

CBO

The Cost of Replacing Today's Army Aviation Fleet



MAY 2019

Notes

The years referred to in this report are federal fiscal years, which run from October 1 to September 30 and are designated by the calendar year in which they end.

All costs are expressed in 2018 dollars. For the years before 2018, costs are adjusted for inflation with the gross domestic product price index from the Bureau of Economic Analysis. Costs for years after 2018 are adjusted for inflation with the Congressional Budget Office's projection of that index.

On the cover: The drawing depicts, from top to bottom, an H-47 Chinook, an H-60 Black Hawk, and an AH-64 Apache.



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The Cost of Replacing Today's Army Aviation Fleet

Summary

The U.S. Army has about 4,300 piloted aircraft, most of which are helicopters (also known as rotary-wing aircraft). Three large, high-value fleets—the H-60 Black Hawks, AH-64 Apaches, and H-47 Chinooks—account for most of the helicopters, and their eventual replacement dominates the Army's future procurement costs. In this report, the Congressional Budget Office estimates the costs of replacing those helicopters and the Army's other aircraft through 2050 if the service implemented its current plans and, for aircraft with no announced replacement plans, if they were replaced when they reached the end of their typical service life.¹

- **Replacement Costs.** CBO projects that the annual cost of replacing the aircraft in the Army's current fleet would decline during the 2020s, from about \$4 billion in 2018 to about \$1.5 billion in 2027. It would then rise to a peak of about \$4.7 billion in 2032 before drifting downward between 2035 and 2045. Because the Army made considerable investments in aircraft between 2007 and 2016, relatively few aircraft are near the end of their service life, reducing the number of aircraft to be replaced during the 2020s.
- **Methods.** CBO's projections are based on publicly articulated procurement plans for some aircraft and, for aircraft without such plans, on their typical retirement age; the projections do not take into account the costs of development, operations and maintenance, modifications, or personnel associated with aircraft.
- **Future Vertical Lift Plans.** The Army's Future Vertical Lift (FVL) program is developing new technologies to include in aircraft in the late 2020s to early 2030s: the Future Long-Range Assault Aircraft (FLRAA) for transport and the Future Attack Reconnaissance

Aircraft (FARA) for improved armed reconnaissance capabilities. The FLRAA is expected to replace today's Black Hawk helicopters, and the FARA may eventually replace today's Apaches when they are retired.

- **Uncertainty.** CBO's estimates are subject to several sources of uncertainty. The characteristics of the two FVL aircraft have not been finalized, and technical challenges could change schedules, characteristics, or costs. Additionally, the Army has recently indicated that it may substantially change or cancel plans to modernize the CH-47F Chinook helicopters that are included in CBO's projection.

The Cost of Replacing Today's Fleet

According to data the Army provided to CBO, as of April 15, 2018, the Army's aviation fleet consisted of 21 different types of aircraft, including the following:

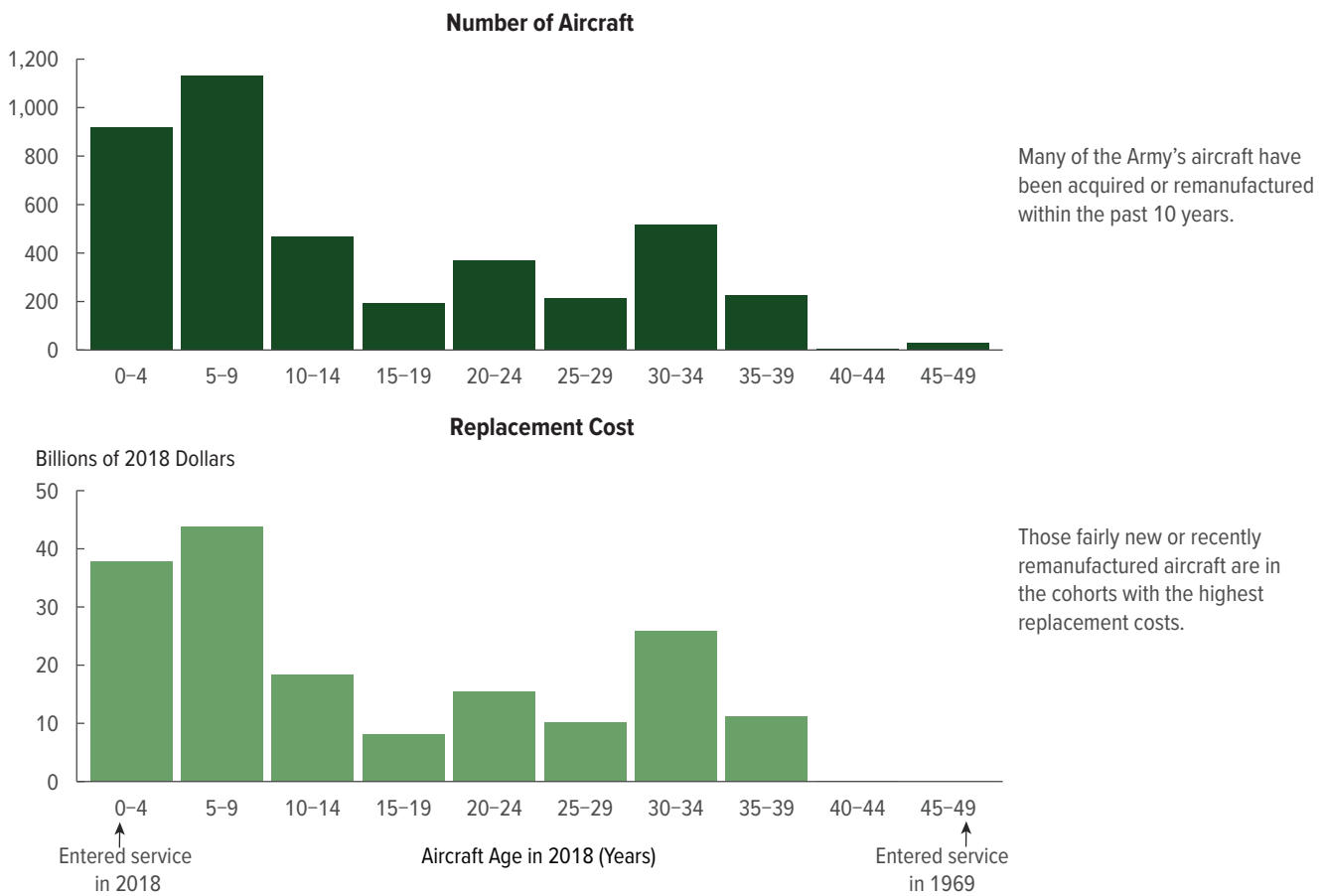
- 2,279 Sikorsky H-60 Black Hawk helicopters, most of which are utility transports;
- 744 Boeing AH-64 Apache heavy attack helicopters, which are also used for armed reconnaissance missions;
- 423 Boeing H-47 Chinook heavy-lift cargo helicopters;
- 411 Airbus UH-72 Lakota light utility helicopters; and
- 92 Beechcraft C-12 Huron fixed-wing passenger turboprop airplanes (plus an additional 30 RC-12 reconnaissance airplanes).²

1. CBO undertook a similar analysis of Air Force aircraft. See Congressional Budget Office, *The Cost of Replacing Today's Air Force Fleet* (December 2018), www.cbo.gov/publication/54657.

2. The H-60 Black Hawks include EH-60, HH-60, MH-60, and UH-60 helicopters. The H-47 Chinooks include both CH-47 and MH-47 helicopters. For more details on the Army's force structure, see Congressional Budget Office, *The U.S. Military's Force Structure: A Primer* (July 2016), Chapter 2, www.cbo.gov/publication/51535.

Figure 1.

Age and Replacement Cost of the Army's Fleet, 2018



Source: Congressional Budget Office, using data from the U.S. Army.

Age is measured in years since acquisition or remanufacture. The figure does not include data for MQ-1C Gray Eagles because ages for those aircraft were not available.

Although those aircraft range widely in age, many Army aircraft are fairly new, having been acquired or remanufactured within the past 10 years (see the upper panel in Figure 1).³

CBO assigned each type of aircraft in the current Army fleet an estimated replacement unit cost and then projected the total replacement cost for each aircraft type by multiplying the per-aircraft replacement cost by the number of aircraft in that fleet (see the

appendix). For example, the December 2017 CH-47F Modernized Cargo Helicopter (CH-47F Block II) Selected Acquisition Report (SAR) indicated an average procurement unit cost of \$28 million in 2017 dollars, or about \$29 million in 2018 dollars. Assigning each of the Army's 423 H-47 Chinooks that average replacement cost resulted in an estimated overall fleet-replacement cost of \$12.2 billion.⁴ Not surprisingly, the Army's largest fleets—the H-60 Black Hawks, AH-64 Apaches, and H-47 Chinooks—had the highest total replacement costs. The aircraft with the highest replacement

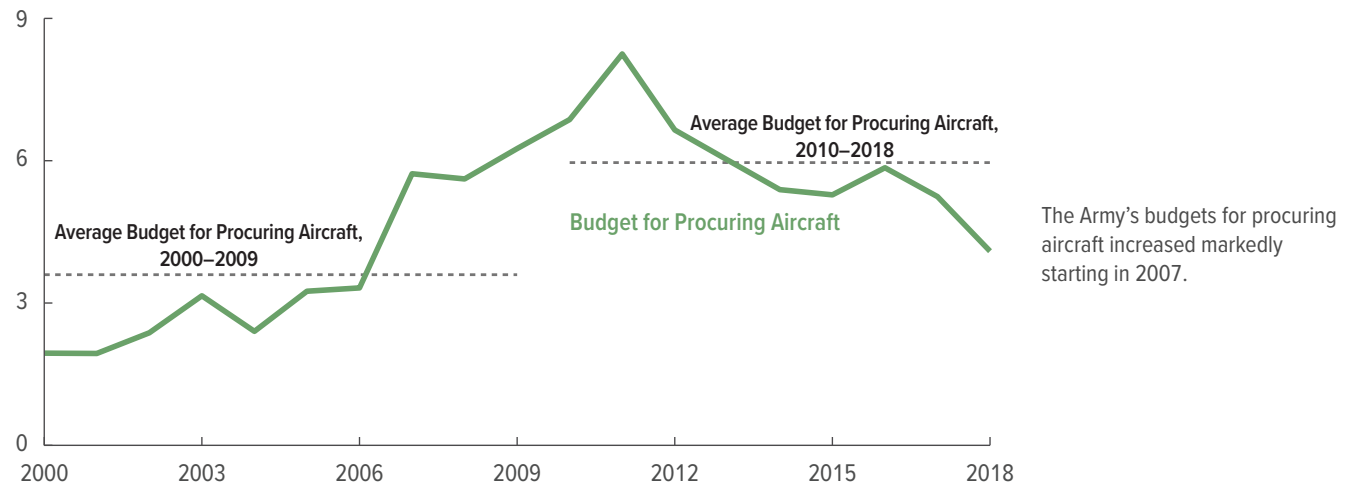
3. The Army often remanufactures helicopters, rebuilding the aircraft using the original metallic chassis. The Army assigns new tail numbers to remanufactured helicopters, so they appear in the data CBO analyzed as new aircraft. CBO cannot tell whether a given helicopter is new or remanufactured, so aircraft age is measured from either acquisition or remanufacture date.

4. That technique does not imply that Chinook aircraft in the current fleet are worth \$29 million today. Rather, replacing today's (Block I) Chinooks with Block IIs would have an average procurement unit cost of that amount.

Figure 2.

The Army's Budgets for Procuring Aircraft, 2000–2018

Billions of 2018 Dollars



Source: Congressional Budget Office, using data from the U.S. Army.

costs tend to be the newest ones (see the lower panel in Figure 1).

The Army's total annual budget for procuring aircraft increased markedly starting in 2007 (see Figure 2). Measured in 2018 dollars, that budget was \$1.9 billion in 2000 but rose to a peak of \$8.3 billion in 2011. The budget declined in most years after 2011, falling to \$4.1 billion in 2018. Aircraft procurement represented about 15 percent of the Army's total procurement budget over the 2000–2018 period; ground vehicles such as tanks and trucks accounted for the largest portion of the Army's total procurement budget over that period. The procurement budget for aircraft has generally been less than 3 percent of the Army's overall budget, much of which goes to military and civilian personnel costs.

CBO projects that the costs of replacing the aircraft in the Army's current fleet would decline in most years through the 2020s, dropping to about \$1.5 billion in 2027 before rising above \$4 billion per year through the early-mid 2030s as procurement for the two FVL programs ramped up (see Figure 3). Those costs would decline between 2035 and 2045 and remain relatively stable thereafter, at around \$3 billion per year, until 2050. The projected annual costs for 2019 to 2050 are below the average budget for procurement of Army

aircraft over the 2010–2018 period but similar to the average budget over the 2000–2009 period.

The \$4.7 billion peak in 2032 is composed of funding for the FARA (\$1.4 billion), which would initially augment the Army's current armed reconnaissance capabilities and possibly replace the AH-64 Apache later; the FLRAA (\$1.3 billion), which would replace the H-60 Black Hawk; projected replacement of the fixed-wing MQ-1C Gray Eagle (\$1.0 billion); and modernization of the CH-47 Chinook (\$0.7 billion) (see Figure 4).⁵ Apache procurement would end in 2025 before FARA procurement began in 2028, but procurement of Black Hawks (ending in 2035) and FLRAAs (beginning in 2030) would overlap.

Although CBO's projections address changes in the Army's fleet through 2050, the agency formed no judgment about whether the aircraft procurements in its analysis are necessary or appropriate. Instead, this report projects the costs to procure the aircraft in the Army's

5. Currently, Apaches carry out their original heavy attack missions as well as reconnaissance or light attack missions that OH-58D Kiowa Warrior helicopters performed before the Army retired those aircraft in 2012. The Army has not determined whether it will retire the Apaches as FARA squadrons enter the force around 2030 or simply transition them back to their original heavy attack role.

Figure 3.

Projected Army Costs for Procuring Aircraft, 2019–2050

Billions of 2018 Dollars



According to CBO's projections, the costs of procuring Army aircraft would decline in the early to mid-2020s, rise through the early to mid-2030s, and decline after 2035. Annual costs would remain below the average budget the service received from 2010 to 2018.

Source: Congressional Budget Office.

publicly articulated plans and to replace other aircraft on a one-for-one basis when they reach the end of their service life.⁶

How CBO Made Its Projections

CBO used two complementary approaches to project changes in the Army's fleet and the costs of aircraft procurement associated with those changes.

First, for the Army's three major aviation acquisition programs (H-60, AH-64, and H-47), CBO developed detailed procurement cost projections. CBO used information from Department of Defense-issued SARs that summarize projected development schedules, purchase quantities, and costs for the Congress each year. The agency then supplemented those SARs with its own projections of program costs and schedules based on the Army's general plans:

- The December 2017 UH-60M Black Hawk Helicopter SAR gives quantities and estimates of procurement costs through 2028.⁷ With input

from the Army, CBO projected that procurement of replacements for Black Hawks (the FLRAA) would begin in 2030. CBO based its estimate of the FLRAA's procurement costs on the costs of current transport aircraft but adjusted the total to account (as described below) for specific performance characteristics that the Army has proposed for the FLRAA.

- The December 2017 AH-64E Apache Remanufacture SAR gives quantities and procurement cost estimates through 2025. CBO projected that procurement of an aircraft the Army is developing to augment its armed reconnaissance capabilities (the FARA) would eventually be extended to also replace Apaches when they reached the end of their service life.⁸ With input from the Army, CBO projected procurement of 30 FARAs per year but made no judgment about which ones would augment the current force and which would replace retiring Apaches. CBO based

than were indicated in the December 2017 SAR. If that program changed, it would reduce CBO's projection of costs through 2028; see "Uncertainties" on page 6 for details on how that change could affect CBO's projection.

6. The Army told CBO that it does not plan to replace its fixed-wing C-20, C-23, and C-27 aircraft or its rotary-wing OH-58 and UH-1H aircraft. Hence, CBO projects no replacement costs for those aircraft (see Table A-3 on page 14).

7. The five-year plan submitted with the Army's budget request for 2020 included fewer UH-60 purchases from 2020 through 2024

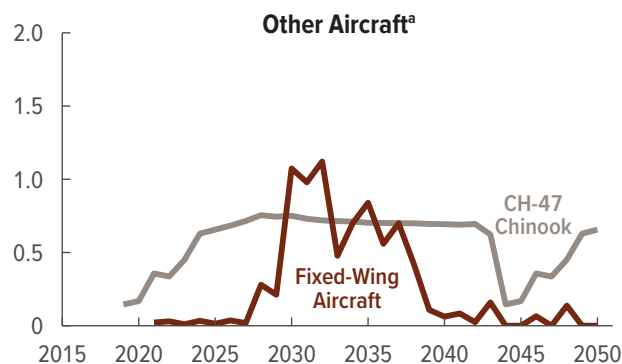
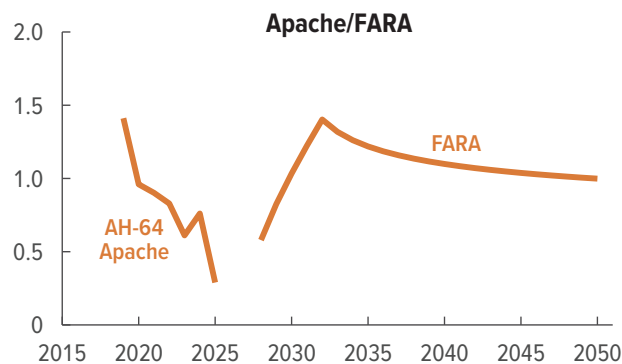
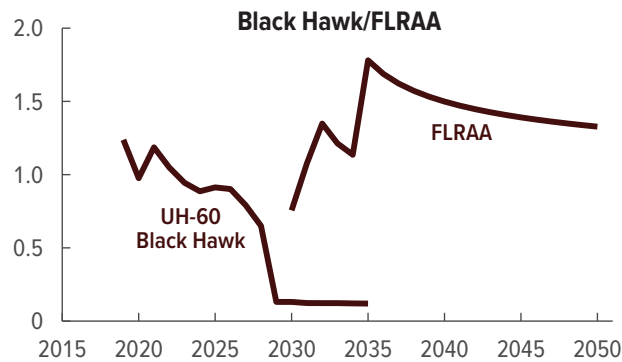
8. The Army might instead limit FARA purchases to the number needed for armed reconnaissance missions and develop a new aircraft that is larger than the FARA to replace the Apache for heavy attack missions. That approach could result in costs that are higher than CBO's projections.

Figure 4.

Projected Army Costs for Procuring Selected Aircraft, 2019–2050

The FLRAA is the most costly upcoming program. AH-64 Apache procurement ends before FARA procurement begins, but H-60 Black Hawk and FLRAA procurement overlap.

Billions of 2018 Dollars



Source: Congressional Budget Office.

FARA = Future Attack Reconnaissance Aircraft; FLRAA = Future Long-Range Assault Aircraft.

a. CBO projects additional costs for other rotary-wing aircraft in two years: \$36 million in 2019 and \$94 million in 2050.

its estimate of the FARA's procurement costs on the costs of current attack and armed reconnaissance aircraft but adjusted the total to account for specific performance characteristics that the Army has proposed for the FARA.

- The December 2017 CH-47F Modernized Cargo Helicopter (Block II) SAR gives quantities and procurement cost estimates through 2043. For the years after 2043, CBO projected that the Army would replace H-47s in the annual quantities in which the aircraft were procured 25 years earlier.⁹

Second, CBO projected that the Army would retire and replace other aircraft when they reached specified ages (see the appendix). For example, as of April 15, 2018, the Army had 28 UC-35 medium-range, fixed-wing transport aircraft ranging in age from 16 years to 21 years. If the Army retired those aircraft at age 35, the oldest UC-35s would be retired in 2032 and the newest would be retired in 2037.

With input from the Army, CBO estimated the unit costs for procuring replacement aircraft.¹⁰ New aircraft typically have higher procurement unit costs than the aircraft they replaced, reflecting their increased capability. CBO projected that the new or remanufactured aircraft will enter service two years after appropriations are enacted for procurement, which is consistent with the Department of Defense's experience.

Future Vertical Lift Aircraft

For the past several years, the Army has been investing in new technologies that would enable improved performance for its future aircraft. The Army's FVL program has been exploring technologies such as increased use of composite materials, tilt-rotor propulsion, and double coaxial rotors that may sizably increase flight range, speed, and endurance relative to today's Army

9. The five-year plan submitted with the Army's budget request for 2020 included fewer than half of the Block II Chinook purchases from 2020 through 2024 that were indicated in the December 2017 SAR. Army officials have stated that Block II purchases may be further deferred, curtailed, or canceled depending on factors such as availability of funds and progress with the FVL program.

10. Average procurement unit cost is total program procurement cost divided by the number of units procured. See Defense Acquisition University, "Average Procurement Unit Cost" (accessed May 7, 2019), <https://go.usa.gov/xEVFb>.

helicopters.¹¹ The Army has also been investing in technologies to enable more fuel-efficient and powerful engines (the Improved Turbine Engine Program) for use in both current and future aircraft.

The Army envisions at least two aircraft emerging from the FVL program. The FLRAA would transport light forces and equipment farther and faster than the Black Hawks that it would replace.¹² The FARA, an armed scout, would conduct reconnaissance, attack, and electronic warfare and might fly without human pilots on at least some missions.¹³ It would initially fulfill the armed reconnaissance missions previously carried out by the now-retired OH-58D Kiowa Warrior fleet, and the Army might eventually extend FARA procurement to replace the Apaches. CBO's projections of FLRAA and FARA costs draw on insights from Army officials as well as on documentation that the Army provided.

Projected Procurement Schedules and Costs

For the Black Hawk and its replacement, the FLRAA, CBO's projection reflects the following specifications:

- Procurement of FLRAAs would start with 6 in 2030, increase to 30 per year starting in 2035, and remain steady at that rate thereafter.
- Procurement of UH-60V Black Hawks would continue through 2035 (so FLRAAs and UH-60Vs would be concurrently procured for six years, 2030 to 2035).
- The average unit cost for procuring FLRAAs through 2050 would be \$53 million.

For the Apache and the FARA, CBO's projection includes the following specifications:

- Procurement of FARAs would start with 6 in 2028, increase to 30 per year starting in 2032, and remain steady at that rate thereafter.

- Procurement of AH-64E Apaches would continue through 2025, so no Apache or FARA procurement would occur in 2026 and 2027.
- The average unit cost for procuring FARAs through 2050 would be \$40 million.

Age of Fleets

With the projected procurement schedule, the average age of the combined Black Hawk/FLRAA fleet would rise considerably in the 2040s (see Figure 5). CBO projects that the average age of that fleet would plateau at about 15 years from the late 2020s through the late 2030s, but it would increase thereafter, reaching 22.4 years by 2050 (and continuing to increase after 2050 if the Army took no further steps to reduce the age of the fleet). By contrast, between the 1980s and the 2000s, the average age of Army helicopters was 12 to 18 years.¹⁴ In 2018, the oldest H-60s in operation were 39 years old. Under the projected acquisition plan, the age of the oldest operating H-60s would be 35 years in 2030 and 31 years in 2040, but it would be 37 years in 2050.

The average age of the Apache fleet was 7.8 years in 2018. How plans to procure 30 FARAs per year would affect the combined Apache/FARA fleet depends on how many FARAs the Army added to augment its current armed reconnaissance capability and how many it added to replace retiring Apaches. If, for example, the Army opted to retire an Apache for every FARA it purchased, the average age of the combined AH-64/FARA fleet would be 10.6 years in 2030, 13.0 years in 2040, and 12.8 years in 2050—average ages within the typical range for Army helicopters. The average ages would be higher if the Army added the initial FARAs to the force without retiring Apaches.

Uncertainties

Because the future national security environment and future Army budgets are unknown, projections out to 2050 are quite uncertain. An aircraft's retirement may be accelerated or postponed, or the aircraft may be retired and not replaced. Increased capabilities of new aircraft may also allow the Army to purchase fewer aircraft than it would under CBO's assumption of one-for-one

11. Possible approaches for FVL are discussed in "Whirlybirds Are Go," *Economist* (August 25, 2018), <http://tinyurl.com/y4xrrcya>.

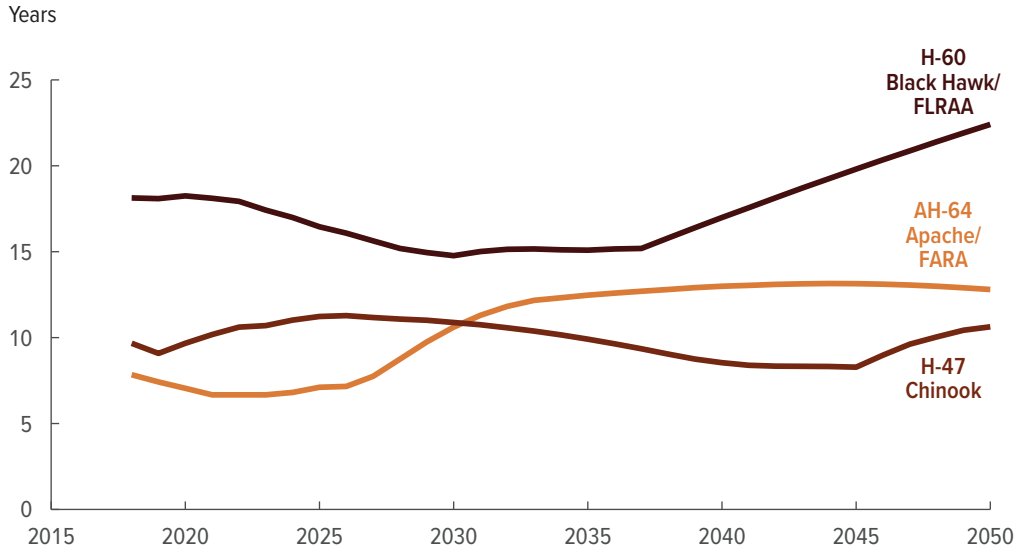
12. See Sydney J. Freedberg Jr., "Bell V-280 Flies 322 MPH: Army Secretary Praises Program," *Breaking Defense* (January 24, 2019), <https://tinyurl.com/yxgqnz4a>.

13. See Sydney J. Freedberg Jr., "Army Wants Revolutionary Scout Aircraft for \$30 Million, Same As Apache E," *Breaking Defense* (October 3, 2018), <https://tinyurl.com/y3mwjfdp>.

14. See Congressional Budget Office, *The Long-Term Implications of Current Defense Plans: Detailed Update for Fiscal Year 2008* (March 2008), Figures 3–7, www.cbo.gov/publication/19541.

Figure 5.

Estimated Average Ages of the AH-64 Apache/FARA, H-47 Chinook, and H-60 Black Hawk/FLRAA Fleets, 2018–2050



The average age of the H-60 Black Hawk/FLRAA fleet would increase considerably starting in the late 2030s if the Army procured 30 FLRAAs each year and did not remanufacture older H-60s.

Source: Congressional Budget Office.

Age is measured in years since acquisition or remanufacture.

FARA = Future Attack Reconnaissance Aircraft; FLRAA = Future Long-Range Assault Aircraft.

replacement of existing aircraft. Moreover, new aircraft that do not replace existing aircraft may emerge, such as the Army's remotely piloted MQ-1C Gray Eagle aircraft, which did not replace any existing aircraft. Two examples of uncertainties that pertain to the Army's plans for procuring aircraft (and, therefore, to CBO's projections) are how the FVL program will progress in the coming decades and, more immediately, how plans for the Chinook Block II modernization will change relative to the SAR on which CBO's projections are based.

Long-range projections are nevertheless useful because they can assist the Congress, the Department of Defense, and the Army in setting appropriate budgets for procuring aircraft. They can also identify key future issues—when many programs might need procurement appropriations at the same time, for example, or when retained aircraft would be growing old—and give decisionmakers enough time to address them.

Uncertainty About the Future Vertical Lift Program

How the FVL program will progress is a source of considerable uncertainty in CBO's projections, and it raises a variety of questions:

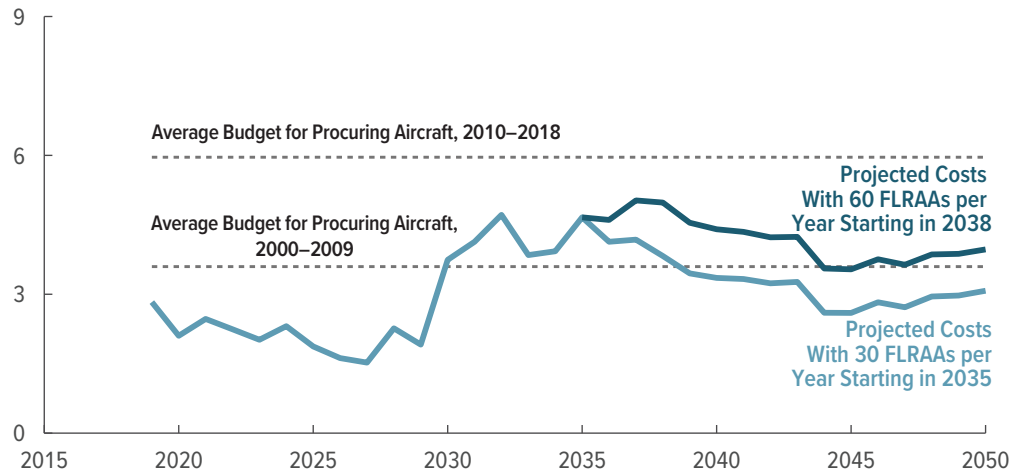
- What performance will the FVL variants achieve?
- How many FLRAAs and FARAs will be acquired, and how many FARAs will augment the force rather than replace Apaches?
- Will procurement quantities be sufficient to replace retiring aircraft, or will production need to be increased or supplemented with continued production of older designs?
- What will the unit costs of new aircraft be?
- Will there eventually be a Chinook FVL variant?

One example of such uncertainty is that the planned purchase rates for the FLRAA might be insufficient to keep up with the retirement of the Black Hawks. To address the Black Hawk/FLRAA age issue, the Army could adopt an alternative approach: At an annual procurement rate of 60 (rather than 30) FLRAAs per year starting in 2038, CBO estimates, the combined fleet's average age would be 17.6 years in 2050 instead of the 22.4 years it would be if the Army procured

Figure 6.

Projected Army Costs for Procuring Future Long-Range Assault Aircraft at Different Procurement Rates, 2019–2050

Billions of 2018 Dollars



Doubling the procurement rate for the FLRAA from 30 to 60 per year would considerably increase the projected costs of procuring Army aircraft but also reduce the age of the fleet.

Source: Congressional Budget Office.

FLRAA = Future Long-Range Assault Aircraft.

30 FLRAAs per year. (Also, the oldest operating Black Hawk in 2050 would be 33 years old, not 37 years old.) However, doubling the annual procurement rate for the FLRAA would considerably increase the Army's aviation procurement costs, although the costs would remain below the average budget for procuring Army aircraft over the 2010–2018 period (see Figure 6). A less costly alternative would be to continue procuring H-60 Black Hawks beyond 2035, although H-60s would be less capable helicopters than FLRAAs. Another option would be to retire more than one Black Hawk for each FLRAA procured. Doing so would reduce the size of the Army's fleet and its operating costs.

Uncertainty About Chinook Modernization

CBO's projection reflects the assumption that the Army will modernize its entire fleet of CH-47 and MH-47G heavy-lift helicopters by upgrading the aircraft to the improved Block II configuration, as indicated in the December 2017 CH-47 SAR. The Block II upgrades are intended to improve the Chinook's performance (range, payload, and lifting capacity at higher altitudes and hotter ambient temperatures) and are expected to reduce operating costs. The upgrades will not, however, provide the dramatic increases in performance that the Army

anticipates from the FVL technology it plans to incorporate into its FLRAA and FARA fleets. In particular, a Block II Chinook's speed would be about 100 knots slower than what the Army hopes to achieve with the FLRAA. That difference could limit the Army's ability to take advantage of the FLRAA's speed in situations where heavy lift is also needed.¹⁵

In its budget request for the 2020 fiscal year, the Army reduced Chinook Block II purchases for 2020 through 2024 from 72 to 34 aircraft, and it limited those upgrades to the much smaller MH-47G fleet used by special operations forces. Subsequent statements by Army officials described the service's intent to defer or cancel Block II upgrades to the larger CH-47 fleet and redirect funding previously slated for those upgrades to higher-priority modernization efforts. The Army may revisit that decision, however, depending on the availability of future funding and on how FLRAA development

15. The extent to which large speed differences would be a problem depends on the details of how the Army expects to operate. The Marine Corps, for example, operates fleets of widely differing speeds—the higher-speed MV-22 tiltrotor along with the slower CH-53, UH-1, and AH-1 conventional helicopters.

progresses.¹⁶ (The relatively young age of the CH-47F fleet gives the Army time to wait and see how FVL technologies progress before committing to further upgrades to the much older CH-47 design.) Additionally, the Congress may decide to reverse the Block II cuts in authorization and appropriation legislation for 2020.

In CBO's projection, canceling Block II upgrades to the CH-47F fleet would reduce the Army's costs by about \$700 million per year from the mid-2020s until after

2040. That reduction would be particularly large on a percentage basis in the 2020s before the increase in costs that, CBO projects, would occur in the 2030s when the Army began to purchase significant numbers of higher-cost FLRAAs and FARAs. Conversely, if the Army canceled the Chinook, it might need to begin developing an entirely new heavy-lift aircraft in the 2030s, when the oldest CH-47Fs would be approaching 25 years of age. An entirely new heavy-lift aircraft would certainly cost much more than Chinook Block II upgrades—and, probably, substantially more than the medium-lift FLRAA—and would lead to significantly higher costs for the Army in the late 2030s and 2040s than in CBO's projections.

16. See Sydney J. Freedberg Jr. and Paul McLeary, "Will Army Uncancel CH-47F Chinook Upgrade? Sec. Esper and Gen. McConville," *Breaking Defense* (April 16, 2019), <https://tinyurl.com/yyzmzmp7>.



Appendix: Composition of the Army's Current Fleet and CBO's Estimate of Replacement Costs

The three tables in this appendix describe the Army's current fleet and the analytical assessments the Congressional Budget Office used to project the costs of procuring aircraft.

Table A-1 shows the number of aircraft by category and by type of aircraft within each category, as well as information about the age of the fleet, as of April 15, 2018. In aggregate, the aircraft ranged in age from just-delivered to 45 years old. Some types of aircraft

ranged widely in age, including the Army's largest fleets (H-60 Black Hawks, AH-64 Apaches, and H-47 Chinooks). Detailed descriptions of selected aircraft appear in Table A-2.

A fleet's estimated total replacement cost is its fleet size from Table A-1 multiplied by its estimated replacement unit cost from Table A-3. CBO used that unit cost and the retirement schedule, also shown in Table A-3, to project the costs of procuring aircraft over time.

Table A-1.

Number and Age of Army Aircraft as of April 15, 2018

Aircraft	Number	Age (Years)		
		Minimum	Average	Maximum
Large Rotary-Wing	3,446	0	14.9	39
AH-64 Apache	744	0	7.8	29
H-47 Chinook ^a	423	0	9.7	32
H-60 Black Hawk ^b	2,279	0	18.1	39
Fixed-Wing	206	0	21.2	40
C-12	92	0	25.1	40
C-20	1	26	26.0	26
C-23	3	20	22.0	26
C-26	13	0	14.2	26
C-27	7	n.a.	n.a.	n.a.
C-37	3	13	15.3	18
CE-182	2	27	27.0	27
EO-5C	8	11	17.4	21
RC-12	30	18	23.9	37
T-6	12	3	3.0	3
T-34	1	1	1.0	1
UC-35	28	16	18.8	21
UV-18	6	2	20.3	40
Other Rotary-Wing	649	0	8.1	46
MH-6M	53	n.a.	n.a.	n.a.
OH-58	28	45	45.5	46
TH-67	155	n.a.	n.a.	n.a.
UH-1H	2	n.a.	n.a.	n.a.
UH-72	411	0	5.6	11
Entire Fleet	4,301	0	14.4	46

Source: Congressional Budget Office, using data from the U.S. Army.

The table does not include data for fixed-wing MQ-1C Gray Eagles, which were not available. Age is calculated as 2018 minus the fiscal year in which the aircraft was accepted into the fleet.

n.a. = not available.

a. The H-47 Chinooks include both CH-47 and MH-47 helicopters.

b. The H-60 Black Hawks include EH-60, HH-60, MH-60, and UH-60 helicopters.

Table A-2.

Descriptions of Selected Army Aircraft

Aircraft	Manufacturer	Function	Engine(s)	Operating Range (Miles)	Crew	Maximum Gross Weight (Pounds)	Maximum Speed (Miles per hour)
Large Rotary-Wing							
AH-64 Apache (E model)	Boeing	Attack	2 turboshaft engines	300	1 pilot, 1 gunner	20,260	189
CH-47 Chinook	Boeing	Heavy cargo transport	2 turboshaft engines	750	1 pilot, 1 copilot, 1 flight engineer	50,000	184
UH-60 Black Hawk (M model)	Sikorsky	Utility transport	2 turboshaft engines	360	2 pilots, 2 crew chiefs	22,000	175
Fixed-Wing							
C-12 Huron ^a	Beechcraft	Passenger transport	2 turboprop engines	1,990 ^b	1 pilot, 1 copilot	12,500	363
C-20	Gulfstream	Passenger transport	2 turbofan engines	4,140	1 pilot, 1 copilot, 1 cabin attendant	72,000	528
C-37	Gulfstream	Long-range transport	2 turbofan engines	6,770	2–3 pilots, 1 cabin attendant	85,000	574
MQ-1C Gray Eagle	General Atomics	Long-endurance, remotely piloted attack	1 heavy fuel engine	2,880	None	3,600	173
UC-35	Cessna	Medium-range transport	2 turbofan engines	2,000	1 pilot, 1 copilot	16,630	300
Other Rotary-Wing							
OH-58 Kiowa	Bell	Training	1 turboshaft engine	290	1 pilot, 1 observer	4,500	149
UH-72 Lakota	Airbus	Light utility transport	2 turboshaft engines	430	2 pilots	7,900	167

Sources: U.S. Army, *Weapon Systems Handbook, 2016*, www.army.mil/e2/c/downloads/431298.pdf (50 MB); Paul Jackson, ed., *Jane's All the World's Aircraft: 2006–2007* (Jane's Information, 2006).

a. The RC-12 resembles the C-12 but is used for reconnaissance.

b. Operating range with four passengers.

Table A-3.

CBO's Estimates of Replacement Unit Costs and Retirement Ages for Each Aircraft Type

Aircraft	Replacement Unit Cost (Millions of 2018 dollars)	Will Retire . . .
Large Rotary-Wing		
AH-64	40	As replacements arrive. ^a New FARA procurement starts in 2028; steady-state procurement of 30 FARAs per year starts in 2032.
H-47	29	As replacements arrive. ^b Beyond 2043, CBO used the annual procurement quantities from 25 years earlier.
H-60	53	As replacements arrive. ^c New FLRAA procurement starts in 2030; steady-state procurement of 30 FLRAAs per year starts in 2035.
Fixed-Wing		
C-12	6	At age 45, starting in 2023
C-20	n.a.	[Army divesting C-20s; no replacement]
C-23	n.a.	[Army divesting C-23s; no replacement]
C-26	12	At age 45, starting in 2037
C-27	n.a.	[Army divesting C-27s; no replacement]
C-37	65	At age 45, starting in 2045
CE-182	0.5	At age 45, starting in 2036
EO-5C	10	At age 35, starting in 2032
MQ-1C	140 ^d	At age 20, starting in 2030
RC-12	14	At age 45, starting in 2023
T-6	6	At age 35, starting in 2050
T-34	3	At age 35, starting in 2052
UC-35	16	At age 35, starting in 2032
UV-18	10	At age 45, starting in 2023
Other Rotary-Wing		
OH-58	n.a.	[Army divesting OH-58s; no replacement]
TH-67	11	In 2021, to be replaced by UH-72s
UH-1H	n.a.	[Army divesting UH-1Hs; no replacement]
UH-72	8	At age 45, starting in 2052

Source: Congressional Budget Office.

CBO's estimate reflects the assumption that funding for an aircraft must be appropriated two years before the aircraft arrives. The table does not include the MH-6C helicopter because age data were not available.

FARA = Future Attack Reconnaissance Aircraft; FLRAA = Future Long-Range Assault Aircraft; SAR = Selected Acquisition Report; n.a. = not applicable.

a. Per the AH-64E Apache Remanufacture SAR.

b. Per the CH-47F Modernized Cargo Helicopter (CH-47F Block II) SAR.

c. Per the UH-60M Black Hawk Helicopter SAR and the Army's plans for UH-60V upgrades.

d. Cost per platoon.



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About This Document

This report was prepared at the request of the Chairman and Ranking Member of the Senate Budget Committee. In keeping with CBO's mandate to provide objective, impartial analysis, the report makes no recommendations.

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CBO continually seeks feedback to make its work as useful as possible. Please send any comments to communications@cbo.gov.

A handwritten signature in black ink, appearing to read "Keith Hall".

Keith Hall
Director
May 2019