### U.S. Air Force

### John Venable

he U.S. Air Force (USAF), originally part I 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). The addition of the Space Force as the fifth uniformed service within the Department of Defense (DOD) and the global SARS-CoV-2 (COVID-19) pandemic have had a notable impact on the Air Force in the year since the 2020 Index of Military Strength was published.

With the birth of the Space Force in December 2019,<sup>1</sup> 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 (DOAF) and allow the Air Force to focus the weight of its efforts on the core missions within 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 2020 finds the Air Force, like the rest of DOD, dealing with and supporting national efforts to mitigate the effects of COVID-19. The pandemic has had several different and at times offsetting impacts on the service. As of August 2, 2020, the total number of COVID-19 cases in the Department of the Air Force (military, civilian, dependent, and contractor) was 7,187, and this number will certainly grow.<sup>2</sup> Air Force recruiting and other training pipelines like pilot training have slowed, and this has affected Air Force accessions. However, the pandemic's impact on the economy has reduced external hiring opportunities, and this should increase retention of the most experienced airmen over the next several months if not years.3

Day-to-day training opportunities and major exercises designed to hone readiness and deployment faculties have been reduced. DEFENDER-Europe 20, for example, which was scheduled to be the largest deployment and employment exercise in Europe since the end of the Cold War, was truncated.<sup>4</sup> Sortie rates and flying hours likewise have been reduced. And 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.

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.<sup>5</sup> 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 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 was 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.<sup>6</sup>

During a series of speeches in 2018, Air Force Secretary Heather Wilson and Air Force Chief of Staff General David Goldfein referenced a series of statistics and an in-depth study, "The Air Force We Need" (TAFWN), to convey the message that the service's capacity, capability, and readiness levels were below the requirements outlined by the 2018 National Defense Strategy (NDS).7 TAFWN stated that the service needed to grow by 25 percent, from 312 to 386 squadrons, and its most senior leaders conveyed the need for more time in the air for its aircrews,<sup>8</sup> all of which required a bigger budget. The funding the service needed to acquire those weapons systems and increase readiness arrived with

the Trump Administration, which has significantly increased the DOAF's budget over the past four years.<sup>9</sup> Unfortunately, the Air Force has not increased aircraft acquisition in line with that funding surge, nor has it made significant or even proportional improvements in its capability or readiness levels.

### 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 strategic airlift platforms. Following 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 major regional contingencies (MRCs).

Fifteen years of trading capacity for readiness funding to further modernization has led to serious reductions in the bottom-line number of available fighter, bomber, tanker, and airlift platforms. It is projected that the active-duty Air Force will have 1,481 fighter, 122 bomber, 243 tanker, and 182 strategic airlift platforms at the end of 2020. When the strategic reserve is added, the Air Force will have a total force of 2,141 fighters, 140 bombers, 493 tankers, and 274 airlift platforms,<sup>10</sup> which equates to 47 percent of the fighter and bomber assets and 72 percent of the tanker and airlift assets that it possessed the last time the United States was prepared to fight a peer competitor.

Recognizing the threat from a rising China and resurgent Russia, the 2018 National Defense Strategy directed the services to prepare for a large-scale, high-intensity conventional conflict with a peer adversary. Later that same year, the Air Force released TAFWN, which conveyed the capacity and capabilities it would need to execute the NDS. Based on thousands of war-game simulations, the study assessed that the service needed, among other things,

### Air Force Budgets, 2016–2021

IN BILLIONS OF U.S. DOLLARS



### NOTE: FY 2021 figures are proposed.

**SOURCE:** 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 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 1, 2020), and Table 1, "Department of the Air Force Budget Summary," in U.S. Department of Defense, Secretary of the Air Force, Office of Financial Management and Budget (SAF/FMB), *United States Air Force FY 2021 Budget Overview*, February 2020, 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 1, 2020).

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one additional airlift squadron and seven additional fighter, five additional bomber, and 14 additional tanker squadrons to execute the NDS. That equates to an additional 182 fighter, 50 bomber, 210 air refueling, and 15 airlift platforms,<sup>11</sup> as well as \$80 billion in funding to procure those platforms.<sup>12</sup>

Considering the shortfall conveyed in TAFWN, and assuming that funding was made available, one would expect the Air Force to increase its procurement budget and accelerate acquisition of fifth-generation offensive platforms and next-generation tanker aircraft throughout the Future Years Defense Program (FYDP) by a substantial margin. In 2017, for the first time in more than 26 years, the Department of the Air Force began to enjoy real budget growth that was not associated with a contingency.<sup>13</sup> Assuming the President's budget request for fiscal year (FY) 2021 is approved as submitted, the DOAF's funding will have increased by 31 percent since 2016, making this an excellent opportunity to refresh and actually increase the Air Force aircraft fleet.<sup>14</sup> Since the end of FY 2018 when TAFWN was announced, however, funding for aircraft procurement has grown from \$24.8 billion in FY 2019 to just \$25.4 billion in FY 2021—a growth rate of 2 percent that has not even kept up with inflation. In spite of the need to recapitalize and grow the fleet, the Air Force is holding acquisition of the KC-46 steady at an average of 15 aircraft a year and actually decreasing procurement of the F-35 by 12 jets each year to compensate for the acquisition of the F15EX over the same five-year period.

The research, development, test, and evaluation (RDT&E) budget, on the other hand, has gone from 17 percent of total obligational authority in FY 2018 to 22 percent in FY 2021, rising by \$10.7 billion to \$37.3 billion.15 Much of that funding is being used to develop and field the digital backbone for the Airborne Battle Management System (ABMS). The ABMS is envisioned as relying on a common digital architecture and a heavy dose of artificial intelligence to help move information, process targets, and optimize their engagement. The cost, however, has been high: The Air Force has had to forgo significant recapitalization of its fleet and hope that Congress will provide enough supplemental funding to field the capacity and capability that the service needs to execute the 2018 NDS.

To paraphrase General David Goldfein, there is no congressional lobby, no constituency for a digital highway, but there are plenty in Congress who will support Air Force weapons systems that will use it.<sup>16</sup> Congress, for example, added 14 F-35As to the Air Force's programmed acquisition of 48 in 2019 for a total of 62 fifth-generation fighters.<sup>17</sup>

A belief that congressional "adds" will overcome pending aircraft retirements<sup>18</sup> to field TAFWN ignores the reality of an everexpanding political divide in Congress and extraordinary levels of national debt that will only grow worse with the COVID-19 pandemic. The idea that aircraft production lines will somehow surge to come to the rescue in a peer-level crisis may seem plausible to some, but even if Congress throws an unlimited amount of cash at them, there would not likely be enough time to bring those weapons systems into the force to meet the scenario and timing requirements within the 2018 NDS.<sup>19</sup>

That said, the reduction in programmed fourth-generation fighter retirement rates, coupled with the arrival of F-35As on Air Force flight lines in Florida, Arizona, Utah, Alaska, and Vermont, has allowed the service to increase its total aircraft inventory for the second year in a row.<sup>20</sup> The Air Force added 53 aircraft to its roster for a projected total of 5,504 at the end of FY 2020.<sup>21</sup>

Previous editions of the *Index of U.S. Military Strength* have used "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 noncombatcoded 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 2020, 1,428 are active-duty fighters, and 1,011 of those are combat-coded aircraft.<sup>22</sup> This number includes all active-duty backup inventory aircraft as well as attrition reserve spares.<sup>23</sup>

The number of fighters and fighter squadrons available for deployment to contingency operations affects more than wartime readiness; it also affects retention. The constant churn of overseas deployments and stateside

### **Precision-Guided Munitions Expenditures and Programmed Acquisitions**

	ΕX	XPENDITURE	S		ACQUISI	TIONS	
	FY 2017	FY 2018	FY 2019	FY 2018	FY 2019	FY 2020	FY 2021*
JDAM	30,664	5,462	7,354	35,106	36,000	25,000	16,800
HELLFIRE	1,536	2,110	2,449	3,629	3,734	3,859	2,497
SDB-I/II	4,507	749	1,289	7,312	6,254	8,253	3,595
APKWS	Unknown	Unknown	Unknown	10,621	6879	3,927	10,200
JASSM-ER	360	19	16	360	360	390	400
LGB	276	373	106	0	0	0	0
TOTALS	38,092	9,462	11,963	57,777	53,976	42,178	34,241

TOTAL MUNITIONS EXPENDED OR ACQUIRED PER YEAR

\* Estimate based on data from President's Budget.

**SOURCES:** Department of the Air Force, "FY 20201 Budget Overview," February 10, 2020, p. 6, Table 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 20, 2020), and Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, June 10, 2018, and July 24, 2020.

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temporary duty (TDY) assignments is one of the primary reasons cited by pilots for separating from the service. This problem can be solved in two ways: by decreasing operational tempo, which is not at the discretion of the Air Force, and/or by increasing capacity. Although the Air Force has made a string of budgetary decisions *not* to increase the rate at which it builds additional capacity, it continually highlights the need to do so.<sup>24</sup>

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. During the past three years, however, funding for munitions has improved significantly, and the preferred munitions inventory is starting to recover to pre-war levels.

In an effort to continue rebuilding the PGM stockpile, the Air Force will purchase 34,241 precision-guided munitions and guidance kits in FY 2021. Typically, there is a delay of 24–36 months between conclusion of a contract and delivery of these weapons, which means that munitions are often replaced three years after they were expended. (See Table 5.)

### Capability

The risk assumed with capacity has placed an ever-growing burden on the capability of Air Force assets. The ensuing capability-overcapacity 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 30 years, and some fleets, such as the B-52 bomber, average 59 years. In addition, KC-135s comprise 87 percent of the Air Force's tankers and are over 58 years old on average. The average age of the F-15C fleet is over 36 years, leaving less than 4 percent of its useful service life remaining,<sup>25</sup> and that fleet comprises 56 percent of USAF air superiority platforms.<sup>26</sup>

The planes in the fleet of F-16Cs are almost 30 years old on average,<sup>27</sup> and the service has used up nearly 85 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 2050.28 SLEPs lengthen the useful life of airframes, and these F-16 modifications also include programmed funding for the modernization of avionics within those airframes. However, these modifications are costly, and the added expense consumes available funding, reducing the amount 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 intends to add 46 MQ-9s to its inventory by the end of 2021 for a total of 31 Reapers.<sup>29</sup> The service lost an RQ-4 in 2019 and intends to reduce its inventory of these strategic reconnaissance platforms from 31 to eight in FY 2021. With an average age of 38 years, the U-2, a manned high-altitude reconnaissance aircraft, is still very much in demand and currently has no scheduled retirement date.<sup>30</sup>

The E-8 Joint Surveillance Target Attack Radar System (J-STARS) and the 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 41 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. In its stead, 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 will require enhanced and hardened communications links. Known as the Advanced Battle Management System (ABMS),<sup>31</sup> it is envisioned as an all-encompassing approach to both airborne and ground Battle Management Command and Control (BMC2) that will allow the Air Force to fight and support joint and coalition partners in high-end engagements.32

With respect to air combat, the Active Air Force has just 105 F-15Cs left in its fleet, and 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 183 F-22As for the Active, Guard, and Reserve force.<sup>33</sup>

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 retrofit that always causes some portion of those jets to be unavailable for operational use. The retrofit is a mix of structural alterations that are required for the airframe to reach its promised service life, and the process takes six F-22s off the flight line at any given time. The retrofit is forecasted to continue through 2021.<sup>34</sup>

TABLE 6

# U.S. Air Force Total Aircraft Inventory (Page 1 of 3)

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			FY 2020				<b>MISSION CA</b>	PABLE (MC)			FY 2021	
Type	Active Duty	Air National Guard	Air Force Reserve	Total Active, Guard and Reserve	Average Age in Years	MC Rate FY 2018	MC Rate FY 2019	Change	Average Daily MC Aircraft, FY 2020	Programmed Retirements	Programmed Acquistions	Estimated Total Aircraft Inventory
A010C	143	85	55	283	38	73%	71%	-1.80%	201	-44	I	239
AC130J	34	0	0	34	2	87%	86%	-0.88%	29	I	3	37
AC130U	7	0	0	7	29	87%	86%	-1.38%	9	-2	I	4
B-1B	61	0	0	61	32	52%	46%	-5.58%	28	-17	I	44
B-2A	20	0	0	20	25	61%	60%	-0.53%	12	I	I	20
B-52H	58	0	18	76	58	69%	66%	-3.27%	50	I	I	76
C-130H	2	127	42	171	29	68%	66%	-2.49%	112	-24	I	147
C-130J	109	16	10	135	10	77%	77%	0.02%	104	I	11	146
C-17A	146	50	26	222	16	83%	82%	-0.77%	183	I	I	222
CV022B	51	0	0	51	7	59%	53%	-5.55%	27	I	Ι	51
E003B	10	0	0	10	41	69%	74%	5.41%	7	I	I	10
E003C	-1	0	0	1	36	70%	73%	3.19%	1	I	I	4
E003G	20	0	0	20	39	66%	74%	8.36%	15	I	I	20
E008C	0	16	0	16	19	67%	67%	0.36%	11	I	I	16
EC130H	11	0	0	11	46	73%	73%	0.19%	8	-1	I	10
EC130J	0	7	0	7	19	66%	57%	-8.62%	4	I	I	7
F015C	88	123	0	211	35	71%	70%	-0.95%	148	I	I	211
F015D	6	14	0	23	35	69%	72%	3.45%	17	I	I	23
F015E	218	0	0	218	27	71%	71%	0.29%	155	I	I	218

TABLE 6

# U.S. Air Force Total Aircraft Inventory (Page 2 of 3)

INCLUDES ALL ACTIVE DUTY, AIR NATIONAL GUARD, AND AIR FORCE RESERVE AIRCRAFT

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	Estimated Total Aircraft Inventory	780	151	186	326	34	м	71	7	43	68	317	49	10	29	16	50	7	315	2
FY 2021	Programmed Acquistions	I	I	I	56	2	I	I	7	I	16	I	I	I	I	I	4	I	46	I
	<b>Programmed</b> <b>Retirements</b>	-3	I	I	Ι	I	I	-27	I	-16	I	-13	I	I	I	I	I	I	I	I
	Average Daily MC Aircraft, FY 2020	571	106	94	166	25	2	65	I	47	33	239	35	4	29	11	36	7	240	2
PABLE (MC)	Change	2.97%	4.37%	-1.43%	11.60%	-1.19%	7.13%	-4.80%	I	-0.90%	0.00%	-0.50%	-2.89%	-4.72%	0.00%	0.65%	-1.46%	7.52%	-0.68%	17.46%
MISSION CA	MC Rate FY 2019	73%	70%	51%	62%	80%	68%	66%	I	79%	63%	73%	71%	40%	100%	%69	78%	100%	89%	82%
	MC Rate FY 2018	70%	66%	52%	50%	81%	61%	71%	I	80%	n/a	73%	74%	45%	100%	68%	79%	92%	%06	65%
	Average Age in Years	29	29	12	4	5	25	29	0	35	1	58	59	34	6	31	5	12	9	57
	Total Active, Guard and Reserve	783	151	186	270	31	3	86	0	59	52	330	49	10	29	16	46	7	269	2
FY 2020	Air Force Reserve	52	2	0	0	0	0	15	0	0	0	74		0	0	0	0	0	0	0
	Air National Guard	288	45	20	20	12	3	23	0	0	12	140	24	10	0	0	0	0	24	0
	Active Duty	443	104	166	250	19	0	60	0	59	40	116	25	0	29	16	46	7	245	2
	Type	F016C	F016D	F022A	F035A	HC130J	HC130N	D090HH	HH060W	KC010A	KC046A	KC135R	KC135T	LC130H	MC012W	MC130H	MC130J	MQ001B	MQ009A	0C135B

TABLE 6

# U.S. Air Force Total Aircraft Inventory (Page 3 of 3)

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	Estimated Total Aircraft Inventory	2	2	8	12	11	178	53	442	31	
FY 2021	<b>Programmed</b> Acquistions	I	I	I	I	Ι	I	I	I	I	
	<b>Programmed</b> Retirements	I	I	I	I	-20	I	Ι	I	I	
	Average Daily MC Aircraft, FY 2020	3	2	9	8	23	108	39	279	24	
PABLE (MC)	Change	11.39%	8.07%	3.10%	9.49%	1.75%	1.51%	1.48%	2.05%	1.00%	
<b>MISSION CAI</b>	MC Rate FY 2019	80%	91%	74%	%69	76%	61%	74%	63%	78%	
	MC Rate FY 2018	79%	83%	71%	80%	74%	59%	73%	61%	77%	
	Average Age in Years	57	54	55	56	8	25	53	52	28	
	Total Active, Guard and Reserve	3	2	8	12	31	178	53	442	31	
FY 2020	Air Force Reserve	0	0	0	0	0	0	0	0	0	
	Air National Guard	0	0	0	0	0	0	0	0	0	
	Active Duty	м	2	8	12	31	178	53	442	31	
	Type	RC135S	RC135U	RC135V	RC135W	RQ004B	T001A	T038A	T038C	U2	

capable-rate/ (accessed August 1, 2020); and table, "Aircraft Total Active Inventory (TAI) (As of Sept 30, 2019)," in "Air Force & Space Force Almanac," Air Force Magazine, Vol. 103, No. 6 (June 2020), p. SOURCES: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020; Brian W. Everstine, "Breaking Down USAF's 70-Percent Overall Mission Capable Rate," Air Force Magazine, May 19, 2020, https://www.airforcemag.com/breaking-down-usafs-70-percent-overall-mission-63, https://www.airforcemag.com/app/uploads/2020/06/June2020\_Fullissue5.pdf (accessed August 1, 2020)

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The Air Force's number-one acquisition priority remains the F-35A, the nextgeneration fighter scheduled to replace all legacy multirole and close air support aircraft. The jet's full operating capability (FOC) was delivered in early 2018.35 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.36 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.37 Heritage analysis has identified a requirement for a total of 1,260 F-35s, and the Air Force should reduce the program to that level and accelerate the rate at which it acquires those platforms.38

A second top acquisition priority is the KC-46A air refueling tanker. The KC-46 has experienced a series of delays, the most recent of which involves the air refueling system that currently cannot refuel operational fighters. The Air Force will have 52 KC-46s (40 active and 12 in the Guard) by the end of FY 2020 and will receive 16 more in FY 2021 for a total of 68 on the ramp by the end of FY 2021.<sup>39</sup> The plan is to acquire the remaining 111 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 58 years old) that still need to be recapitalized.<sup>40</sup>

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 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.<sup>41</sup>

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.42 The B-21 is programmed to begin replacing portions of the B-52 and B-1B fleets by the mid-2020s.43 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. The Air Force currently has 61 B-1s, but the current state of repair of 17 of those jets is so poor that the Air Force has conveyed its intent to retire them in FY 2021.44 The Air Force plans to modernize the B-2's Defense Management System, Stores Management Operational Flight Program, and Common Very-Low-Frequency/ Low Frequency Receiver Program to ensure that this penetrating bomber remains viable in highly contested environments, keeping it fully mission capable until it is replaced by the B-21.

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, and the aircraft will remain in the inventory through 2050.

When the Secretary of the Air Force and the Chief of Staff rolled out the Air Force's plan 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.45 Curiously, the Air Force is now acquiring the fourth-generation F-15EX, based primarily on projected operating cost savings, to increase fighter capacity.46 Although the service will certainly increase its numbers with that approach, the capability of the F-15X system will not be survivable in the high-threat environment in which deployed assets will be required to fight by the time that fielding has been completed. Thus, the Air Force is using precious acquisition dollars to buy an aircraft of rather limited utility.

### Readiness

The 2018 National Defense Strategy's focus on peer-level war was designed to bring 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 2019.47 The move was designed to make more of an alltoo-small fleet of combat aircraft available to deploy in 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 felt they were an inaccurate portrayal of the service's overall health. Instead of using that historic marker for readiness, the service wants to highlight how deployable the fleet is within a short period of time.<sup>48</sup>

The service is focusing on the number of "force elements"- fighters, bombers, and tankers-that it has across all of 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 2019.49 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 bombers rapidly is a capability, it may be 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 official 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 those "pacing squadrons are on track to reach 80% readiness before the end of Fiscal Year 2020."<sup>50</sup> They 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 the entire fleet.<sup>51</sup>

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

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."<sup>52</sup> In the three 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 aircraft possessed by a unit that are capable of executing the unit's 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

### **Maintenance Manning**

Skill Level	2018	2019
Apprentice: 3-level	117%	118%
Journeyman: 5-level	91%	96%
Craftsman: 7-level	97%	101%
Leadership: 9-level	99%	99%

**SOURCE:** Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020.

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of aircraft within a particular fleet yields the actual operational capacity of that capability.

There are 186 F-22As in the Total Aircraft Inventory (TAI), but 28 are dedicated trainers, and 16 are primary development aircraft inventory (used for testing new equipment). In 2019, the F-22A had an MC rate of 50.57 percent, which means that there were just 71 F-22As that could be committed to combat at any given time.53 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 missioncapable jets were ready to fight the Soviet Union. While the F-22A is an incredibly capable fighter and 71 F-22s would be a formidable capability against a regional threat, numbers are critical to winning a peer fight, particularly for offensive platforms, and 71 would not be sufficient for a peer-level fight.

There are 36 operational B-1s in the Lancer fleet,<sup>54</sup> and with an MC rate of 46 percent, 17 are available for combat at any given time during the year. The small size of the B-2 fleet, coupled with its 60 percent MC rate, means that, on average, just 12 are combat capable. If the B-52 operational fleet and its mission-capable rate of 66 percent are added, there were just 68 bombers in the Air Force inventory that were capable of executing combat missions on any given day in 2019.

Maintenance manning is now healthy across the board (see Table 7), but the pilot shortage shows no signs of abatement. 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).<sup>55</sup>

The numbers continued to fall, and at the end of FY 2017, the Air Force was short more than 2,000 pilots. Today, the total Air Force has a shortfall of 2,100 pilots (950 Active, 650 Air National Guard, and 500 Reserve) of a total requirement of 20,850 pilots.<sup>56</sup> 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 projects that it will graduate 1,200 in 2020 (down from 1,480 because of the impact of COVID-19).

	Combat-Coded Fighters	Average Age	FY 2019 Mission- Capable Rate	Mission-Capable Combat-Coded Fighters
A-10C	116	37	0.71	82
F-15C	105	35	0.70	74
F-15E	158	27	0.71	112
F-16C	406	29	0.72	292
F-22A	133	13	0.51	68
F-35A	94	4	0.62	58
TOTALS	1,011			679

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

**SOURCES:** Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020; Brian W. Everstine, "Breaking Down USAF's 70-Percent Overall Mission Capable Rate," *Air Force Magazine*, May 19, 2020, https://www.airforcemag.com/breaking-down-usafs-70-percent-overall-mission-capable-rate/ (accessed August 2, 2020); and table, "Aircraft Total Active Inventory (TAI) (As of Sept. 30, 2019)," in "Air Force & Space Force Almanac," *Air Force Magazine*, Vol. 103, No. 6 (June 2020), p. 63, https://www.airforcemag.com/app/uploads/2020/06/June2020\_Fullissue5.pdf (accessed August 2, 2020).

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Those projected numbers rely on a graduation rate of nearly 100 percent for every pilot training class, and the service is already close to that mark.

Near-perfect graduation rates imply one or more of three things:

- The course of instruction is sufficiently easy that all students are able to pass;
- All students are so good that they are able to pass even when the standards demanded by air combat in the modern age are very high; or
- Because the service needs pilots, some students are graduated even if they have not met standard.

In 2016, the graduation rate was 93 percent; in 2017, it was 98 percent; and in 2018, it was 97 percent. $^{57}$  The expectation of high graduation

rates during years of significant pilot shortfalls runs the risk of compromising quality for quantity. It is hard to fathom how the pilot production pipeline is going to ensure that all of those who earn their wings will be as competent and capable as they need to be in the years ahead. The graduation rate fell to a "more healthy" 93.5 percent in 2019, but the rationale for that number was not released.<sup>58</sup>

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. In the words of General Bill Creech, "Higher sortie rates mean increased proficiency for our combat aircrews,"<sup>59</sup> 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.<sup>60</sup>

As the Air Force recovers from an 18-year drought in training for combat with a nearpeer competitor, it will take even highly experienced fighter pilots another year of training to master the skill sets required to dominate the air against a near-peer competitor in a highthreat environment. Because squadrons have a mix of experience and talent levels, it will take several more years of robust training for the roster of operational fighter squadrons to be fully ready for a high-end fight.

While the Air Force has made significant strides in sortie production since 2014, low fighter mission-capable rates still prevent pilots from meeting the 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. (For a summary of the mission-capable rates for combat-coded (operational) aircraft of the five fighter weapons systems, see Table 8.)

As noted, the primary drivers for missioncapable rates are maintenance manning and O&M funding. Maintenance manning has been healthy for more than three years, and O&M funding has risen by 16 percent since 2017, but flying hours across the fleet of fighters have increased by just 9 percent over that same period. USAF leadership has not increased the flying hour budget for FY 2021 because of an assessment that the Air Force is flying at the maximum executable levels.<sup>61</sup> 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.<sup>62</sup> The maintenance organization that created that turnaround was changed in 1989 to "save money by reducing maintenance staffing, equipment and base level support,"<sup>63</sup> 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.

Flying hours for the average Air Force fighter pilot have increased by 8 percent since 2017 even though overall funding has increased by over 30 percent. Fighter pilots received an average of 13.0 hours per month in 2017, 12.9 hours per month in 2018, and 14.1 hours per month in 2019.<sup>64</sup> (See Table 9.)

The average combat mission-ready (CMR) pilot assigned to a combat-coded (operational) unit received just 14.6 hours and 7.5 sorties a month in 2019,<sup>65</sup> which is down from 2018. While there have been no indications that COVID-19 adversely affected flying hours, sortie rates, or readiness during the first five months of 2020, many months of weathering this virus lie ahead. (See Table 10.)

Deployability. Because of limitations on support equipment and aircraft availability due to long-term inspections and depot-level work, 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 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.66

Normal fighter squadron manning levels are based on a ratio of 1.25 aircrew members for every aircraft,<sup>67</sup> which means that a unit with 24 assigned aircraft should have 30 line pilots and five supervisor pilots who are

### Average Hours All Fighter Pilots Received a Month

FLYING HOUR AVERAGES INCLUDE LINE PILOTS AND SUPERVISORS IN ALL OPERATIONAL, TRAINING, AND TEST & EVALUATION SQUADRONS

	2017	2018	2019	Change, 2018 to 2019
F-22	10.8	10.8	10.7	-1%
F-35A	10.4	10.4	14.7	41%
F-15C	10.5	10.5	11.8	13%
F-16C	12.2	12.2	12.2	0%
F-15E	18.3	18.3	20.6	13%
A-10	15.1	15.1	16.5	9%
All Jets	13.0	12.9	14.1	10%
Average Hours/Year	155.4	154.6	169.4	10%

**SOURCE:** Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020.

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TABLE 10

### Average Flying Hours All Fighter Line Pilots Received a Month

FLYING HOUR AVERAGES INCLUDE LINE PILOTS (ONLY) IN ALL OPERATIONAL, TRAINING, AND TEST & EVALUATION SQUADRONS

	2017	2018	2019	Change, 2018-2019
F-22	11.7	12.8	10.9	-15%
F-35A	10.6	12.4	15.0	21%
F-15C	10.5	13.1	11.8	-10%
F-16C	11.9	15.5	12.5	-19%
F-15E	19.1	20.3	21.3	5%
A-10	16.7	23.0	16.9	-27%
All Jets	13.2	16.1	14.6	-9%
Average Hours/Year	159	193	175	-9%

**SOURCE:** Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020.

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### Average Sorties All Fighter Pilots Received a Month

FOR LINE PILOTS AND SUPERVISORS IN ALL OPERATIONAL, TRAINING, AND TEST AND EVALUATION SQUADRONS

	2017	2018	2019	Change, 2018-2019
F-22	6.4	6.4	7.2	12%
F-35A	6.6	6.6	6.5	-1%
F-15C	7.0	7.0	6.7	-5%
F-16C	7.4	7.4	7.4	0%
F-15E	7.9	7.9	7.7	-3%
A-10	7.1	7.1	7.5	6%
All Jets	7.2	7.2	7.2	1%
Average Sorties/Year	86.5	86.2	87.0	1%

**SOURCE:** Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020.

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TABLE 12

### Average Flying Hours and Sorties Line Combat Mission Ready Fighter Pilots Received a Month in 2019

HOUR AND SORTIE AVERAGES INCLUDE LINE PILOTS (ONLY) IN OPERATIONAL SQUADRONS (ONLY)

	Hours	Sorties
F-22	11.0	7.4
F-35A	15.4	6.7
F-15C	11.9	6.8
F-16C	12.7	7.6
F-15E	21.7	8.0
A-10	16.9	7.7
All Jets	14.6	7.5
Average Sorties/Year	174.7	89.9

**NOTE:** This is the first year the Air Force has provided Line operational fighter pilot hours and sorties. **SOURCE:** Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020.

	2017	2018	2019	Change, 2018-2019
F-22	6.3	4.5	7.3	62%
F-35A	6.5	7.5	6.6	-12%
F-15C	7.2	8.4	6.7	-20%
F-16C	7.3	9.3	7.5	-19%
F-15E	8.0	8.5	7.9	-7%
A-10	7.2	9.7	7.7	-21%
All Jets	7.2	8.3	7.4	-11%
Average Sorties/Year	86	100	89	-11%

### Average Sorties All Line Fighter Pilots Received a Month by Aircraft

**SOURCE:** Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020.

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combat mission ready.<sup>68</sup> 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.<sup>69</sup> Pilots from the "donor" squadron 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 Air Force has reduced the number of fighter squadrons to two or even one in many wings, significantly complicating the math behind the number of deployable active-duty fighter squadrons. At best, the deployable and therefore employable capacity of the Air Force will likely be limited to just two out of every three combat-coded squadrons, equating to just 21 active-duty fighter squadrons.

Guard and Reserve units face the same challenges, 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.70 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. That allowed 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.<sup>71</sup> Nevertheless, it was common for Guard units to pull pilots from other units in order to fulfill manning requirements for "rainbow" fighter squadrons.72

Calculating the number of deployable Guard and Reserve squadrons that could be made available to meet an order for emergency deployment to a high-threat environment is at best an exercise in guesswork, but given the readiness and manning issues that have been addressed, two Air National Guard (ANG) squadrons would likely enable one to deploy forward.<sup>73</sup> Of the 54 operational fighter FIGURE 3

### Air Force Active Duty Combat-Coded Fighter Squadrons (31 Total)



**SOURCES:** Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020; Brian W. Everstine, "Breaking Down USAF's 70-Percent Overall Mission Capable Rate," *Air Force Magazine*, May 19, 2020, https://www.airforcemag.com/breaking-down-usafs-70-percent-overall-mission-capable-rate/ (accessed August 2, 2020); and table, "Aircraft Total Active Inventory (TAI) (As of Sept. 30, 2019)," in "Air Force & Space Force Almanac," *Air Force Magazine*, Vol. 103, No. 6 (June 2020), p. 63, https://www.airforcemag.com/app/uploads/2020/06/June2020 Fullissue5.pdf (accessed August 2, 2020).

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squadrons on the Air Force roster, 31 are active duty and 23 are Guard or Reserve Units. (See Figures 3 and 4, which present the number of active, Guard, and Reserve squadrons by type of platform.) By itself, the airframe disposition of each wing would allow just 20 active-duty fighter squadron equivalents (24 fighter aircraft each) to deploy to a fight, equating to 480 active-duty fighters that could deploy to meet a crisis situation—less than the fighter requirement for one full major regional contingency.

The average ANG and Reserve fighter squadron has one-third fewer jets than similar active-duty units. By rainbowing units with similar aircraft, they could muster 12 squadrons as a strategic reserve, equating to 288 fighters that could deploy sometime later. Those 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 continually generate 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

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



**SOURCES:** Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020; Brian W. Everstine, "Breaking Down USAF's 70-Percent Overall Mission Capable Rate," *Air Force Magazine*, May 19, 2020, https://www.airforcemag.com/breaking-down-usafs-70-percent-overall-mission-capable-rate/ (accessed August 2, 2020); and table, "Aircraft Total Active Inventory (TAI) (As of Sept 30, 2019)," in "Air Force & Space Force Almanac," *Air Force Magazine*, Vol. 103, No. 6 (June 2020), p. 63, https://www.airforcemag.com/app/uploads/2020/06/ June2020\_Fullissue5.pdf (accessed August 2, 2020).

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readily to a crisis. Because of the pilot shortage, actual unit manning levels in fighter squadrons are below peacetime requirements (if only slightly), and those manning thresholds are not enough to meet the significantly increased 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. This means that the only way units will 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 54 fighter squadrons that are unable to deploy immediately in a crisis could be combined to create more combat power. The vast majority of aircraft that are left would be used for homeland defense and to train replacement pilots or as replacement aircraft that are lost through combat attrition.

The current state of overall Air Force readiness includes many intangibles, but the factors that can be measured, such as mission-capable rates, aircrew training, and deployability, all point to a readiness level that did not visibly increase between 2018 and 2019.

### 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. 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 force capable of executing two MRCs (rounded up to 1,000 fighter aircraft to simplify the numbers).

As part of its overall assessment of capacity, the *2021 Index* looks for 1,200 active-duty fighter aircraft to account for the 20 percent reserve necessary when considering availability for deployment and the risk involved in employing 100 percent of fighters at any one time. It also incorporates the requirements stated in the 2018 TAFWN study.

- **Two-MRC Level:** 1,200 combat-coded fighter aircraft.
- Actual 2019 Level: 1,011 combat-coded fighter aircraft.

Based on a pure count of combat-coded fighter/attack platforms that have achieved initial operating capability (IOC), the USAF currently is at 84 percent of the capacity required to meet a two-MRC benchmark. However, the disposition of those assets (one to two squadrons for the majority of wings and Combat Air Force–wide manning levels) limits its ability to deploy rapidly to a crisis region and win a single MRC. While the active fighter and bomber assets 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 8), 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." This score is now trending upward.

### **Capability Score: Marginal**

The Air Force's capability score is "marginal," the result of being scored "strong" in "Size of Modernization Program," "marginal" for "Age of Equipment" and "Health of Modernization Programs," but "weak" for "Capability of Equipment." These assessments are the same as those in the *2020 Index*. However, new F-35 and KC-46 aircraft continue to roll off their respective production lines, this score is now trending upward.

### **Readiness Score: Marginal**

The Air Force scores "marginal" in readiness in the 2021 Index, the same grade it received in the 2020 Index. The USAF's sustained pilot deficit and systemically low sortie rates and flying hours certainly contribute to this assessment, but its stagnant mission-capable rates and the lack of a systemic increase in operational fighter training reflect 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.74 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.

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. Even with greatly improved maintenance manning and experience levels and increased funding, average monthly sorties and flying hours have not reached those thresholds. Whether they can or will be sustained for the length of time it will take to recover from the ongoing readiness shortfall is therefore open to question.

### Overall U.S. Air Force Score: Marginal

This is an unweighted average of the USAF's capacity score of "marginal," capability score of "marginal," and readiness score of "marginal." The shortage of pilots and flying time for those pilots degrades the ability of the Air Force to generate the amount and quality of combat air power that would be needed to meet wartime requirements. Although it could eventually win a single major regional contingency in any theater, if the Air Force had to go to war today with a peer competitor, both the time needed to win that battle 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.

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity			<b>~</b>		
Capability			<b>~</b>		
Readiness			<b>~</b>		
OVERALL			~		

### **U.S. Military Power: Air Force**





### **Strategic Bomber**

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
B-52 Stratofortress Inventory: 76 Fleet age: 57.8 Date: 1961			The B-21 is an advanced stealth bomber tha B-1s and B-2s within the Air Force bomber f is scheduled for 2021. Procurement is expec	it will repla leet. Fligh ted to be	ace all ht testing gin FY22.
The B-52, the oldest of the bombers, provides global strike capabilities with conventional or nuclear payloads. Programmed upgrades for B-52 include new communications, avionics, and Multi-Functional Color Displays. The Air Force plans to use this aircraft through the 2050s.	0				
B-1 Lancer		2			
Inventory: <b>62</b> Fleet age: <b>32.4</b> Date: <b>1986</b>					
The B-1B is a supersonic all-weather conventional bomber. It was modified in the mid-1990s to disable its nuclear weapon delivery capability. Block 16 upgrades to be completed by 2020 include a fully integrated data link, navigation, radar, and diagnostic upgrades. B-1B phase-out is scheduled for 2032.	2				
B-2 Spirit					
Inventory: <b>20</b> Fleet age: <b>24.2</b> Date: <b>1997</b> 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. The current plan is to begin phasing out the B-2 in 2032.	3	4			





### Ground Attack/Multi-Role Aircraft

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM		Size Score	Health Score
A-10 Thunderbolt II Inventory: 281 Fleet age: 36.8 Date: 1977			F-35A Timeline: 2016-TBD		6	3
The A-10 is the only USAF platform designed specifically for close-air support missions using both self- designated precision-guided munitions and an internal 30mm cannon. The retirement of the A-10 has been discussed for years, but it now appears it will keep flying through 2040.	2	2	The F-35A "Lightning" is a multirole became IOC on August 2, 2016. The 48 F-35As a year across the Future however the Senate markup of the 2 funding for the acquisition of 12 more <b>PROCUREMENT</b>	stealth Air Ford Years Do 021 ND e F-35A DING (3	fighter th ce plans to efense Pro DAA conta As in FY 20 \$ millions)	at o acquire ogram, ins 021.
F-16C Falcon			338 I,425 \$45,4	15	\$186,382	
Inventory: <b>783</b> Fleet age: <b>26.7</b> Date: <b>1980</b>						
The F-16 is a multirole 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.						
F-35A Lightning						
Inventory: <b>203</b> Fleet age: <b>3.7</b> Date: <b>2016</b>	•	•				
The F-35 is a multirole stealth fighter that became operational in 2016. The Air Force has received more than 200 of a planned purchase of 1,763 aircraft.	9	9				
F-15E Strike Eagle						
Inventory: <b>218</b> Fleet age: <b>27.4</b> Date: <b>1989</b>						
The F-15E is a multirole aircraft capable of all-weather, deep interdiction/ attack, and tactical nuclear weapons delivery. Upgrades include an AESA radar, EPAWSS self-defense suite, a new central computer, and cockpit displays.	2	2				





### **Fighter Aircraft**

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score	
F-15C/D Eagle Inventory: 234 Fleet age: 29.1 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 including 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.	0	2	The F-15EX will be based on the two-seat F-15QA (Qata configuration upgraded with USAF-only capabilities, in the Eagle Passive Active Warning and Survivability Sys (EPAWSS) and advanced Operational Flight Program ( software. The President's Budget for FY 2020 will acqu F-15EXs in FY 2020 and a total of 80 over the Future Ye Defense Program.			
F-22A Raptor Inventory: 186 Fleet age: 13.2 Date: 2005 The F-22 is the preeminent air superiority stealth fighter aircraft, modified to enable delivery of precision-guided weapons delivery. The jet is currently undergoing a modification called RAAMP that will improve reliability, maintainability, and performance.	4	6				





### Tanker

PLATFORM	Age Score	Capability Score	REPLACEMENT PROG	iram	Size Score	Health Score
KC-10 Extender Inventory: 59 Fleet age: 34.7 Date: 1981			<b>KC-46</b> Timeline: <b>2019–2017</b>		3	3
The KC-10 is a multirole tanker and airlift platform that can refuel both boom- and drogue-compatible fighters on the same mission. Recent modifications have enabled a service life extension through 2045. The Air Force planned to retire the KC-10 by 2024, but with a shortfall of refueling platforms, and slow acquisition of the KC-46, that appears unlikely.	2	6	The KC-46 Pegasus w tanker fleet. The prog in August 2016, and th Pegasus on January 10 deficiencies and is cur to problems with its re is still accepting appro the Pegasus being un <b>PROCUREMENT</b>	ill replace portions o ram entered low-rate he Air Force accepter 0, 2019. The tanker h rrently unable to refu emote visual system. oximately 15 aircraft a able to perform its p SPENDING (	f the KC-1 e initial pr d the first as had se lel aircraft The Air F a year des rimary mi <i>\$ millions)</i>	35 oduction veral due orce pite ssion.
KC-135 Stratotanker			79 99	\$21,210	\$22,39	02
Inventory: <b>379</b> Fleet age: <b>58.7</b> Date: <b>1957</b> The KC-135 is a multirole tanker/airlift platform. The aircraft has undergone several modifications, mainly engine upgrades to improve performance and reliability. Part of the fleet will be replaced with the KC-46, with the remainder scheduled to be in service through 2040.	0					
KC-46 Pegasus						
Inventory: <b>21</b> Fleet age: <b>0.1</b> Date: <b>2020</b> This Pegasus is a multirole tanker/airlift platform that can refuel both boom- and drogue-compatible fighters on the same mission. The Air Force accepted the first of 179 programmed aircraft in 2019. The program has had significant problems, but deliveries will continue at a rate of 15 aircraft a year.	6	0				





### **Heavy Lift**

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
C-5M Galaxy Inventory: 52 Fleet age: 32.4 Date: 1970			None		
The C-5 is the USAF's largest mobility aircraft. It can transport 270,000 pounds of cargo over intercontinental ranges and is air refuelable. 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 and mission computer, and improved Large Aircraft IR Countermeasures (LAIRCM).	2	6			
C-17 Globemaster III Inventory: 222 Fleet age: 17 Date: 1995 The C-17 is a large, air-refuellable transport aircraft that is capable of operating on small airfields (3,500 feet by 90 feet). Ongoing modifications include next-generation Large Aircraft Infrared Countermeasures (LAIRCM), and structural, safety, and sustainment modifications.	4	_			

### **Medium Lift**

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score	
C-130J Super Hercules			C-130J	6	6	
Inventory: <b>132</b> Fleet age: <b>9.3</b> Date: <b>2006</b>			Timeline: 2006–2022	•	•	
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 transition to the C-130J in October 2017.	6	6	An upgraded 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 ca 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 FY 2023, and to procure an additional 24 H/MC-130 aircraft from 2021 to 2025.			
			176 \$14,0	016.4 \$	141.7	

### **AIR FORCE SCORES**



### Intelligence, Surveillance, and Reconnaissance (ISR)

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
RQ-4 Global Hawk Inventory: 35 Fleet age: 9.5 Date: 2011 The RQ-4 is an unmanned aerial vehicle (UAV). Unlike the MQ-9, the RQ-4 is a high-altitude, long-endurance (HALE) UAV, which in addition to higher altitude has a longer range than medium- altitude, long-endurance (MALE) UAVs.	4	3	None		
MQ-9 A/B Reaper Inventory: 269 Fleet age: 5.5 Date: 2007 The MQ-9 is a hunter/killer Remotely Piloted Aircraft (RPA) with EO/IR and SAR targeting capabilities, and is capable of station times in excess of 24 hours. The Extended Range modification adds external fuel tanks, a four-bladed propeller, engine alcohol/ water injection, heavyweight landing gear, longer wings, and tail surfaces.	6	2	MQ-9 Timeline: 2007–2017 The MQ-9 "Reaper" is a proven hunter/kille Aerial Vehicle (UAV). The Air Force FY 202 funds the procurement of 24 Reapers, but President's Budget for 2021 unexpectedly of acquisition. However, both the House (16 ai Senate (\$170.6m) markups of the 2021 ND, funding for the acquisition of additional MC PROCUREMENT 48 16 SPENDING (\$	5 r unmann D budget the propos ends MQ-S rcraft) and AA contair Q-9 UAS. <i>s millions</i> ) 06 \$	<b>5</b> ed sed d 1
RC-135 Rivet Joint Inventory: 20 Fleet age: 55.8 Date: 1972 The RC-135 is a manned ISR platform that collects electronic and signals intelligence with real-time analysis and dissemination for tactical forces, combatant commanders, and National Command Authorities. Ongoing upgrades include new direction finding COMINT, precision ELINT/ SIGINT system integration, wideband SATCOMS, enhanced near real-time data dissemination, and new steerable beam antenna.	0	4	None		
U-2 Dragon Lady Inventory: 27 Fleet age: 36.7 Date: 1956 The U-2 is a manned strategic high- altitude, long-endurance ISR platform. Capable of SIGINT, IMINT and MASINT collection, it can carry a variety of advanced optical, multispectral, EO/ IR, SAR, SIGINT, and other payloads simultaneously. No other aircraft in the U.S. inventory has this capability, which will indefinitely delay the U-2's retirement.	0				

### **AIR FORCE SCORES**



### **Command and Control**

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
E-3 AWACS			None		
Inventory: <b>31</b> Fleet age: <b>38.2</b> Date: <b>1977</b>					
The E-3 is an airborne warning and control system (AWACS) that delivers 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, modernizing airborne moving- target indication, and adding high- speed jam-resistant Link 16. The E-3 is scheduled to stay in service through the 2040s.	0	2			
E-8 JSTARS					
Inventory: <b>16</b> Fleet age: <b>17.8</b> Date: <b>2010</b>					
The E-8 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 plans to retire this platform in the mid-2020s.					

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

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- 9. 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 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 11, 2020), and Table 1, "Department of the Air Force Budget Summary," in U.S. Department of Defense, Secretary of the Air Force, Office of Financial Management and Budget (SAF/FMB), Department of the Air Force FY 2021 Budget Overview, February 2020, p. 2, https://www.saffm.hq.af.mil/Portals/84/documents/FY21/SUPPORT\_/FY21%20Budget%200verview\_1.pdf?ver=2020-02-10-152806-743 (accessed August 11, 2020).
- 10. Appendix, "Department of the Air Force Total Aircraft Inventory (TAI)," in U.S. Department of Defense, Secretary of the Air Force, Office of Financial Management and Budget (SAF/FMB), *Department of the Air Force FY 2021 Budget Overview*, p. 42.
- 11. "The Air Force We Need" calls for one additional airlift squadron and five additional bomber, seven additional fighter, and 14 additional tanker squadrons. While the number of aircraft in any one of those categories varies from unit to unit, there are approximately 30 fighters, 10 bombers, 15 tankers, and 15 strategic airlift aircraft in each squadron. Mathematically, "The Air Force We Need" calls for 182 more fighters, 50 more bombers, 210 more refuelers, and 15 more airlift aircraft than the Air Force currently has in its inventory. U.S. Air Force, "The Air Force We Need: 386 Operational Squadrons."
- \$80 billion is a rough estimate based on the need for 182 more F-35s (seven squadrons, 26 fighters per squadron, \$80 million each); 50 more B-21 bombers (five squadrons, 10 bombers per squadron, \$564 million each); 210 more KC-46s (14 squadrons, 15 tankers per squadron, \$169 million each); and 15 additional C-17s (one squadron, 15 aircraft per squadron, no longer in production but an average of \$262 million each); and 15 additional C-17s (one squadron, 15 aircraft per squadron, no longer in production but an average of \$262 million each in FY 2020 dollars). See, respectively, Marcus Weisgerber, "Price Drop: Lockheed Pitches \$80M F-35A to Pentagon," *Defense One*, May 7, 2019, https://www.defenseone.com/business/2019/05/price-drop-lockheed-pitches-80m-f-35a-pentagon/156825/ (accessed August 5, 2020); Jeremiah Gertler, "Air Force B-21 Raider Long-Range Strike Bomber," Congressional Research Service *Report for Members and Committees of Congress*, updated November 13, 2019, p. 4, https://fas.org/sgp/crs/weapons/R44463.pdf (accessed August 5, 2020); U.S. Department of the Air Force, *Department of Defense Fiscal Year (FY) 2020 Budget Estimates, Air Force, Justification Book Volume 1 of 2: Aircraft Procurement, Air Force Vol-1, March 2019, p. 25, https://www.saffm.hq.af.mil/Portals/84/documents/FY20/PROCURE, Air MENT/FY20\_PB\_3010\_Aircraft\_Vol-1.pdf?ver=2019-03-18-152821-713 (accessed August 5, 2020); and Fact Sheet, "C-17 Globemaster III," U.S. Air Force, May 14, 2018, https://www.af.mil/About-Us/Fact-Sheets/Display/Article/1529726/c-17-globemaster-iii/ (accessed August 5, 2020).*

- 13. Until FY 2021, the "Air Force" budget included procurement; research, development, test, and evaluation (RDT&E); personnel; and operations and maintenance (O&M) for all space assets and personnel in the Department of the Air Force portfolio. In order to compare the budgets year over year, this discussion uses "DOAF" budget numbers for each of the subcategories. Additionally, the Defense Department's National Defense Budget Estimates or "Green Book" budget for the Department of the Air Force totals slightly more than \$207 billion, but the DOAF's FY 2021 budget overview document specifies a total budget of almost \$169 billion. See Table 6-18, "Air Force TOA by Public Law Title," in U.S. Department of Defense, Office of the Under Secretary of Defense (Comptroller), National Defense Budget Estimates for FY 2021, April 2020, p. 211, https://comptroller.defense.gov/ Portals/45/Documents/defbudget/fy2021/FY21 Green Book.pdf (accessed August 12, 2020), and Table 1, "Department of the Air Force Budget Summary," in U.S. Department of Defense, Secretary of the Air Force, Office of Financial Management and Budget (SAF/FMB), Department of the Air Force FY 2021 Budget Overview, February 2020, p. 2, https://www.saffm.hg.af.mil/Portals/84/ documents/FY21/SUPPORT /FY21%20Budget%200verview 1.pdf?ver=2020-02-10-152806-743 (accessed August 12, 2020). This is because the "Green Book" budget numbers for the DOAF include more than \$38 billion in non-Air Force ("non-Blue") funding that is designated for black programs and "other" agencies. Although placed in the DOAF budget, it is "pass-through" funding that the DOAF cannot use and cannot control. For the purposes of this evaluation, the author has therefore removed passthrough funding from all calculations and comparisons. It should also be noted that the first footnote in the February 2020 DOD document specifies that the total "Does not include Pass Through."
- 14. See note 9, supra.
- 15. These numbers are estimates based on the requirements presented by the Air Force within the President's budget for FY 2021. For consistency, the calculations include procurement and RDT&E figures for the Space Force, as they were not separated in any previous fiscal year's budget.
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- 22. The numbers of 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), Department of the Air Force FY 2021 Budget Overview, and International Institute for Strategic Studies, The Military Balance 2020: The Annual Assessment of Global Military Capabilities and Defence Economics (London: Routledge, 2020), pp. 54–56. Where the two publications were in conflict for 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 those types of aircraft. The numbers and types of

aircraft associated with Weapons Instructor Course Squadrons, Adversary Tactics, Test, OT&E, and other units are not standard/ determinable and could not be assessed. 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 those aircraft; and spreading the error equally across all combat-coded fighter and training units. The total number of fighters associated with non–Fighter Training Unit (FTU) squadrons was counted as "combat-coded."

- 23. The numbers here are complicated. Air Force formulas contained in Adam J. Herbert, "The Fighter Numbers Flap," Air Force Magazine, Vol. 91, No. 4 (April 2008), p. 26, http://www.airforcemag.com/MagazineArchive/Documents/2008/April%20 2008/0408issue.pdf (accessed July 29, 2019), convey how the service estimates this number, but it is merely an estimate. Using this formula on an AF/A8XC-provided (as of June 9, 2018) figure of 710 PMAI fighters renders a total of 1,136 total Air Force active-duty fighters, a number that is well short of the 1,374 carried on the Air Force roster. This calls for the use of a different method to determine the actual number of combat-coded fighters as detailed in note 22, *supra*.
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- 64. Averages for sorties and hours are based on weighted fighter manning levels for each of the five major weapons systems provided in Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020. The numbers were weighted based on aircraft numbers as explained in note 22, *supra*, as well as standard aircrew ratios established in Figure A8.1, "Air Force Single Flying Hour Model F-I6C Example," in U.S. Air Force, "Flying Operations: Flying Hour Program Management," Air Force Instruction 11-102, August 30, 2011, p 17, https:// static.e-publishing.af.mil/production/1/af\_a3\_5/publication/afi11-102/afi11-102.pdf (accessed August 5, 2020).
- 65. See note 64.
- 66. Author's experience through 26 years of Air Force operations, coupled with senior leader engagements from 2018–2019.
- 67. 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 August 4, 2020).
- 68. Even though active-duty fighter squadrons have an average of 30 aircraft per squadron, that number includes maintenance spares and attrition reserve platforms. Manning is based on Primary Assigned Aircraft (PAA), which is 24 aircraft for active-duty fighter squadrons.
- 69. Based on a squadron with 24 Primary Assigned Aircraft. For units with 18 PAA, four additional pilots are required.
- 70. 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.
- 71. "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 August 4, 2020).
- 72. The author commanded the 349th Expeditionary Combat Group at AI 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.
- 73. Interview with senior Air National Guard leader, November 20, 2019.
- 74. See Venable, "Independent Capability Assessment of U.S. Air Force Reveals Readiness Level Below Carter Administration Hollow Force."