** 50 combat-coded airlift squadrons (93 percent) / 538 combat-coded airlifters (99 percent).

Based on a pure count of combat-coded squadrons and platforms that have achieved initial operating capability (IOC), the USAF currently is at 86 percent of the capacity required to meet a two-MRC/TAFWN benchmark. However, the disposition of those assets limits the ability of the service to deploy them rapidly to a crisis region. While the active fighter and bomber assets that are available would likely prove adequate to fight and win a single regional conflict, when coupled with the low mission capability rates of those aircraft (see Table 7), the global sourcing needed to field the required combat fighter force assets would leave the rest of the world uncovered.

Nevertheless, the capacity level is well within the methodology's range of "marginal." With programmed retirements that will exceed acquisitions, capacity is now trending downward.

Capability Score: Marginal

The Air Force’s capability score is “marginal,” based on scores of “strong” for “Size of Modernization Program,” “marginal” for “Age of Equipment” and “Health of Modernization Programs,” but “weak” for “Capability of Equipment.” These assessments are the same as those in the *2021 Index*. New F-35 and KC-46 aircraft continue to roll off their respective production lines, but these additions are more than offset by aircraft retirements. As a consequence, this score will probably not improve over the next three to five years.

Readiness Score: Weak

The Air Force scores “weak” for readiness in the *2022 Index*, one grade lower than it received in the *2021 Index*. The USAF’s sustained pilot deficit and the impact of COVID-19 on already low sortie rates and flying hours certainly contribute to this assessment. The Air Force’s mission-capable rates improved slightly in 2020, but the lack of a systemic effort to increase operational training reflects a service that is content with being ready to respond to a regional contingency rather than building the readiness levels required to meet the 2018 NDS.⁸¹

The Air Force should be prepared to respond quickly to an emergent crisis not with a “task force” of four bombers, but with the speed and capacity required to stop a peer competitor

in its tracks. With the significant curtailment of deployments in support of the global war on terrorism, the Air Force should be much farther along in its full-spectrum readiness than we have witnessed to date.

Overall U.S. Air Force Score: Weak

This is an unweighted average of the USAF’s capacity score of “marginal,” capability score of “marginal,” and readiness score of “weak.” The shortage of pilots and flying time for those pilots degrades the ability of the Air Force to generate the quality of combat air power that would be needed to meet wartime requirements. Fighter pilots should receive an average of three or more sorties a week and 200 hours per year to develop the skill sets needed to survive in combat, and while the service cannot be blamed for the effects of COVID-19 on readiness, it elected not to surge to acquire more aircraft or significantly increase training/sortie production in the window of robust funding.

Although it would likely win a single MRC in any theater, there is little doubt the Air Force would struggle in war with a peer competitor. Both the time required to win such a conflict and the attendant rates of attrition would be much higher than they would be if the service had moved aggressively to increase high-end training and acquire the fifth-generation weapon systems required to dominate such a fight.

U.S. Military Power: Air Force

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

AIR FORCE SCORES



Procurement and Spending ■ Through FY 2021
■ Pending

Strategic Bomber

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
B-52 Stratofortress Inventory: 76 Fleet age: 60 Date: 1961 The B-52, oldest of the bombers, provides global strike capabilities with conventional or nuclear payloads. Programmed upgrades for the B-52 include new communications, avionics, and Multi-Functional Color Displays. The Air Force plans to use this aircraft through the 2050s.	1		B-21 Raider Timeline: TBD The B-21 is an advanced stealth bomber that is currently programmed to replace all B-1s and B-2s in the Air Force bomber fleet by 2032. Flight testing is scheduled for late 2021, and procurement is expected to begin in FY 2022. The Raider is projected to enter service in the mid-2020s and deliver a fleet of at least 100 aircraft.		
B-1B Lancer Inventory: 44 Fleet age: 34 Date: 1986 Nicknamed “The Bone,” the B-1B Lancer is a long-range, multi-mission, supersonic conventional bomber, that has served the United States Air Force since 1985. Originally designed for nuclear capabilities, the B-1 switched to an exclusively conventional combat role in the mid-1990s. In September 2020, the entire B-1B Lancer fleet completed the Integrated Battle Station upgrade to modernize the jet’s datalinks, cockpit displays, and test system. The B-1B is scheduled to be phased out in 2032.	2	2			
B-2 Spirit Inventory: 20 Fleet age: 27 Date: 1997 The B-2 bomber provides the USAF with global strike capabilities for both nuclear and conventional payloads. The stealth bomber’s communication suite is currently being upgraded. At present, the plan is to begin phasing out the B-2 in 2032.	3	4			

NOTE: See page 450 for details on fleet ages, dates, timelines, and procurement spending.

AIR FORCE SCORES

1 2 3 4 5
Weakest ← Strongest

Procurement and Spending ■ Through FY 2021
■ Pending

Ground Attack/Multi-Role Aircraft

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
A-10 Thunderbolt II Inventory: 281 Fleet age: 41 Date: 1977 <p>The A-10 is the only USAF platform that is designed specifically for close air support missions using both self-designated precision-guided munitions and an internal 30mm cannon. Retirement of the A-10 has been discussed for years, but it appears that it will continue flying through 2040.</p>	2	2	F-35A Timeline: 2016–2035 <p>The F-35A “Lightning” is a multirole stealth fighter that became IOC on August 2, 2016. In FY21, Congress funded the procurement of 60 F-35As (including 12 congressional adds) and in FY22, the number fell back to 49 jet (including a single congressional add). The Block 4 version of the aircraft will upgrade capabilities of early production.</p> <div> <div> PROCUREMENT </div> <div> SPENDING (\$ millions) </div> </div>	4	3
F-16C Falcon Inventory: 935 Fleet age: 31 Date: 1980 <p>The F-16 is a multi-role aircraft capable of tactical nuclear delivery, all-weather strike, and Suppression of Enemy Air Defenses (SEAD). An ongoing Service Life Extension Program (SLEP) will keep this jet in the inventory through the late 2040s.</p>	2	2			
F-35A Lightning Inventory: 326 Fleet age: 5 Date: 2016 <p>The F-35 is a multi-role stealth fighter that became operational in 2016. The Air Force has received more than 326 of a planned purchase of 1,763 aircraft.</p>	5	5			
F-15E Strike Eagle Inventory: 218 Fleet age: 29 Date: 1989 <p>The F-15E is a multi-role aircraft capable of all-weather, deep interdiction/attack, and tactical nuclear weapons delivery. Upgrades include an AESA radar, an EPAWSS self-defense suite, a new central computer, and cockpit displays.</p>	2	2			

NOTE: See page 450 for details on fleet ages, dates, timelines, and procurement spending.

AIR FORCE SCORES



Procurement and Spending ■ Through FY 2021 ■ Pending

Fighter Aircraft

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
F-15C/D Eagle Inventory: 233 Fleet age: 37 Date: 1975 The F-15C/D is an air superiority fighter that has been in service since the late 1970s. The jet is receiving upgrades that include a new AESA radar and self- defenses needed to survive and fight in contested airspace. Discussions are underway to retire the F-15C in late 2020s.	1	2	F-15 EX Timeline: 2020–2029	2	1
F-22A Raptor Inventory: 186 Fleet age: 15 Date: 2005 The F-22 is the preeminent air superiority stealth fighter aircraft, modified to enable delivery of precision- guided weapons. The jet is currently undergoing a modification called RAAMP that will improve reliability, maintainability, and performance. In FY 2022, the jet will begin fielding the Link-16, which will allow it to transmit data with legacy aircraft via the Multifunctional Information Distribution System/Joint Tactical Radio System (MIDS/JTRS).	4	5	PROCUREMENT 12 12 SPENDING (\$ millions) \$1,234 \$1,187		


NOTE: See page 450 for details on fleet ages, dates, timelines, and procurement spending.

AIR FORCE SCORES

1 2 3 4 5
Weakest ← Strongest

Procurement and Spending ■ Through FY 2021 ■ Pending

Tanker

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
KC-10 Extender Inventory: 50 Fleet age: 36 Date: 1981 The KC-10 is multi-role tanker and airlift platform that can refuel both boom-compatible and drogue-compatible fighters on the same mission. Recent modifications have enabled a service life extension through 2045. The USAF targeted fleet reduction to 40 aircraft in FY 2021, but Congress directed the service to maintain at least 50 aircraft to provide sufficient tanker support because of shortfalls with the KC-46.	2		KC-46 Timeline: 2019–2027	3	3
KC-135 Stratotanker Inventory: 340 Fleet age: 61 Date: 1957 The KC-135 a multi-role tanker/airlift platform. The aircraft has undergone several modifications, mainly engine upgrades to improve performance and reliability. The USAF plans to modify 395 aircraft with Block 45 upgrades (an additional glass cockpit display for engine instrumentation, a radar altimeter, an advanced autopilot, and a modern flight director) at a rate of 38 aircraft per year through 2026. Part of the fleet will be replaced with the KC-46, with the remainder scheduled to be in service through 2050.	1	5	PROCUREMENT SPENDING (\$ millions) 		
KC-46 Pegasus Inventory: 68 Fleet age: 1 Date: 2020 This Pegasus is a multi-role tanker/airlift platform that can refuel both boom-compatible and drogue-compatible fighters on the same mission. The Air Force accepted the first of 179 programmed aircraft in 2019. The program has significant problems that preclude use of the plane as a refueling platform in combat, but 15 of the aircraft will be delivered in 2021, bringing the total number of KC-46s in the inventory to 68.	5	1			

NOTE: See page 450 for details on fleet ages, dates, timelines, and procurement spending.

AIR FORCE SCORES



Procurement and Spending ■ Through FY 2021 ■ Pending

Heavy Lift

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
C-5M Galaxy Inventory: 52 Fleet age: 34 Date: 1970 The C-5 is the USAF's largest mobility aircraft. It can transport 270,000 pounds of cargo over intercontinental ranges and can be refueled in the air. The "M" models are heavily modified C-5A/Bs that have new engines, avionics, and structural/reliability fixes. Ongoing modifications include a new weather radar, a new mission computer, and improved Large Aircraft Infrared Countermeasures (LAIRCM).	2	5	None		
C-17 Globemaster III Inventory: 222 Fleet age: 19 Date: 1995 The C-17 is a heavy-lift strategic transport capable of direct tactical delivery of all classes of military cargo. It is the U.S. military's core airlift asset; it can be refueled in the air and is capable of operating on small airfields (3,500 feet by 90 feet). Ongoing modifications include next-generation Large Aircraft Infrared Countermeasures (LAIRCM), structural, safety, and sustainment modifications.	4				

Medium Lift

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
C-130J Super Hercules Inventory: 146 Fleet age: 12 Date: 2006 The C-130J is an improved tactical airlift platform that can operate from small, austere airfields, and provide inter-theater airlift and airdrop and humanitarian support. The Air Force active component completed its transition to the C-130J in October 2017.	5	5	C-130J Timeline: 2006–2022 The C130J Super Hercules is an upgraded tactical airlift platform with a medium-lift capability with multiple variants including the C-130J-30, AC-130J gunship, and HC-130 rescue/air refueling platform. The C-130J-30 can carry 92 airborne troops and lift over 40,000 pounds of cargo. The Air Force currently has two multi-year contracts underway with Lockheed Martin to procure 16 C-130Js per year through FY2023, and second to procure an additional 24 H/MC-130 aircraft from FY 2021–FY 2025. PROCUREMENT <div><div></div><div>1821</div></div> SPENDING (\$ millions) <div><div></div><div>\$16,417\$129</div></div>	5	5

NOTE: See page 450 for details on fleet ages, dates, timelines, and procurement spending.

AIR FORCE SCORES

1 2 3 4 5
Weakest → Strongest

Procurement and Spending ■ Through FY 2021
■ Pending

Intelligence, Surveillance, and Reconnaissance (ISR)

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
RQ-4 Global Hawk Inventory: 30 Fleet age: 11 Date: 2011 The Global Hawk is a strategic, high-altitude, long-endurance (HALE), “deep look” ISR platform that complements satellite and manned ISR. Unlike the MQ-9, which is a medium-altitude, long-endurance unmanned aerial vehicle (UAV), the RQ-4 has a higher altitude and longer range.	4	2	None		
MQ-9 A/B Reaper Inventory: 330 Fleet age: 7 Date: 2007 The MQ-9B is a medium-altitude to high-altitude, long-endurance hunter-killer RPA (remotely piloted aircraft) tasked primarily with eliminating time-critical and high-value targets in permissive environments. The USAF is attempting to end the MQ-9 procurement and seeks to replace the Reaper with a more survivable, flexible, and advanced platform as early as 2031.	5	2	MQ-9 Timeline: 2007–2024 The MQ-9 Reaper is a hunter-killer unmanned aerial vehicle (UAV). The Air Force planned to end procurement of the Reaper in FY 2021, but Congress decided to procure an additional 16 Reaper aircraft. The Air Force is planning to replace the Reaper with a more survivable, flexible, and advanced platform as early as 2031.	5	5
RC-135 Rivet Joint Inventory: 22 Fleet age: 58 Date: 1972 The RC-135V/W is tasked with real-time electronic and signals intelligence-gathering, analysis, and dissemination in support of theater and strategic-level commanders. The RC-135, an extensively modified reconnaissance version of the C-135, detects, identifies, and geolocates signals throughout the electromagnetic spectrum.	1	4	None		



NOTE: See page 450 for details on fleet ages, dates, timelines, and procurement spending.

AIR FORCE SCORES

1 2 3 4 5
Weakest ← Strongest

Procurement and Spending ■ Through FY 2021
■ Pending

Intelligence, Surveillance, and Reconnaissance (ISR) (Cont.)

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
U-2 Dragon Lady Inventory: 31 Fleet age: 40 Date: 1956 The U-2S is the Air Force's only manned, strategic, high-altitude, long-endurance ISR platform and is capable of SIGINT, IMINT, and MASINT collection. The aircraft's modular payload systems allow it to carry a wide variety of advanced optical, multispectral, EO/IR, SAR, SIGINT, and other payloads simultaneously. Its open system architecture also permits rapid fielding of new sensors to counter emerging threats and requirements.	1	4	None		

Command and Control

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
E-3 Sentry Inventory: 35 Fleet age: 41 Date: 1977 The E-3 Airborne Warning and Control System (AWACS) is tasked with all-weather air and maritime surveillance, command and control, battle management, target, threat, and emitter detection, classification, and tracking. Ongoing upgrades include an urgent operational requirement to shorten kill-chains on time-sensitive targets, modernization of airborne moving target indication, and addition of high-speed jam-resistant Link 16. The E-3 is scheduled to stay in service through the 2040s.	1	2	None		
E-8 JSTARS Inventory: 16 Fleet age: 41 Date: 2010 E-8C is a ground moving target indication (GMTI), airborne battlefield management/command and control platform. Its primary mission is providing theater commanders with ground surveillance data to support tactical operations. The Air Force planned to retire this platform in the mid-2020s, but Congress blocked this. The USAF aims to re-engine the fleet with refurbished JT8D-219 turbofans as a cost-effective interim solution to improve performance and reliability.					

NOTES: See Methodology for descriptions of scores. The date is the year the platform achieved initial operational capability. The timeline is from the year the platform achieved initial operational capability to its final procurement. Spending does not include advanced procurement or research, development, test, and evaluation (RDT&E).

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61. Venable, “Independent Capability Assessment of U.S. Air Force Reveals Readiness Level Below Carter Administration Hollow Force,” p. 4.
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68. Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force sortie rates, July 25, 2020.
69. Venable, “Independent Capability Assessment of U.S. Air Force Reveals Readiness Level Below Carter Administration Hollow Force,” p. 4.
70. *Ibid.*
71. Table 2, “Department of the Air Force Budget Summary,” in U.S. Department of the Air Force, *Department of the Air Force FY 2022 Budget Overview*, p. 12.
72. Author’s experience through 26 years of Air Force operations, coupled with senior leader engagements from 2018–2019.
73. Albert A. Robbert, Anthony D. Rosello, Clarence R. Anderegg, John A. Ausink, James H. Bigelow, William W. Taylor, and James Pita, *Reducing Air Force Fighter Pilot Shortages* (Santa Monica, CA: RAND Corporation, 2015), p. 33, https://www.rand.org/content/dam/rand/pubs/research_reports/RR1100/RR1113/RAND_RR1113.pdf (accessed July 7, 2021).
74. Even though active-duty fighter squadrons have an average of 30 aircraft per squadron, that number includes maintenance, spare, and attrition reserve platforms. Manning is based on Primary Assigned Aircraft (PAA), which is 24 aircraft for active-duty fighter squadrons.
75. Based on a squadron with 24 Primary Assigned Aircraft. For units with 18 PAA, four additional pilots are required.
76. The very premise of these units is that they are manned with citizen soldiers whose main source of income is full-time civilian jobs and who are committed to travel and temporary duty locations that make them unavailable for days or weeks at a time. Those units would likely require several days to assemble the manpower required to deploy, and once an assessment of their real mission currency was made, they would need some period of intense training before a responsible senior leader could employ them in a fight with a peer competitor.
77. “Deployments most suited to the ARC are those in which there is long lead time (six months or more), and in which the operation is of short duration (six days or less), requiring a small force package (12 aircraft or less), and in which the scheduling is flexible.” John T. Correll, “Future Total Force,” *Air Force Magazine*, Vol. 82, No. 7 (July 1999), p. 32, <https://www.airforcemag.com/PDF/MagazineArchive/Documents/1999/July%201999/0799total.pdf> (accessed July 5, 2021).
78. The author commanded the 349th Expeditionary Combat Group at Al Udeid, Qatar, from 2004–2005. During that time, he flew with seven different Air National Guard F-16 squadrons. Every one of those units had some level of rainbow manning, and each performed admirably.
79. Interview with senior Air National Guard leader, November 20, 2019.

80. The number of fighters needed for a two-MRC strategy is based on a Heritage Foundation study of airpower requirements and actual fighter deployments for all major combat operations and conflicts from 1950 through 2021.
81. See Venable, "Independent Capability Assessment of U.S. Air Force Reveals Readiness Level Below Carter Administration Hollow Force."