United States Government Accountability Office

Report to Congressional Committees

November 2022

WEAPON SYSTEM SUSTAINMENT

Aircraft Mission Capable Goals Were Generally Not Met and Sustainment Costs Varied by Aircraft

Accessible Version

GAO-23-106217

GAO Highlights

Highlights of GAO-22-106217, a report to congressional requesters

Why This Matters

The Department of Defense (DOD) spends tens of billions of dollars annually to sustain its weapon systems in an effort to ensure that these systems are available to simultaneously support today's military operations and maintain the capability to meet future defense requirements. This report provides observations on mission capable rates and costs to operate and sustain 49 fixed- and rotary-wing aircraft in the Army, Navy, Marine Corps, and Air Force

How GAO Did This Study

GAO initiated this work in response to continuing interest in the operational availability and O&S costs for major weapon systems. We also initiated this work as part of our response to a provision in section 802 of the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 for GAO to report on sustainment reviews conducted by the military services, with a specific focus on O&S cost growth. In addition to this report, GAO plans to issue additional reports in response to the provision. GAO reviewed documentation and interviewed program office officials to identify reasons for the trends in mission capability rates and O&S costs as well as any challenges in sustaining the aircraft.

View GAO-22-106217. For more information, contact Director Diana Maurer at (202) 512-9627 or maurerd@gao.gov.

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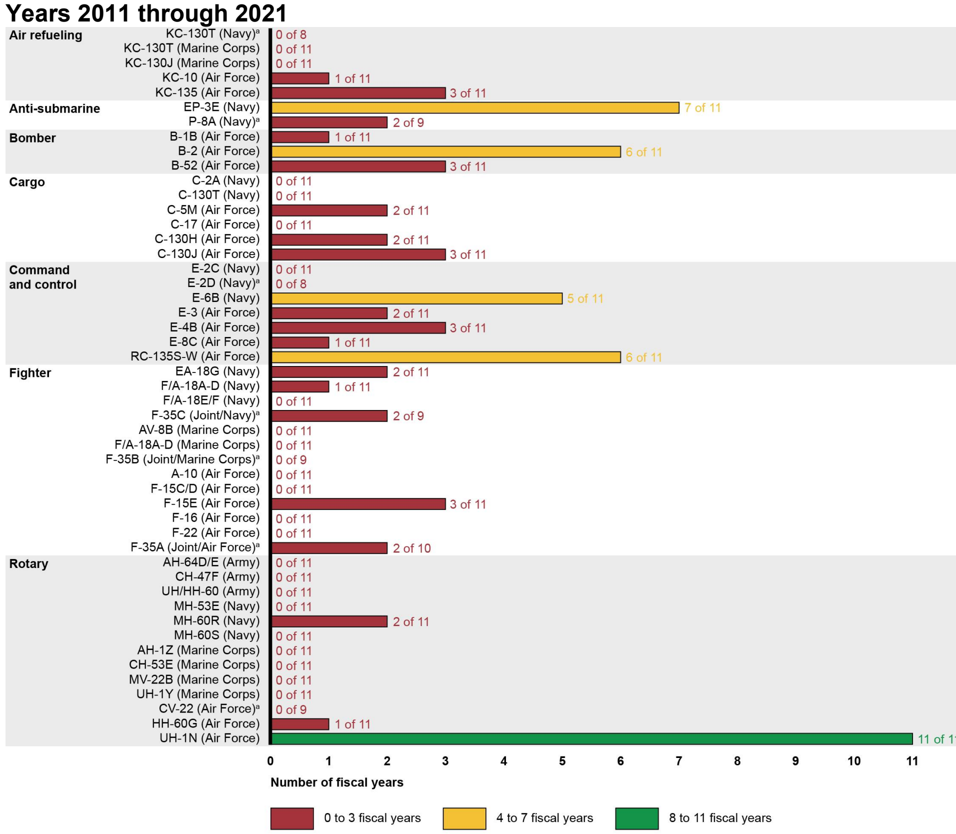
Aircraft Mission Capable Goals Were Generally Not Met and Sustainment Costs Varied by Aircraft

Mission Capable Rates for Selected Department of Defense Aircraft

GAO examined 49 aircraft and found that only four met their annual mission capable goal in a majority of the years from fiscal years 2011 through 2021. As shown below, 26 aircraft did not meet their annual mission capable goal in any fiscal year. The mission capable rate—the percentage of total time when the aircraft can fly and perform at least one mission—is used to assess the health and readiness of an aircraft fleet.

Number of Years Selected Aircraft Met Their Annual Mission Capable Goal, Fiscal Years 2011 through 2021



Source: GAO analysis of Army, Navy, and Air Force data. | GAO-23-106217

Data table for Number of Years Selected Aircraft Met Their Annual Mission Capable Goal, Fiscal Years 2011 through 2021

Aircraft	Number of fiscal years aircraft met mission capable goal	Number of fiscal years mission capable rate and goal compared
KC-130T (Navy)a	0	8
KC-130T (Marine Corps)	0	11
KC-130J (Marine Corps)	0	11
KC-10 (Air Force)	1	11

Aircraft	Number of fiscal years aircraft met mission capable goal	Number of fiscal years mission capable rate and goal compared
KC-130T (Navy)[a]	0	8
KC-135 (Air Force)	3	11
EP-3E (Navy)	7	11
P-8A (Navy)[a]	2	9
B-1B (Air Force)	1	11
B-2 (Air Force)	6	11
B-52 (Air Force)	3	11
C-2A (Navy)	0	11
C-130T (Navy)	0	11
C-5M (Air Force)	2	11
C-17 (Air Force)	0	11
C-130H (Air Force)	2	11
C-130J (Air Force)	3	11
E-2C (Navy)	0	11
E-2D (Navy)[a]	0	8
E-6B (Navy)	5	11
E-3 (Air Force)	2	11
E-4B (Air Force)	3	11
E-8C (Air Force)	1	11
RC-135S-W (Air Force)	6	11
EA-18G (Navy)	2	11
F/A-18A-D (Navy)	1	11
F/A-18E/F (Navy)	0	11
F-35C (Joint/Navy)[a]	2	9
AV-8B (Marine Corps)	0	11
F/A-18A-D (Marine Corps)	0	11
F-35B (Joint/Marine Corps)[a]	0	9
A-10 (Air Force)	0	11
F-15C/D (Air Force)	0	11
F-15E (Air Force)	3	11
F-16 (Air Force)	0	11
F-22 (Air Force)	0	11
F-35A (Joint/Air Force)[a]	2	10
AH-64D/E (Army)	0	11
CH-47F (Army)	0	11
UH/HH-60 (Army)	0	11
MH-53E (Navy)	0	11
MH-60R (Navy)	2	11
MH-60S (Navy)	0	11
AH-1Z (Marine Corps)	0	11
CH-53E (Marine Corps)	0	11
MV-22B (Marine Corps)	0	11
UH-1Y (Marine Corps)	0	11
CV-22 (Air Force)[a]	0	9
HH-60G (Air Force)	1	11
UH-1N (Air Force)	11	11

Source: GAO analysis of Army, Navy and Air Force data. | GAO-23-106217

/a/ For this aircraft, the military department did not provide a mission capable goal for all eleven years.

Comparing fiscal year 2011 to fiscal year 2021, the average mission capable rate for the selected aircraft has fallen for the Air Force, Navy, and Marine Corps, to varying degrees. The average mission capable rate for the selected Army aircraft has risen.

For fiscal year 2021, GAO found that only two of the 49 aircraft examined met the service-established mission capable goal. More specifically, for fiscal year 2021, 30 aircraft were more than 10 percentage points below the mission capable goal in fiscal year 2021; and 17 aircraft were 10 percentage points or less below the mission capable goal in fiscal year 2021.

Many of the selected aircraft are facing one or more sustainment challenges, as shown below. According to program officials, these challenges have an effect on mission capable rates.

Sustainment Challenges Affecting Some of the Selected Department of Defense Aircraft

	Aging aircraft			Maintenance				Supply support		
	Delays in acquiring replacement aircraft	Service life extension	Unexpected replacement of parts and repairs	Access to technical data	Delays in depot maintenance	Shortage of trained maintenance personnel	Unscheduled maintenance	Diminishing manufacturing source	Parts obsolescence	Parts shortage and delay
C-5M (Air Force)			●		●	●	●	●	●	●
F/A-18E/F (Navy)		●	●	●		●	●	●	●	●
F-35A/B/C (Joint)		●	●	●	●	●	●	●		●
AH-64D/E (Army)	●		●	●	●	●	●	●	●	●
MV-22B (Marine Corps)				●			●	●	●	●

Source: GAO analysis of Army, Navy, and Air Force information. | GAO-23-106217

Data table for Sustainment Challenges Affecting Some of the Selected Department of Defense Aircraft

	Aging aircraft			Maintenance				Supply Support		
	Delays in acquiring replacement aircraft	**Service life extension**	**Unexpected replacement of parts and repairs**	**Access to technical data**	**Delays in depot maintenance**	**Shortage of trained maintenance personnel**	**Unscheduled maintenance**	**Diminishing manufacturing source**	**Parts Obsolesnence**	**Parts shortage and delay**
C-5M (Air Force	No	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
F/A-18E/F (Navy	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
F-35A/B/C (Joint)	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
AH-64D/E (Army)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MV-22B (Marine Corp	No	No	No	No	Yes	No	No	Yes	Yes	Yes

Source: GAO analysis of Army, Navy, and Air Force information. | GAO-23-106217

Operating and Support Costs for Selected Department of Defense Aircraft

Operating and support (O&S) costs totaled about $54 billion in fiscal year 2020 for the reviewed aircraft—a decrease of about $2.9 billion since fiscal year 2011 after factoring in inflation using constant fiscal year 2020 dollars. Maintenance costs became a larger portion of O&S costs—increasing by $1.2 billion since fiscal year 2011. Air Force and Army O&S costs have decreased, while Navy and Marine Corps O&S costs have increased. Based on our analysis and information provided by the program offices, these trends have largely been driven by changes in the size of aircraft inventory and reduced flying hours. Additionally, O&S costs have varied widely across aircraft fleets. For example, the total fiscal year 2020 O&S costs for the systems we reviewed ranged from about $97 million for the KC-130T fleet (Navy and Marine Corps) to a high of about $4.3 billion for the F-16 fleet (Air Force). Based on our analysis and information provided by the system program offices, cost variances were based on aircraft type and factors such as age of the fleet, the number of aircraft included in the inventory, and the number of flying hours flown by a fleet.

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Abbreviations

AFTOC	Air Force Total Ownership Cost
AMCOM	Aviation and Missile Command
AMSRR	Aviation Maintenance Supply Readiness Reporting
ASD (Sustainment)	Assistant Secretary of Defense for Sustainment
CAPE	Cost Assessment and Program Evaluation
CITE	Center for Industrial and Technical Excellence
CLS	Contractor Logistics Support
DECKPLATE	Decision Knowledge Programming for Logistics Analysis and Technical Evaluation
DOD	Department of Defense
MCAR	Mission Capable Aircraft Required
NMCM	Not Mission Capable Maintenance
NMCS	Not Mission Capable Supply
O&S	Operating and Support
OSMIS	Operating and Support Management Information System
USD (A&S)	Under Secretary of Defense for Acquisition and Sustainment
VAMOSC	Visibility and Management of Operating and Support Costs

U.S. GOVERNMENT ACCOUNTABILITY OFFICE
441 G St. N.W.
Washington, DC 20548

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Congressional Committees

The Department of Defense (DOD) spends tens of billions of dollars annually to sustain its weapon systems. These dollars are meant to ensure that the weapon systems are available to simultaneously support today's military operations and maintain the capability to meet future defense requirements.

Operating and support (O&S) costs historically account for approximately 70 percent of an aircraft's total life-cycle cost—costs to operate and sustain the weapon system from initial operations through the end of its life—and include costs for repair parts, depot and field maintenance, contract services, engineering support, and personnel, among other things.[1] Weapon systems are costly to sustain in part because they often incorporate a complex array of technical subsystems and components and need expensive repair parts and logistics support to meet required readiness levels.

We have previously reported that DOD has not met its goals for the material availability for all of its aircraft.[2] One of the key metrics used by DOD and the services to assess the health of an aircraft fleet is its mission capable rate. For example, the F-22 Raptor (Air Force) has two primary air-to-air focused missions and one secondary air-to-ground mission and would be considered mission capable if it could fulfill only

[1]There are two levels of DOD maintenance: field-level and depot-level. Field-level maintenance includes organizational and intermediate maintenance and requires fewer skills, but occurs more frequently. Depot-level maintenance occurs less frequently but requires greater skills. Specifically, depot maintenance is an action performed on materiel or software in the conduct or inspection, repair, overhaul, or modification or rebuild of end items, assemblies, subassemblies, and parts that, among other things, requires extensive industrial facilities, specialized tools and equipment, or uniquely experienced and trained personnel that are not available in other maintenance activities.

[2]For example, see GAO, *Weapon System Sustainment: Aircraft Mission Capable Rates Generally Did Not Meet Goals and Cost of Sustaining Selected Weapon Systems Varied Widely*, GAO-20-67SPSU (Washington, D.C.: Aug. 27, 2020) and GAO, *Weapon System Sustainment: Aircraft Mission Capable Rates Generally Did Not Meet Goals and Cost of Sustaining Selected Weapon Systems Varied Widely,* GAO-21-101SP (Washington, D.C.: Nov. 19, 2020).

one of these missions.[3] Each military department determines a mission capable goal for its aircraft and tracks and reports aircraft mission capable rates.[4] For example, for fiscal year 2021, the F-22 had a mission capable goal of 75 percent.[5]

We initiated this work due to continuing interest in the operational availability and O&S costs for major weapon systems. Additionally, we initiated this work as part of our response to a provision in section 802 of the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 for us to report on information associated with sustainment reviews conducted by the military services with a specific focus on O&S cost growth.[6] This report examines (1) the extent to which the military services met established mission capable goals for 49 selected aircraft, including trends since fiscal year 2011 in mission capable rates and any sustainment challenges for those aircraft; and (2) the costs to operate and support these aircraft since fiscal year 2011.[7]

In addition, we provide "Sustainment Quick Looks", some of which cover multiple aircraft that are similar but have separate goals and are reported separately by DOD and the services. These "Sustainment Quick Looks" include detailed information on mission capable and aircraft availability (Air Force only) rates, O&S costs, and sustainment challenges and mitigation actions to address these challenges.

[3]The two primary air-to-air missions of the F-22 are Offense Counter-Air—Escort/Sweep and Defensive Counter-Air. The secondary air-to-ground mission of the F-22 is Air Interdiction/Offensive Counter-Air—Attack Operations. For further details on the F-22, see GAO, *Force Structure: F-22 Organization and Utilization Changes Could Improve Aircraft Availability and Pilot Training*, GAO-18-190 (Washington, D.C.: July 19, 2018).

[4]The military departments develop mission capable goals for each aircraft based on service priorities and warfighting plans and use those goals as a benchmark against which to compare mission capable rates achieved. The military services also measure whether systems are fully mission capable (that is, can perform all of their assigned missions). We do not discuss fully mission capable rates in this report.

[5]Mission capable designations are used in the context of specific identified missions; i.e., mission capable is a materiel condition indicating the percentage of time that weapon system is capable of performing an identified mission.

[6]Pub. L. No. 116-283 (2021). We are currently conducting work on the section 802 provision in a separate engagement.

[7]Our review focused on the Air Force, Army, Navy, and Marine Corps and does not include the U.S. Space Force. This report includes two aircraft, the RC-135 S-W (Air Force) and the MH-53E (Navy), not included in our last Sustainment Quick Look reports.

This is a public version of a sensitive report that we issued in September 2022.[8] DOD deemed some of the information in our September report to be sensitive (i.e., Controlled Unclassified Information), which must be protected from public disclosure. Therefore, this report omits sensitive information about mission capable and aircraft availability rates. Although the information provided in this report is more limited, the report addresses the same objectives as the sensitive report and uses the same methodology.

To address our researchable questions, we selected 49 fixed- and rotary-wing aircraft that support combat-related missions in the Departments of the Army, Navy, and Air Force.[9] In selecting these aircraft, we considered a number of factors, such as the mission of the aircraft (e.g., fighters, bombers, or cargo) and the size and age of the inventory for each aircraft. For example, we did not select aircraft that are used solely for training or are used to meet the operational airlift support mission.

For objective one, we collected and analyzed data for the Army, Navy, Marine Corps, and Air Force on key sustainment metrics for each of the 49 aircraft, including mission capable rates and goals for fiscal years 2011 through 2021. Where an aircraft is operated by more than one component within a service—active, National Guard, or reserve—we analyzed mission capable rates and goals for each component to determine any differences between the components.[10] We also obtained information, including questionnaire responses and discussions, from program office officials regarding the reasons for changes in mission capable rates as well as any challenges in sustaining these aircraft and any actions taken to mitigate those challenges.

[8]GAO, *Weapon System Sustainment: Aircraft Mission Capable Goals Were Generally Not Met and Sustainment Costs Varied by Aircraft,* GAO-22-105050SU (Washington, D.C.: September 19, 2022).

[9]The total number of aircraft included in our review is 49. This number includes aircraft, such as the KC-130T and F/A-18 A-D, which are operated by multiple services and are, therefore, included as individual aircraft. In some cases, such as our discussions of operating and support costs, aircraft flown by the Marine Corps and Navy are combined because these data cannot be separated by the service. We did not select unmanned aircraft or aircraft that are used only for training or transportation of personnel.

[10]As discussed in more detail later in this report, of the 49 aircraft reviewed, more than one component operates 27 of the aircraft while only one component operates 22 of the aircraft.

For objective two, we collected and analyzed O&S data from the Departments of the Army, Navy, and Air Force cost reporting systems.[11] Specifically, we collected O&S cost data for fiscal years 2011 through 2020, the last fiscal year for which complete data were available at the time of our work. We also obtained information through questionnaire responses from program office officials about the reasons for changes and trends in O&S costs.

We conducted data-reliability assessments for the data provided by the military departments. To do this, we reviewed related documentation; held interviews with knowledgeable agency officials; and performed electronic data testing for missing data, outliers, and obvious errors. As a result, we determined these data to be sufficiently reliable for reporting the numbers of aircraft, rates, averages, costs, and trends since fiscal year 2011 that we provide in this report.

Appendix I provides further information on our scope and methodology.

We conducted this performance audit from March 2021 to September 2022, in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. We subsequently worked with DOD from September 2022 to November 2022 to prepare this unclassified version of the original sensitive report for public release. This public version was also prepared in accordance with these standards.

Background

Roles and Responsibilities for the Sustainment of Aircraft

There are several DOD offices that have roles and responsibilities related to sustaining fixed- and rotary-wing aircraft. For example, the Under Secretary of Defense for Acquisition and Sustainment (USD [A&S]) is the principal advisor to the Secretary of Defense for all matters concerning

[11]We obtained cost information from the Army Operating and Support Management Information System (OSMIS), the Navy Visibility and Management of Operating and Support Costs system (VAMOSC), and the Air Force Total Ownership Cost system (AFTOC).

acquisition and sustainment. Specifically, USD (A&S) is responsible for, among other things, establishing policies on and supervising all elements of DOD related to sustainment—including logistics, maintenance, and material readiness—to include on fixed- and rotary-wing aircraft. The Assistant Secretary of Defense for Sustainment (ASD [Sustainment]) serves as the principal advisor to the USD (A&S) on logistics and materiel readiness within DOD. Specifically, the ASD (Sustainment) (1) establishes DOD policies and procedures for logistics, maintenance, materiel readiness, strategic mobility, and sustainment support; (2) provides related guidance to the Secretaries of the military departments; and (3) monitors and reviews programs associated with these areas, among other duties and responsibilities.

For the Air Force, the Air Force Materiel Command develops, acquires, and sustains weapon systems through research, development, testing, evaluation, acquisition, maintenance, and program management of the systems and their components. This command provides acquisition and life-cycle management services and logistics support, among other things.

Within this command, the Air Force Life Cycle Management Center is responsible for the life-cycle management of weapon systems from inception to retirement. A Program Executive Officer—responsible for managing a specific portfolio of weapon systems—is responsible for each of the selected fixed- and rotary-wing aircraft. The Program Executive Officer oversees the program office that manages each weapon system. The Air Force Sustainment Center, a subordinate organization of the Air Force Materiel Command, provides depot maintenance through its Air Logistics Complexes for weapon systems.[12]

For the Navy and Marine Corps, the Naval Air Systems Command is responsible for providing the full life-cycle support of naval aviation aircraft, weapons, and systems. This support includes research, design, development, and systems engineering; acquisition; test and evaluation; training facilities and equipment; repair and modification; and in-service engineering and logistics support. As with the Air Force, Program

[12]The Department of the Air Force operates three Air Logistics Complexes that perform depot-level maintenance. These complexes are located in Ogden, Utah; Oklahoma City, Oklahoma; and Warner Robins, Georgia. Each has been designated as a Center for Industrial and Technical Excellence (CITE) to focus on the maintenance and repair of specific aircraft, systems, and equipment.

Executive Officers oversee their assigned program managers. Naval Air Systems Command is also responsible for the Navy Fleet Readiness Centers, which provide depot-level maintenance for Navy and Marine Corps fixed- and rotary-wing aircraft.[13]

The Army Materiel Command is the Army's primary logistics and sustainment command, responsible for managing the global supply chain and ensuring installation and materiel readiness. The Army's Aviation and Missile Command (AMCOM)—a subordinate command of Army Materiel Command—is a life-cycle management command that works to integrate sustainment, logistics, and contracting in order to support the product life-cycle management efforts. Within AMCOM, the AMCOM Logistics Center provides readiness support for aviation and missile weapon systems, including sustainment logistics, supply chain management, and field and sustainment maintenance. Individual program managers work closely with AMCOM to manage their aircraft sustainment programs. The Army Materiel Command also provides depot-level maintenance through its depots.[14]

DOD relies on program managers to lead the development, delivery, and sustainment of individual weapon systems through their life cycles. The program managers are the designated individuals with responsibility for accomplishing the program's sustainment objectives to meet the users' operational needs. Product support managers, who work within the weapon system program offices, are responsible for developing and implementing support strategies for weapon systems that maintain readiness and control life-cycle costs. Weapon systems are sustained

[13]The Department of the Navy operates three major Fleet Readiness Centers (in Cherry Point, North Carolina (East); Jacksonville, Florida (Southeast); and North Island, California (Southwest)) that perform depot-level maintenance. As with the Air Force, each has been designated as a CITE, and all three are CITEs for sea-based and maritime aircraft and the related aeronautical systems.

[14]The Department of the Army operates two depots that support aircraft: Corpus Christi Army Depot, Texas and Tobyhanna Army Depot, Pennsylvania. Corpus Christi Army Depot is the Army's CITE for the maintenance and repair of structural helicopter airframes and blades; advanced composite technologies; flight controls and control surfaces; and aviation engines, transmissions, and hydraulic systems. Tobyhanna Army Depot is the Army's CITE for the maintenance and repair of systems associated with command, control, communications, and computers; intelligence, surveillance, and reconnaissance; electronics; avionics; and missile control.

under various arrangements that may include contractors, DOD organic facilities, or some combination of the two.

Additionally, the Air Force Sustainment Center, the Navy Supply Systems Command, and Army Materiel Command, as well as the Defense Logistics Agency, manage inventories of spare parts. Further, individual weapon system programs are typically supported by a complex supplier network that includes a prime contractor, subcontractors, and various tiers of parts suppliers. Sustainment functions and responsibilities—either in their entirety, or particular elements—may also be contracted out as part of a public-private partnership or a performance-based logistics contract, or even both as is the case with the F-22 Raptor.[15]

Key Sustainment Metrics for Aircraft

The services monitor the readiness status of aircraft through multiple performance metrics. This report provides information on, among other things, the following three metrics that the Air Force, Navy, and Army have in common:

- Mission capable rate. The percentage of total time when an aircraft possessed by a squadron can fly and perform at least one mission.
- Not mission capable maintenance (NMCM) rate. The percentage of total time when an aircraft possessed by a squadron is not capable of performing any of its assigned missions because of maintenance.
- Not mission capable supply (NMCS) rate. The percentage of total time when an aircraft possessed by a squadron is not capable of performing any of its assigned missions because of the lack of a repair part.

[15]According to DOD Instruction 4151.21, *Public-Private Partnerships for Product Support* (Nov. 21, 2016) (incorporating change 4, effective July 31, 2019), a public-private partnership, including those for depot-level maintenance, is a cooperative arrangement between an organic product support provider and one or more private-sector entities to perform defense-related work and/or to utilize DOD facilities and equipment. According to DOD's *Performance-Based Logistics Guidebook*, performance-based logistics is synonymous with performance-based life cycle product support, where outcomes are acquired through performance-based arrangements that deliver warfighter requirements and incentivize product support providers to reduce costs through innovation. These arrangements are contracts with industry or intragovernmental agreements. DOD, *PBL Guidebook: A Guide to Developing Performance-Based Arrangements* (2016).

In addition to these metrics, the Air Force measures aircraft availability, the number of aircraft that are available for flight operations, and not mission capable for both supply and maintenance aircraft that are not in depot and not capable of performing any of their assigned missions because of both maintenance and the lack of a repair part. Lastly, the Navy tracks not mission capable depot—aircraft possessed by the squadron that are not capable of performing any assigned missions because of standard or special rework that is required, such as depot maintenance, special inspections, or modifications.[16] In addition, for the F-35—which is operated by the Air Force, Navy, and Marine Corps—aircraft availability is measured by service.

Operating and Support Costs for Major Weapon Systems

O&S costs historically account for approximately 70 percent of a weapon system's total life-cycle cost and include costs for repair parts, depot and field maintenance, contract services, engineering support, and personnel, among other things. DOD's Operating and Support Cost-Estimating Guide provides direction to the service components on developing estimates to support various analyses and reviews throughout the program life cycle.[17] According to the guide, each military department is responsible for conducting periodic reviews of operating and support costs of major weapon systems after such systems achieve initial operational capability. These periodic reviews identify and address factors resulting in growth of operating and support costs and adapt support strategies to reduce such costs.

DOD requires that each military department maintain a database that collects historical data on the O&S costs for fielded major weapon systems.[18] DOD's Office of Cost Assessment and Program Evaluation (CAPE) provides policy guidance on this requirement, known as the

[16]Aircraft possessed by a depot are excluded from the calculation of mission capable rates. Only aircraft that are possessed by a squadron are used to calculate mission capable rates.

[17]DOD, Office of the Secretary of Defense— Cost Assessment and Program Evaluation, *Operating and Support Cost-Estimating Guide* (September 2020).

[18]DOD Instruction 5000.73, *Cost Analysis Guidance and Procedures* (Mar. 13, 2020). The Air Force uses the Air Force Total Ownership Cost system, the Army uses the Operating and Support Cost Management Information System, and the Navy uses the Navy Visibility and Management of Operating and Support Costs system to collect and report on historical weapon system O&S costs.

Visibility and Management of Operating and Support Costs program; specifies the common format in which the data are to be reported; and monitors its implementation by each of the military departments.

In accordance with DOD's Operating and Support Cost-Estimating Guide, O&S costs are categorized using the following five overarching cost elements:[19]

1. unit level personnel—cost of operators, maintainers, and other support personnel assigned to operating units;[20]
2. unit operations—cost of unit operating materiel such as fuel, and training material, unit support services, and unit travel;
3. maintenance—cost of system maintenance including depot- and intermediate-level maintenance;
4. sustaining support—cost of system support activities that are provided by organizations other than the system's operating units; and
5. continuing system improvements—cost of system hardware and software modifications.

Prior GAO Work

In November 2020, we reported that the average annual mission capable rate for selected Air Force, Navy, and Marine Corps aircraft decreased from fiscal year 2011 through fiscal year 2019, while the average annual mission capable rate for selected Army aircraft slightly increased. More specifically, we found that for fiscal year 2019 only three of the 46 types of aircraft examined met the service-established mission capable goal. Furthermore, for fiscal year 2019, we found that six aircraft were 5 percentage points or fewer below the goal; 18 were from 15 to 6 percentage points below the goal; and 19 were more than 15 percentage points below the goal, including 11 that were 25 or more percentage

[19]These five cost elements are further classified into additional subcategories. For example, the Navy's maintenance cost element is further classified into subcategories including consumable materials and repair parts, depot-level reparables, depot maintenance, and other maintenance. The Air Force's maintenance cost element is further classified into subcategories that include consumable materials and repair parts, contractor logistics support, depot-level reparables, depot maintenance, interim contractor support, and other maintenance.

[20]DOD refers to this as unit level manpower.

points below the goal. Program officials provided various reasons for the overall decline in mission capable rates, including aging aircraft, maintenance challenges, and supply support issues.[21]

Over the years, we have we have reported extensively on aircraft sustainment challenges, such as aviation depot and field maintenance, as well as the availability of and sustainment approaches for particular aircraft, such as the F-35 and F-22. For example, we reported in April 2022 that the F-35 continues not to meet its targets for mission capable rates—a measure of the readiness of an aircraft fleet—or its reliability and maintainability metrics, in part because of issues with its engine.[22] See the Related GAO Products page at the end of this report for a list of aviation sustainment related reports.

Most Aircraft Did Not Meet Mission Capable Goals and Rates Decreased

DOD did not meet its mission capable goals for fiscal year 2021 for 47 of the 49 aircraft we reviewed. Further, mission capable rates for most aircraft decreased from fiscal years 2011 through 2021 and varied among the components. According to officials, a number of sustainment challenges including aging aircraft, maintenance challenges, and supply support issues account for this decrease in mission capable rates.

Nearly All Aircraft Did Not Meet Mission Capable Goals

In our review of selected aircraft, only two of the 49 met their service-established mission capable goal in fiscal year 2021, with most aircraft more than 10 percentage points below the goal. According to DOD Instruction 3110.05, it is DOD policy that the military services shall maintain all mission essential systems and equipment to the optimum mission capable status.[23] The two aircraft that met their service mission capable goal for fiscal year 2021 were both Air Force aircraft. The 47

[21]GAO-21-101SP.

[22]GAO, *F-35 Sustainment: DOD Faces Several Uncertainties and Has Not Met Key Objectives*, GAO-22-105995 (Washington, D.C.: Apr. 28, 2022).

[23]DOD Instruction 3110.05, *Readiness-based Materiel Condition Reporting for Mission-Essential Systems and Equipment* (Sept. 25, 2006) (incorporating change 1, effective Aug. 31, 2018).

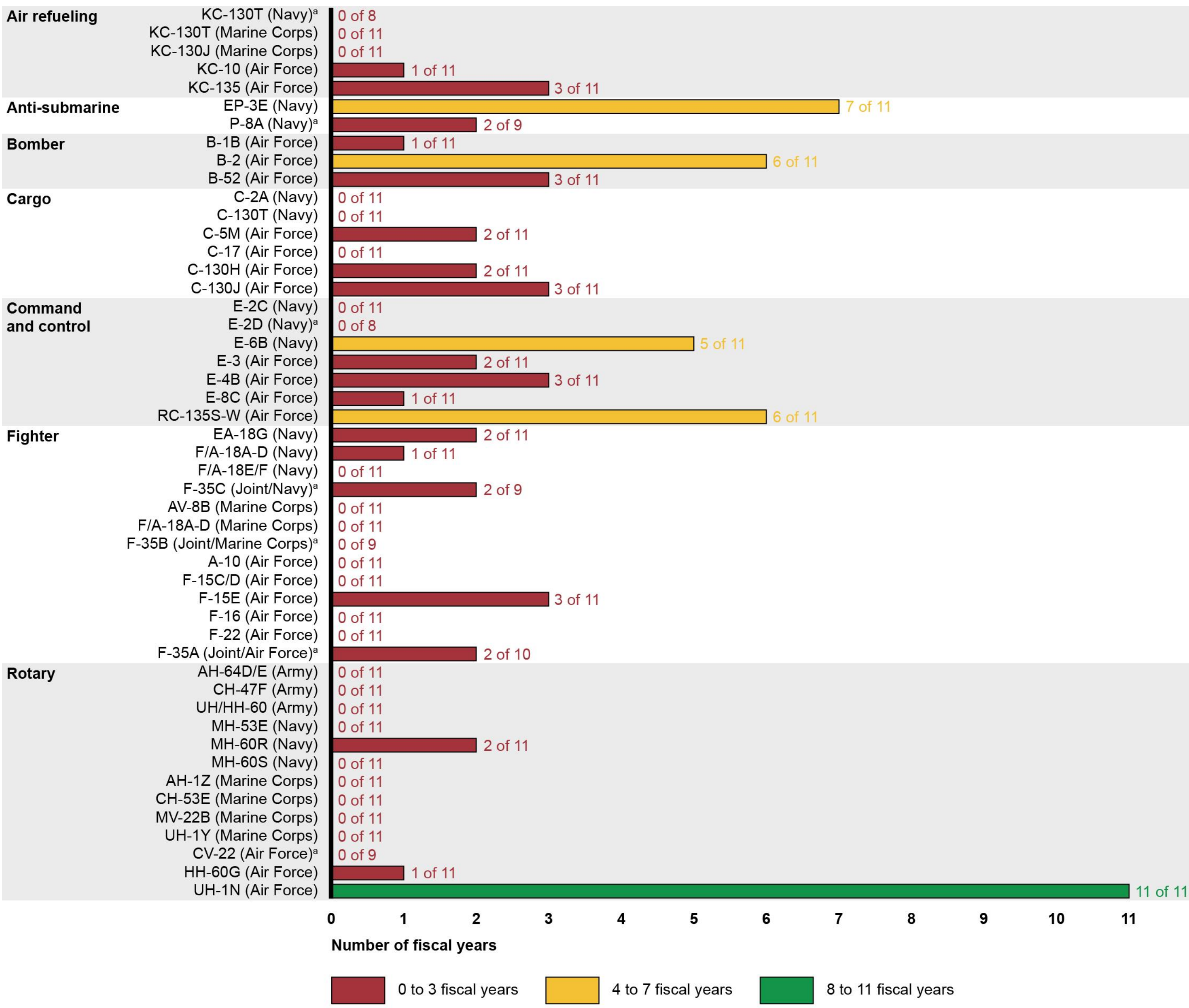
aircraft that did not meet their mission capable goal for that fiscal year included 20 Air Force aircraft, 15 Navy, nine Marine Corps, and three Army aircraft. Additionally, for fiscal year 2021

- 30 aircraft were more than 10 percentage points below the mission capable goal in fiscal year 2021; and
- 17 aircraft were 10 percentage points or less below the mission capable goal in fiscal year 2021. [24]

Furthermore, as shown in figure 1, from fiscal years 2011 through 2021 only the following four aircraft met their annual mission capable goal in a majority of those years: the Air Force's B-2, RC-135S-W, UH-1N, and the Navy's EP-3.

[24] Based on our analysis and prior Sustainment Quick Look reports, it is not unusual for mission capable rates achieved to fluctuate from year to year based on various factors impacting the aircraft. Therefore, in this report we chose to focus on those aircraft that achieved mission capable rates at least 10 percent lower than the goal.

Figure 1: Number of Years Selected Aircraft Met Their Annual Mission Capable Goal, Fiscal Years 2011 through 2021



Source: GAO analysis of Army, Navy, and Air Force data. | GAO-23-106217

Data table for Figure 1: Number of Years Selected Aircraft Met Their Annual Mission Capable Goal, Fiscal Years 2011 through 2021

Aircraft	Number of fiscal years aircraft met mission capable goal	Number of fiscal years mission capable rate and goal compared
KC-130T (Navy)[a]	0	8
KC-130T (Marine Corps)	0	11
KC-130J (Marine Corps)	0	11
KC-10 (Air Force)	1	11
KC-135 (Air Force)	3	11
EP-3E (Navy)	7	11
P-8A (Navy)[a]	2	9
B-1B (Air Force)	1	11
B-2 (Air Force)	6	11
B-52 (Air Force)	3	11
C-2A (Navy)	0	11
C-130T (Navy)	0	11
C-5M (Air Force)	2	11
C-17 (Air Force)	0	11
C-130H (Air Force)	2	11
C-130J (Air Force)	3	11
E-2C (Navy)	0	11
E-2D (Navy)[a]	0	8
E-6B (Navy)	5	11
E-3 (Air Force)	2	11
E-4B (Air Force)	3	11
E-8C (Air Force)	1	11
RC-135S-W (Air Force)	6	11
EA-18G (Navy)	2	11
F/A-18A-D (Navy)	1	11
F/A-18E/F (Navy)	0	11
F-35C (Joint/Navy)[a]	2	9
AV-8B (Marine Corps)	0	11
F/A-18A-D (Marine Corps)	0	11
F-35B (Joint/Marine Corps)[a]	0	9
A-10 (Air Force)	0	11
F-15C/D (Air Force)	0	11
F-15E (Air Force)	3	11

Aircraft	Number of fiscal years aircraft met mission capable goal	Number of fiscal years mission capable rate and goal compared
F-16 (Air Force)	0	11
F-22 (Air Force)	0	11
F-35A (Joint/Air Force)[a]	2	10
AH-64D/E (Army)	0	11
CH-47F (Army)	0	11
UH/HH-60 (Army)	0	11
MH-53E (Navy)	0	11
MH-60R (Navy)	2	11
MH-60S (Navy)	0	11
AH-1Z (Marine Corps)	0	11
CH-53E (Marine Corps)	0	11
MV-22B (Marine Corps)	0	11
UH-1Y (Marine Corps)	0	11
CV-22 (Air Force)[a]	0	9
HH-60G (Air Force)	1	11
UH-1N (Air Force)	11	11

Source: GAO analysis of Army, Navy and Air Force data. | GAO-23-106217

[a]For this aircraft, the military department did not provide a mission capable goal for all eleven years.

Conversely, 26 of the 49 aircraft in our review did not meet their annual mission capable goal for any year. Those aircraft were the following, by military service:

- Air Force: A-10, C-17, CV-22, F-15C/D, F-16, and F-22.
- Army: AH-64D/E, CH-47F, and UH/HH-60.
- Navy: C-130T, C-2A, E-2C, E-2D, F/A-18E/F, KC-130T, MH-53E, MH-60S.
- Marine Corps: AH-1Z, AV-8B, CH-53E, F-35B, F/A-18A-D, KC-130J, KC-130T, MV-22B, UH-1Y.

Specific details on the rates for each aircraft were omitted because the information was deemed by DOD to be sensitive.

Component-level Mission Capable Rates Varied

For the 27 aircraft operated by more than one component—active, National Guard, and reserve—the mission capable rate achieved by each component varied in fiscal year 2021. Specific details on the rates for each aircraft were omitted because the information was deemed by DOD to be sensitive.

In our questionnaires and discussions with the program offices, we explored the factors driving the differences in component mission capable rates and found several factors may account for the differences. These factors included the different number of maintenance shifts that active duty versus National Guard/reserve are able to perform, personnel and funding differences between the components, the age of assigned aircraft, and the environment in which the aircraft were operated. For example, officials from the F-22 program told us that each F-22 base is different in terms of location, climate, unit size/organization, and facilities, which can affect mission capable and aircraft availability rates. Officials said that the Air National Guard owns 23 F-22s based out of Hickam Air Force Base, Hawaii. The climate at Hickam is mild and less corrosive for low observable coatings. Therefore, Hickam has not experienced the same challenges with low observable coatings maintenance as other F-22 bases.

Mission Capable Rates Generally Have Trended Downward

The average mission capable rate, calculated by service for the selected aircraft, has fallen to varying degrees for the Air Force, Navy, and Marine Corps, from fiscal year 2011 through fiscal year 2021. The average mission capable rate for the selected Army aircraft has risen. Specific details of these rates were omitted because the information was deemed by DOD to be sensitive.

Wide Variety of Sustainment Challenges Affected Selected DOD Aircraft

Many of the aircraft we reviewed are facing one or more sustainment challenges related to the age of the aircraft, maintenance constraints, and supply support. According to program officials, these challenges have an effect on mission capable rates and the costs required to sustain those aircraft. Figure 2 shows the sustainment challenges that we determined were affecting each of the aircraft that we reviewed.

Figure 2: Sustainment Challenges Affecting Selected Aircraft

	Aging aircraft			Maintenance				Supply support		
	Delays in acquiring replacement aircraft	Service life extension[a]	Unexpected replacement of parts and repairs	Access to technical data	Delays in depot maintenance	Shortage of trained maintenance personnel	Unscheduled maintenance	Diminishing manufacturing source[b]	Parts obsolescence[c]	Parts shortage and delay
Air refueling										
KC-130T (Navy/Marine Corps)					●					●
KC-130J (Marine Corps)				●	●					●
KC-10 (Air Force)	●									
KC-135 (Air Force)		●	●	●		●	●	●	●	●
Anti-submarine										
EP-3E (Navy)			●				●	●	●	●
P-8A (Navy)			●		●					●
Bomber										
B-1B (Air Force)			●				●	●	●	●
B-2 (Air Force)	●		●	●	●	●	●	●	●	●
B-52 (Air Force)			●		●	●	●	●	●	●
Cargo										
C-2A (Navy)						●			●	
C-130T (Navy)					●					●
C-5M (Air Force)			●		●	●	●	●	●	●
C-17 (Air Force)		●	●	●	●		●	●	●	●
C-130H (Air Force)					●	●		●	●	
C-130J (Air Force)					●	●		●	●	
Command and control										
E-2C (Navy)						●			●	
E-2D (Navy)						●	●	●	●	●
E-6B (Navy)			●	●	●		●	●	●	●
E-3 (Air Force)			●		●		●	●	●	●
E-4B (Air Force)	●	●	●		●	●	●	●	●	●
E-8C (Air Force)					●		●	●	●	●
RC-135S-W (Air Force)		●			●	●	●	●	●	●
Fighter										
EA-18G (Navy)		●	●	●		●	●	●	●	●
F/A-18A-D (Navy/Marine Corps)						●	●		●	
F/A-18E/F (Navy)		●	●	●		●	●	●	●	●
F-35A/B/C (Joint)		●	●	●	●	●	●	●		●
AV-8B (Marine Corps)			●		●	●		●	●	●
A-10 (Air Force)			●		●	●	●	●	●	●
F-15C/D (Air Force)		●	●		●	●	●	●	●	●
F-15E (Air Force)			●		●	●	●	●	●	●
F-16 (Air Force)		●	●	●	●	●	●	●	●	●
F-22 (Air Force)			●	●				●	●	●
Rotary										
AH-64D/E (Army)	●		●	●	●	●	●	●	●	●
CH-47F (Army)					●	●		●	●	●
UH/HH-60 (Army)						●				●
MH-53E (Navy)			●		●			●	●	●
MH-60R (Navy)				●	●	●		●	●	●
MH-60S (Navy)				●	●	●		●	●	●
AH-1Z (Marine Corps)			●		●	●	●	●	●	●
CH-53E (Marine Corps)			●		●			●	●	●
MV-22B (Marine Corps)				●			●	●	●	●
UH-1Y (Marine Corps)			●		●	●	●	●	●	●
CV-22 (Air Force)				●	●		●	●	●	●
HH-60G (Air Force)					●					
UH-1N (Air Force)	●				●					

Source: GAO analysis of Army, Navy, and Air Force information. | GAO-23-106217

[a]A service life extension refers to a modification to extend the service life of an aircraft beyond what was planned.

[b]Diminishing manufacturing sources refers to a loss or impending loss of manufacturers or suppliers of items.

[c]Obsolescence refers to a lack of availability of a part due to its lack of usefulness or its no longer being current or available for production.

Over the last several years, we reported on field-level and depot-level maintenance issues for aircraft. First, in June 2022, we reported on Air Force and Navy field-level maintenance challenges and found that neither service had mitigated persistent fixed-wing aircraft sustainment risks.[25] In 2016, the National Defense Authorization Act for Fiscal Year 2017 included a provision requiring the military departments to conduct sustainment reviews for major weapon systems to assess their product support strategy, performance, and operation and support costs.[26] In 2021, the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 amended this sustainment review provision to, among other things require the secretaries of the military departments to annually provide these reviews to the congressional defense committees.[27] . DOD recognizes regular sustainment reviews as a critical tool to assess and address performance shortcomings and to identify maintenance and other risks to readiness.

We have previously reported on systemic, fleet-wide aircraft availability challenges and significant sustainment issues that have faced Air Force

[25]GAO, *Air Force and Navy Aviation: Actions Needed to Address Persistent Sustainment Risks*, GAO-22-104533 (Washington, D.C.: June 15, 2022).

[26]Pub. L. No. 114-328, § 849(c) (2016). The requirement was initially codified as section 2441 of title 10, U.S. Code. The William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 recodified the provision, as amended, as section 4323 of title 10, U.S. Code, effective January 1, 2022. Pub. L. No. 116-283, §§ 1801(d), 1848(c) (2021).

[27]Pub. L. No. 116-283, § 802(c) (2021) (codified, as amended, at 10 U.S.C. § 4323(d)). The act further amended the sustainment review provision to require, as part of the annual sustainment review submissions, for a covered weapon system with critical operating and support cost growth to include a remediation plan to reduce operating and support costs or a certification by the secretary concerned that such critical operating and support cost growth is necessary to meet national security requirements. 10 U.S.C. § 4323(d). Section 4323 defines critical operating and support cost growth as operating and support cost growth of (a) at least 25 percent more than the estimate documented in the most recent independent cost estimate for the system; or (b) at least 50 percent more than the estimate documented in the original baseline cost estimate (as defined in section 4214(d) of title 10, U.S. Code) for the system. 10 U.S.C. § 4323(e)(2). The military departments provided information to the defense congressional committees in response to this requirement. Specifically, the Air Force conducted nine sustainment reviews during fiscal year 2021 and submitted documentation of these reviews. The Army completed four sustainment reviews during fiscal year 2021 and submitted documentation of those reviews. The Navy did not submit any sustainment reviews completed during fiscal year 2021, but rather issued guidance and a schedule to complete the required sustainment reviews in future years.

and Navy aircraft since 2011.[28] The Air Force and Navy plan to complete all sustainment reviews for current major weapon systems by 2026. Specifically, DOD officials told us that completing these reviews for current systems by fiscal year 2026 would be in accordance with the sustainment review statute and DOD implementing guidance.[29]

In our June 2022 report, we recommended that the Air Force and Navy prioritize the completion of required sustainment reviews and update their schedules to complete the reviews in a timelier manner.[30] The Air Force concurred and the Navy partially concurred with the recommendations. The Navy in its comments on the recommendation stated that it needed to balance the workload required to conduct the sustainment reviews and that completing the sustainment reviews more expeditiously would not increase the rate of readiness initiatives being implemented. While we acknowledge the need to balance workload and to generate considerable information and data to complete sustainment reviews, we continue to believe that the Navy should complete its statutorily required sustainment reviews with a greater sense of urgency.[31] Without prioritizing the completion of its sustainment reviews and updating its planned schedules to complete them in a timelier manner, the Navy is missing an opportunity to identify sustainment risks to aircraft availability. Furthermore, DOD and

[28]GAO-21-101SP; GAO-20-67SPSU; and GAO, *Weapon System Sustainment: Selected Air Force and Navy Aircraft Generally Have Not Met Availability Goals, and DOD and Navy Guidance Need to Be Clarified*, GAO-18-678 (Washington, D.C.: Sept. 10, 2018) and *Weapon System Sustainment: Selected Air Force and Navy Aircraft Generally Have Not Met Availability Goals, and DOD and Navy Guidance Need Clarification*, GAO-18-146SU (Washington, D.C.: April 25, 2018).

[29]For weapon systems currently in the development and/or early construction phase, the Navy plans to complete sustainment reviews not later than five years after reaching initial operating capability, in accordance with the statute. *See* 10 U.S.C. § 4323(a). DOD defines initial operating capability as a point in time where a system can meet the minimum operational capabilities for a user’s stated need.

[30]GAO-22-104533.

[31]For example, the sustainment review must include an independent cost estimate for the remainder of the life cycle of the program. 10 U.S.C. § 4323. According to a DOD official, there are a limited number of cost estimators in the services and DOD’s Office of Cost Assessment and Program Evaluation (CAPE), limiting the ability of the services and DOD to conduct independent cost estimates thereby impeding the completion of sustainment reviews. In addition, DOD’s implementing guidance for sustainment reviews also states that each sustainment review will occur in coordination with an updated Life Cycle Sustainment Plan and a revalidated Product Support Business Case Analysis. Under Secretary of Defense for Acquisition and Sustainment Memorandum, *Implementation of Sustainment Reviews* (June 2, 2021).

Congress may not be fully informed of the magnitude of sustainment challenges impeding efforts to reverse the downward decline in outcomes.

In addition, we recommended in the June 2022 report that the Air Force and Navy should develop mitigation plans, with specific milestones, to remedy maintenance challenges, risks, or related impacts to aircraft availability identified in completed sustainment reviews.[32] The Air Force and Navy concurred with this recommendation.

We also suggested to Congress that it consider amending section 4323 of title 10, U.S. Code, to require the Air Force and Navy to submit to Congress mitigation plans related to identified maintenance challenges and risks to aircraft availability found in sustainment reviews based on a specific sustainment threshold. Such thresholds could include aircraft falling below their mission capable rate goal for consecutive years; an aircraft's mission capable rate declining by a specified percentage; or some other sustainment metric or metrics.

Second, in June 2020 we reported that the Air Force and Navy varied in the extent that they completed depot maintenance on time for selected fixed-wing aircraft in fiscal years 2014 through 2019.[33] Specifically, we found that:

- Air Force depots completed aircraft maintenance on time or early in 5 of 6 years, with percentages for on-time or early-completion maintenance ranging from 78 to 90 percent.

[32]GAO-22-104533. The mitigation plans that we recommended would remain different plans than any military department remediation plans to reduce critical operating and support cost growth submitted under section 4323 of title 10, U.S. Code. *See* 10 U.S.C. § 4323(d). Specifically, these recommended mitigation plans would focus on the military department's actions to remedy maintenance challenges, risks, or related impacts to aircraft availability.

[33]GAO, *Military Depots: The Navy Needs Improved Planning to Address Persistent Aircraft Maintenance Delays While Air Force Maintenance Has Generally Been Timely*, GAO-20-390 (Washington, D.C.: June 23, 2020). In this report, we collected data on the date depot maintenance—maintenance, maintenance repair, and overhaul as well as any modification work conducted as part of the depot maintenance workload—began and was completed for individual aircraft, as well as the original estimate of time (in days) needed to complete maintenance. We also collected updated estimates if available. We used this information to calculate the difference between the number of days planned for maintenance (using the updated estimate if available) and the number of days used for maintenance in order to determine whether the services completed aircraft maintenance on time, early, or late.

- Navy depots completed aircraft maintenance late for each of the 6 years, with percentages for on-time or early-completion maintenance ranging from 45 to 63 percent. Navy fixed-wing aircraft have spent over 62,000 more days in maintenance than expected since fiscal year 2014.

The Air Force generally had accurately planned for depot maintenance requirements for selected fixed-wing aircraft during fiscal year 2014 through 2019, but the Navy had not. Specifically:

- The Navy had not effectively used historical data to analyze turnaround time—total days planned for depot maintenance periods—and established accurate planning targets for aircraft maintenance packages.
- Navy depot planners did not have visibility into aircraft maintenance that is performed outside the depots by an operational unit or other maintenance facility—information critical to planning for the condition and depot maintenance needs of individual aircraft.
- The Navy did not yet have formal processes and related guidance for communication and coordination between depot stakeholders to inform maintenance requirements planning.

We made recommendations to the Navy to address each of these issues. Regarding the use of historical data, the Navy has implemented initiatives such as the Naval Sustainment System-Aircraft Initiative intended to mitigate or reduce maintenance delays for fighter aircraft, including the F/A-18. Without addressing these challenges, the Navy cannot appropriately plan for depot maintenance workload and will likely continue to experience maintenance delays that reduce the time aircraft are available for operations and training.

Lastly, in January 2020, we reported that commercial companies we reviewed proactively address reliability issues in the development of weapon systems.[34] Commercial companies strive to identify reliability issues at the component level early in the development process to avoid expensive rework after producing an entire system. We found these companies focus on the following key practices: (1) leveraging reliability engineers early and often, (2) establishing realistic reliability requirements, (3) emphasizing reliability with their suppliers, and (4) employing reliability engineering activities to improve a system's design

[34]GAO, *Defense Acquisitions: Senior Leaders Should Emphasize Key Practices to Improve Weapon System Reliability*, GAO-20-151 (Washington, D.C.: Jan. 14, 2020).

throughout development. However, we found that seven DOD acquisition programs did not consistently adhere to these key practices, including the V-22, F-22, and F-35. These programs often prioritized schedule and cost over incorporating the key reliability practices, and these systems generally were not as reliable as promised.

For example, the F-35 program deferred key reliability engineering activities intended to improve system designs until later in development. As a result, the program missed opportunities to identify, understand, and mitigate reliability issues early in the development process that could have reduced sustainment-related costs for the program. Furthermore, in April 2022, we reported that F-35 reliability and maintainability metrics had slightly declined over the last year.[35] For example, in March 2021, we reported that, as of June 2020, the program was meeting or close to meeting 17 of its 24 reliability and maintainability goals.[36] In April 2022, however, we found that although reliability and maintainability metrics declined, the F-35 program office is prioritizing funding and implementing initiatives to improve its reliability and maintainability metrics consistent with our previous recommendations.[37]

Operating and Support Costs Decreased Slightly and Varied by Aircraft

Total O&S costs across the selected aircraft decreased slightly from fiscal year 2011 through fiscal year 2020 while maintenance costs have increased, becoming a larger portion of total O&S costs. Air Force and Army O&S costs decreased while Navy and Marine Corps O&S costs increased. Based on our analysis and information provided by the program offices, these trends were largely driven by changes in the size of aircraft inventory and reduced flying hours. Additionally, O&S costs varied widely across aircraft fleets. For example, the total fiscal year 2020 O&S costs for the systems we reviewed ranged from about $97 million for the KC-130T fleet (Navy and Marine Corps), to a high of about $4.3 billion for the F-16 fleet (Air Force). Based on our analysis of cost data provided

[35]GAO, *F-35 Joint Strike Fighter: Cost Growth and Schedule Delays Continue*, GAO-22-105128 (Washington, D.C.: Apr. 25, 2022).

[36]GAO, *F-35 Joint Strike Fighter: DOD Needs to Update Modernization Schedule and Improve Data on Software Development*, GAO-21-226 (Washington, D.C.: Mar. 18, 2021).

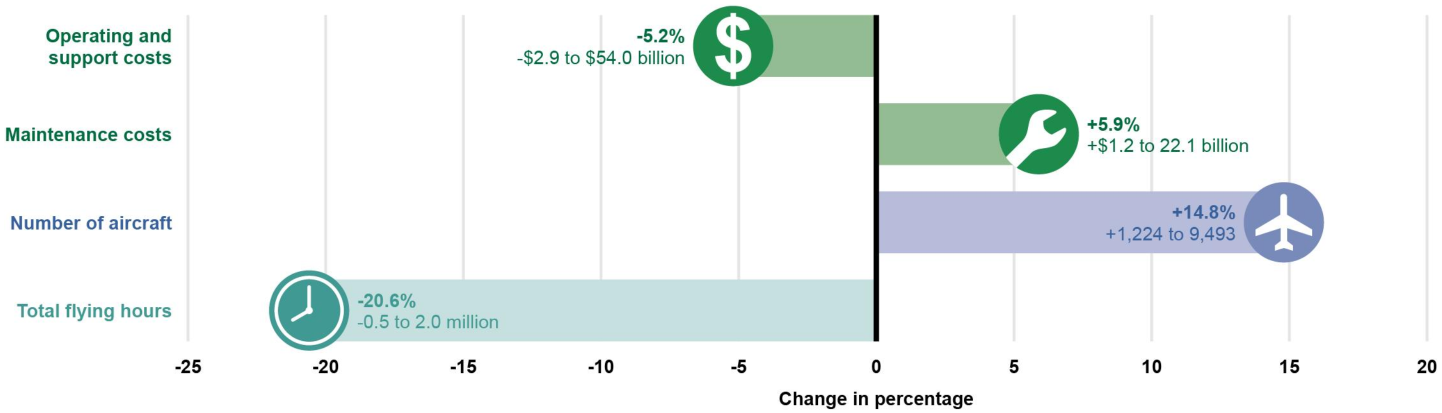
[37]GAO-22-105128.

by the departments and information provided by the system program offices, the cost variances were based on aircraft type and factors such as age of the fleet, the number of aircraft included in the inventory, and the number of flying hours flown by a fleet.

Total Operating and Support Costs Decreased while Maintenance Costs Increased Since Fiscal Year 2011

We analyzed O&S cost changes from fiscal years 2011 through 2020, using constant fiscal year 2020 dollars as well as factors such as changes to the number of aircraft in the fleet and flying hours executed.[38] We found that total O&S costs across the selected aircraft decreased slightly while maintenance costs have increased, while the total inventory of aircraft increased but the total number of flying hours decreased (see figure 3).

Figure 3: Changes in Total Costs, Number of Selected Aircraft, and Flying Hours, Fiscal Years 2011 through 2020 (rounded, in constant fiscal year 2020 dollars)



Source: GAO analysis of Army, Navy, and Air Force data. | GAO-23-106217

Data table for Figure 3: Changes in Total Costs, Number of Selected Aircraft, and Flying Hours, Fiscal Years 2011 through 2020 (rounded, in constant fiscal year 2020 dollars)

	Change in percentage	Change in amount
Operating and support costs	-5.2	-$2.9 to $54.0 billion
Maintenance costs	+5.9	+$1.2 to $22.1 billion
Number of aircraft	+14.8	+1,224 to 9,493

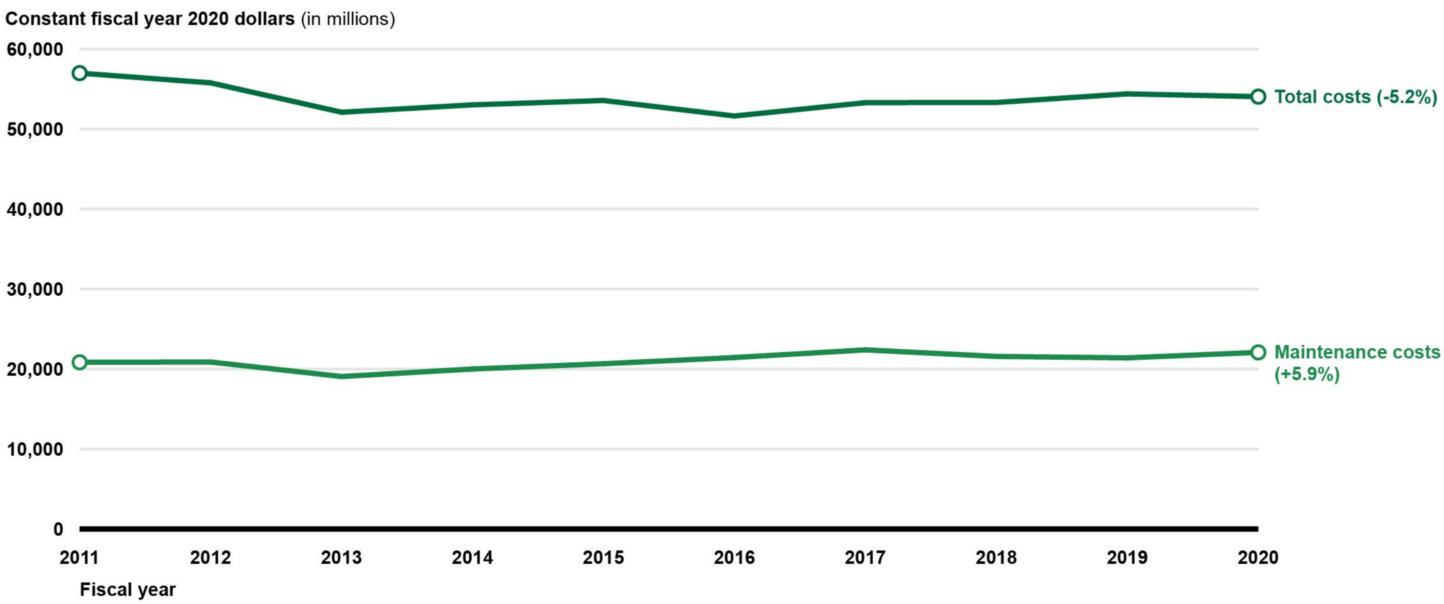
[38]Fiscal year 2020 was the last fiscal year for which complete data were available at the time of our work.

	Change in percentage	Change in amount
Total flying hours	-20.6	-0.5 to 2.0 million

Source: GAO analysis of Army, Navy and Air Force data. | GAO-23-106217

While total O&S costs decreased, maintenance costs—which are included in the total O&S costs—increased as shown in figure 4. Maintenance costs increased due to a variety of reasons: sustainment challenges associated with the aging or high use of some aircraft, which led to an increase in aircraft maintenance, and growth in the number of aircraft.

Figure 4: Total Operating and Support Costs for Selected Fleets of Aircraft, Fiscal Years 2011 through 2020



Source: GAO analysis of Army, Navy, and Air Force data. | GAO-23-106217

Data table for Figure 4: Total Operating and Support Costs for Selected Fleets of Aircraft, Fiscal Years 2011 through 2020 (Constant fiscal year 2020 dollars (in millions))

Fiscal year	Total costs (-5.2%)	Maintenance costs (+5.9%)
2011	56984.6	20839
2012	55767.6	20873.4
2013	52095.9	19060.4
2014	53018.2	20000.9
2015	53566.3	20658.8
2016	51628	21433.4

Fiscal year	Total costs (-5.2%)	Maintenance costs (+5.9%)
2017	53291	22392.3
2018	53319.1	21571.4
2019	54393.4	21394.3
2020	54042.7	22077.8

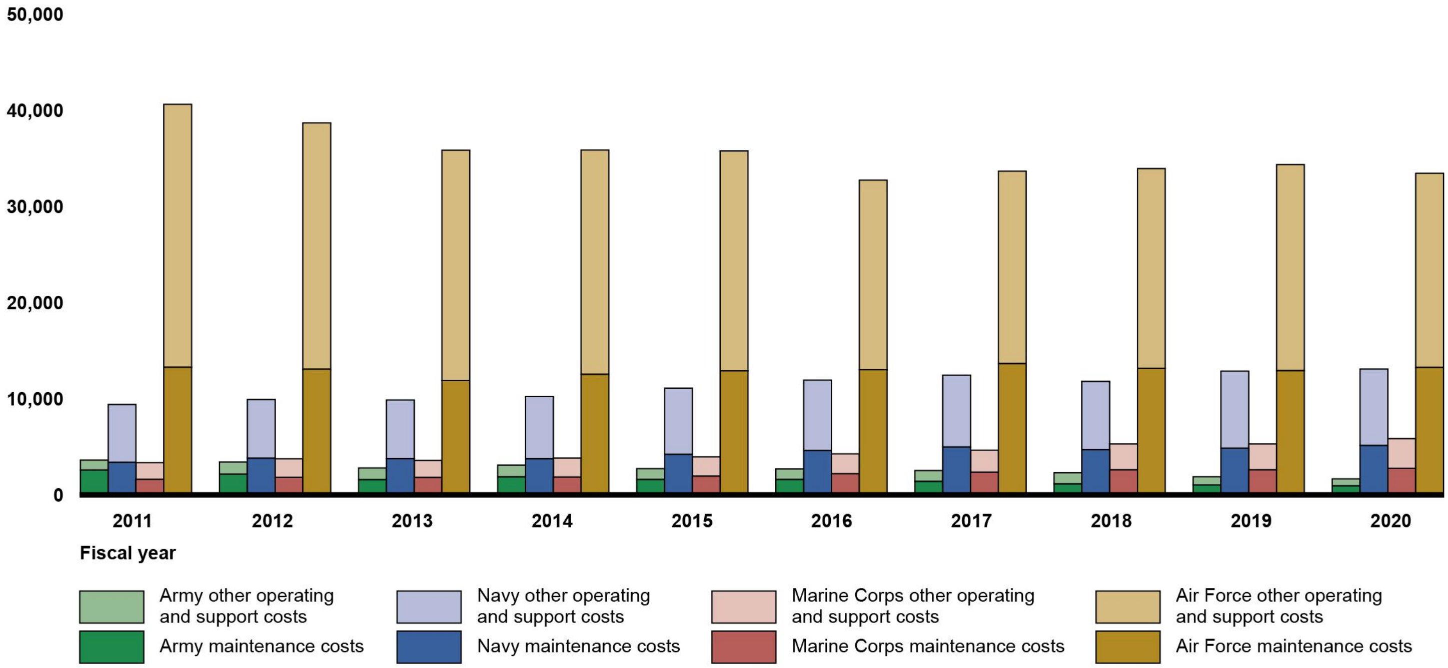
Source: GAO analysis of Army, Navy and Air Force data. | GAO-23-106217

Air Force and Army Operating and Support Costs Decreased while Navy and Marine Corps Costs Increased Since Fiscal Year 2011

Air Force and Army total O&S costs decreased by 18 and 54 percent, respectively, since fiscal year 2011. The Air Force inventory of aircraft remained about the same since fiscal year 2010—increasing only 10 aircraft, or 27 percent, from about 3,554 aircraft to about 3,564 aircraft. However, Air Force flying hours decreased about 411,000 hours, or 31 percent—from about 1.3 million hours to about 932,000 hours—with a corresponding decrease in O&S costs across its inventory. On the other hand, the Army increased its inventory of aircraft by about 322, or 12 percent—growing from about 2,711 aircraft to about 3,033 aircraft. However, the Army's flying hours decreased by 180,000, or 29 percent—from about 624,000 hours to about 444,000 hours.

Navy and Marine Corps total O&S costs increased by 39 and 75 percent, respectively. The Navy increased its inventory of aircraft by about 270, or 22 percent—growing from about 1,236 to about 1,506 aircraft. In addition, flying hours also increased by about 63,000 hours, or 16 percent—from about 402,000 flying hours to about 465,000. The Marine Corps experienced large increases in its fleet while flying hours remained constant. Specifically, the Marine Corps increased its inventory of aircraft by about 408, or 53 percent—growing from about 763 to about 1,171 aircraft. Flying hours increased by about 200 hours—remaining at about 193,000. Details appear in figure 5.

Figure 5: Total Operating and Supports Costs by Service for Selected Fleets of Aircraft, Fiscal Years 2011 through 2020



Source: GAO analysis of Army, Navy, and Air Force data. | GAO-23-106217

Data table for Figure 5: Total Operating and Supports Costs by Service for Selected Fleets of Aircraft, Fiscal Years 2011 through 2020 (Constant fiscal year 2020 dollars (in millions))

Fiscal year	Service	Maintenance costs	Other operating and support costs
2011	Army	2588.95	1026.11
	Navy	3378.16	6027.22
	Marine Corps	1610.19	1738.53
	Air Force	13261.7	27353.8
2012	Army	2160.53	1260.14
	Navy	3823.71	6084.72
	Marine Corps	1831.06	1916.92
	Air Force	13058.1	25632.5
2013	Army	1585.51	1217.48
	Navy	3762.19	6097.49
	Marine Corps	1815.26	1761.64
	Air Force	11897.4	23959

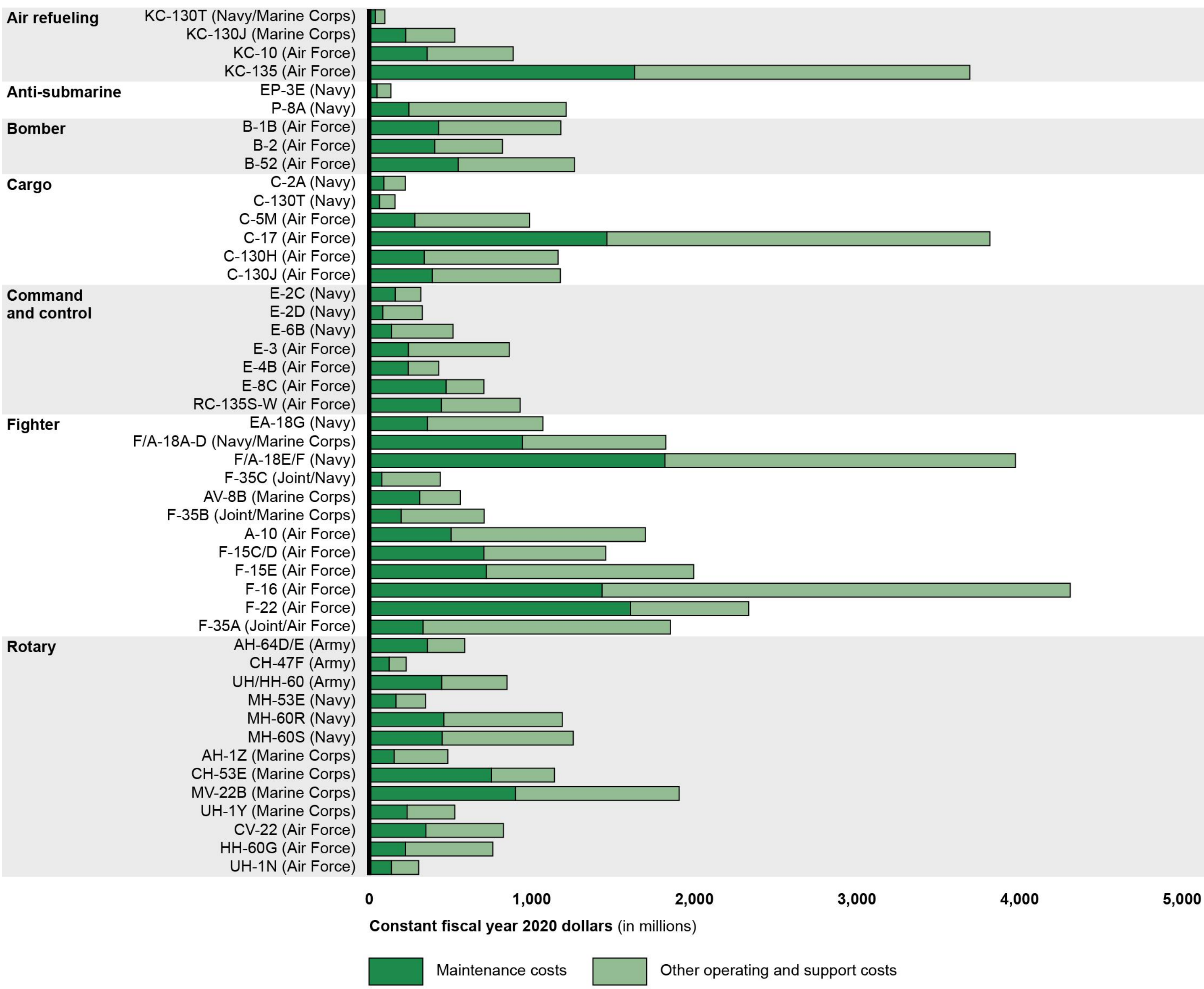
Fiscal year	Service	Maintenance costs	Other operating and support costs
2014	Army	1867.73	1233.71
	Navy	3741.36	6484.21
	Marine Corps	1851.71	1975.76
	Air Force	12540.1	23323.7
2015	Army	1594.36	1146.2
	Navy	4219.35	6881.44
	Marine Corps	1947.74	2003.52
	Air Force	12897.3	22876.4
2016	Army	1603.56	1091.36
	Navy	4613.01	7313.75
	Marine Corps	2203.19	2066.36
	Air Force	13013.6	19723.2
2017	Army	1400.18	1134.98
	Navy	4975.51	7466.02
	Marine Corps	2364.34	2289.21
	Air Force	13652.2	20008.5
2018	Army	1126.19	1178.62
	Navy	4692.33	7103.64
	Marine Corps	2592.22	2699.38
	Air Force	13160.6	20766.1
2019	Army	1034.73	845.13
	Navy	4849.12	8010.75
	Marine Corps	2595.3	2704.6
	Air Force	12915.1	21438.6
2020	Army	926.78	737.38
	Navy	5134.54	7943.73
	Marine Corps	2771.27	3080.19
	Air Force	13245.2	20203.6

Source: GAO analysis of Army, Navy and Air Force data. | GAO-23-106217

Operating and Support Costs and Trends in Those Costs Varied Across the Selected Aircraft Fleets

O&S costs varied widely based on aircraft type, as shown in figure 6. Based on our analysis of cost data provided by the departments and information provided by the system program offices, factors affecting the cost to operate and support each aircraft included: the number of aircraft in the inventory, the number of flying hours flown, and the age of the fleet.

Figure 6: Total Operating and Support Costs for Selected Fleets of Aircraft, Fiscal Year 2020



Source: GAO analysis of Army, Navy, and Air Force data. | GAO-23-106217

Data table for Figure 6: Total Operating and Support Costs for Selected Fleets of Aircraft, Fiscal Year 2020, Constant fiscal year 2020 dollars (in millions)

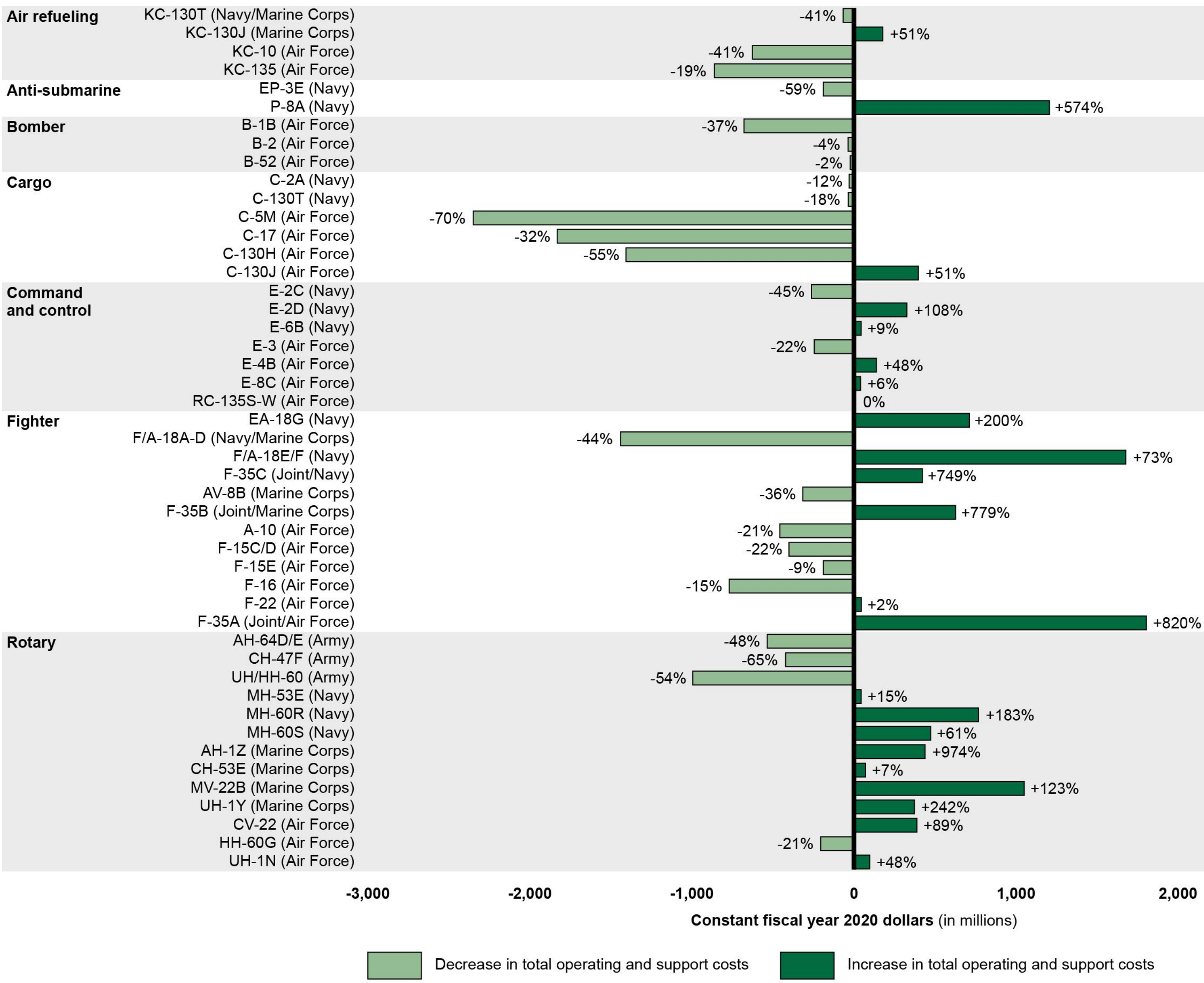
Aircraft	Maintenance costs	Other operating and support costs
KC-130T (Navy/Marine Corps)	37.99	58.69
KC-130J (Marine Corps)	224.6	302.33
KC-10 (Air Force)	356.58	529.54
KC-135 (Air Force)	1631.95	2062.13
EP-3E (Navy)	47.57	86.03
P-8A (Navy)	243.85	967.55
B-1B (Air Force)	426.66	752.33
B-2 (Air Force)	403.14	417.1
B-52 (Air Force)	547.2	716.07
C-2A (Navy)	89.96	132.9
C-130T (Navy)	63.64	95.6
C-5M (Air Force)	280.81	705.6
C-17 (Air Force)	1462.52	2355.02
C-130H (Air Force)	338.69	822.95
C-130J (Air Force)	387.8	787.85
E-2C (Navy)	159.54	158.24
E-2D (Navy)	82.99	243.67
E-6B (Navy)	138.03	377.62
E-3 (Air Force)	241.16	620.44
E-4B (Air Force)	240.3	187.81
E-8C (Air Force)	472.69	233.47
RC-135S-W (Air Force)	444.34	484.28
EA-18G (Navy)	358.1	710.1
F/A-18A-D (Navy/Marine Corps)	943.1	880.79
F/A-18E/F (Navy)	1819.1	2155.99
F-35C (Joint/Navy)	78.36	359.07
AV-8B (Marine Corps)	310.58	249.65
F-35B (Joint/Marine Corps)	196.62	511.19
A-10 (Air Force)	503.32	1196.52
F-15C/D (Air Force)	706.13	749.24
F-15E (Air Force)	720.98	1275.27
F-16 (Air Force)	1431.69	2879.82

Aircraft	Maintenance costs	Other operating and support costs
F-22 (Air Force)	1608.16	726.36
F-35A (Joint/Air Force)	331.27	1520.95
AH-64D/E (Army)	357.99	230.16
CH-47F (Army)	123.02	104.84
UH/HH-60 (Army)	445.77	402.37
MH-53E (Navy)	164.92	181.67
MH-60R (Navy)	458.57	729.23
MH-60S (Navy)	448.81	806.57
AH-1Z (Marine Corps)	153.43	330.06
CH-53E (Marine Corps)	752.09	387.74
MV-22B (Marine Corps)	900.23	1006.55
UH-1Y (Marine Corps)	233.72	292.67
CV-22 (Air Force)	349.3	476.59
HH-60G (Air Force)	223.67	536.48
UH-1N (Air Force)	136.87	167.8

Source: GAO analysis of Army, Navy and Air Force data. | GAO-23-106217

Trends in total O&S costs in constant fiscal year 2020 dollars during the period of fiscal years 2011 through 2020 varied for selected aircraft, as shown in figure 7.

Figure 7: Change in Operating and Support Costs from Fiscal Years 2011 through 2020 for Selected Fleets of Aircraft



Source: GAO analysis of Army, Navy, and Air Force data. | GAO-23-106217

Data table for Figure 7: Change in Operating and Support Costs from Fiscal Years 2011 through 2020 for Selected Fleets of Aircraft, Constant fiscal year 2020 dollars (in millions)

Aircraft	Change in total operating and support costs	Percentage change in total operating and support costs
KC-130T (Navy/Marine Corps)	-66.33	-41
KC-130J (Marine Corps)	178.17	+51
KC-10 (Air Force)	-626.9	-41
KC-135 (Air Force)	-861.24	-19
EP-3E (Navy)	-189.58	-59
P-8A (Navy)	1206.06	+574
B-1B (Air Force)	-678.32	-37
B-2 (Air Force)	-35.91	-4
B-52 (Air Force)	-23.03	-2
C-2A (Navy)	-29.45	-12
C-130T (Navy)	-35.12	-18
C-5M (Air Force)	-2349.72	-70
C-17 (Air Force)	-1831.55	-32
C-130H (Air Force)	-1407.03	-55
C-130J (Air Force)	397.92	+51
E-2C (Navy)	-262.02	-45
E-2D (Navy)	326.66	+108
E-6B (Navy)	44.41	+9
E-3 (Air Force)	-245.42	-22
E-4B (Air Force)	138.43	+48
E-8C (Air Force)	41.07	+6
RC-135S-W (Air Force)	0.68	0
EA-18G (Navy)	712.26	+200
F/A-18A-D (Navy/Marine Corps)	-1440.72	-44
F/A-18E/F (Navy)	1677.74	+73
F-35C (Joint/Navy)	422.08	+749
AV-8B (Marine Corps)	-315.99	-36
F-35B (Joint/Marine Corps)	627.28	+779
A-10 (Air Force)	-457.12	-21
F-15C/D (Air Force)	-400.72	-22
F-15E (Air Force)	-189.36	-9

Aircraft	Change in total operating and support costs	Percentage change in total operating and support costs
F-16 (Air Force)	-769.53	-15
F-22 (Air Force)	44.57	+2
F-35A (Joint/Air Force)	1804.97	+820
AH-64D/E (Army)	-534.87	-48
CH-47F (Army)	-421.44	-65
UH/HH-60 (Army)	-994.6	-54
MH-53E (Navy)	44.41	+15
MH-60R (Navy)	768.18	+183
MH-60S (Navy)	473.6	+61
AH-1Z (Marine Corps)	438.48	+974
CH-53E (Marine Corps)	70.92	+7
MV-22B (Marine Corps)	1050.83	+123
UH-1Y (Marine Corps)	372.51	+242
CV-22 (Air Force)	388.72	+89
HH-60G (Air Force)	-205.24	-21
UH-1N (Air Force)	98.14	+48

Source: GAO analysis of Army, Navy and Air Force data. | GAO-23-106217

Note: Program officials noted that increases and decreases in total operating and support costs for an aircraft fleet occur for several reasons, including the size of the fleet. For example, the 820 percent increase in the F-35A total operating and support costs resulted from the dramatic increase in fleet size—from about nine in fiscal year 2011 to about 231 in fiscal year 2020.

The selected aircraft fleet cost trends generally fell into the following categories:

- Increased costs. Costs for 22 of 47 aircraft generally increased by more than 5 percent over the past 10 years.[39] For example, costs for the F-35A (Air Force) increased by about $1.8 billion, from about $47 million in fiscal year 2011 to about $1.9 billion in fiscal year 2020. This increase in costs is generally due to the expansion of the F-35A fleet, from two aircraft in fiscal year 2011 to 231 in fiscal year 2020. Likewise, the F/A-18E/F (Navy) increased by about $1.7 billion, from $2.3 billion in fiscal year 2011 to just under $4 billion in fiscal year 2020. The cost increase for the F/A-18E/F was driven by an increase

[39]As aircraft costs tend to fluctuate from year to year, we determined cost increases or decreases of more than 5 percent to be significant and took steps to understand what drove those cost increases. The Navy reports operating and support costs for both Navy and Marine Corps aircraft. Costs for the KC-130T and F-18 AD—operated by both the Navy and Marine Corps—are combined in the above graphic. Therefore, our discussion of cost changes the aircraft totals to 47, two short of the total 49 aircraft.

in the size of the fleet as well as an increase in maintenance and continuing system improvement costs.

- Consistent costs. Four of 47 aircraft had relatively stable total O&S costs—less than a 5 percent change—over the past 10 years. Specifically, those aircraft with less than a 5 percent growth or decrease in total O&S costs included the B-2 and B-52 (Air Force), F-22 (Air Force), and RC-135 (Air Force).
- Decreased costs. Total O&S costs for 21 of 47 aircraft decreased by more than 5 percent over the past 10 years, including the A-10 (Air Force), the EP-3 (Navy), and the AH-64 (Army). For example, the A-10 O&S costs decreased by about $457 million, from about $2.2 billion in fiscal year 2011 to about $1.7 billion in fiscal year 2020. A-10 program office officials cited the decreased fleet size, from 346 aircraft in 2011 to 281 in 2020, as well as decreased flying hours related to the pandemic as a driver for the decreased costs in fiscal year 2020.

Maintenance costs comprise a large portion of the total O&S costs for aircraft. For example, in fiscal year 2020, total maintenance costs for the 47 aircraft represented an average of about 40 percent of the total O&S cost. Also, the trends in maintenance costs in constant fiscal year 2020 dollars varied by aircraft fleet and generally fell into the following categories:

- Increased costs. Maintenance costs for 28 of the 47 aircraft increased by more than 5 percent since fiscal year 2011. For example, maintenance costs for the F-22 (Air Force) have increased, according to officials, primarily due to increased contractor support costs and repairs to the low-observable coating, from about $1.1 billion in fiscal year 2011 to about $1.6 billion in fiscal year 2020. The EA-18 (Navy) also experienced a significant increase in maintenance costs, from about $85 million in fiscal year 2011 to about $358 million in fiscal year 2020. Navy officials stated that maintenance costs increase because the systems become more expensive to maintain as they age.
- Consistent costs. Maintenance costs for three of the 47 aircraft: the EP-3 (Navy), the HH-60, and F-16 (Air Force) were relatively stable.
- Decreased costs. Maintenance costs for 16 of the 47 aircraft decreased by more than 5 percent since fiscal year 2011. For example, the C-130H (Air Force) maintenance costs decreased from about $815 million in fiscal year 2011 to about $339 million in fiscal year 2020. Among other reasons, officials told us the C-130 conversion from the H to the J model resulted in a significant

reduction in maintenance costs for the H model, as there are fewer of these aircraft.

In addition, the maintenance costs for the F/A-18A-D (Navy and Marine Corps) have decreased from about $1.4 billion in fiscal year 2011 to about $943 million in fiscal year 2020. Program office officials told us this decrease was due to a reduction in overall aircraft inventory for F/A-18A-D. Also, the Army's AH-64 experienced a decrease in maintenance costs, from about $852 million in fiscal year 2011 to about $358 million in fiscal year 2020. In response to our program office questionnaire, Army officials attributed this decrease to modernization efforts, which have resulted in a reduction of maintenance actions.

Operating and Support Costs per Aircraft and Flying Hour Varied Across the Aircraft Fleets

O&S costs per aircraft and O&S costs per flying hour metrics are two metrics used to compare costs across aircraft fleets.[40] Each of these metrics have different strengths and provide different insights to O&S costs for aircraft.[41] Cost-per-aircraft is a good metric for comparing O&S costs of aircraft as well as the affordability of an aircraft. Cost-per-aircraft also allows for O&S cost comparisons across different fleets of aircraft. Cost-per-flying hour is more suitable for measuring the cost to provide operational flying hours. However, this metric is sensitive to flying-hour levels—increasing when flying hours decrease and decreasing when flying hours increase—and therefore can be misleading if not used in the proper context. Both cost-per-aircraft and cost-per-flying hour comparisons across the fleet can be used to inform DOD decisions regarding retirement or retention of existing aircraft and could also be used to monitor the progress of aircraft programs in meeting sustainment funding constraints.

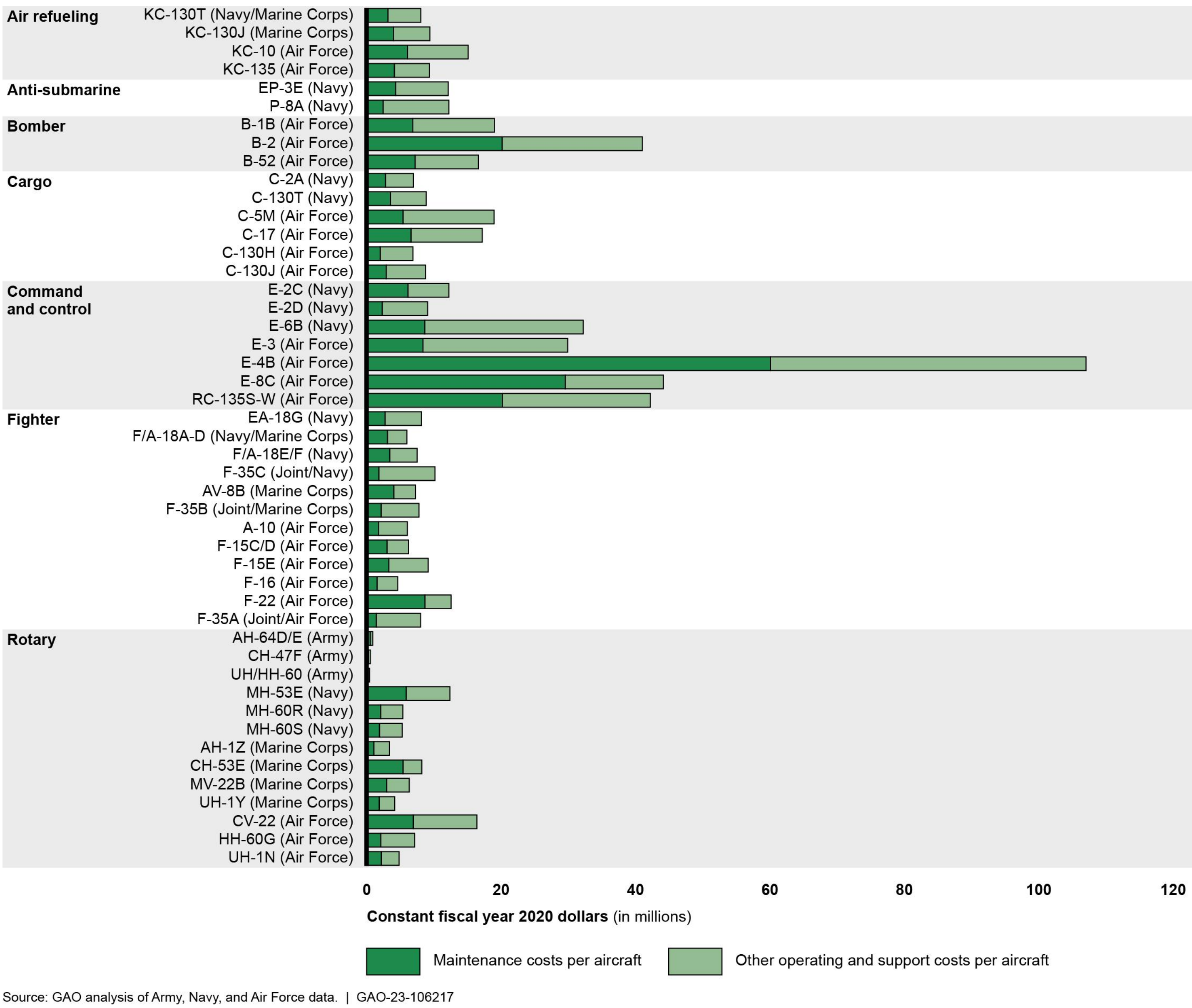
[40]We calculated cost-per-aircraft by summing the total O&S costs for an aircraft (active, National Guard, and reserve) in a fiscal year and then dividing by the average of the total inventory for that aircraft in the same fiscal year. We calculated cost-per-flying hour by summing the total O&S cost for an aircraft (active, National Guard, and reserve) in a fiscal year and then dividing that by the sum of the total flying hours for that aircraft in the same fiscal year.

[41]RAND Corporation, *Metrics to Compare Aircraft Operating and Support Costs in the Department of Defense* (Santa Monica, CA: 2015).

Metrics and changes in those metrics across the selected aircraft are depicted in the following figures:

- fiscal year 2020 O&S costs per aircraft (figure 8);
- changes in O&S costs per aircraft from fiscal year 2011 through fiscal year 2020 (figure 9);
- fiscal year 2020 O&S costs per flying hour (figure 10); and
- changes in O&S costs per flying hour from fiscal year 2011 through fiscal year 2020 (figure 11).

Figure 8: Total Operating and Support Costs per Aircraft for Selected Aircraft, Fiscal Year 2020



Source: GAO analysis of Army, Navy, and Air Force data. | GAO-23-106217

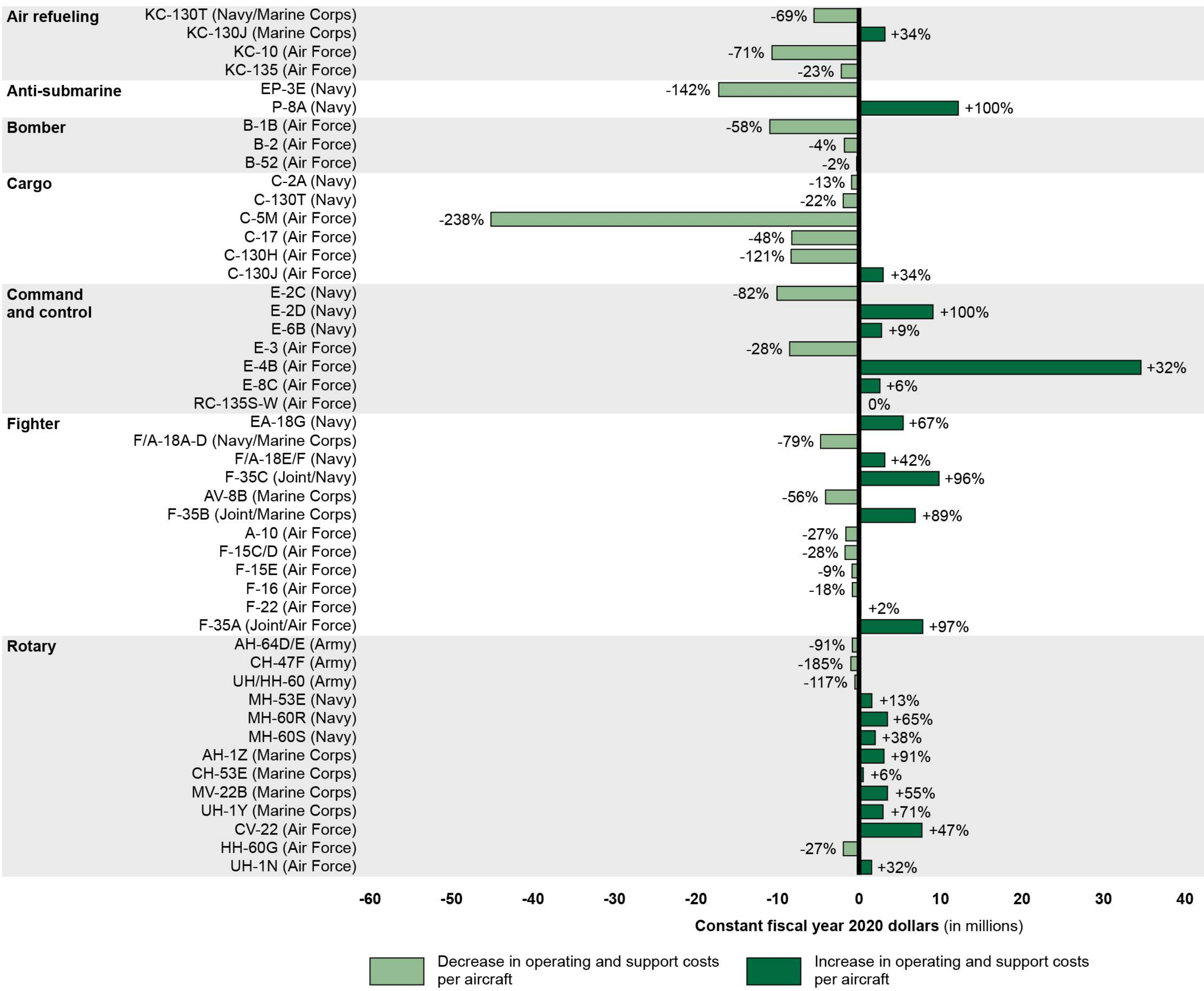
Data table for Figure 8: Total Operating and Support Costs per Aircraft for Selected Aircraft, Fiscal Year 2020, Constant fiscal year 2020 dollars (in millions)

Aircraft	Maintenance costs per aircraft	Other operating and support costs per aircraft
KC-130T (Navy/Marine Corps)	3.17	4.89
KC-130J (Marine Corps)	4.01	5.4
KC-10 (Air Force)	6.08	9.02
KC-135 (Air Force)	4.12	5.21
EP-3E (Navy)	4.32	7.82
P-8A (Navy)	2.46	9.77
B-1B (Air Force)	6.88	12.13
B-2 (Air Force)	20.16	20.86
B-52 (Air Force)	7.2	9.42
C-2A (Navy)	2.81	4.15
C-130T (Navy)	3.54	5.31
C-5M (Air Force)	5.4	13.57
C-17 (Air Force)	6.59	10.61
C-130H (Air Force)	2.01	4.88
C-130J (Air Force)	2.9	5.88
E-2C (Navy)	6.14	6.09
E-2D (Navy)	2.31	6.77
E-6B (Navy)	8.63	23.6
E-3 (Air Force)	8.37	21.54
E-4B (Air Force)	60.08	46.95
E-8C (Air Force)	29.54	14.59
RC-135S-W (Air Force)	20.2	22.01
EA-18G (Navy)	2.73	5.42
F/A-18A-D (Navy/Marine Corps)	3.09	2.89
F/A-18E/F (Navy)	3.43	4.07
F-35C (Joint/Navy)	1.82	8.35
AV-8B (Marine Corps)	4.03	3.24
F-35B (Joint/Marine Corps)	2.16	5.62
A-10 (Air Force)	1.79	4.26
F-15C/D (Air Force)	3.02	3.21
F-15E (Air Force)	3.31	5.85
F-16 (Air Force)	1.53	3.08

Aircraft	Maintenance costs per aircraft	Other operating and support costs per aircraft
F-22 (Air Force)	8.65	3.91
F-35A (Joint/Air Force)	1.44	6.59
AH-64D/E (Army)	0.55	0.36
CH-47F (Army)	0.3	0.25
UH/HH-60 (Army)	0.23	0.2
MH-53E (Navy)	5.89	6.49
MH-60R (Navy)	2.08	3.31
MH-60S (Navy)	1.89	3.4
AH-1Z (Marine Corps)	1.07	2.31
CH-53E (Marine Corps)	5.41	2.79
MV-22B (Marine Corps)	2.99	3.34
UH-1Y (Marine Corps)	1.85	2.32
CV-22 (Air Force)	6.94	9.47
HH-60G (Air Force)	2.1	5.03
UH-1N (Air Force)	2.17	2.66

Source: GAO analysis of Army, Navy and Air Force data. | GAO-23-106217

Figure 9: Change in the Total Operating and Support Costs per Aircraft in Fiscal Years 2011 through 2020 for Selected Aircraft



Source: GAO analysis of Army, Navy, and Air Force data. | GAO-23-106217

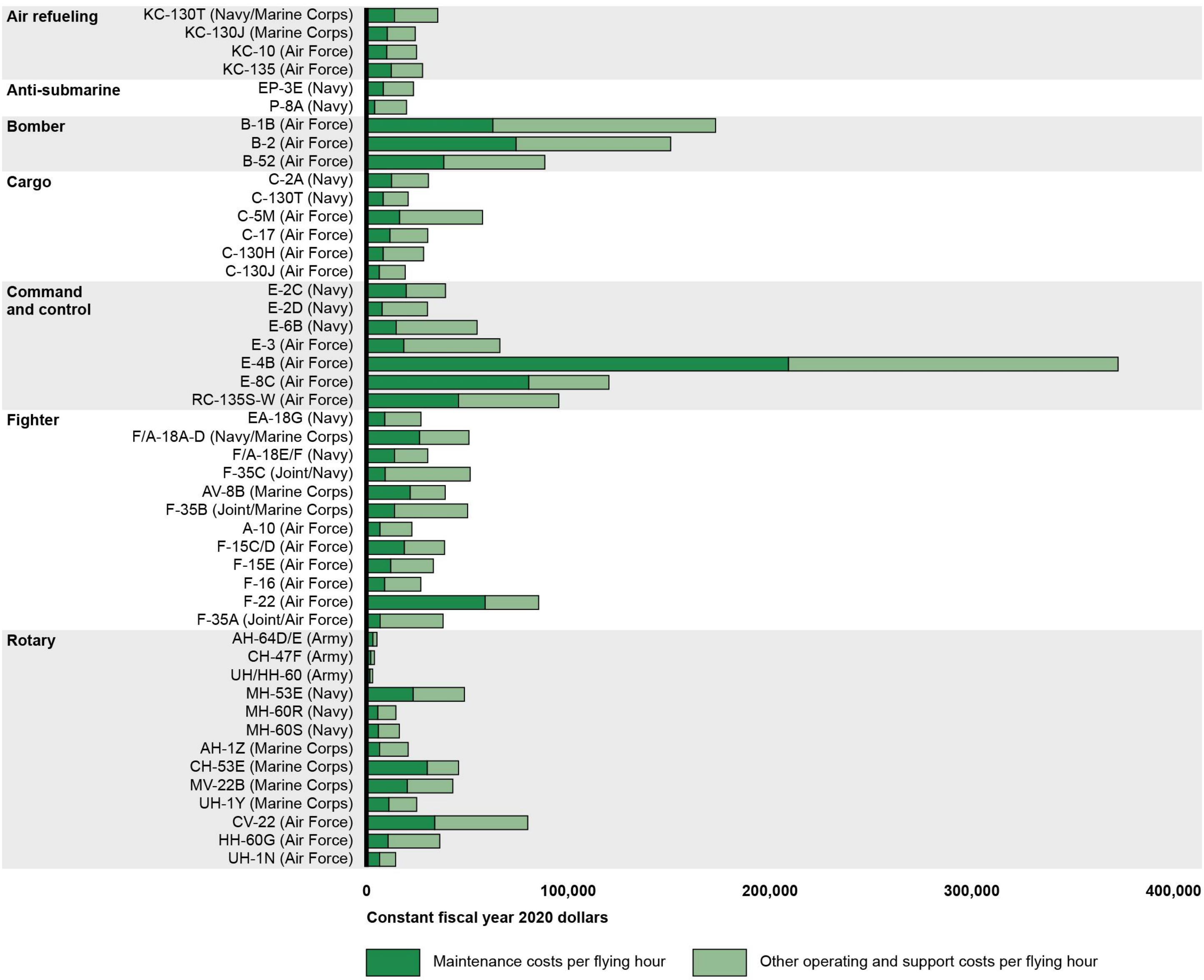
Data table for Figure 9: Change in the Total Operating and Support Costs per Aircraft in Fiscal Years 2011 through 2020 for Selected Aircraft, Constant fiscal year 2020 dollars (in millions)

Aircraft	Change in total operating and support costs per aircraft	Percentage change in total operating and support costs per aircraft
KC-130T (Navy/Marine Corps)	-5.52	-69
KC-130J (Marine Corps)	3.18	+34
KC-10 (Air Force)	-10.68	-71
KC-135 (Air Force)	-2.17	-23
EP-3E (Navy)	-17.23	-142
P-8A (Navy)	12.18	+100
B-1B (Air Force)	-10.94	-58
B-2 (Air Force)	-1.79	-4
B-52 (Air Force)	-0.3	-2
C-2A (Navy)	-0.92	-13
C-130T (Navy)	-1.95	-22
C-5M (Air Force)	-45.18	-238
C-17 (Air Force)	-8.25	-48
C-130H (Air Force)	-8.34	-121
C-130J (Air Force)	2.97	+34
E-2C (Navy)	-10.07	-82
E-2D (Navy)	9.07	+100
E-6B (Navy)	2.77	+9
E-3 (Air Force)	-8.52	-28
E-4B (Air Force)	34.6	+32
E-8C (Air Force)	2.56	+6
RC-135S-W (Air Force)	0.03	0
EA-18G (Navy)	5.43	+67
F/A-18A-D (Navy/Marine Corps)	-4.72	-79
F/A-18E/F (Navy)	3.16	+42
F-35C (Joint/Navy)	9.81	+96
AV-8B (Marine Corps)	-4.1	-56
F-35B (Joint/Marine Corps)	6.89	+89
A-10 (Air Force)	-1.62	-27
F-15C/D (Air Force)	-1.71	-28
F-15E (Air Force)	-0.86	-9

Aircraft	Change in total operating and support costs per aircraft	Percentage change in total operating and support costs per aircraft
F-16 (Air Force)	-0.82	-18
F-22 (Air Force)	0.23	+2
F-35A (Joint/Air Force)	7.82	+97
AH-64D/E (Army)	-0.82	-91
CH-47F (Army)	-1.01	-185
UH/HH-60 (Army)	-0.5	-117
MH-53E (Navy)	1.58	+13
MH-60R (Navy)	3.49	+65
MH-60S (Navy)	1.99	+38
AH-1Z (Marine Corps)	3.06	+91
CH-53E (Marine Corps)	0.51	+6
MV-22B (Marine Corps)	3.49	+55
UH-1Y (Marine Corps)	2.95	+71
CV-22 (Air Force)	7.72	+47
HH-60G (Air Force)	-1.92	-27
UH-1N (Air Force)	1.55	+32

Source: GAO analysis of Army, Navy and Air Force data. | GAO-23-106217

Figure 10: Total Operating and Support Costs per Flying Hour for Selected Aircraft, Fiscal Year 2020



Source: GAO analysis of Army, Navy, and Air Force data. | GAO-23-106217

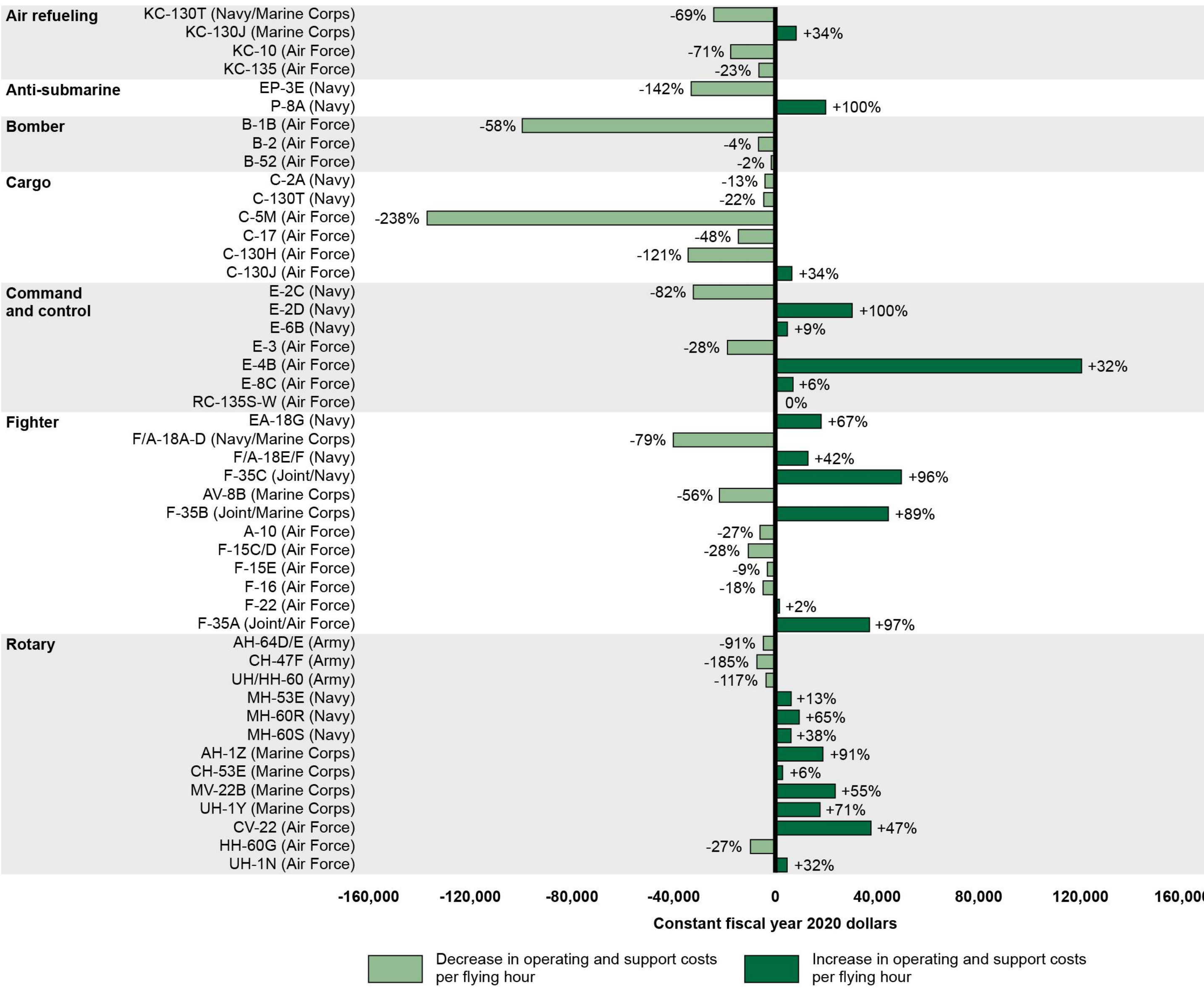
Data table for Figure 10: Total Operating and Support Costs per Flying Hour for Selected Aircraft, Fiscal Year 2020, Constant fiscal year 2020 dollars (in millions)

Aircraft	Maintenance costs per flying hour	Other operating and support costs per flying hour
KC-130T (Navy/Marine Corps)	13886.1	21449.3
KC-130J (Marine Corps)	10303.4	13869
KC-10 (Air Force)	9987.95	14832.8
KC-135 (Air Force)	12281.8	15519.3
EP-3E (Navy)	8302.64	15016.6
P-8A (Navy)	4004.73	15889.9
B-1B (Air Force)	62611.3	110403
B-2 (Air Force)	74087.6	76653.1
B-52 (Air Force)	38271.4	50082.2
C-2A (Navy)	12396.5	18313.7
C-130T (Navy)	8252.6	12398
C-5M (Air Force)	16371.1	41136.7
C-17 (Air Force)	11638.1	18740.3
C-130H (Air Force)	8258.23	20066.1
C-130J (Air Force)	6324.58	12849.1
E-2C (Navy)	19643.5	19483.4
E-2D (Navy)	7676.66	22539
E-6B (Navy)	14679.5	40159.1
E-3 (Air Force)	18508.5	47617.9
E-4B (Air Force)	209086	163410
E-8C (Air Force)	80417.2	39719.3
RC-135S-W (Air Force)	45618.8	49720
EA-18G (Navy)	9054.07	17954.1
F/A-18A-D (Navy/Marine Corps)	26273.1	24537.3
F/A-18E/F (Navy)	13913.6	16490.3
F-35C (Joint/Navy)	9201.92	42164.4
AV-8B (Marine Corps)	21636.8	17392.1
F-35B (Joint/Marine Corps)	13926	36206
A-10 (Air Force)	6671.5	15859.8
F-15C/D (Air Force)	18761.5	19906.7
F-15E (Air Force)	11982.6	21194.8
F-16 (Air Force)	8941.54	17985.8

Aircraft	Maintenance costs per flying hour	Other operating and support costs per flying hour
F-22 (Air Force)	58777.2	26547.9
F-35A (Joint/Air Force)	6794.25	31194.3
AH-64D/E (Army)	3147.6	2023.69
CH-47F (Army)	2116.53	1803.78
UH/HH-60 (Army)	1637.76	1478.33
MH-53E (Navy)	23094.5	25440.6
MH-60R (Navy)	5619.17	8935.72
MH-60S (Navy)	5835.79	10487.8
AH-1Z (Marine Corps)	6550.54	14091.3
CH-53E (Marine Corps)	30095.6	15516
MV-22B (Marine Corps)	20191.2	22576
UH-1Y (Marine Corps)	11050.1	13837
CV-22 (Air Force)	33817.7	46140.8
HH-60G (Air Force)	10691.2	25643.7
UH-1N (Air Force)	6493.37	7960.6

Source: GAO analysis of Army, Navy and Air Force data. | GAO-23-106217

Figure 11: Change in the Total Operating and Support Costs per Flying Hour in Fiscal Years 2011 through 2020 for Selected Aircraft



Source: GAO analysis of Army, Navy, and Air Force data. | GAO-23-106217

Data table for Figure 11: Change in the Total Operating and Support Costs per Flying Hour in Fiscal Years 2011 through 2020 for Selected Aircraft, Constant fiscal year 2020 dollars (in millions)

Aircraft	Change in total operating and support costs per flying hour	Percentage change in total operating and support costs per flying hour
KC-130T (Navy/Marine Corps)	-24245.2	-69
KC-130J (Marine Corps)	8173.42	+34
KC-10 (Air Force)	-17559.6	-71
KC-135 (Air Force)	-6481.56	-23
EP-3E (Navy)	-33091.6	-142
P-8A (Navy)	19806.9	+100
B-1B (Air Force)	-99541.5	-58
B-2 (Air Force)	-6598.96	-4
B-52 (Air Force)	-1610.62	-2
C-2A (Navy)	-4058.51	-13
C-130T (Navy)	-4553.98	-22
C-5M (Air Force)	-136989	-238
C-17 (Air Force)	-14574.7	-48
C-130H (Air Force)	-34307.9	-121
C-130J (Air Force)	6489.71	+34
E-2C (Navy)	-32260	-82
E-2D (Navy)	30215.7	+100
E-6B (Navy)	4723.14	+9
E-3 (Air Force)	-18835.6	-28
E-4B (Air Force)	120450	+32
E-8C (Air Force)	6986.59	+6
RC-135S-W (Air Force)	69.58	0
EA-18G (Navy)	18008.7	+67
F/A-18A-D (Navy/Marine Corps)	-40136	-79
F/A-18E/F (Navy)	12832.4	+42
F-35C (Joint/Navy)	49563.5	+96
AV-8B (Marine Corps)	-22013.9	-56
F-35B (Joint/Marine Corps)	44427.7	+89
A-10 (Air Force)	-6059.11	-27
F-15C/D (Air Force)	-10646.8	-28

Aircraft	Change in total operating and support costs per flying hour	Percentage change in total operating and support costs per flying hour
F-15E (Air Force)	-3147.04	-9
F-16 (Air Force)	-4806.07	-18
F-22 (Air Force)	1628.89	+2
F-35A (Joint/Air Force)	37019.4	+97
AH-64D/E (Army)	-4702.78	-91
CH-47F (Army)	-7250.54	-185
UH/HH-60 (Army)	-3654.2	-117
MH-53E (Navy)	6219.65	+13
MH-60R (Navy)	9413.03	+65
MH-60S (Navy)	6158.17	+38
AH-1Z (Marine Corps)	18720.2	+91
CH-53E (Marine Corps)	2837.79	+6
MV-22B (Marine Corps)	23569.2	+55
UH-1Y (Marine Corps)	17612	+71
CV-22 (Air Force)	37633.4	+47
HH-60G (Air Force)	-9810.33	-27
UH-1N (Air Force)	4656.05	+32

Source: GAO analysis of Army, Navy and Air Force data. | GAO-23-106217

Sustainment Quick Looks for Selected DOD Aircraft

This section contains 45 Sustainment Quick Looks that provide information on 49 DOD aircraft.[42] Some of the Quick Looks cover multiple aircraft that are similar but have separate goals and are reported separately by DOD and the military services. These Quick Looks are broken out into the following mission areas for aircraft: air refueling, anti-submarine, bomber, cargo, command and control, fighter, and rotary. Each Sustainment Quick Look presents information and data on the life cycle, sustainment strategy, availability and condition, O&S costs, and sustainment challenges for the aircraft. To develop these Quick Looks, we collected information and data on each aircraft from the program offices and the military departments, obtained and reviewed agency

[42]When an aircraft is operated by more than one service, such as the F-35A/B/C, we include only one Sustainment Quick Look.

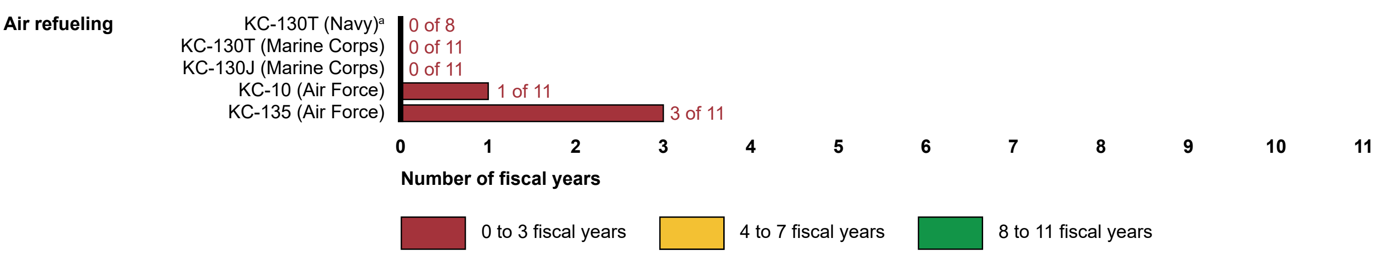
documents, and interviewed program and military department officials. Specific details on mission capable and not mission capable rates were omitted because the information was deemed by DOD to be sensitive.

Air Refueling Aircraft


KC-130J Super Hercules

Source: U.S. Marine Corps/Lance Cpl. Seth Rosenberg. | GAO-23-106217

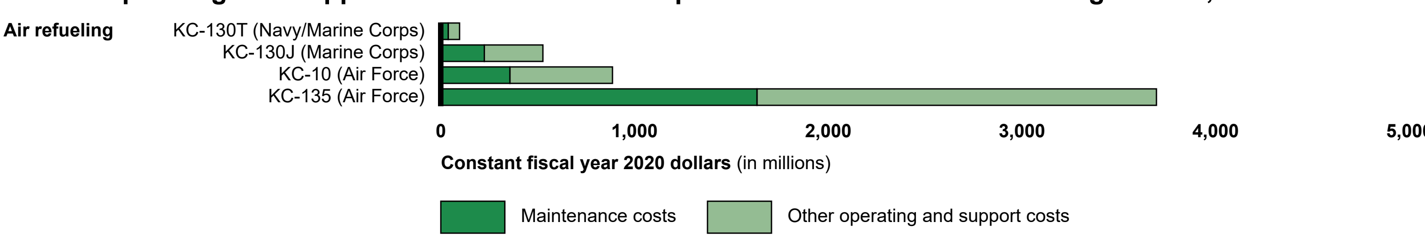
Number of Years Selected Aircraft Met Their Annual Mission Capable Goal, Fiscal Years 2011 through 2021



Source: GAO analysis of Navy and Air Force data. | GAO-23-106217

[a]For this aircraft, the military department did not provide a mission capable goal for all eleven years.

Annual Operating and Support Costs for Selected Department of Defense Air Refueling Aircraft, Fiscal Year 2020



Source: GAO analysis of Navy and Air Force data. | GAO-23-106217

KC-130T
Hercules

Program Essentials

Lead Service
Navy

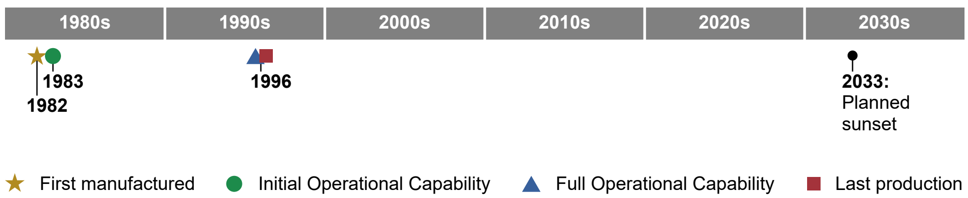
Manufacturer
Lockheed Martin

Program Office
Program Manager – Air 207, Naval Air Systems Command, Patuxent River, Maryland

Sustainment
The Air Force's Ogden Air Logistics Complex performs depot maintenance. Navy personnel conduct field maintenance.

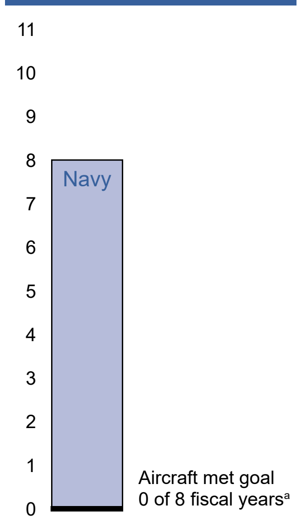
The KC-130T Hercules is a multimission medium-lift transport aircraft capable of intratheater and intertheater airlift operations, including support operations for forward-deployed naval forces, transporting personnel and cargo for delivery in-flight via parachute or landing.

KC-130T Life Cycle Timeline

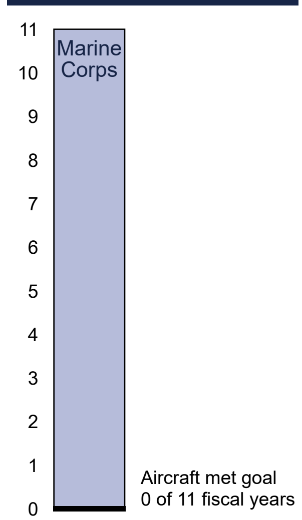


KC-130T Sustainment Status

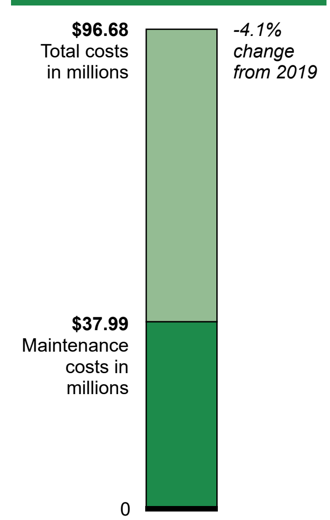
Mission capable rate
Fiscal years met goal



Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

12 total aircraft
Fiscal year 2020

31.9 years
Average aircraft age in fiscal year 2021

Flying hours

2,736 flying hours
Fiscal year 2020

9,689 hours
Average lifetime flying hours per aircraft in fiscal year 2021

Operating and support costs per aircraft and flying hour
Fiscal year 2020

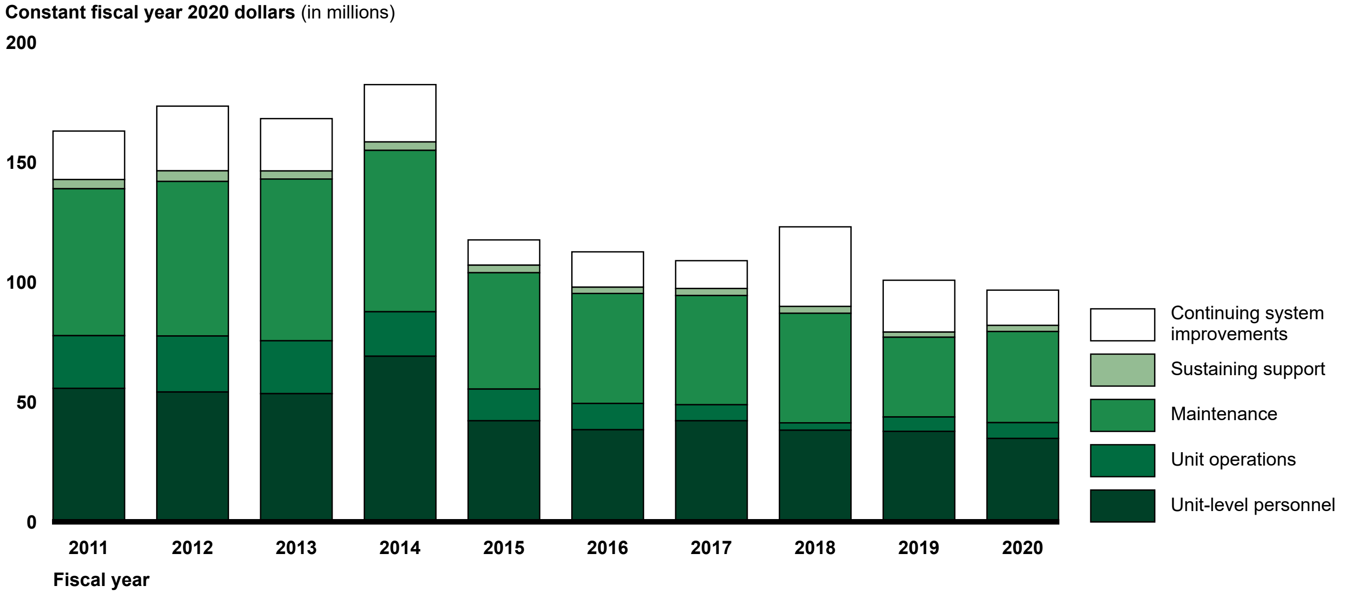
$8.06 million
Total costs per aircraft

$35,335
Total costs per flying hour
-29.2% change from 2019

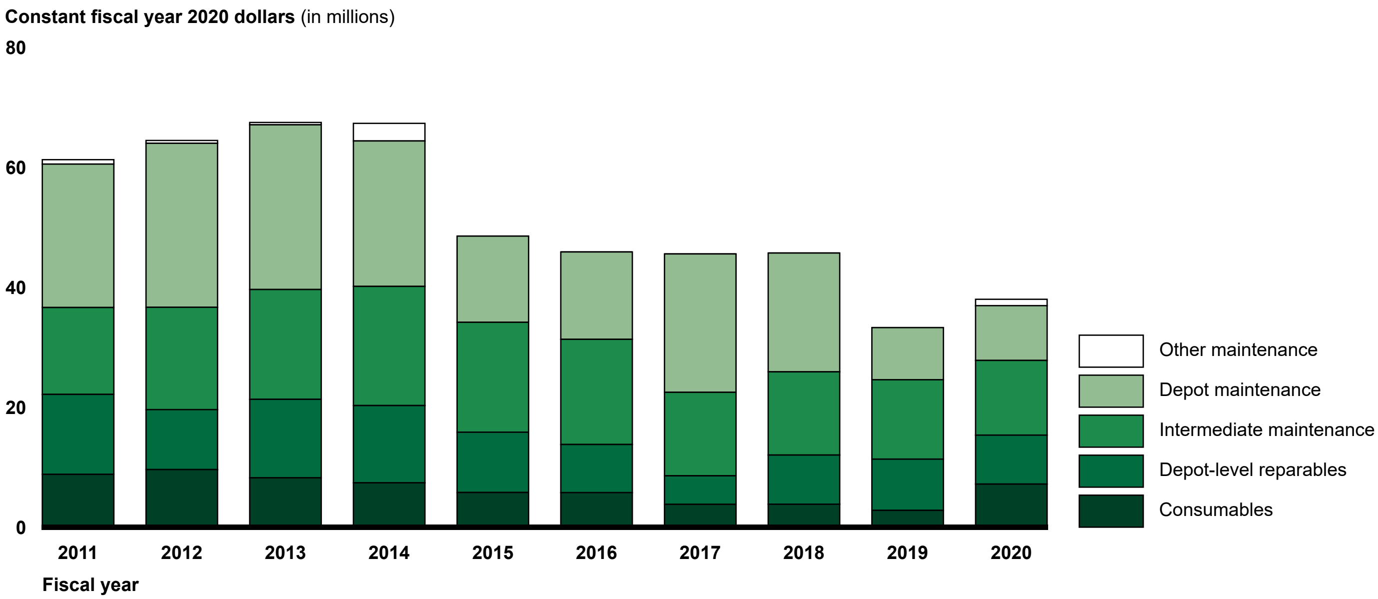
[a]For this aircraft, the military department did not provide a mission capable goal for all eleven years.

Operating and Support Costs

KC-130T Total Operating and Support Costs

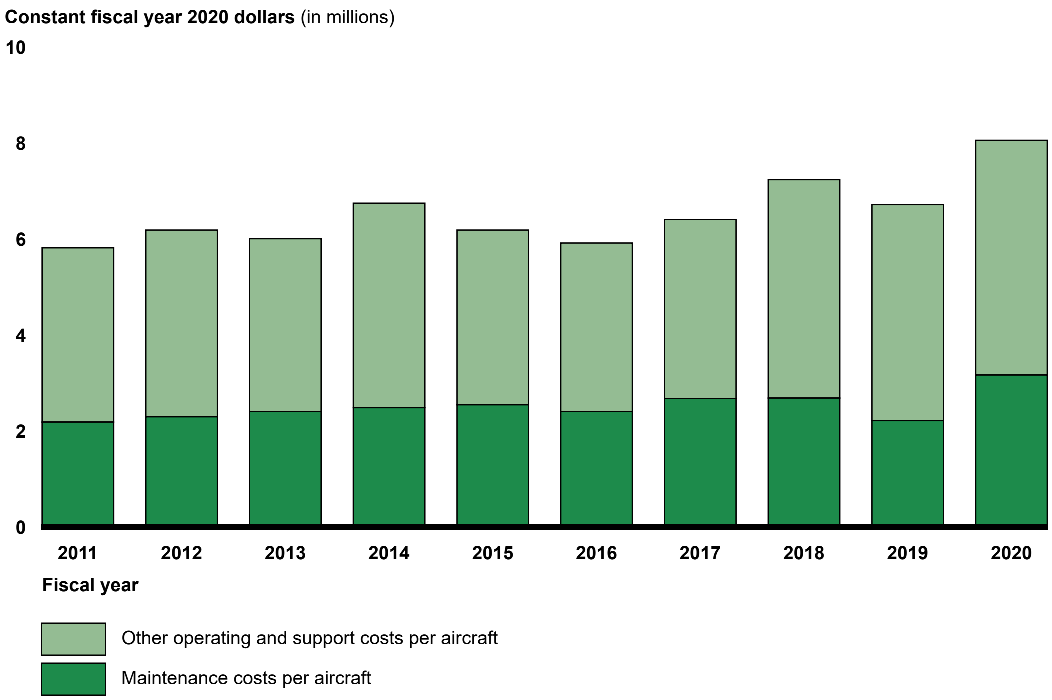


KC-130T Maintenance Costs

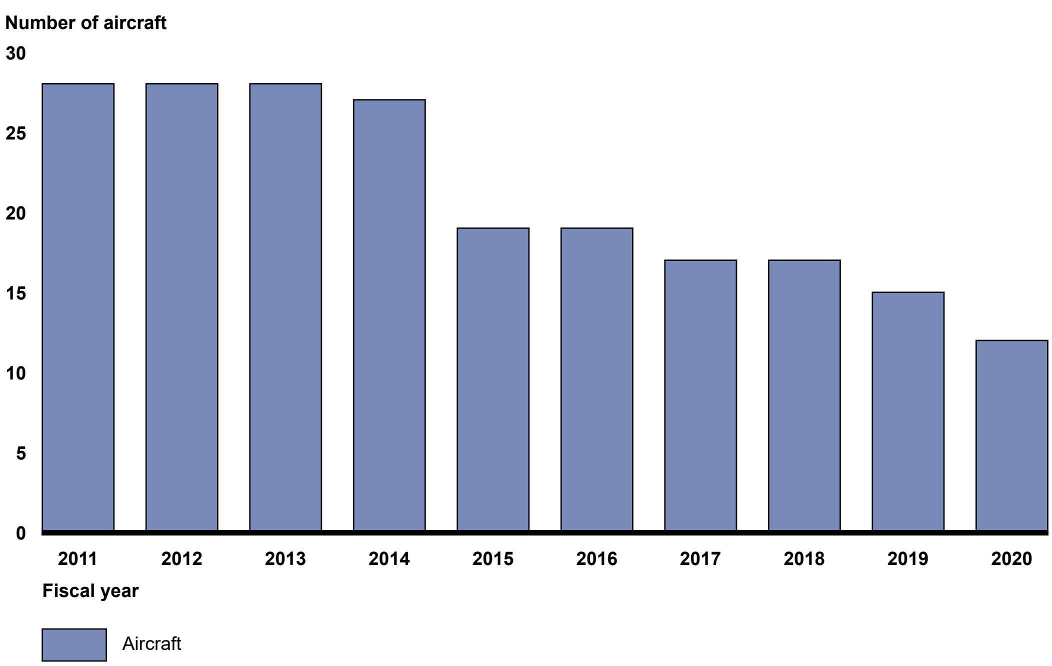


Operating and Support Costs per Aircraft

KC-130T Operating and Support Costs per Aircraft

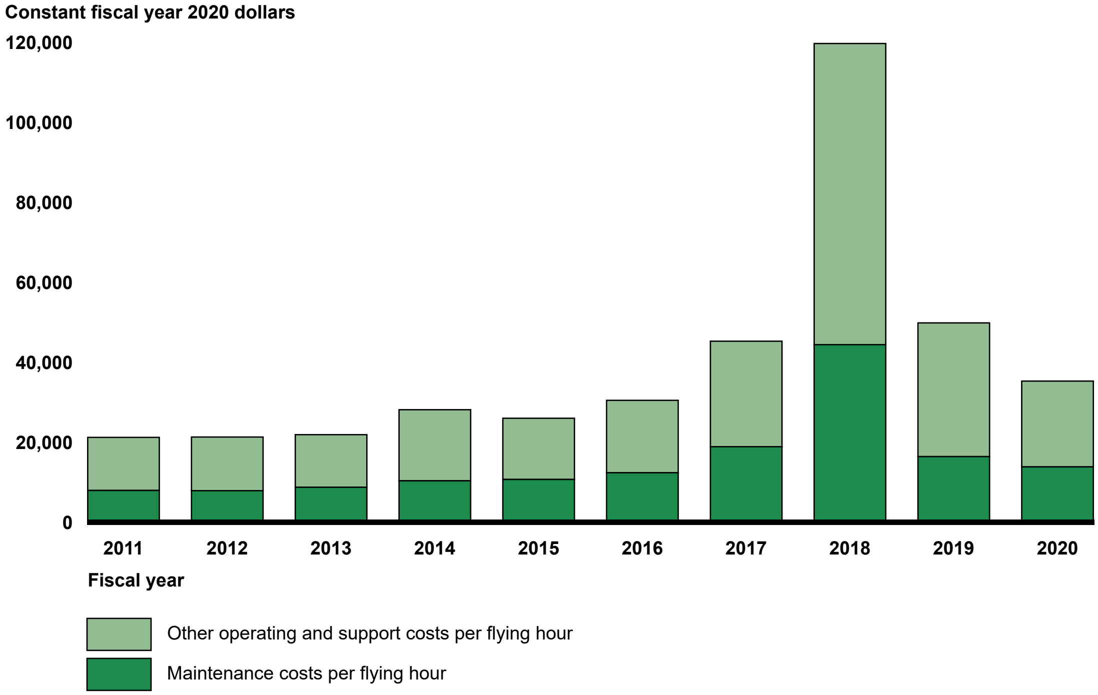


KC-130T Fleet Size

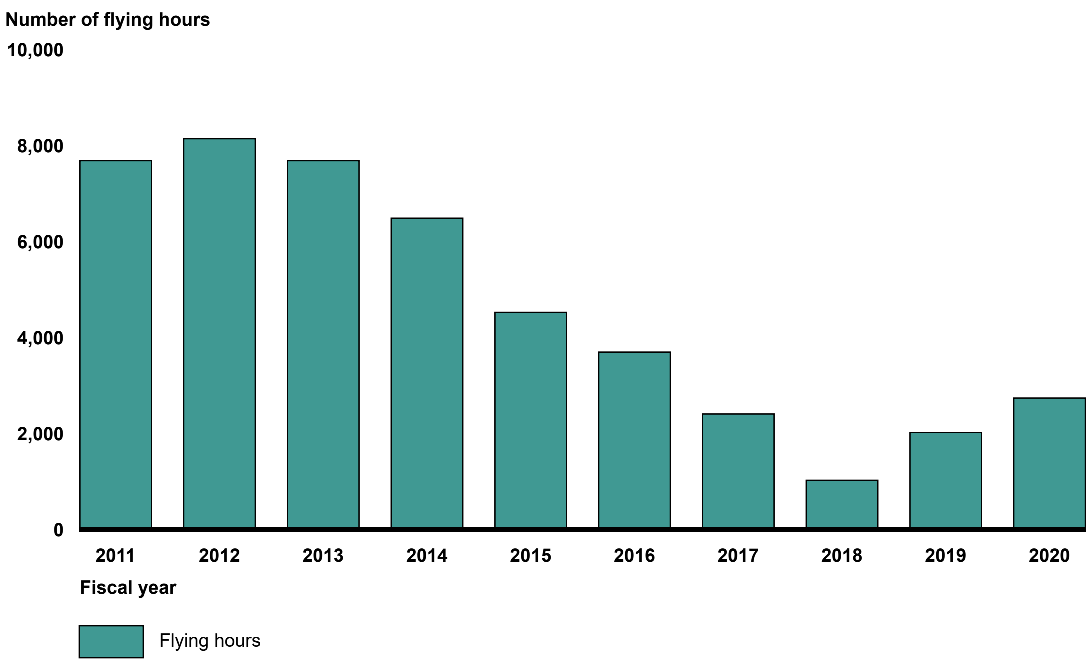


Operating and Support Costs per Flying Hour

KC-130T Operating and Support Costs per Flying Hour



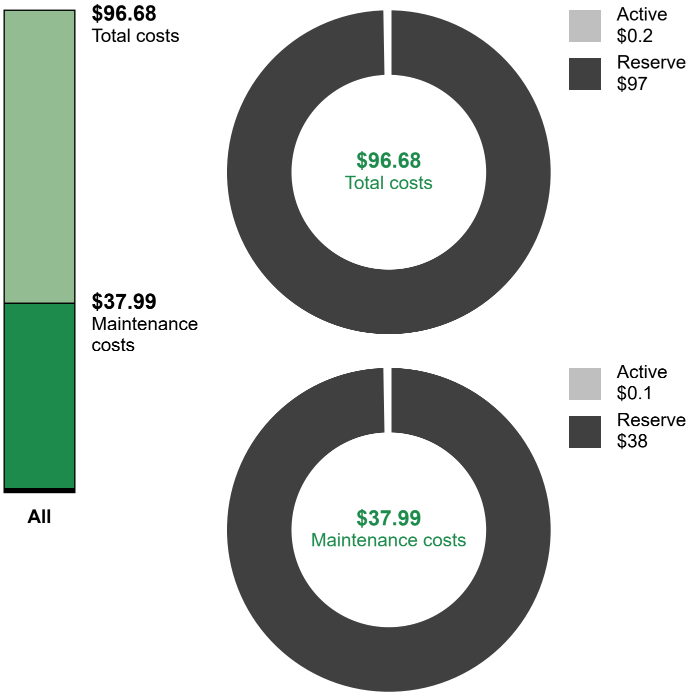
KC-130T Flying Hours



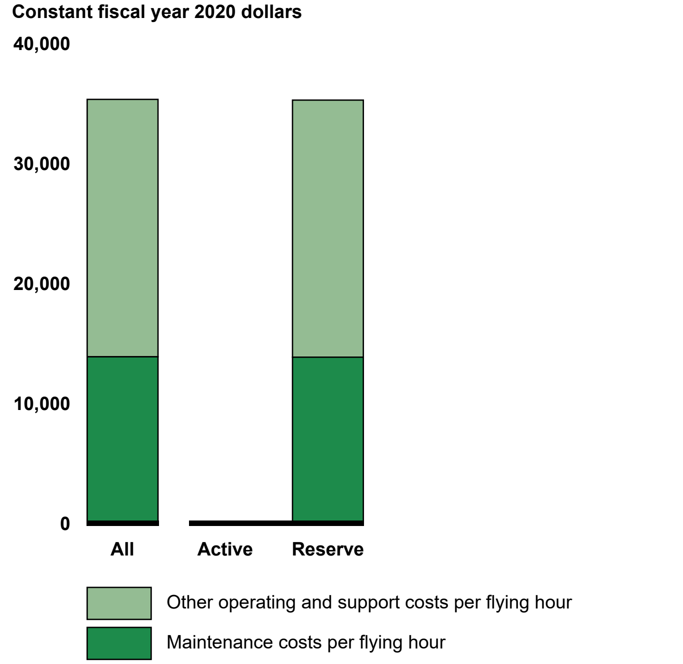
Component-Level Operating and Support Costs

KC-130T Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The KC-130T is a variant of the Air Force's commercially developed C-130 Hercules transport aircraft and the fleet shares a support infrastructure with other C-130 variants. The C-130T and KC-130T airframe and structural components are approximately 80-percent common with the KC-130J. The Air Force's Ogden Air Logistics Complex in Utah performs depot maintenance on the KC-130T. Navy personnel conduct fleet maintenance at squadron locations. The Marine Corps divested all KC-130T aircraft in 2021.

KC-130T Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Aging: According to program officials, the KC-130T has undergone a series of modifications to replace or enhance aging components. The officials provided the following examples:

- An upgrade of the legacy four-blade propeller system with an eight-blade, high-thrust composite blade system is scheduled to be completed in 2023; and
- An effort to modernize the KC-130T's steel brake system with carbon brakes that are designed to provide enhanced safety and maintainability at a reduced weight is planned to be completed in 2022.

Maintenance: The KC-130T has experienced a high rate of not mission capable maintenance primarily due to long turnaround times for scheduled maintenance, according to program officials. They attributed the long turnaround times primarily to the program's outdated sustainment baseline that does not reflect the current maintenance needs of the aircraft. A program official explained that the sustainment baseline consists of the aircraft configuration baseline and the Reliability-Centered Maintenance baseline. The Reliability-Centered Maintenance baseline, according to the official, defines the fundamental periodic maintenance tasks and inspections, and sets the frequencies of those tasks and inspections based on the known or calculated reliability of components.

Further, program officials stated that the lack of a current sustainment baseline adversely affected the program office's ability to identify, evaluate, and take actions regarding changes in aircraft and support system performance as the changes occurred. According to program officials, the failure rates in the KC-130T's baseline were not adequately maintained and updated after changes to aircraft operating techniques or to reflect the increasing age of the aircraft, for example. They stated that the program's funding levels for such updates—and other program-related logistics activities—were less than the amounts required.

The program is pursuing updated sustainment baselines for all of the Navy/Marine Corps C-130 variants, according to program officials. They stated that significant elements of the baselines are nearing completion, most particularly for KC-130J, but work remains to be done for C-130T and KC-130T baselines. While the program officials said that progress on these sustainment baselines continues, it has slowed due to resourcing constraints and priorities, and the baseline completion dates will be dependent on resourcing.

The commonality between the KC-130T, C-130T and the KC-130J airframes will allow for some extrapolation of KC-130J sustainment data for common aircraft elements to the other baselines, according to program officials. For example, they said that the available baseline data for the KC-130J has informed proposed changes to the maintenance baseline for all C-130 variants, including:

- updating and extending fleet and depot maintenance intervals;
- improving retail supply posture; and
- increasing organizational-level maintenance speed and effectiveness.

The officials also stated the program office began a scheduled maintenance optimization effort in 2021 for the C-130T and KC-130T. They said that the effort is expected to reduce the overall amount of time for scheduled maintenance by expanding the intervals in between inductions and by reducing inspection requirements. According to the officials, the scheduled maintenance optimization strategy and execution plan are complete. They said that implementation is planned for the first quarter of fiscal year 2023 and it will include maintenance schedule changes to all Navy and Marine Corps variants.

Finally, the program has also experienced depot production instability as the Air Force moved Navy C-130 maintenance from Ogden Air Logistics Complex to Warner Robins Air Logistics Complex, and back, over a 4-year period (2017 through 2021), according to program officials. They stated that the moves resulted in turnaround time increases, quality issues and cost growth. The officials said that the program utilized commercial depot repair contracts during the 4-year time frame to mitigate depot throughput risks and meet the fleet's demands.

Supply Support: According to program officials, supply challenges continued to affect the KC-130T fleet's overall readiness. The officials said that, due to the lack of a current sustainment baseline, the program has experienced unanticipated and unplanned demand signals that resulted in parts shortages and delays. The shortages and delays occurred because the unanticipated demands:

- required parts that were not previously carried in inventory;
- increased the consumption of stocked parts beyond the program's replenishment allowances; or
- reduced the inventory amounts of parts below the established safety stock levels.

According to officials, the program's ongoing efforts to update the sustainment baseline will result in updated failure rates and frequencies for components and parts that will be used to update the related supply data to reduce unanticipated or unplanned demand signals.

The officials also said that back orders of parts and components increased in fiscal years 2020 and 2021 due to the effects of the COVID-19 pandemic and multi-service priority conflicts. They stated that they plan to mitigate additional increases and reduce the rate of not mission capable supply with close collaboration for multi-service supported components and by improving critical item list allowance levels across the KC-130T fleet.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

KC-130J
Super Hercules

Program Essentials

Lead Service
Marine Corps

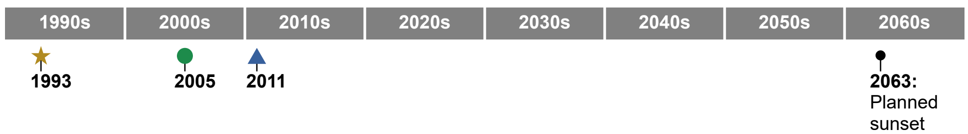
Manufacturer
Lockheed Martin

Program Office
Program Manager – Air 207, Naval Air Systems Command, Patuxent River, Maryland

Sustainment
The Air Force's Ogden Air Logistics Complex, Marshall Aerospace, and Cascade Aerospace perform depot maintenance. Marine Corps personnel predominately perform organizational maintenance.

The KC-130J is an assault support platform that provides air-to-air refueling, tactical troop transport, aerial delivery of personnel and cargo, medical evacuation, multi-sensor image reconnaissance, and close-air support capabilities.

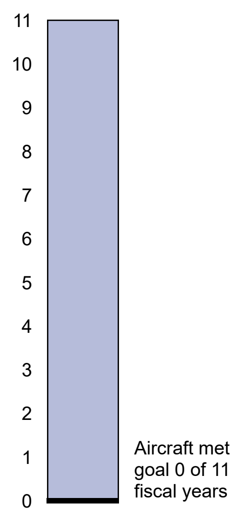
KC-130J Life Cycle Timeline



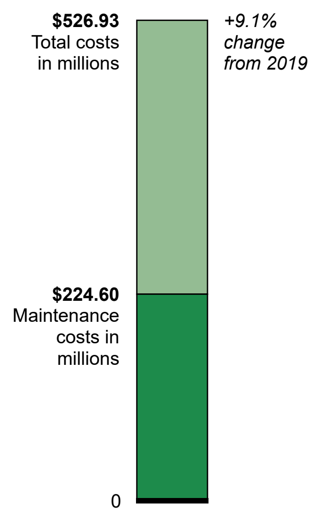
★ First manufactured ● Initial Operational Capability ▲ Full Operational Capability ■ Last production

KC-130J Sustainment Status

Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

56 total aircraft
Fiscal year 2020

11.7 years
Average aircraft age in fiscal year 2021

Flying hours

21,799 flying hours
Fiscal year 2020

6,064 hours
Average lifetime flying hours per aircraft in fiscal year 2021

Operating and support costs per aircraft and flying hour
Fiscal year 2020

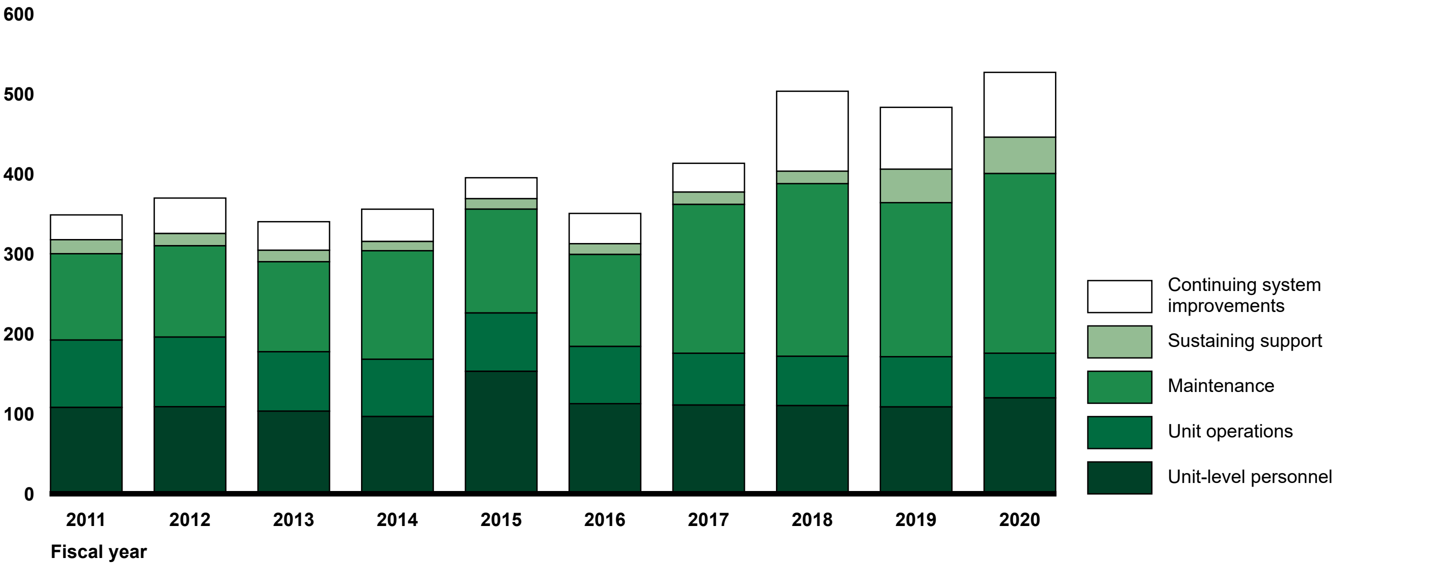
$9.41 million
Total costs per aircraft

$24,172
Total costs per flying hour
+16.7% change from 2019

Operating and Support Costs

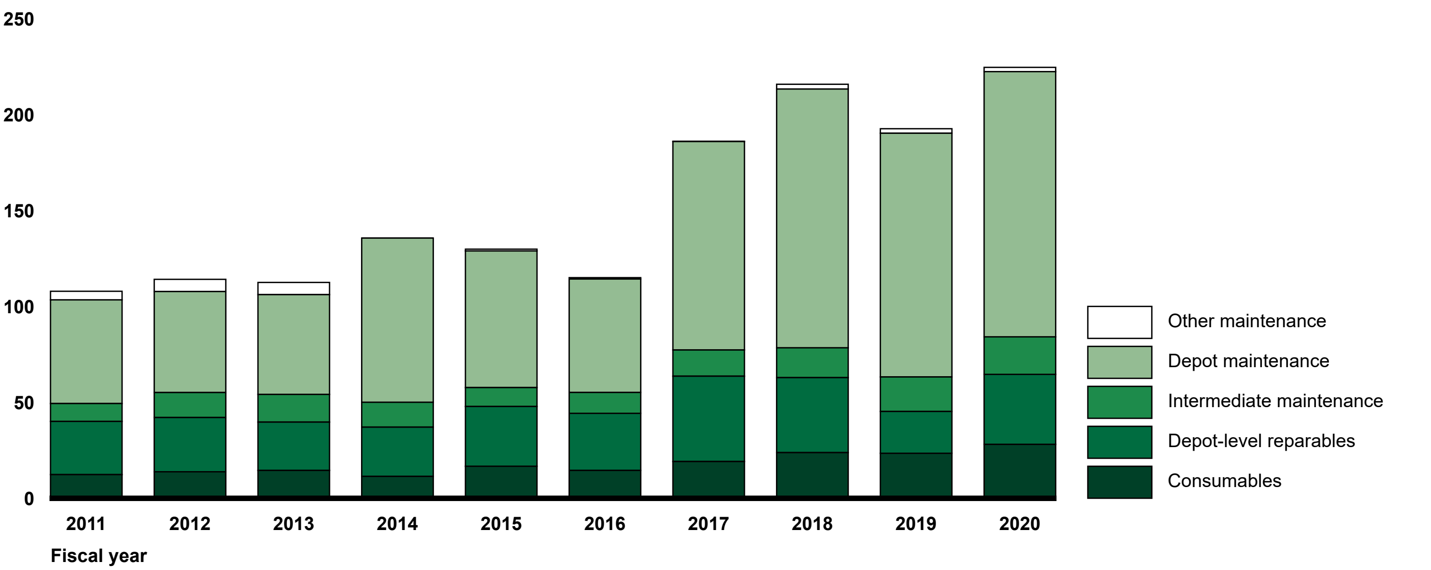
KC-130J Total Operating and Support Costs

Constant fiscal year 2020 dollars (in millions)



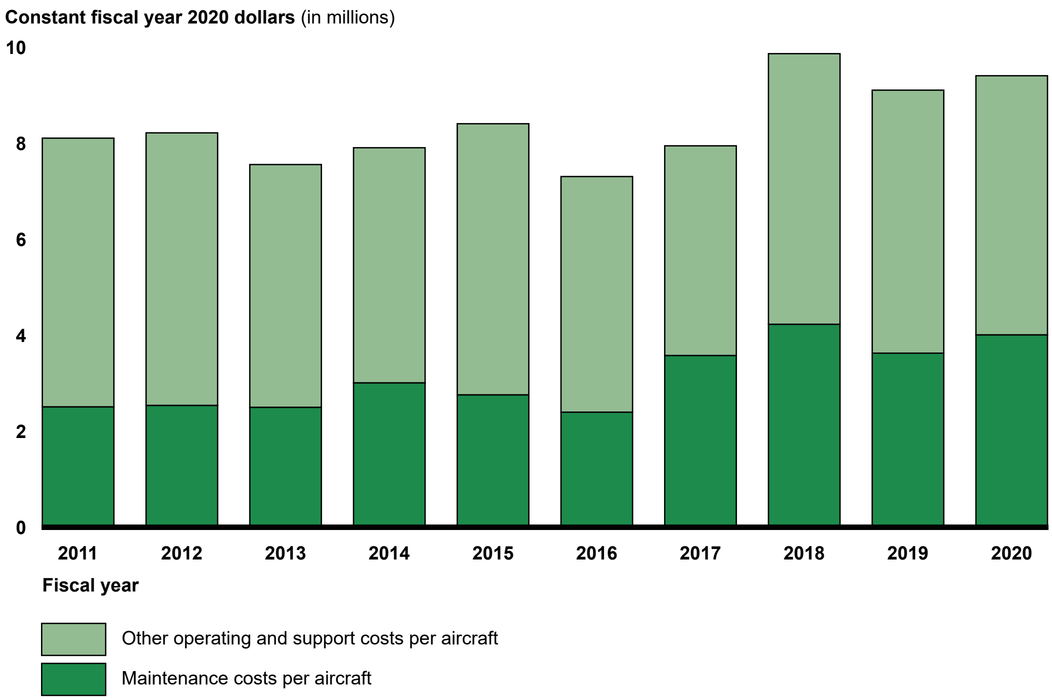
KC-130J Maintenance Costs

Constant fiscal year 2020 dollars (in millions)

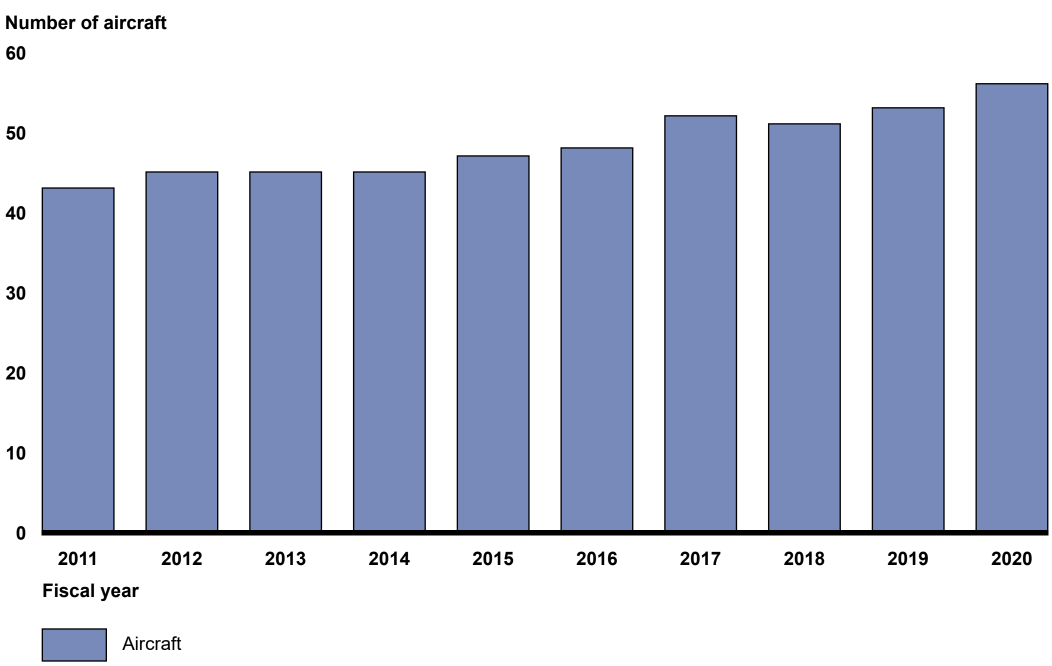


Operating and Support Costs per Aircraft

KC-130J Operating and Support Costs per Aircraft

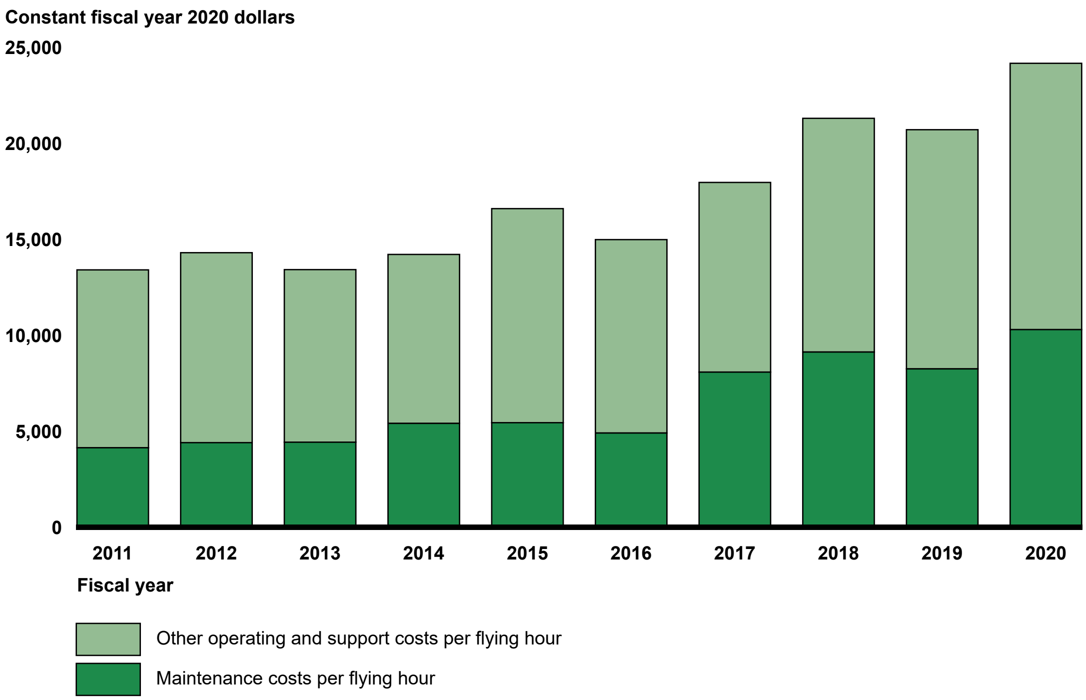


KC-130J Fleet Size

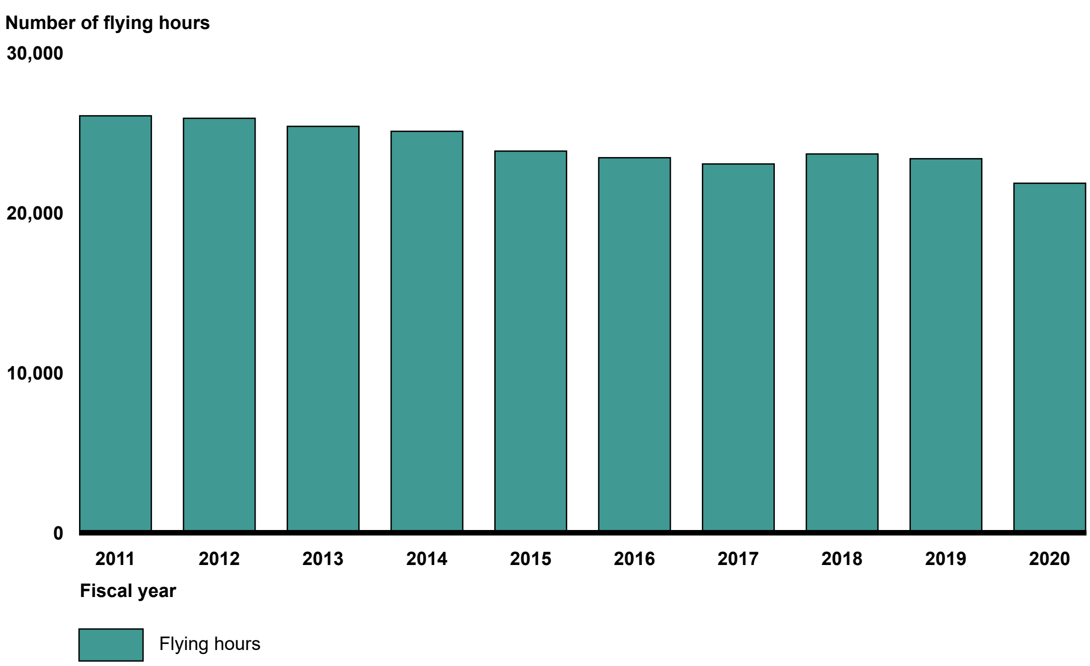


Operating and Support Costs per Flying Hour

KC-130J Operating and Support Costs per Flying Hour



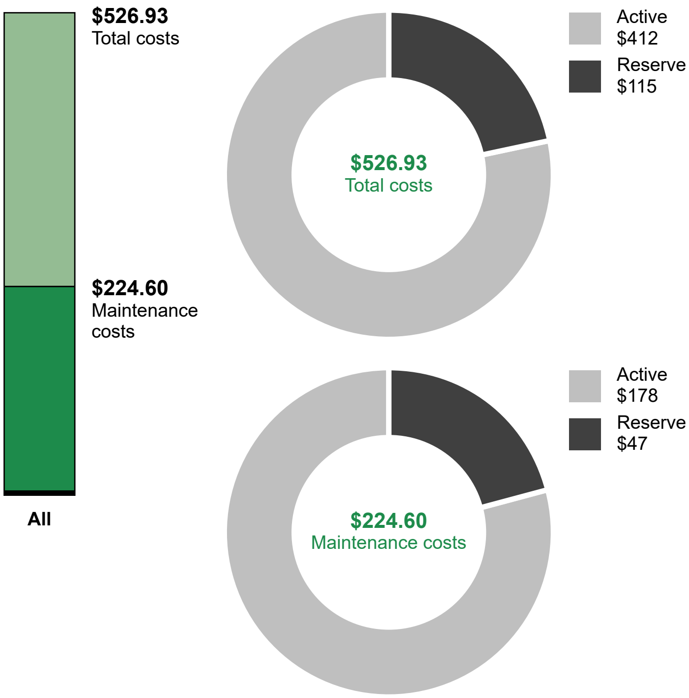
KC-130J Flying Hours



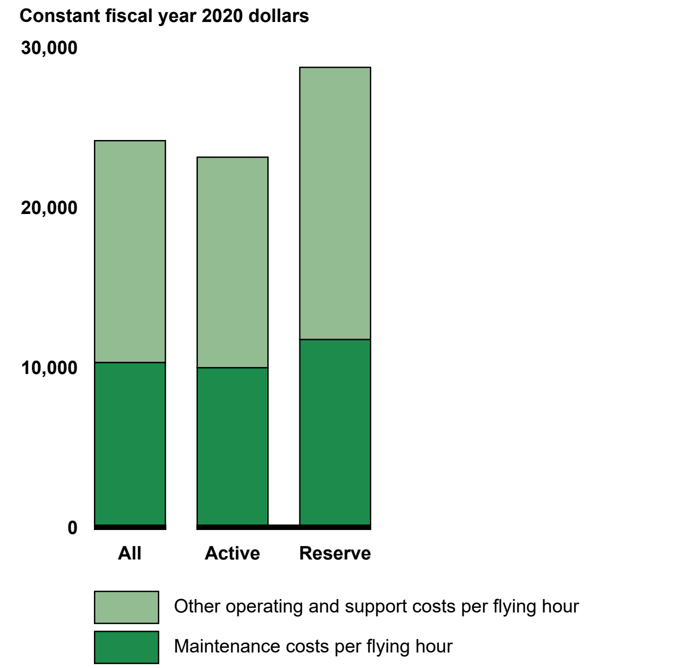
Component-Level Operating and Support Costs

KC-130J Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The KC-130J is nearly identical to the Air Force's commercially developed C-130J Super Hercules, with the exception being the mission peculiar equipment, and the fleet shares a support infrastructure with other C-130 variants. Approximately 80 percent of the KC-130J airframe and components are common with the legacy C-130T and KC-130T. Depot maintenance on the KC-130J is performed by the Air Force's Ogden Air Logistics Complex in Utah, Marshall Aerospace in the United Kingdom, and Cascade Aerospace in Canada. Marine Corps personnel predominately perform fleet maintenance.

KC-130J Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Maintenance: Program officials stated that the lack of access to the technical data necessary to sustain the KC-130J is a challenge. According to the 2019 KC-130J life cycle sustainment plan, when the C-130J fleet of aircraft was procured in the 1990s, the Air Force purchased minimal technical data, which was consistent with the general commercial procurement approach that the federal government emphasized at the time.

The 2019 KC-130J life cycle sustainment plan states that all of the design and engineering data associated with the basic C-130J and its variants, such as the KC-130J, that were procured commercially, including peculiar systems, parts and components, are proprietary to Lockheed Martin and/or its suppliers.

As a result, Lockheed Martin retains commercial proprietary rights to the basic C/KC-130J aircraft and resident systems, according to the KC-130J life cycle sustainment plan, and government access to the data that is required to design, manufacture, and sustain the KC-130J is limited, including the re-procurement data that would allow the government to procure repairs and services in a competitive environment.

Program officials said that the lack of access to technical data has hindered the program's ability to analyze and resolve sustainment issues, particularly after the KC-130J transitioned to sustainment by the government. The Systems Engineering and Logistics Support Services contract with Lockheed Martin is the primary ongoing effort to mitigate the program's limited access to technical data, according to program officials.

The KC-130J has also experienced long turnaround times for scheduled maintenance, according to program officials. They attributed the turnaround times primarily to the program's lack of sustainment baseline that reflects the current maintenance needs of the aircraft. Further, program officials stated that the lack of a current sustainment baseline adversely affected the program office's ability to identify, evaluate, and take actions regarding changes in aircraft and support system performance as the changes occurred. The program officials stated that the program's funding levels for such updates—and other program-related logistics activities—were less than the amounts required.

According to program officials, the program is pursuing updated sustainment baselines for all of the Navy/Marine Corps C-130 variants. Program officials stated that significant elements of the baselines are nearing completion, most particularly for KC-130J, but work remains to be done for C-130T and KC-130T baselines. While the officials said that progress on these sustainment baselines continues, it has slowed due to resourcing constraints and priorities, and the baseline completion dates will be dependent on resourcing.

The commonality between the KC-130T, C-130T and the KC-130J airframes will allow for some extrapolation of KC-130J sustainment data for common aircraft elements to the other baselines, according to program officials. Further, officials said that the available baseline data for the KC-130J has also informed positive change proposals to the maintenance baseline for all C-130 variants. For example, officials told us the proposed changes include:

- updating and extending fleet and depot maintenance intervals;
- improving retail supply posture; and
- increasing organizational-level maintenance velocity and effectiveness.

Other maintenance challenges have also recently affected the KC-130J, according to program officials. For example, officials told us that a large number of aircraft in the depot further increased phase inspection turn-around times.

To mitigate these challenges, the officials stated that the program had taken, or is currently taking, several actions:

- Depot specification updates were delivered in fiscal year 2020 that supported some reductions in depot inspection requirements.
- The program began to use commercial depot facilities in fiscal year 2021, which allowed for demand stabilization at the Air Force's Ogden Air Logistics Complex and facilitated Ogden's implementation of turn-around time efficiencies, showing benefits in the same fiscal year.
- Other actions that are underway as part of the Program's Return to Readiness and its Reliability Control Board efforts, and include additional changes to depot and phase inspection requirements, interval extensions, and further investigation of alternative commercial repair facilities.

Supply Support: Program officials stated that the KC-130J has experienced parts shortages and delays from an increase in turnaround time for component repair and an increase in back orders due to several factors, including the COVID-19 pandemic and multi-service priority conflicts. They stated that they plan to mitigate additional increases with close collaboration for multi-service supported components and by improving critical item list allowance levels across the KC-130J fleet.

According to program officials, supply challenges continued to affect the KC-130J fleet's overall readiness. Officials shared examples of several challenges, including:

- Due to the lack of a current sustainment baseline, the program experienced unanticipated and unplanned demand signals that:
  - resulted in parts shortages and delays due to demands for parts that were not previously carried in inventory;
  - increased consumption of stocked items beyond the program's replenishment allowances; and
  - reductions in the inventory amounts of items below the established safety stock levels.

The officials said that these situations were generally the result of the lack of a current sustainment baseline. The program's ongoing efforts to update the KC-130J sustainment baseline will result in updated failure rates and frequencies for components and parts, which will reduce the number of situations that occur that result in unanticipated or unplanned demand signals, according to program officials.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

KC-10
Extender

Program Essentials

Lead Service
Air Force

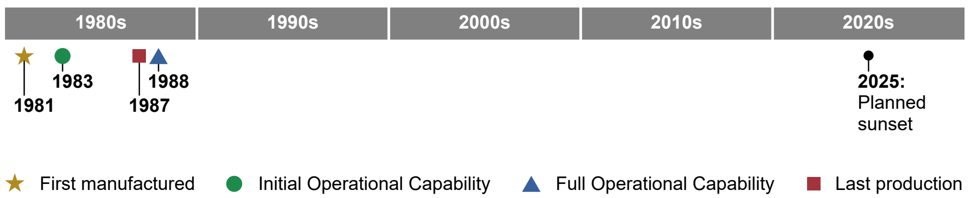
Manufacturer
Boeing

Program Office
Tinker Air Force Base, Oklahoma

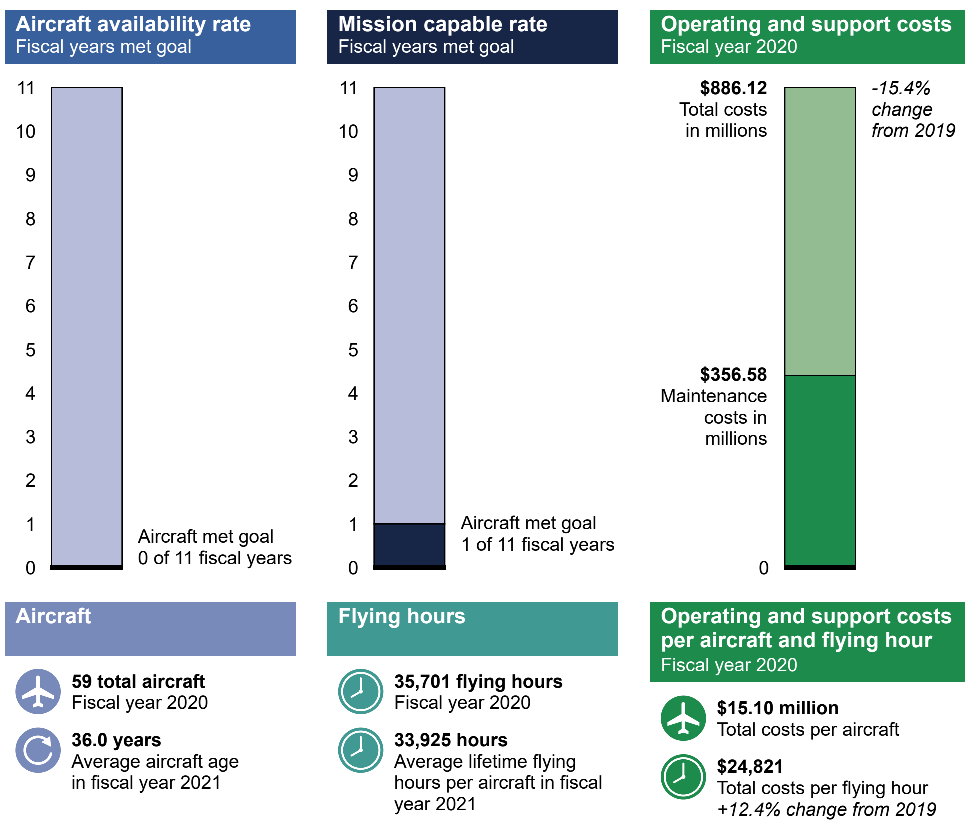
Sustainment
A contractor performs depot maintenance, according to program officials. Air Force personnel perform organizational maintenance, with support from contractors.

The KC-10 Extender is a tanker and cargo aircraft that can refuel aircraft and transport support personnel and equipment on overseas deployments. The KC-10 is also capable of transporting ambulatory patients during aeromedical evacuations.

KC-10 Life Cycle Timeline



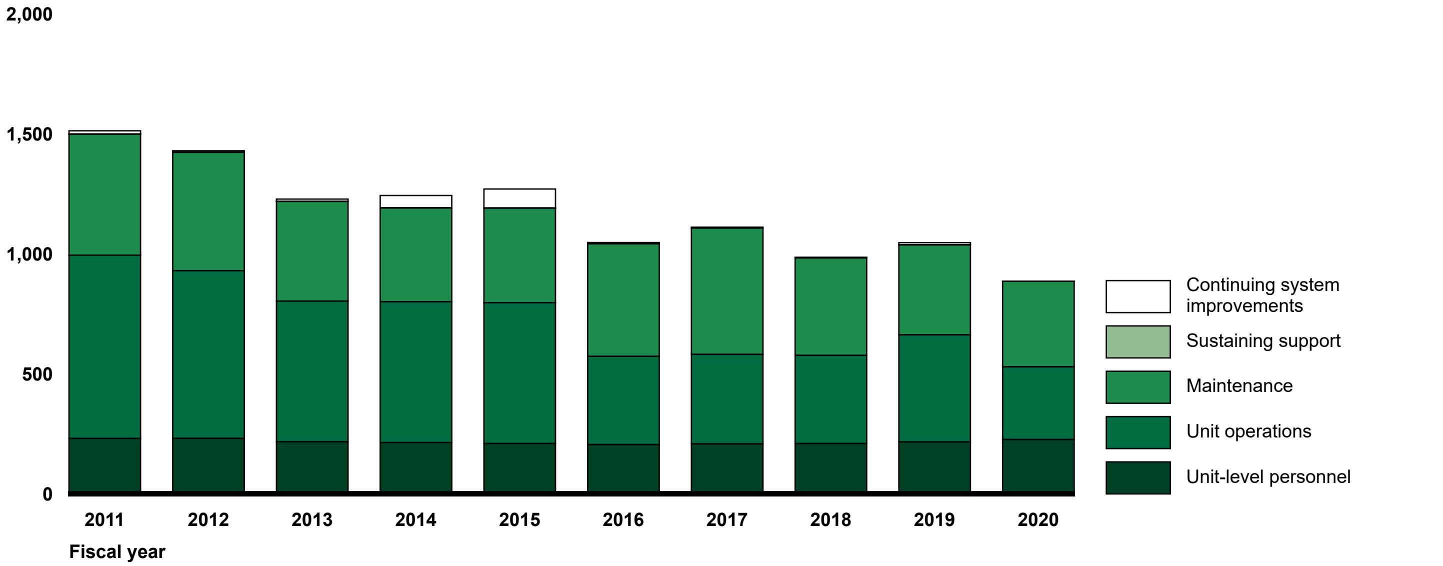
KC-10 Sustainment Status



Operating and Support Costs

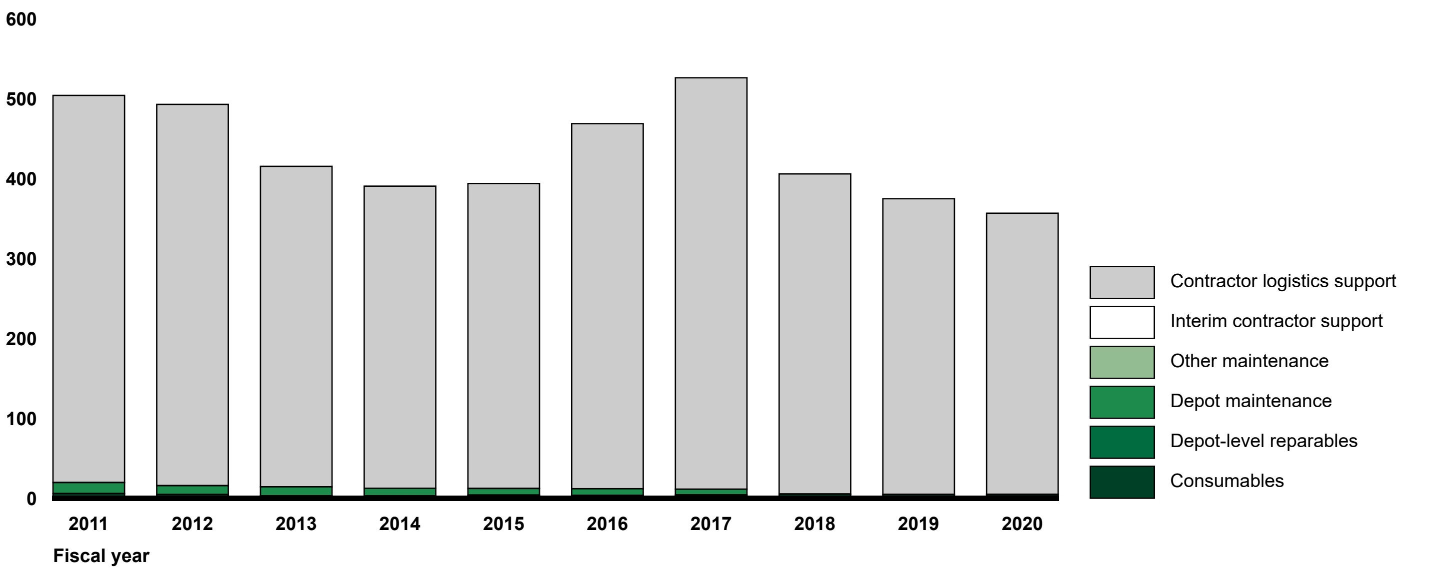
KC-10 Total Operating and Support Costs

Constant fiscal year 2020 dollars (in millions)



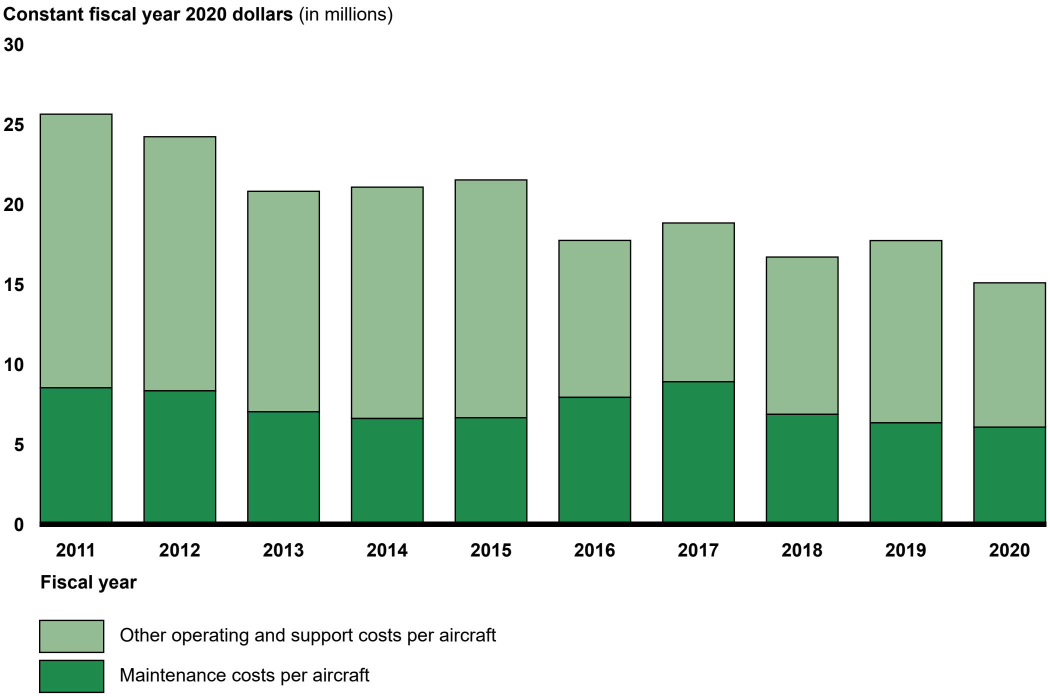
KC-10 Maintenance Costs

Constant fiscal year 2020 dollars (in millions)

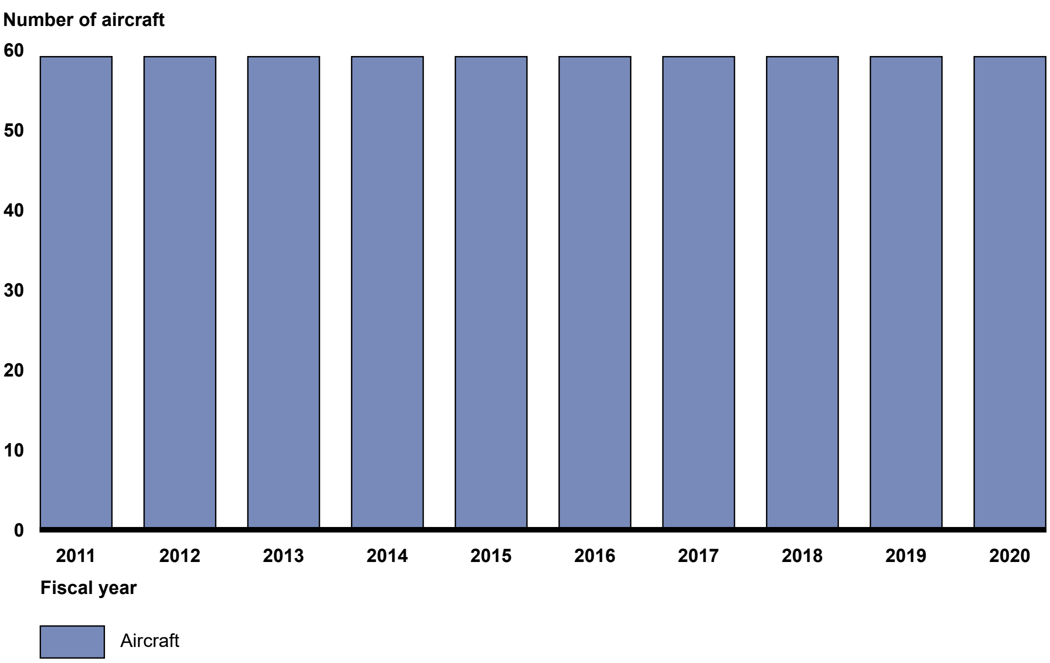


Operating and Support Costs per Aircraft

KC-10 Operating and Support Costs per Aircraft

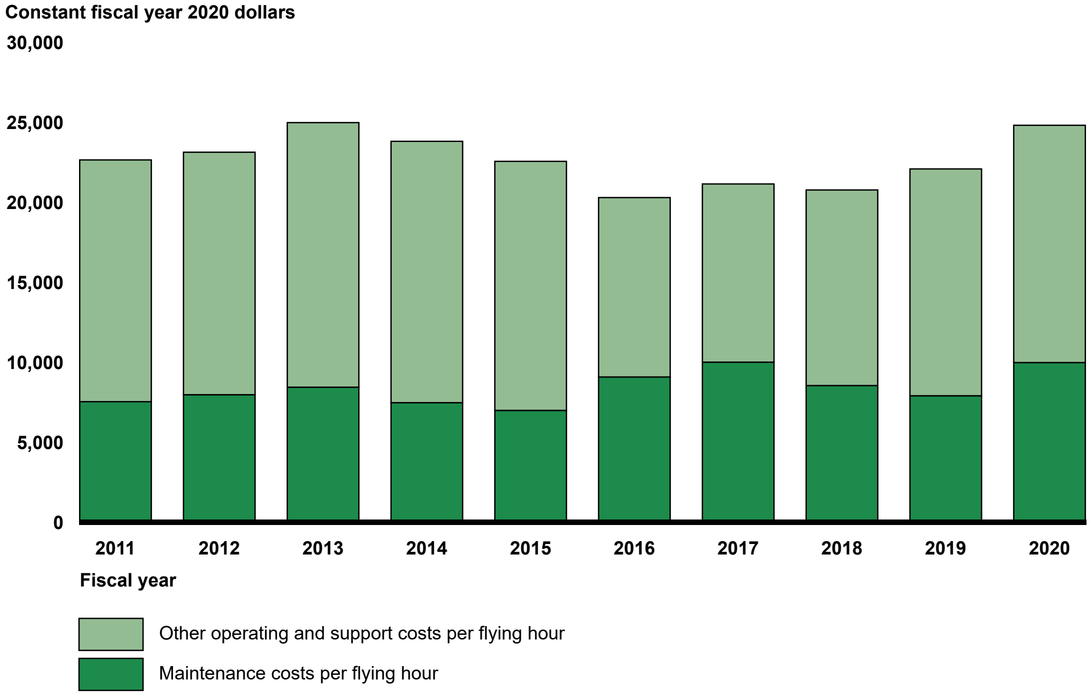


KC-10 Fleet Size

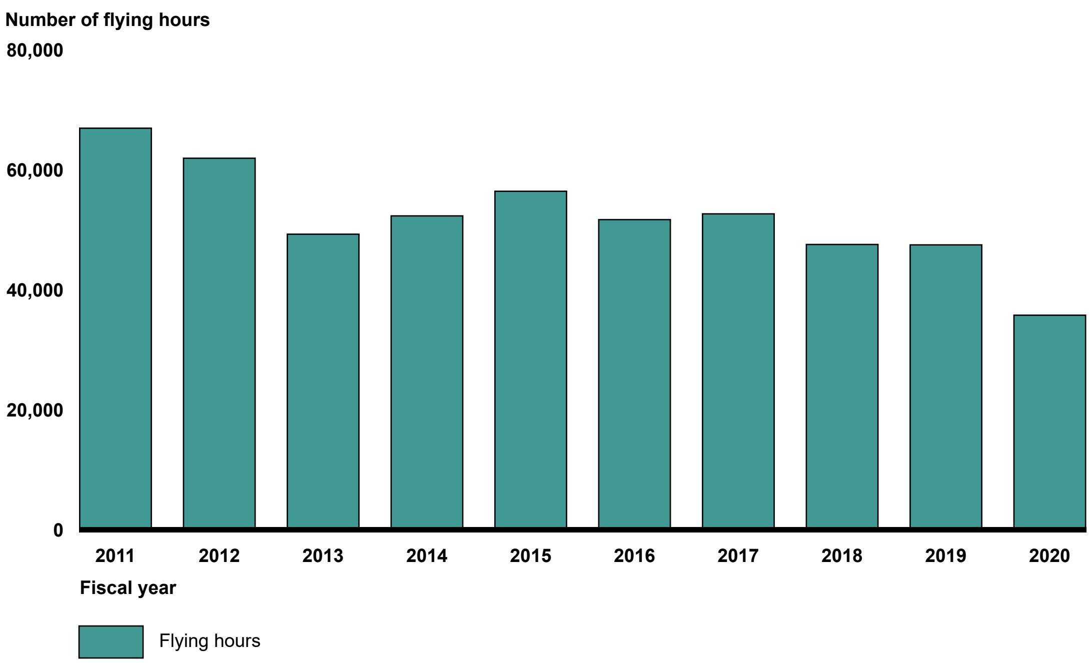


Operating and Support Costs per Flying Hour

KC-10 Operating and Support Costs per Flying Hour



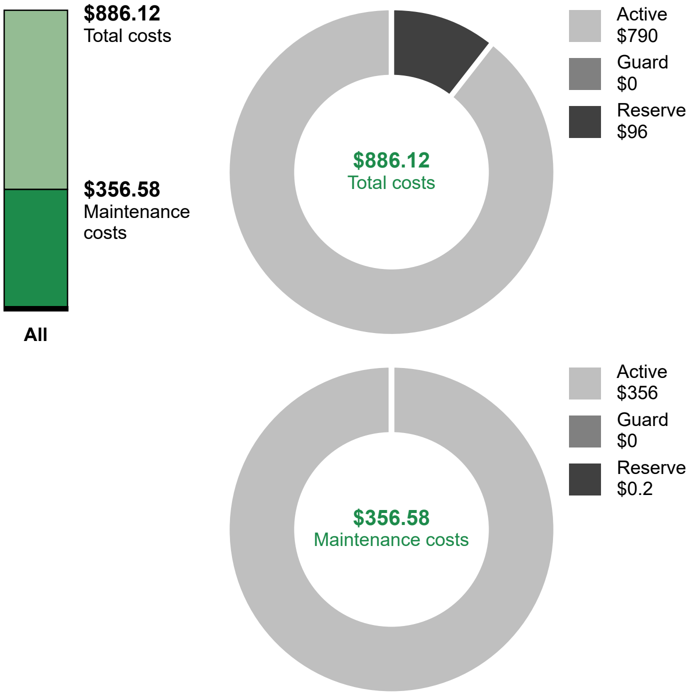
KC-10 Flying Hours



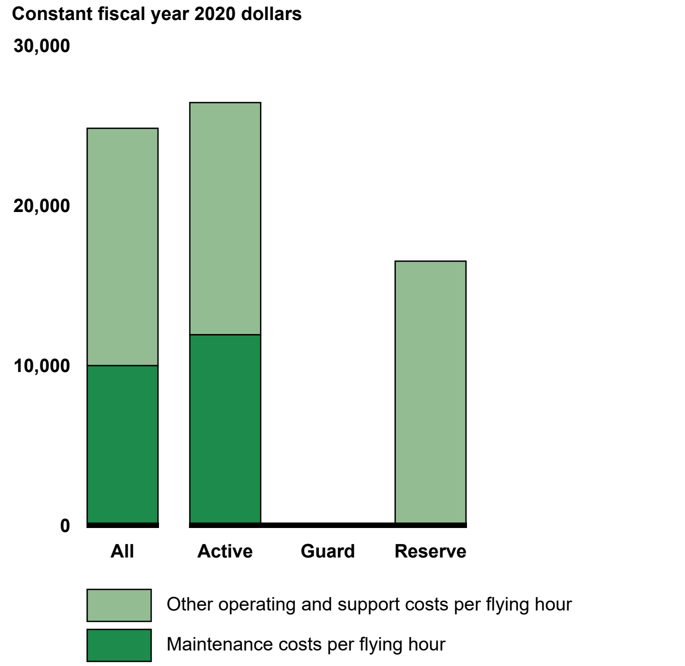
Component-Level Operating and Support Costs

KC-10 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The KC-10, which retains 88 percent systems commonality with the Boeing DC-10 aircraft, uses commercial parts and practices to the maximum extent possible. According to program officials, contractors primarily perform sustainment of the KC-10 under four contractor logistics support contracts: two performance-based logistics contracts for the airframe and the engine and two contractor logistics support contracts for engineering services and avionics engineering services. According to program officials, Vertex Aerospace performs depot maintenance for the airframe at its facility in North Carolina. The officials told us that Vertex Aerospace also provides supply support as part of the airframe contract. Active-duty Air Force personnel provide organizational maintenance with support from the logistics support contractors.

KC-10 Sustainment Challenges

Aging Aircraft
- Delays in acquiring replacement aircraft
- Service life extension
- Unexpected replacement of parts and repairs

Maintenance
- Access to technical data
- Delays in depot maintenance
- Shortage of trained maintenance personnel
- Unscheduled maintenance

Supply Support
- Diminishing manufacturing source
- Parts obsolescence
- Parts shortage and delay

Maintenance: The KC-10 fuel system is the key factor affecting the fleet's aircraft availability rate, according to program officials. To mitigate issues with the fuel system, the program office executed an Aircraft Availability Improvement Program that includes initiatives to improve the fuel system, such as replacing the fuel storage bladders located inside of the fuel tanks and resealing the auxiliary fuel tanks during scheduled depot maintenance. Program officials stated they completed 100 percent of these initiatives, including replacing fuel storage bladders on all of the KC-10 aircraft.

The Air Force plans to retire all of the KC-10 aircraft by the end of fiscal year 2024 and the planned sunset date for the KC-10 program is at the end of fiscal year 2025, according to program officials. However, the officials said that the program office implemented the following initiatives to decrease the KC-10's rate of not mission capable maintenance:

- The Fuel Quantity Indicator System Improvement Plan aims to increase the reliability of the Fuel Quantity Indicator System—the number-one driver of the fleet's rate of not mission capable maintenance—by removing and replacing electrical connectors.
- The Thrust Reverser Improvement Plan aims to identify, repair and replace the components with the highest failure rates on the Thrust Reverser (i.e., helps slow the aircraft down just after touchdown, reducing wear on the brakes and enabling shorter landing distances)—the number-three driver of the fleet's rate of not mission capable maintenance.

Supply Support: According to program officials, the KC-10 platform has not recently experienced supply support challenges. The officials stated that the program office included a requirement to maintain the rate of total not mission capable supply at or below 5 percent in the current logistics support contract for the airframe. The rate of total not mission capable supply is the total percentage of time that aircraft in the fleet are not capable of performing any of their assigned missions due to supply reasons, such as the lack of a repair part, and includes the time that aircraft are not mission capable due to supply and the time that aircraft are not mission capable for both maintenance and supply. The officials said that the total not mission capable supply requirement of 5 percent or less was set by the program office and Air Mobility Command, taking into consideration historical rates and future aerial fueling mission requirements.

Since fiscal year 2019, the contractor, Vertex Aerospace, has met the requirement, according to program officials. The officials attributed this to the contractor's continuous involvement with their supply vendors and the program office's continuous monitoring of the fleet, validation of data provided by Vertex Aerospace, and evaluation of rates of not mission capable supply.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

KC-135
Stratotanker

Program Essentials

Lead Service
Air Force

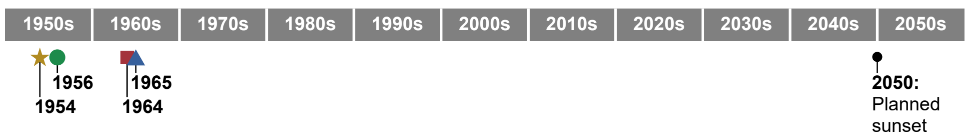
Manufacturer
Boeing

Program Office
Tinker Air Force Base, Oklahoma

Sustainment
Programmed depot maintenance is performed at Oklahoma City Air Logistics Complex. Air Force personnel perform organizational maintenance.

The KC-135 Stratotanker is the Air Force's primary aerial refueling tanker. These aircraft also provide aerial refueling support to Navy, Marine Corps, and allied nation aircraft.

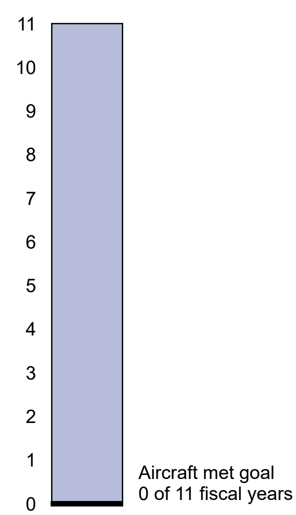
KC-135 Life Cycle Timeline



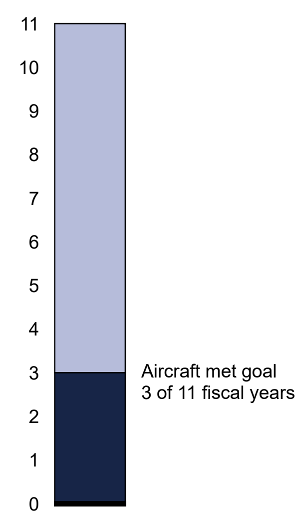
★ First manufactured ● Initial Operational Capability ▲ Full Operational Capability ■ Last production

KC-135 Sustainment Status

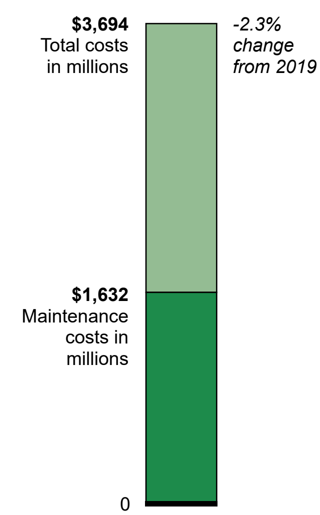
Aircraft availability rate
Fiscal years met goal



Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

396 total aircraft
Fiscal year 2020

60.0 years
Average aircraft age in fiscal year 2021

Flying hours

132,875 flying hours
Fiscal year 2020

28,248 hours
Average lifetime flying hours per aircraft in fiscal year 2021

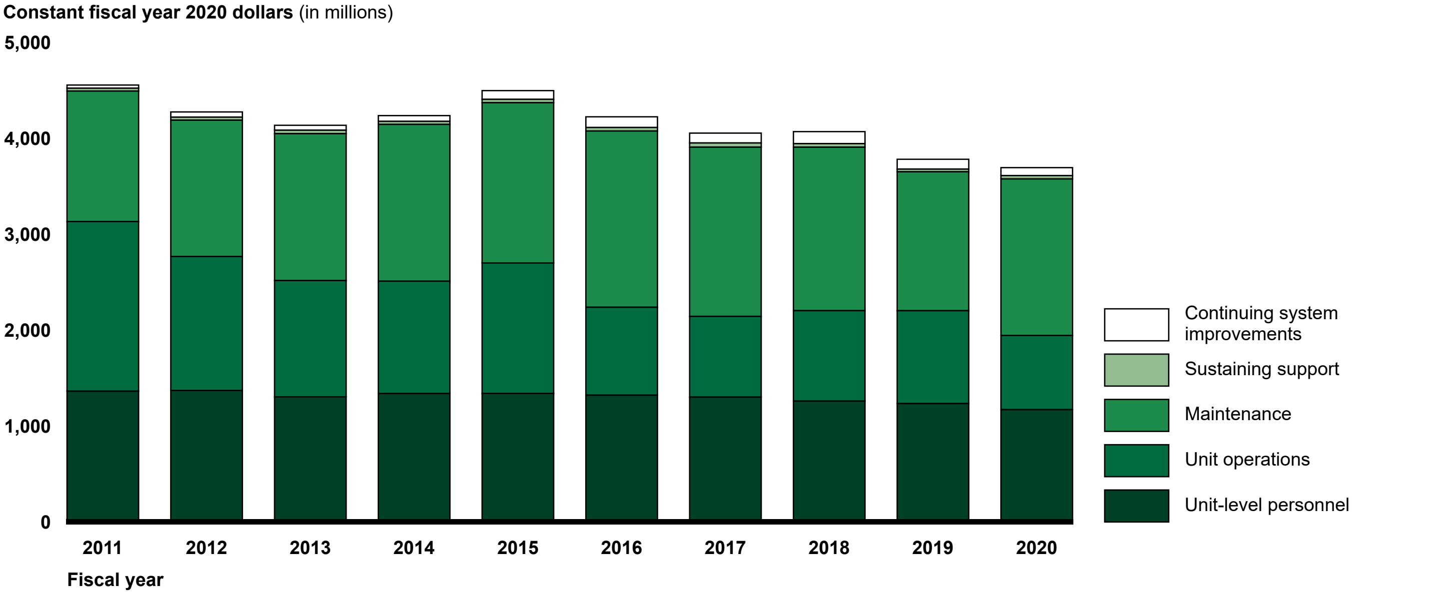
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$9.33 million
Total costs per aircraft

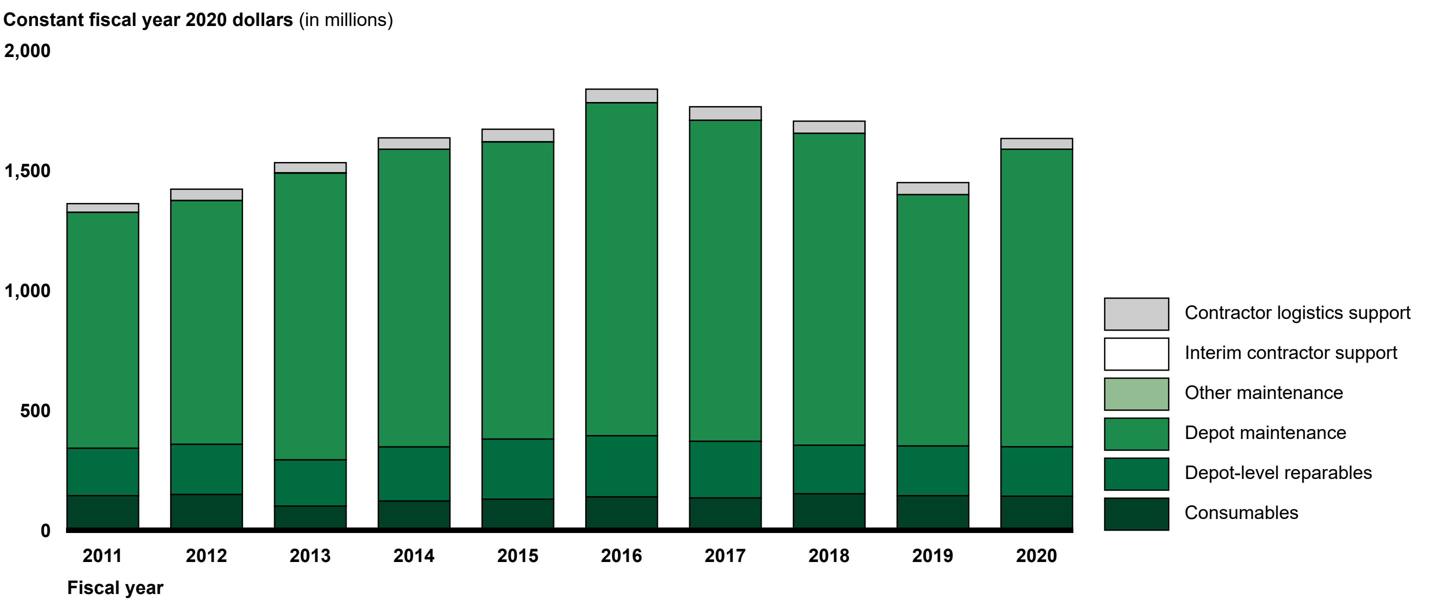
$27,801
Total costs per flying hour
+7.7% change from 2019

Operating and Support Costs

KC-135 Total Operating and Support Costs

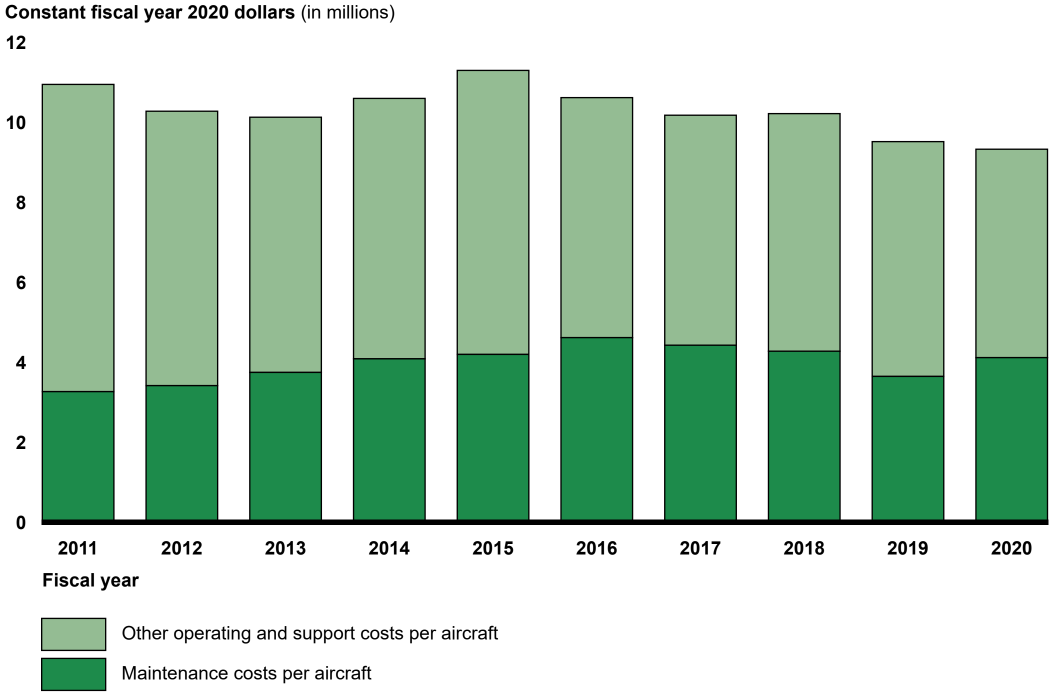


KC-135 Maintenance Costs

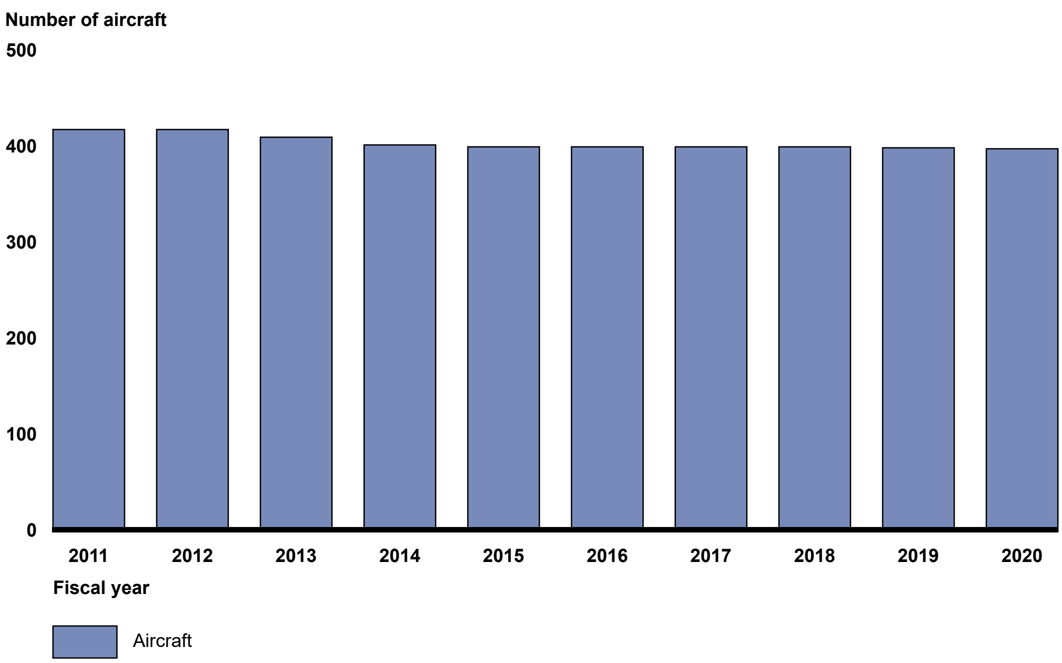


Operating and Support Costs per Aircraft

KC-135 Operating and Support Costs per Aircraft

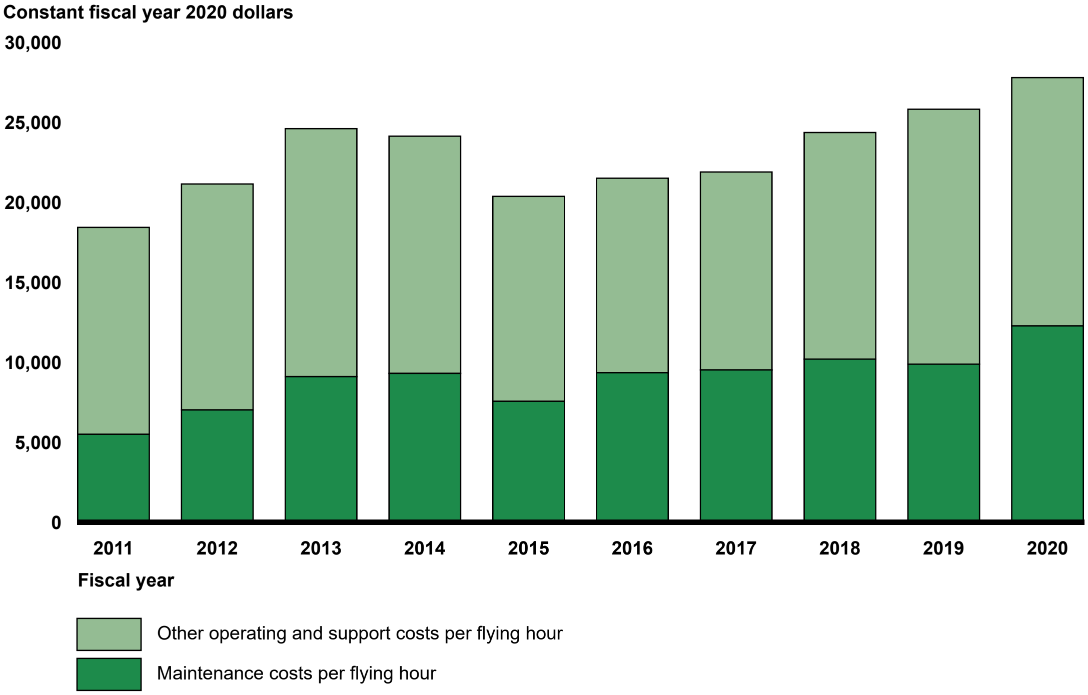


KC-135 Fleet Size

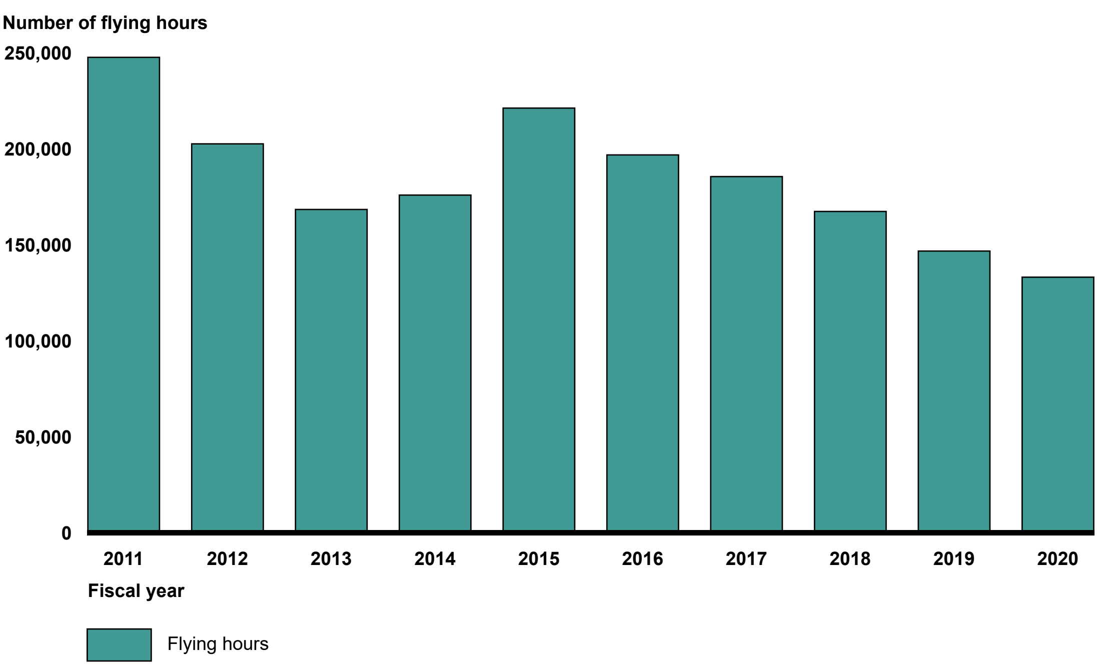


Operating and Support Costs per Flying Hour

KC-135 Operating and Support Costs per Flying Hour



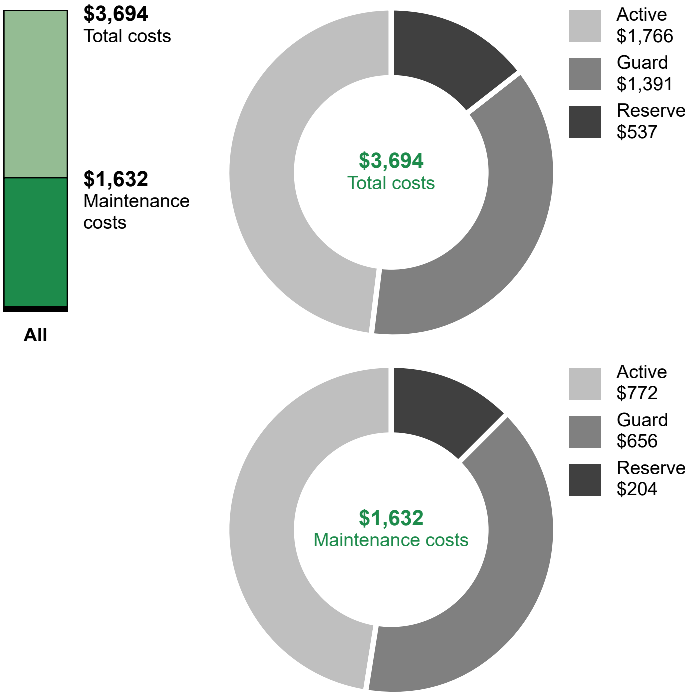
KC-135 Flying Hours



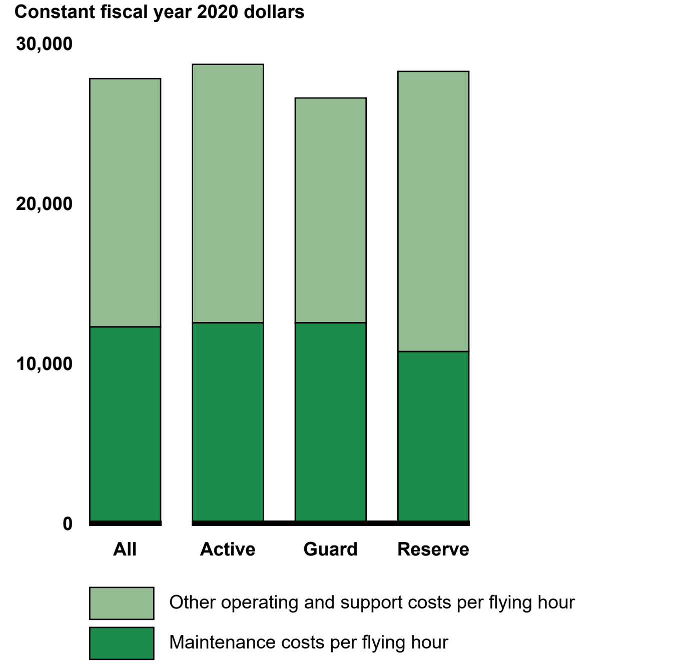
Component-Level Operating and Support Costs

KC-135 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

KC-135 programmed depot maintenance is generally performed on a 5-year cycle at the Air Force's Oklahoma City Air Logistics Complex in Oklahoma, according to program officials. Additionally, active-duty Air Force, Air Force Reserve Command, and Air National Guard personnel perform organizational maintenance. Program officials stated that the Air Force Sustainment Center and the Defense Logistics Agency provide the majority of supply support for the KC-135.

KC-135 Sustainment Challenges

Aging Aircraft
- Delays in acquiring replacement aircraft
- Service life extension
- Unexpected replacement of parts and repairs

Maintenance
- Access to technical data
- Delays in depot maintenance
- Shortage of trained maintenance personnel
- Unscheduled maintenance

Supply Support
- Diminishing manufacturing source
- Parts obsolescence
- Parts shortage and delay

Maintenance: According to Air Force officials, as the KC-135 continues to age, the number of maintenance hours related to corrosion has increased, which has become the program's largest maintenance challenge. However, a program official explained that the program office does not expect this trend to continue because they have "refreshed" most of the heavy metal on the KC-135 airframe through various efforts, such as the “high-flyer” package. The official said that this package is part of the KC-135’s fiscal year 2022 programmed depot maintenance work specifications, but nearing completion. The high-flyer package also served as the program office’s justification for the service life extensions, according to the official, that were certified in November 2020 and raised the KC-135’s flight hour limit, depending on the model, from 39,000 to as high as about 53,000 flight hours. The official stated that—moving forward—the program office does not expect that the structural integrity of the aircraft will be the critical concern that is has been in the past.

The program officials stated that they have established recurring maintenance tasks to address known corrosion problem areas and to reduce aircraft downtime. These tasks include maintenance actions varying from minor rework in some areas to complete component replacement in other areas.

The officials said that they use two programs as part of the KC-135 program office’s mitigation efforts: the Aircraft Structural Integrity Program and the Corrosion Prevention and Control Program. The goal of these programs, in conjunction with the KC-135 Structures Working Group, is to continuously monitor the aircraft and to identify and define the requirements for future inspections and maintenance actions. Additionally, program office officials told us they are implementing Condition Based Maintenance Plus to identify items that are grounding planes and incorporating parts changes and inspections into routine maintenance times, thus reducing overall downtime for unexpected maintenance.

Supply Support: Air Force officials also told us that the vast majority of supply support issues stem from decreased asset availability as a result of insufficient organic (i.e., government-owned and operated) and contract repair sources, obsolescence issues, and increased failures directly related to the aging of the aircraft. Additionally, the organic supply chain has experienced funding shortfalls and supportability issues that have caused delays and aircraft that are not mission capable while waiting for the parts, according to program officials. The officials stated that the program office works with parts suppliers and engineering organizations to develop mitigation strategies that will minimize the effect on aircraft availability. This includes negotiating alternative repair schedules, identifying alternate parts, prioritizing aircraft to ensure the most critical missions are supported first, and allowing reuse of some parts, if appropriate.

Program Office Comments

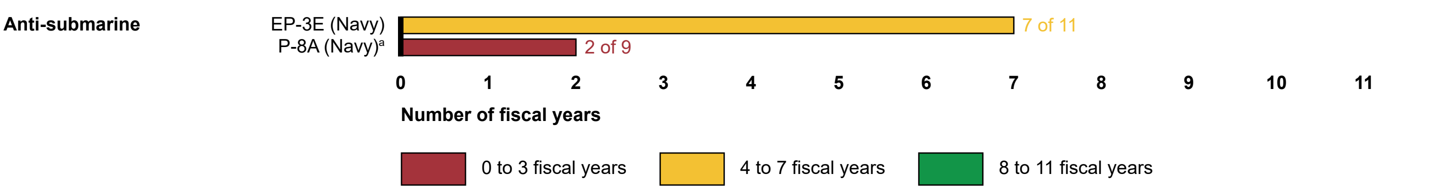
In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

Anti-Submarine Aircraft

EP-3E Aries II

Source: U.S. Navy/Mass Communication Specialist 3rd Class Bobby J. Siens. | GAO-23-106217

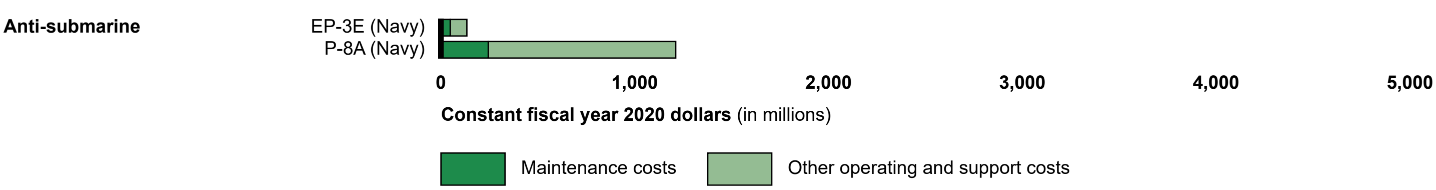
Number of Years Selected Aircraft Met Their Annual Mission Capable Goal, Fiscal Years 2011 through 2021



Source: GAO analysis of Navy data. | GAO-23-106217

[a]For this aircraft, the military department did not provide a mission capable goal for all eleven years.

Annual Operating and Support Costs for Selected Department of Defense Anti-Submarine Aircraft, Fiscal Year 2020



Source: GAO analysis of Navy data. | GAO-23-106217

EP-3E
Aries II

Program Essentials

Lead Service
Navy

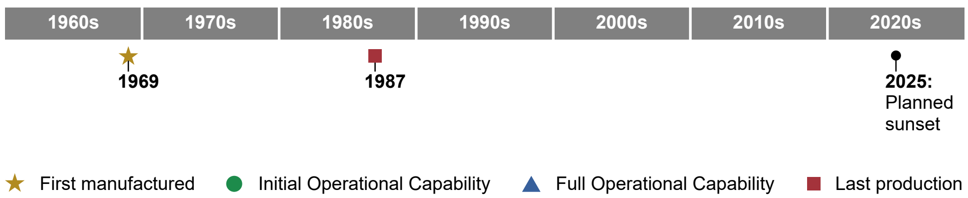
Manufacturer
Lockheed Martin

Program Office
Program Manager – Air 290, Naval Air Systems Command, Patuxent River, Maryland

Sustainment
A contractor performs depot maintenance. Navy personnel perform field maintenance.

The EP-3E is a land-based, multi-intelligence reconnaissance aircraft that provides fleet and theater commanders worldwide with tactical intelligence. This information can be used for information warfare, battle-space situational awareness, and anti-submarine warfare applications.

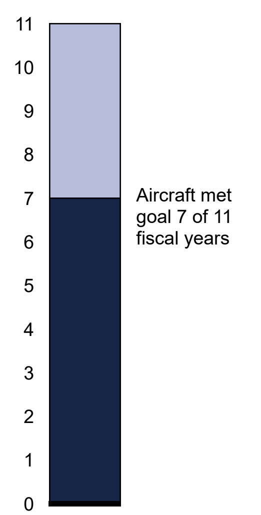
EP-3E Life Cycle Timeline



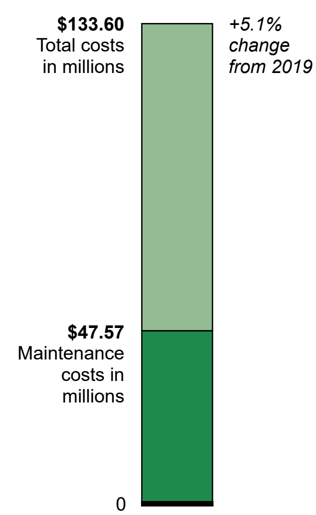
Note: According to program officials, it is unknown when the EP-3E reached initial and full operational capability.

EP-3E Sustainment Status

Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

11 total aircraft
Fiscal year 2020

44.2 years
Average aircraft age in fiscal year 2021

Flying hours

5,729 flying hours
Fiscal year 2020

23,444 hours
Average lifetime flying hours per aircraft in fiscal year 2021

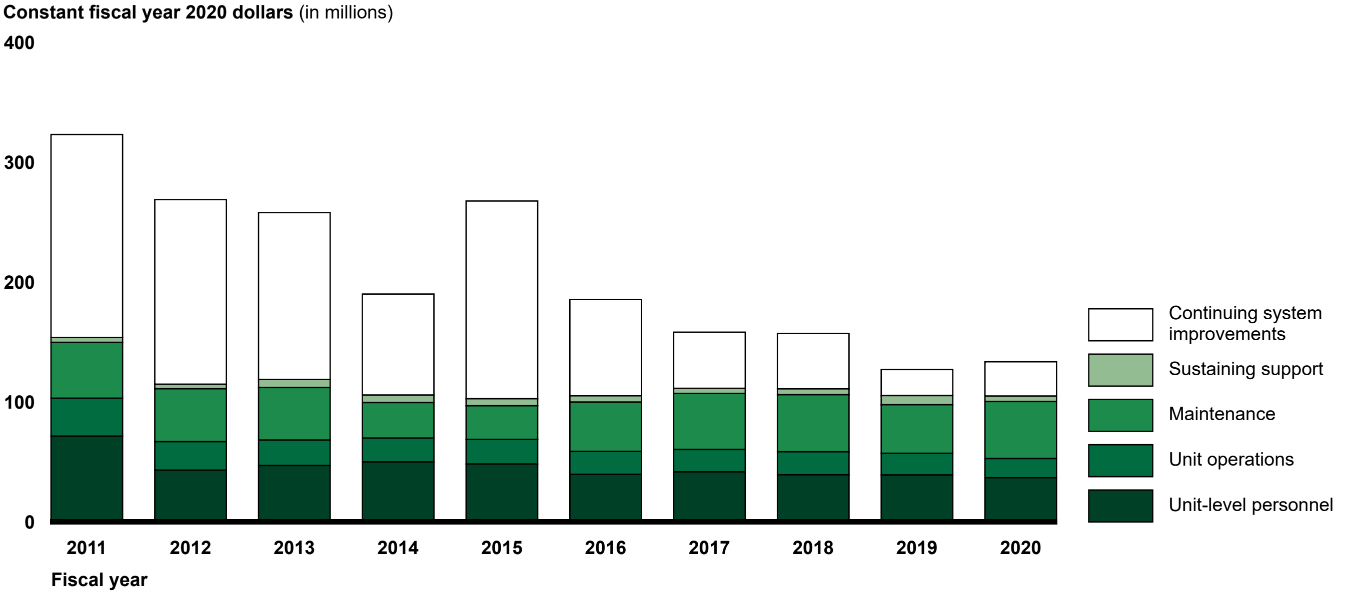
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$12.15 million
Total costs per aircraft

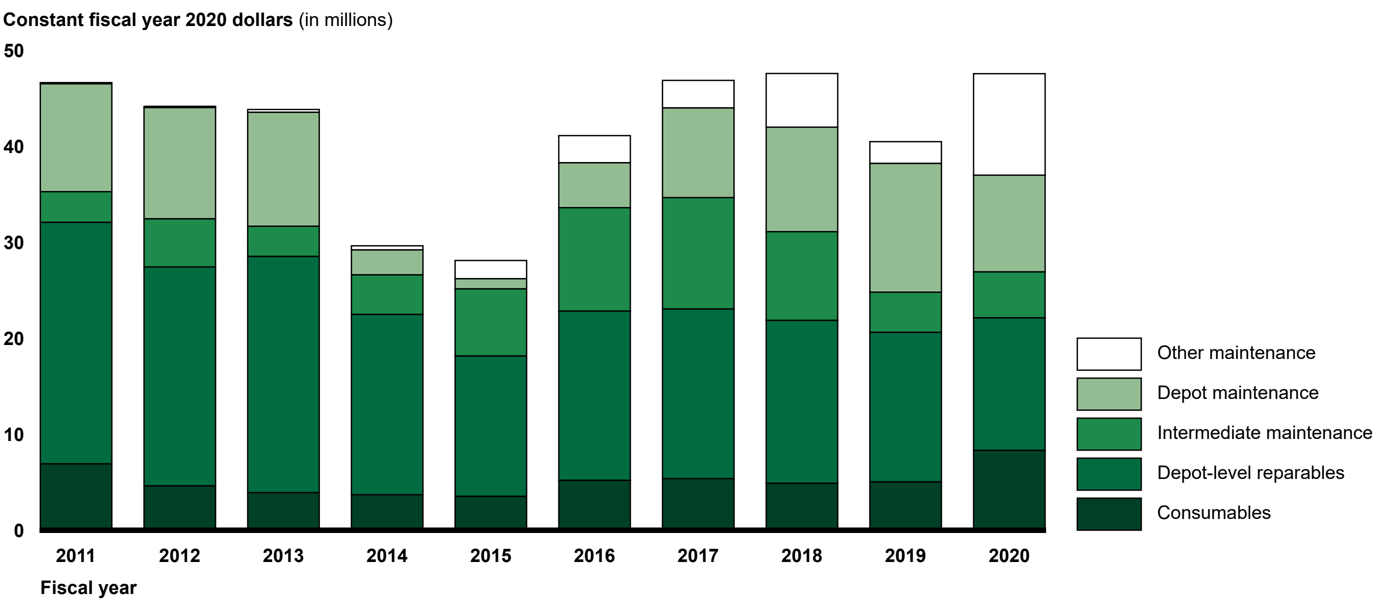
$23,319
Total costs per flying hour
+20.9% change from 2019

Operating and Support Costs

EP-3E Total Operating and Support Costs

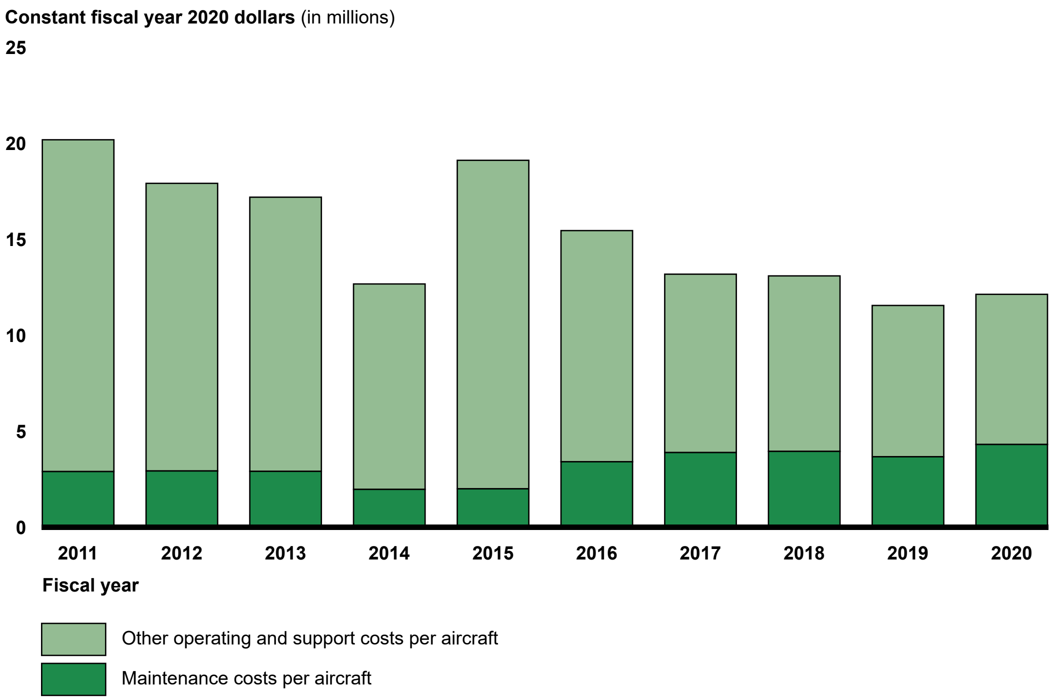


EP-3E Maintenance Costs

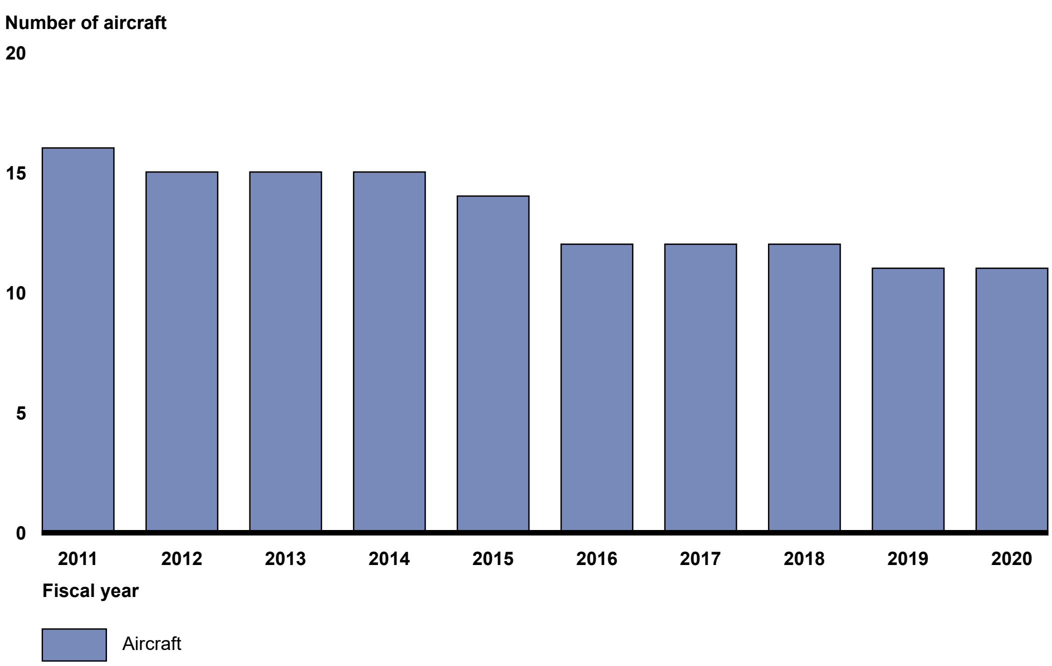


Operating and Support Costs per Aircraft

EP-3E Operating and Support Costs per Aircraft

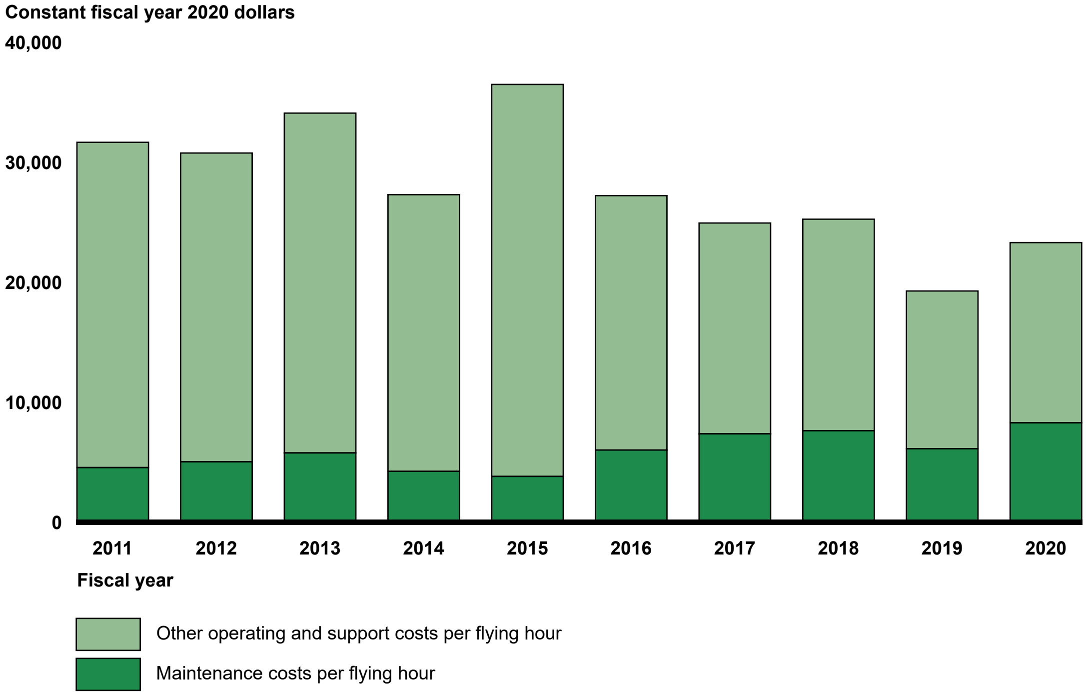


EP-3E Fleet Size

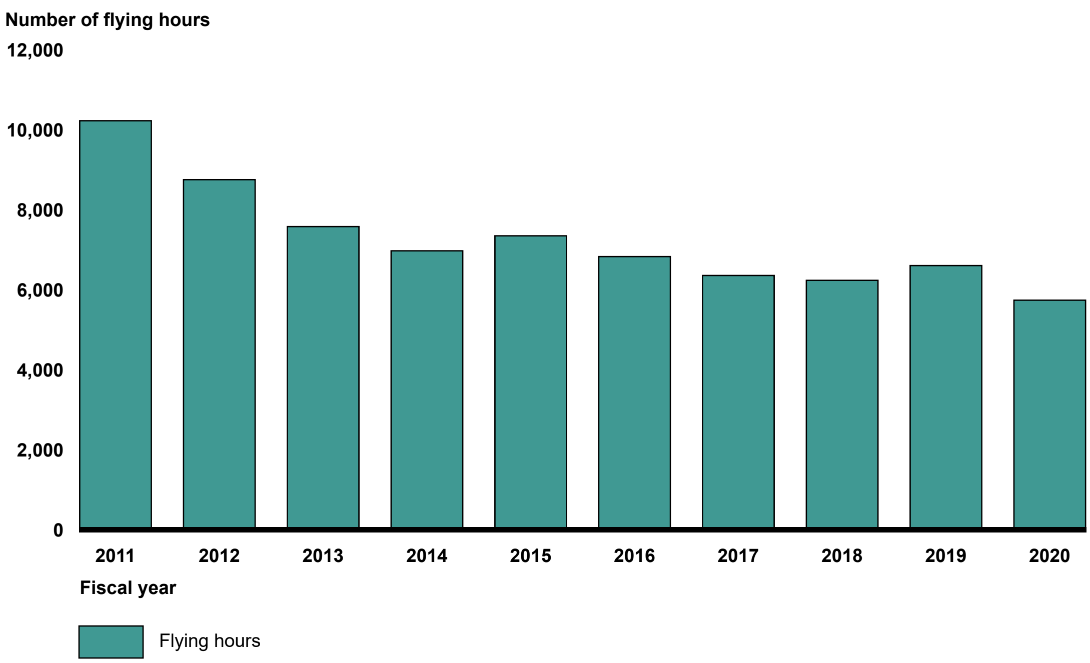


Operating and Support Costs per Flying Hour

EP-3E Operating and Support Costs per Flying Hour



EP-3E Flying Hours



Sustainment Strategy, Challenges, and Mitigation Actions

L3Harris performs EP-3E depot maintenance at its facility in Texas, according to program officials. Navy personnel perform field maintenance. The Naval Supply Systems Command and the Defense Logistics Agency provide supply support for the aircraft.

EP-3E Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Maintenance and Aging: Program officials cited five leading sustainment challenges for the EP-3E as the program approaches the fiscal year 2025 planned sunset date (the Navy plans to retire three aircraft in fiscal year 2023, and the remainder in 2025):

- Corrosion has remained a major challenge, which the officials stated is being addressed through increased prevention efforts at the squadron level and additional planned depot sustainment events.
- Officials cited the need for additional operator and maintenance training and stated that they are working with the Navy's training organizations to provide additional maintenance training courses to improve maintainer efficiency.
- Sustaining the aircraft's information assurance and communication security systems has been challenging, and the program office has issued improved instructions to assist with maintenance.
- The aircraft has experienced increased structural and mission equipment failures that were primarily driven by the age of the airframe and the age of the mission systems, according to officials. At times these failure rates were higher than anticipated, officials said, even when age was taken into account.
- Officials stated that unscheduled maintenance has also increased due to the aircraft and its systems' aging, but mission completion rates have remained at or above average.

Supply Support and Aging: Program officials stated that the program has experienced parts shortages and delays, many of which were due to diminishing manufacturing sources and obsolescence. The officials said that there were a number of special mission systems either on the program's list of shortages or being monitored for possible future shortages, such as a radar transmitter, LCD screen, and antennas.

The original equipment manufacturers for these aging mission systems have either exhausted the manufacturing resources needed for production or will not procure them at prices that are acceptable to the program office, according to program officials. In addition, the officials said that there has been a shortage of available flight control surfaces, because no vendors were available to repair or manufacture them.

Program Office Comments

The program office reviewed a draft of this assessment and did not have any comments.

P-8A
Poseidon

Program Essentials

Lead Service
Navy

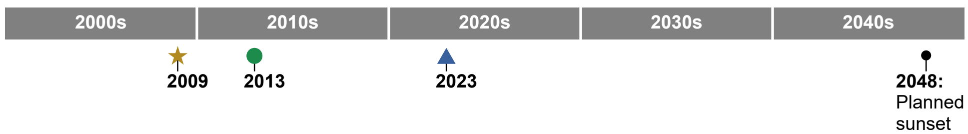
Manufacturer
Boeing Defense Systems

Program Office
Program Manager – Air 290, Naval Air Systems Command, Patuxent River, Maryland

Sustainment
Contractors perform depot maintenance on the airframes and engines. Navy personnel perform field maintenance, with assistance from contractor technical representatives.

The P-8A Poseidon is a multimission capable aircraft with maritime, patrol, and reconnaissance capabilities. The P-8A can operate independently or in conjunction with carrier strike forces and their aircraft, expeditionary strike groups, and other joint and allied assets.

P-8A Life Cycle Timeline

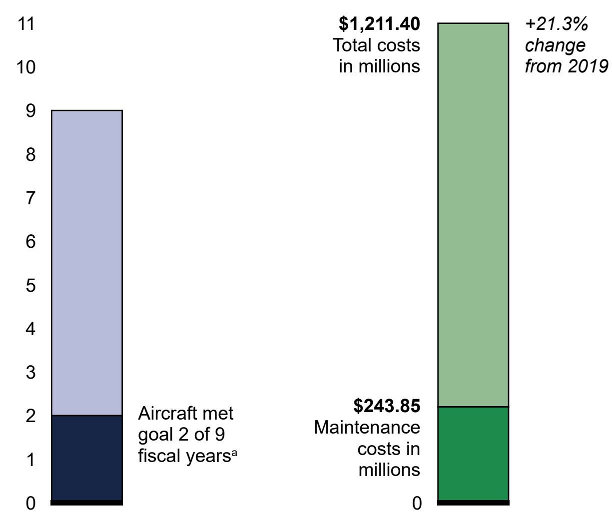


★ First manufactured ● Initial Operational Capability ▲ Full Operational Capability ■ Last production

P-8A Sustainment Status

Mission capable rate
Fiscal years met goal

Operating and support costs
Fiscal year 2020



Aircraft

99 total aircraft
Fiscal year 2020

4.3 years
Average aircraft age in fiscal year 2021

Flying hours

60,891 flying hours
Fiscal year 2020

2,990 hours
Average lifetime flying hours per aircraft in fiscal year 2021

Operating and support costs per aircraft and flying hour
Fiscal year 2020

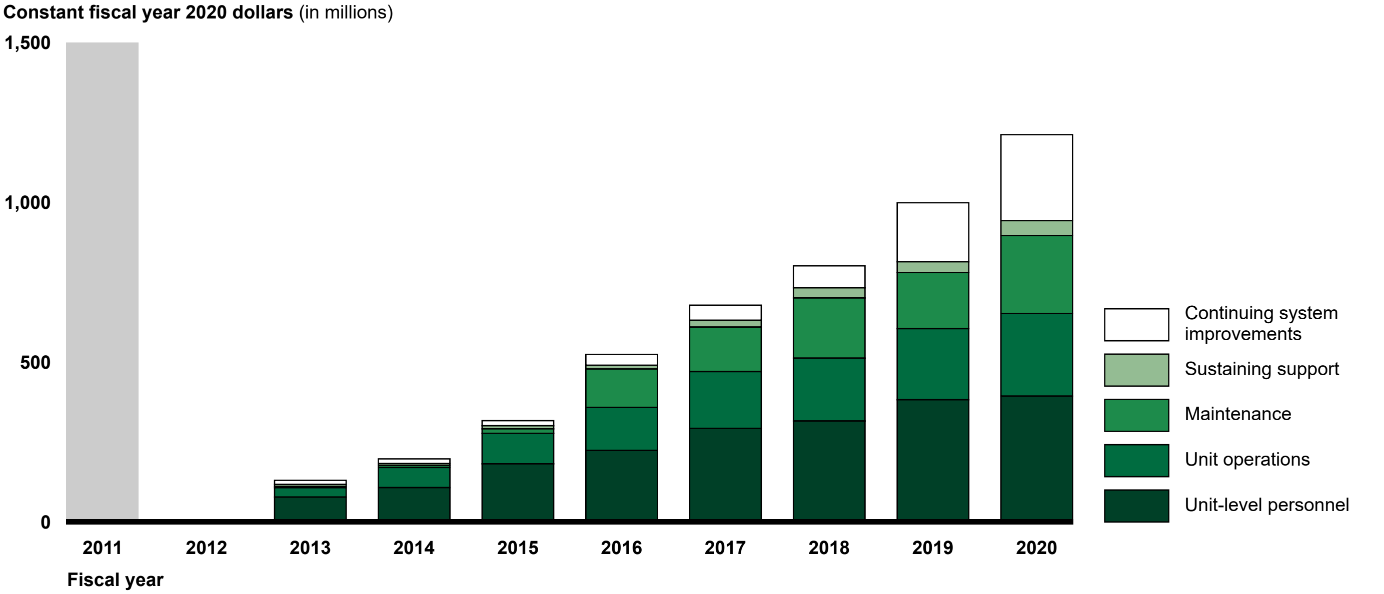
$12.24 million
Total costs per aircraft

$19,895
Total costs per flying hour
+6.5% change from 2019

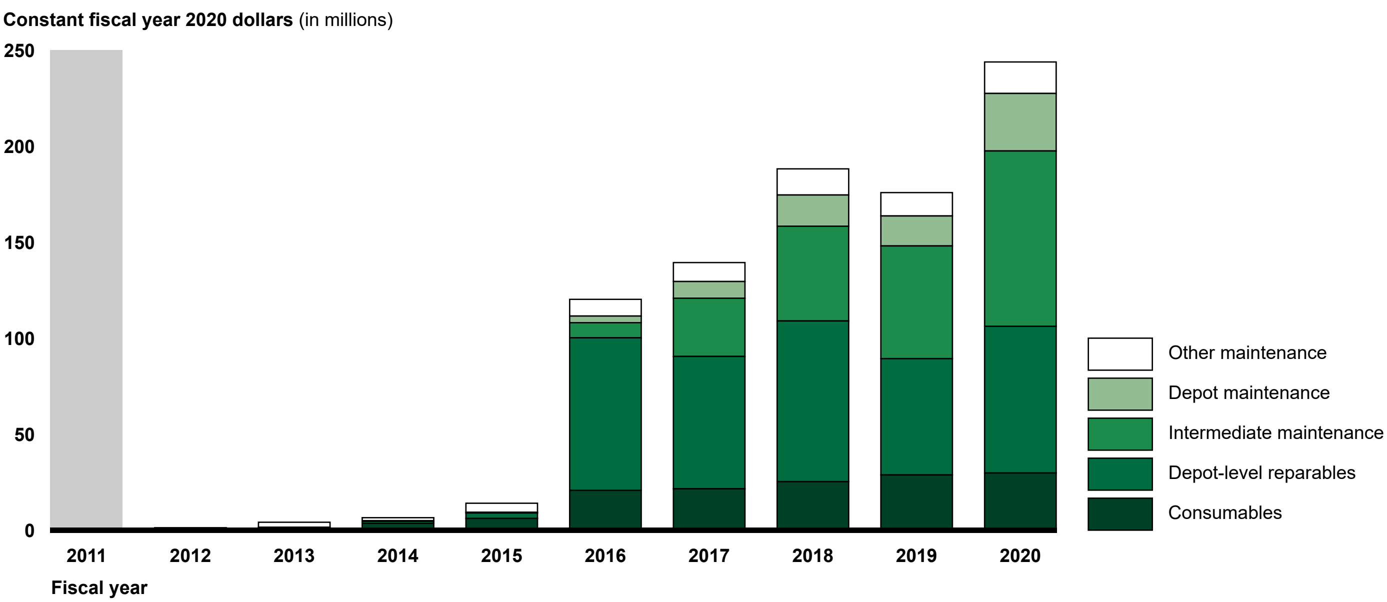
[a]For this aircraft, the military department did not provide a mission capable goal for all eleven years.

Operating and Support Costs

P-8A Total Operating and Support Costs

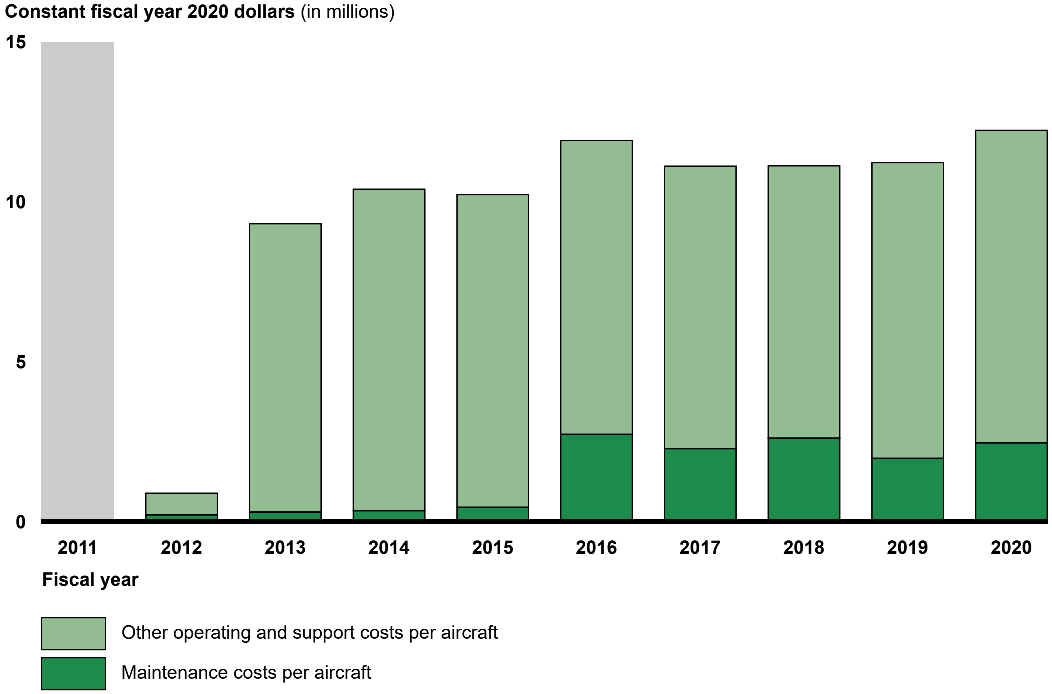


P-8A Maintenance Costs

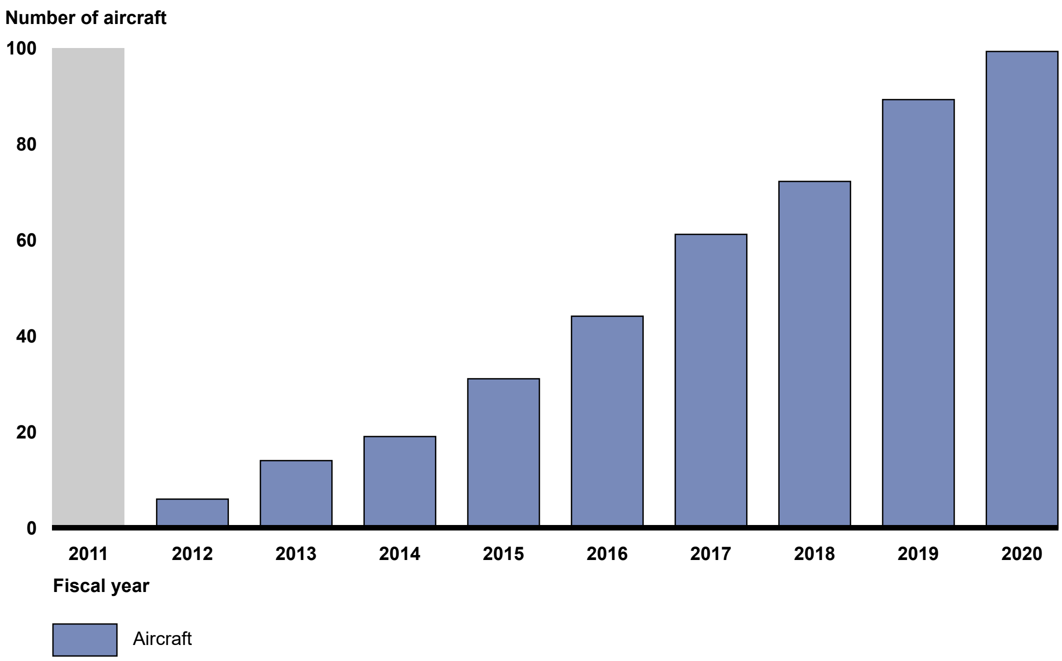


Operating and Support Costs per Aircraft

P-8A Operating and Support Costs per Aircraft

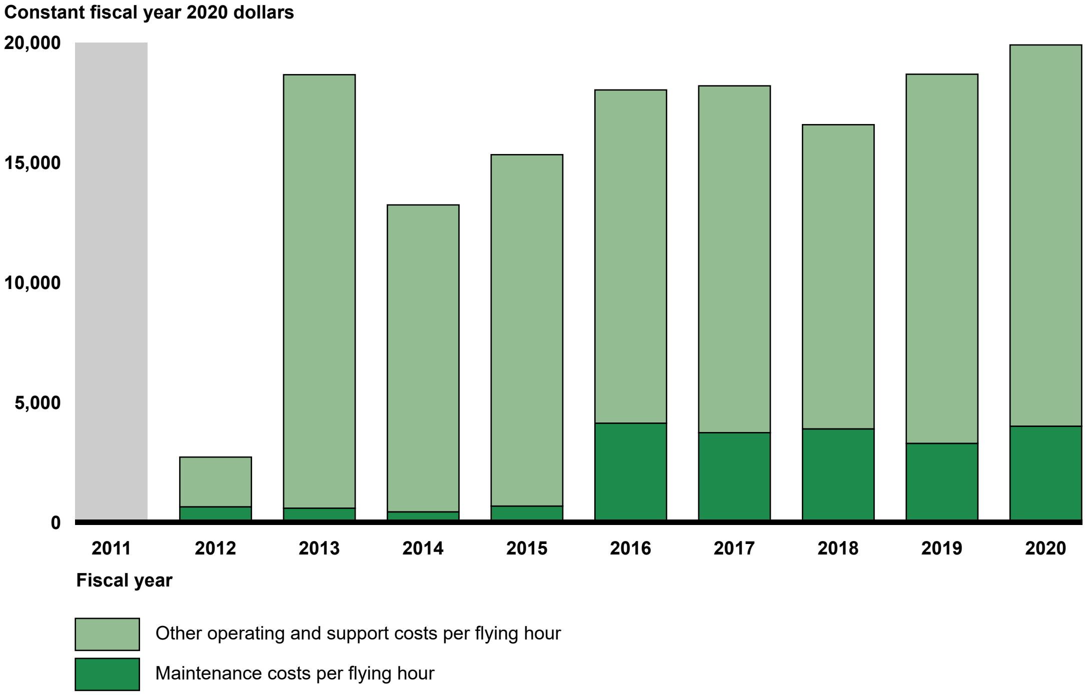


P-8A Fleet Size

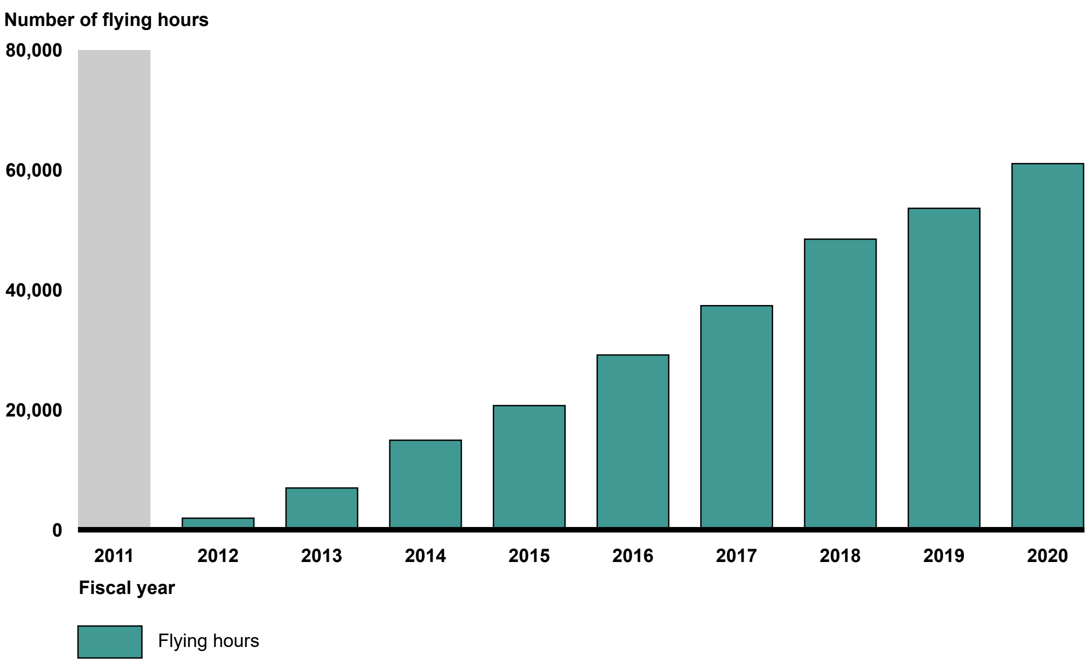


Operating and Support Costs per Flying Hour

P-8A Operating and Support Costs per Flying Hour



P-8A Flying Hours



Sustainment Strategy, Challenges, and Mitigation Actions

AAR Corporation performs scheduled depot maintenance on the P-8A airframe at its facility in Indiana. Boeing subcontracts engine depot maintenance to Delta Tech Ops in Georgia, while Standard Aero performs maintenance in Canada, according to program officials. Navy personnel perform field maintenance with the support of contractor technical representatives. The Naval Supply Systems Command and the Defense Logistics Agency provide supply support for the aircraft.

P-8A Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Maintenance: The unexpected replacement of parts and repairs has been a challenge for the program. In an effort to proactively address these issues, the program implemented multiple fleet- and depot-level scheduled maintenance inspection initiatives to help improve maintenance cycle times and decrease not mission capable maintenance rates. For example, program officials said that squadrons began tracking squadron-level maintenance inspection performance such as cycle time completion.

Further, program officials stated that the aircraft's depot cycle times were lengthy because of inefficiencies in the newly-started depot maintenance process. They said that aircraft depot maintenance had just started in 2018 because the initial depot maintenance induction occurs 6 years after aircraft are delivered. The average depot cycle time was 279 days in fiscal year 2019, according to program officials. However, due to a number of initiatives that the program office implemented to improve efficiency, program officials said that by fiscal year 2021 the cycle times had been reduced to an average of 144 days. Several of the initiatives that the program office implemented to reduce the cycle time included optimizing the Defense Contract Management Agency's inspection checkpoints, expanding access to technical data, and increasing prepositioned materials.

Supply Support: According to program officials, the P-8A program has experienced unexpected replacement of parts and repairs, in addition to parts shortages and delays. Component s that fail to meet reliability requirements are reviewed via the program's Reliability Control Board to determine if design changes, supplemental spares, or increased repair throughput are required to meet readiness requirements, according to these officials.

The program has several dozen projects across 34 parts to improve component-level reliability and maintainability and to remove barriers that have affected overall sustainment system performance, according to program officials. For example, the program assessed why the actual mean flight hours between unscheduled removals for the aircraft's secure network server were significantly lower than the design estimate.

Officials said that the Reliability Control Board developed a multiple-tiered approach to mitigate near-term effects by designing and installing multiple reliability upgrades to reduce damage to internal components caused by in-flight vibration, as well as a long-term redesign and replacement of the secure network server.

Additionally, officials said the P-8A program has seen various parts shortages related to COVID-19 workforce constraints and worldwide semiconductor shortages. To date, the program has been able to mitigate any operational effect from these shortages, according to these officials, but they continue to monitor items based on national supply chain and logistics backlogs.

Officials stated that the program developed its initial spare parts requirements based on engineering estimates for predicted failure rates. As the platform has matured, the program office has updated those requirements based on actual fleet usage and analysis using the Reliability Control Board process. Through this analysis, the program office, in coordination with Naval Supply Systems Command and the Defense Logistics Agency, has continued to improve the overall supply support strategy by significantly increasing inventory allowance accuracy rates for P-8A parts while decreasing supply response time.

Program Office Comments

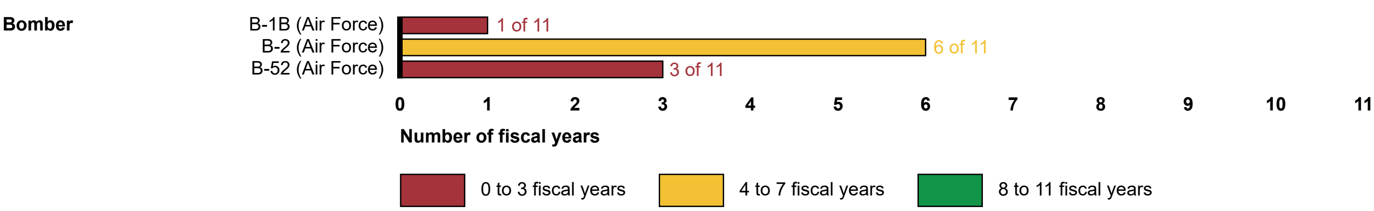
In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

Bomber Aircraft

B-52 Stratofortress

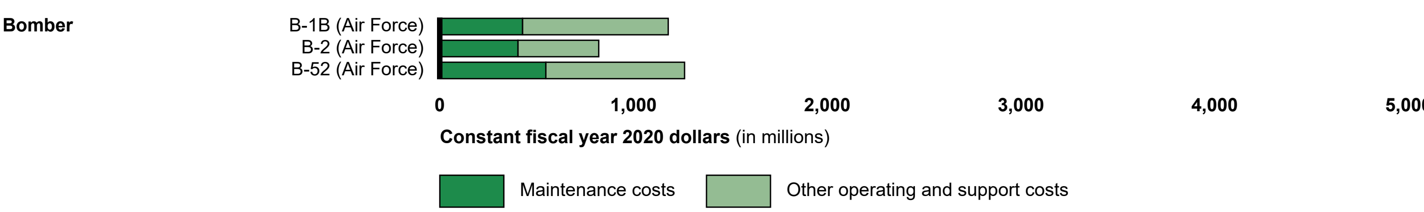
Source: U.S. Air National Guard/Tech. Sgt. Daniel Gagnon. | GAO-23-106217

Number of Years Selected Aircraft Met Their Annual Mission Capable Goal, Fiscal Years 2011 through 2021



Source: GAO analysis of Air Force data. | GAO-23-106217

Annual Operating and Support Costs for Selected Department of Defense Bomber Aircraft, Fiscal Year 2020



Source: GAO analysis of Air Force data. | GAO-23-106217

B-1B
Lancer

Program Essentials

Lead Service
Air Force

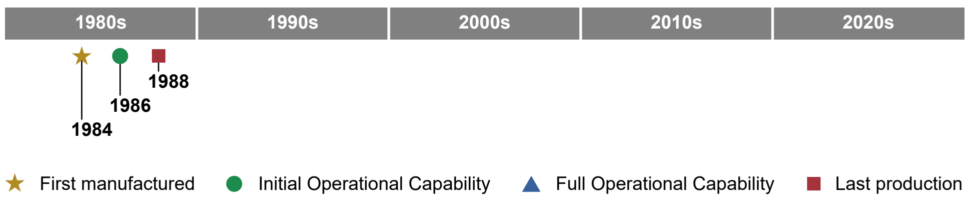
Manufacturer
Boeing

Program Office
Tinker Air Force Base, Oklahoma

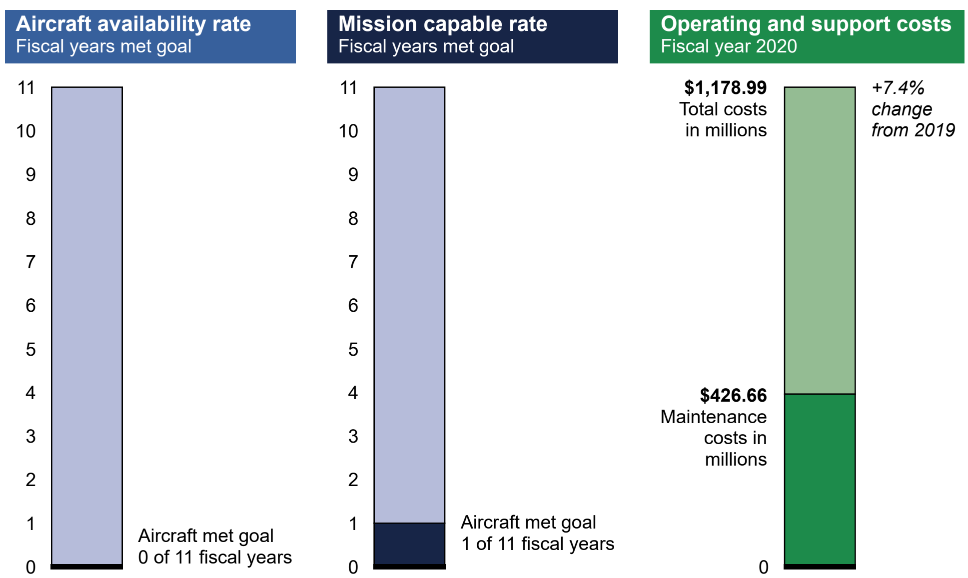
Sustainment
Depot maintenance is conducted at the Oklahoma City Air Logistics Complex.

The B-1B, a long-range, multimission bomber, carries the largest conventional payload of both guided and unguided weapons in the Air Force inventory and can deliver both precision and nonprecision weapons against adversaries.

B-1B Life Cycle Timeline



B-1B Sustainment Status



Aircraft

62 total aircraft
Fiscal year 2020

34.1 years
Average aircraft age in fiscal year 2021

Flying hours

6,814 flying hours
Fiscal year 2020

9,560 hours
Average lifetime flying hours per aircraft in fiscal year 2021

Operating and support costs per aircraft and flying hour
Fiscal year 2020

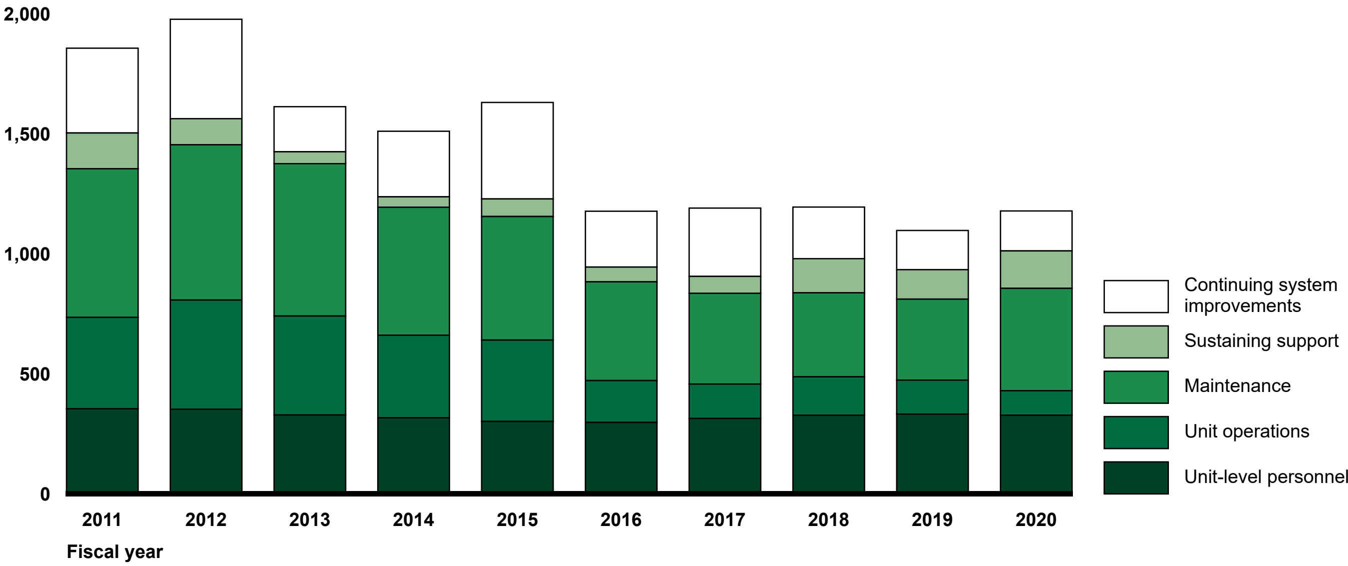
$19.02 million
Total costs per aircraft

$173,014
Total costs per flying hour
+38% change from 2019

Operating and Support Costs

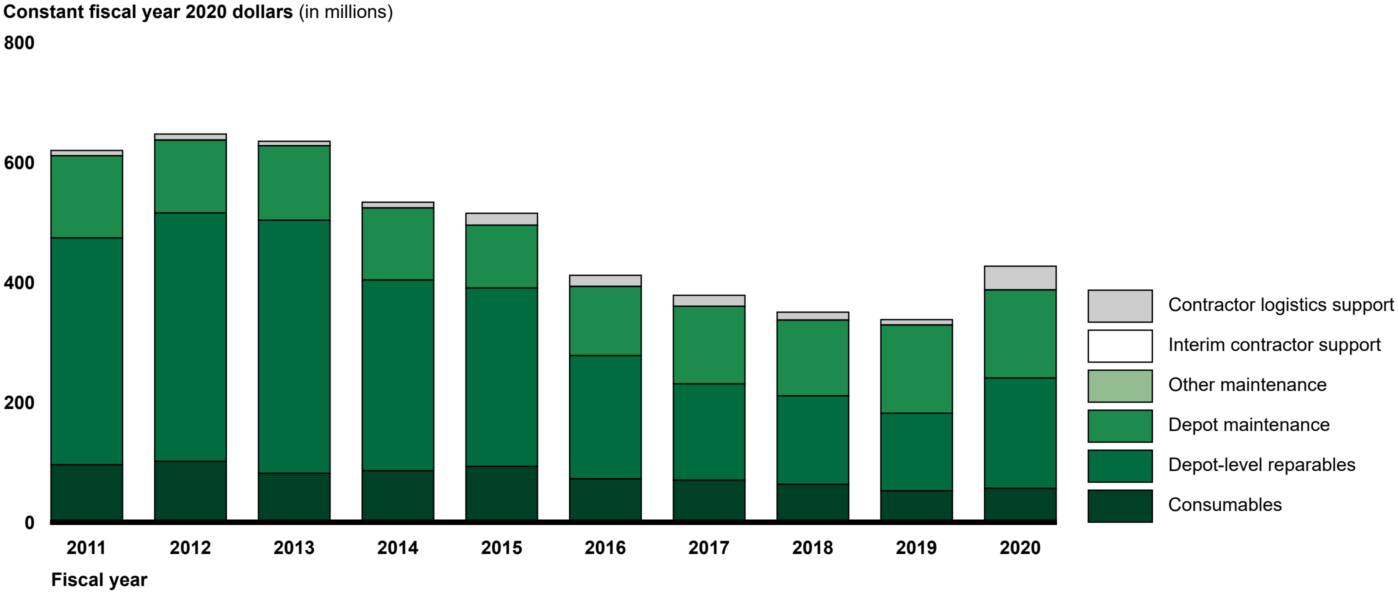
B-1B Total Operating and Support Costs

Constant fiscal year 2020 dollars (in millions)

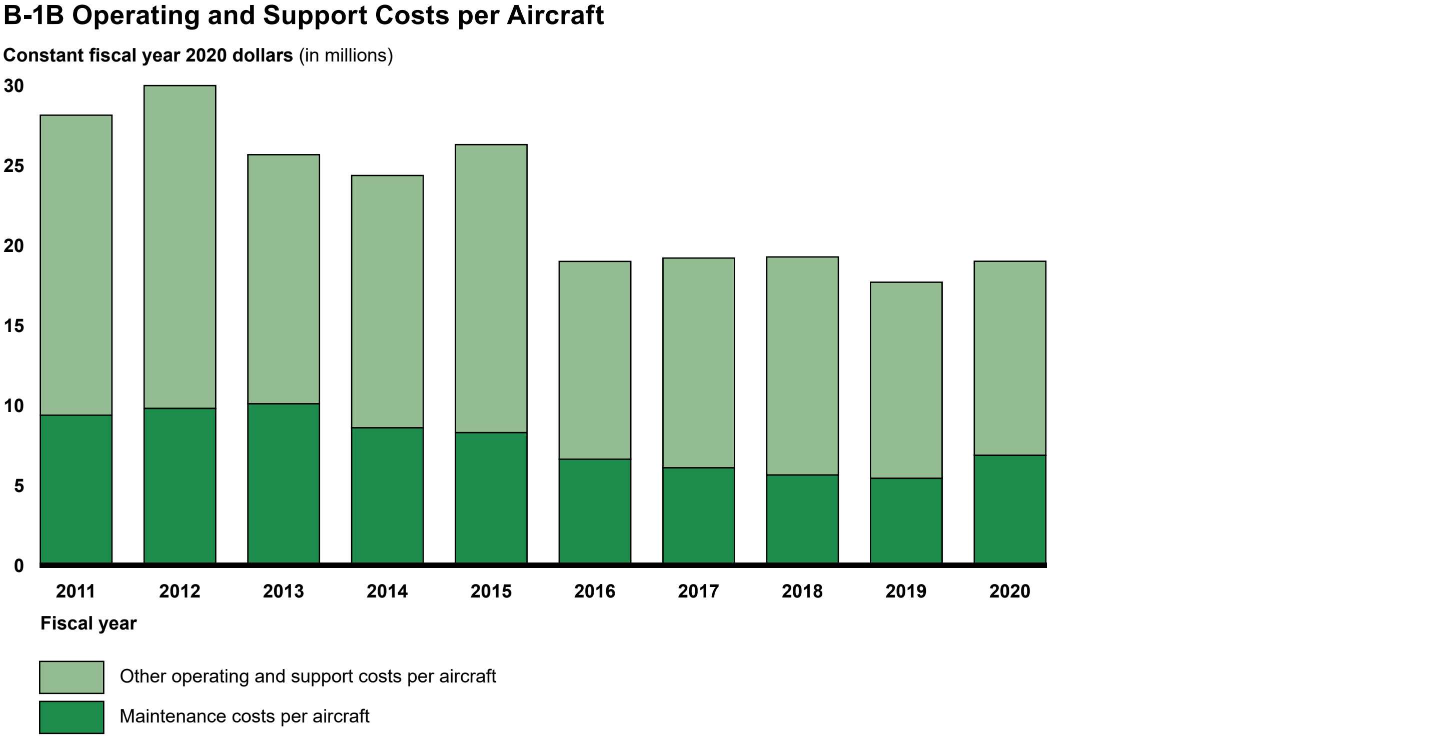


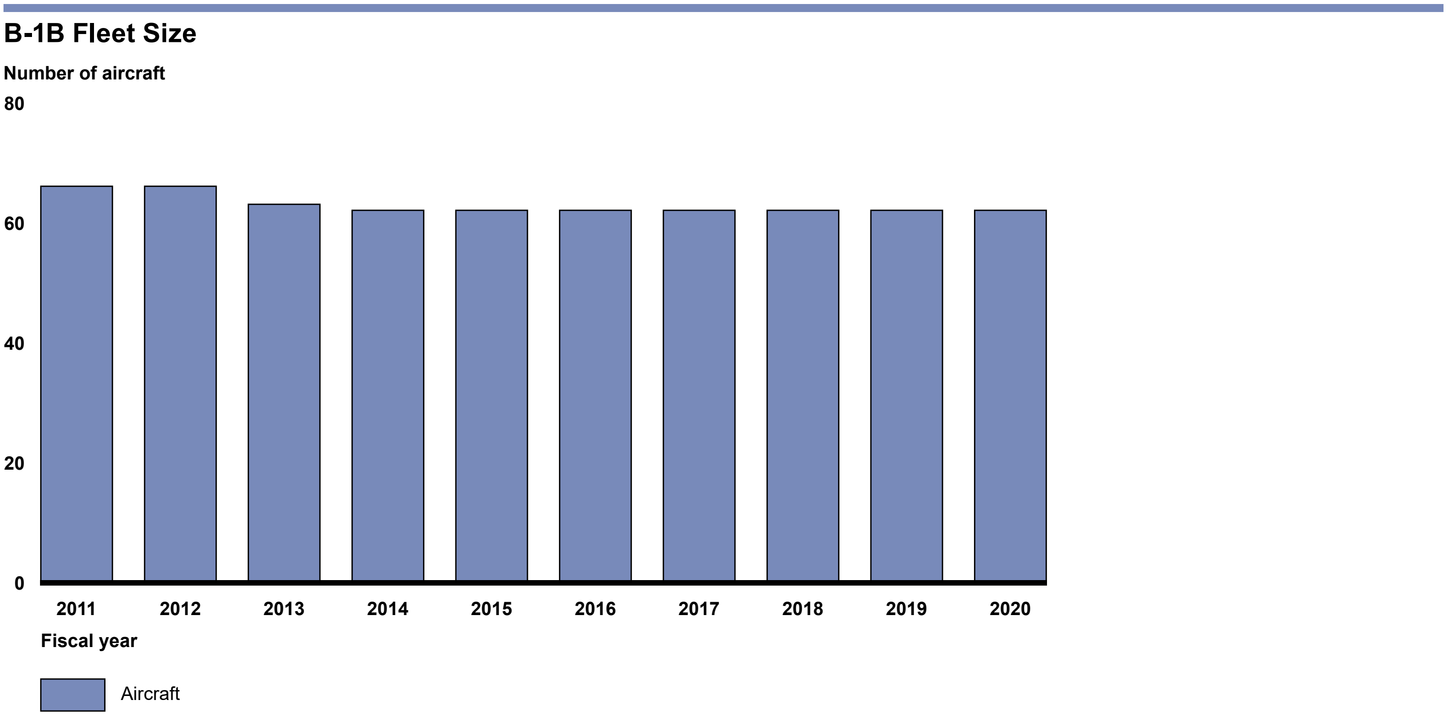
B-1B Maintenance Costs

Constant fiscal year 2020 dollars (in millions)



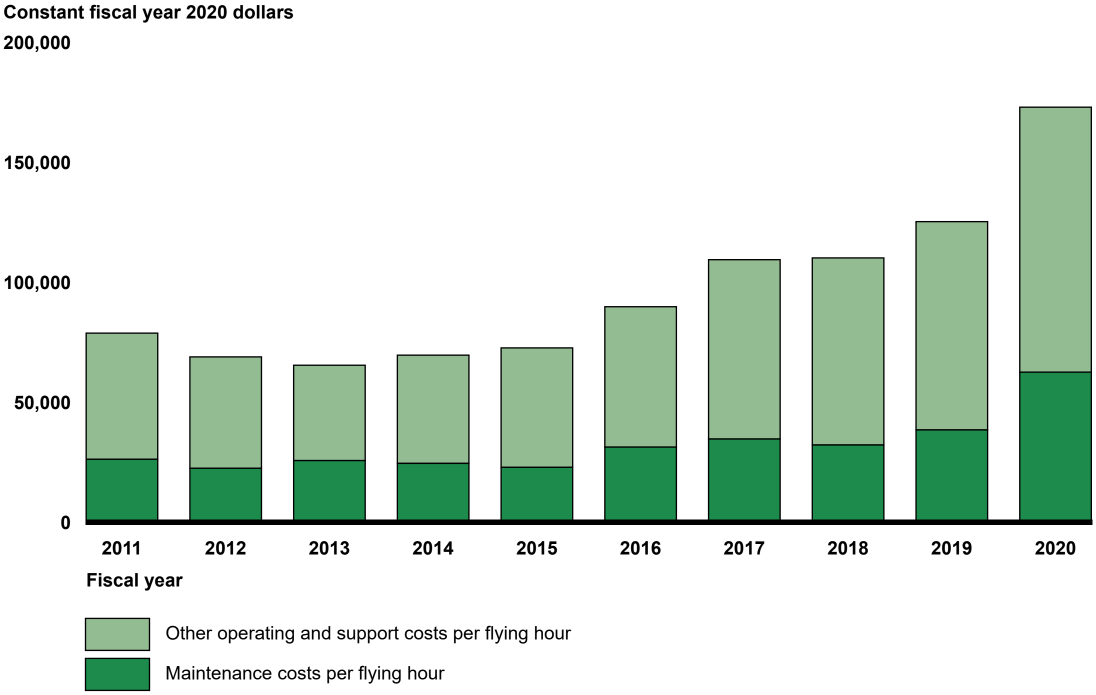
Operating and Support Costs per Aircraft



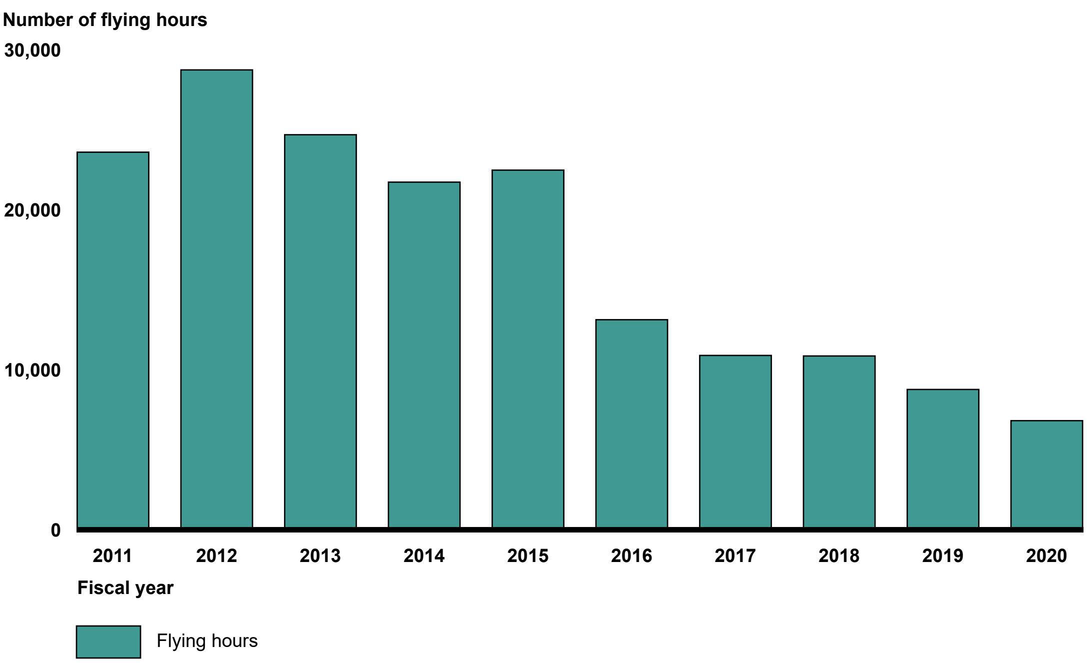


Operating and Support Costs per Flying Hour

B-1B Operating and Support Costs per Flying Hour



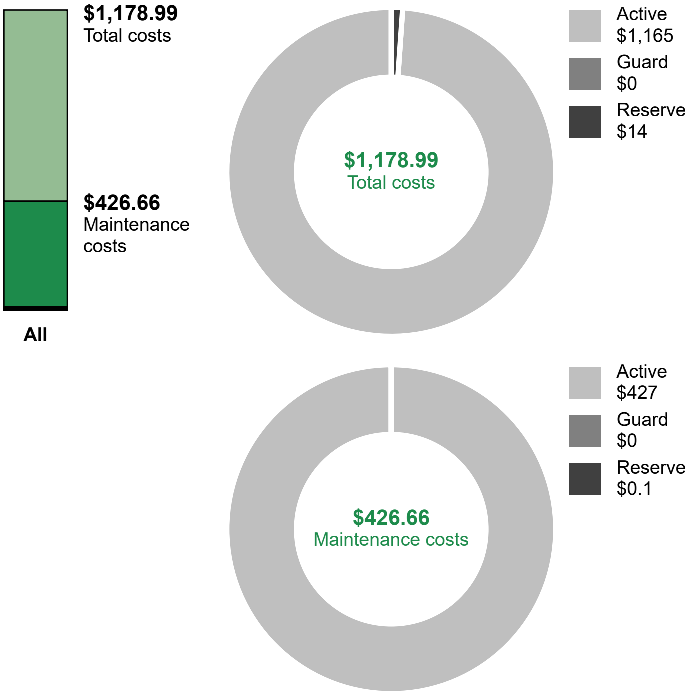
B-1B Flying Hours



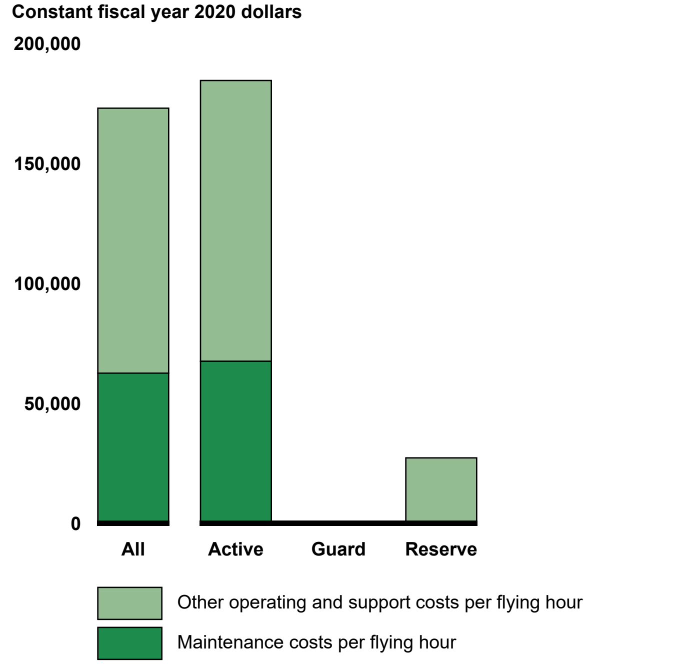
Component-Level Operating and Support Costs

B-1B Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The Air Force sustains the B-1B fleet through modifications and programmed depot maintenance, which is performed on a 5-year cycle at the Oklahoma Air Logistics Complex, Oklahoma. According to the program office, the aircraft underwent five different modification programs, including upgrades to its fuselage and integrated battle station, from 2011 through 2014. The Air Force's Supply Chain Management Wing manages the supply chain for the B-1B fleet.

B-1B Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Aging: According to the program office, the average age of a B-1B aircraft in late fiscal year 2021 was over 34 years, which exceeds its original structural design life of 30 years. Program officials stated that although the Air Force retired 17 B-1Bs in 2021, over time Air Force inspections have identified several issues that are related to the age of the remaining aircraft, including structural issues such as cracks in the wings.

The officials explained that the B-1B was deployed continuously to Southwest Asia from 2011 through 2018 in support of contingency operations. According to program officials, the B-1B fleet is past its certified life and Full-scale Fatigue Testing has identified issues requiring near-term resolution. Therefore, in 2018 and 2019 the Air Force directed a stand down to address aging aircraft issues. The Air Force started flying B-1Bs again in 2020.

Maintenance: Program officials stated that the B-1B fleet has faced challenges with emerging and unplanned requirements that have been found during aircraft structural integrity program inspections. These requirements increased the maintenance hours necessary to repair the aircraft. For example, during Full Scale Fatigue Testing, structural issues were found on the fuselage. Actions that program officials said were being taken to address these issues include partial rib replacement and replacement of the forward intermediate fuselage substructure and skins (i.e., surface of the aircraft).

Supply Support: Additional maintenance requirements were sometimes difficult to address in the past due to challenges in locating replacement parts for the aging weapon system, according to program officials. To address these shortages in replacement parts, officials stated that the program office worked with the Air Force's Air Logistics Complexes and the Defense Logistics Agency to improve parts production and availability.

In addition, program officials said that the B-1B has experienced some issues with parts shortages of certain processors and display card assemblies due to diminishing manufacturing sources and obsolescence. Program officials stated that some, but not all, of these issues have been mitigated when possible with "life of type" buys (i.e., an order for a quantity that is sufficient to meet all of the projected demands for the item in the future).

Program Office Comments

The program office reviewed a draft of this assessment and did not have any comments.

B-2
Spirit

Program Essentials

Lead Service
Air Force

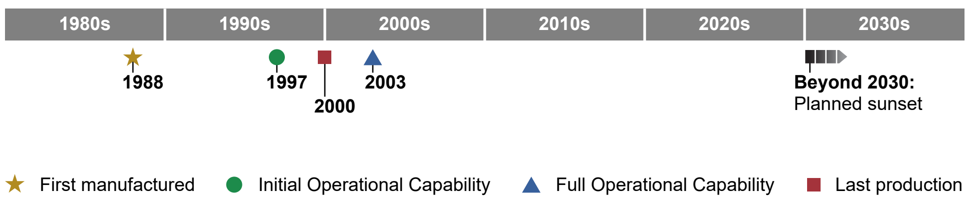
Manufacturer
Northrop Grumman

Program Office
Wright-Patterson Air Force Base, Ohio

Sustainment
A contractor performs programmed depot maintenance on the airframe and Air Force personnel perform field maintenance.

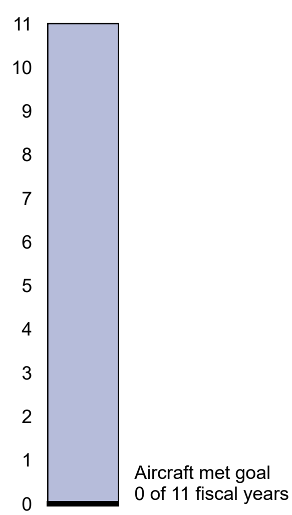
The B-2 Spirit is a multirole bomber that is capable of delivering both conventional and nuclear munitions. The B-2's low observable, or stealth, characteristics give it the ability to penetrate an enemy's defenses.

B-2 Life Cycle Timeline

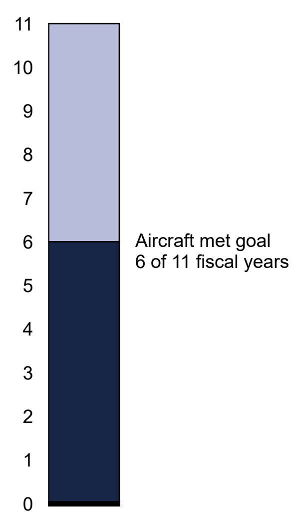


B-2 Sustainment Status

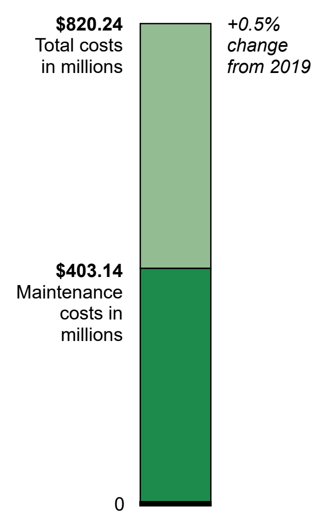
Aircraft availability rate
Fiscal years met goal



Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

20 total aircraft
Fiscal year 2020

27.2 years
Average aircraft age in fiscal year 2021

Flying hours

5,441 flying hours
Fiscal year 2020

7,459 hours
Average lifetime flying hours per aircraft in fiscal year 2021

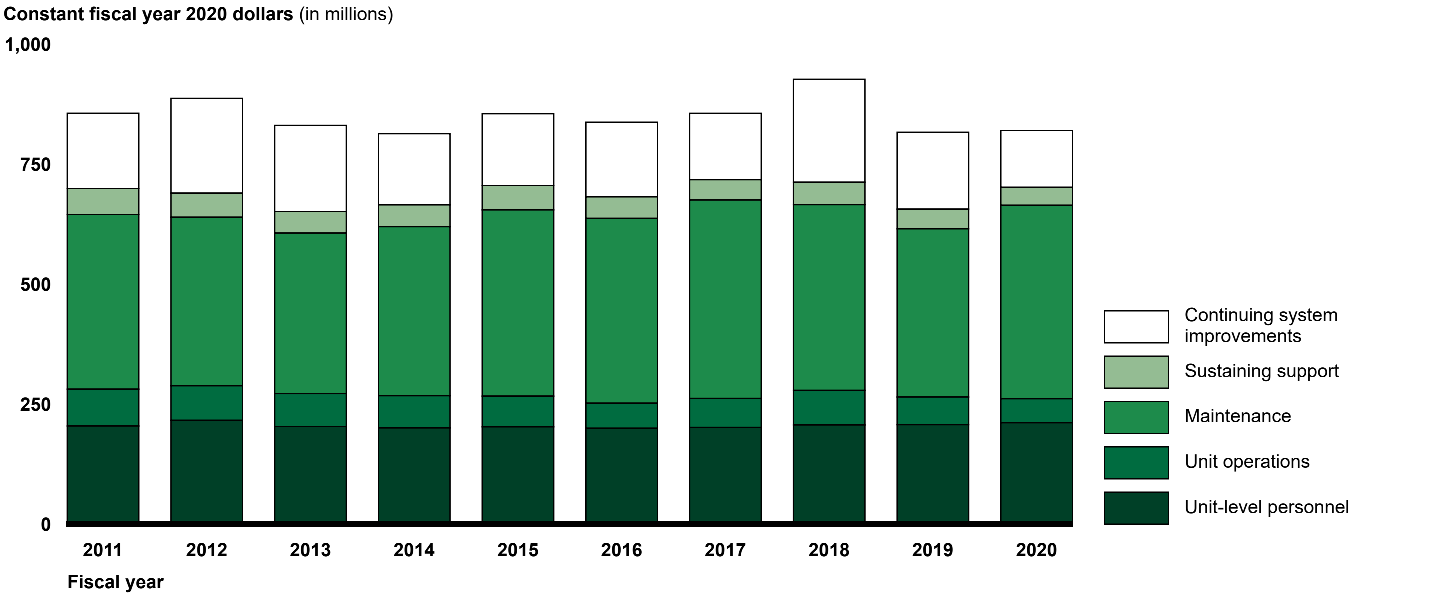
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$41.01 million
Total costs per aircraft

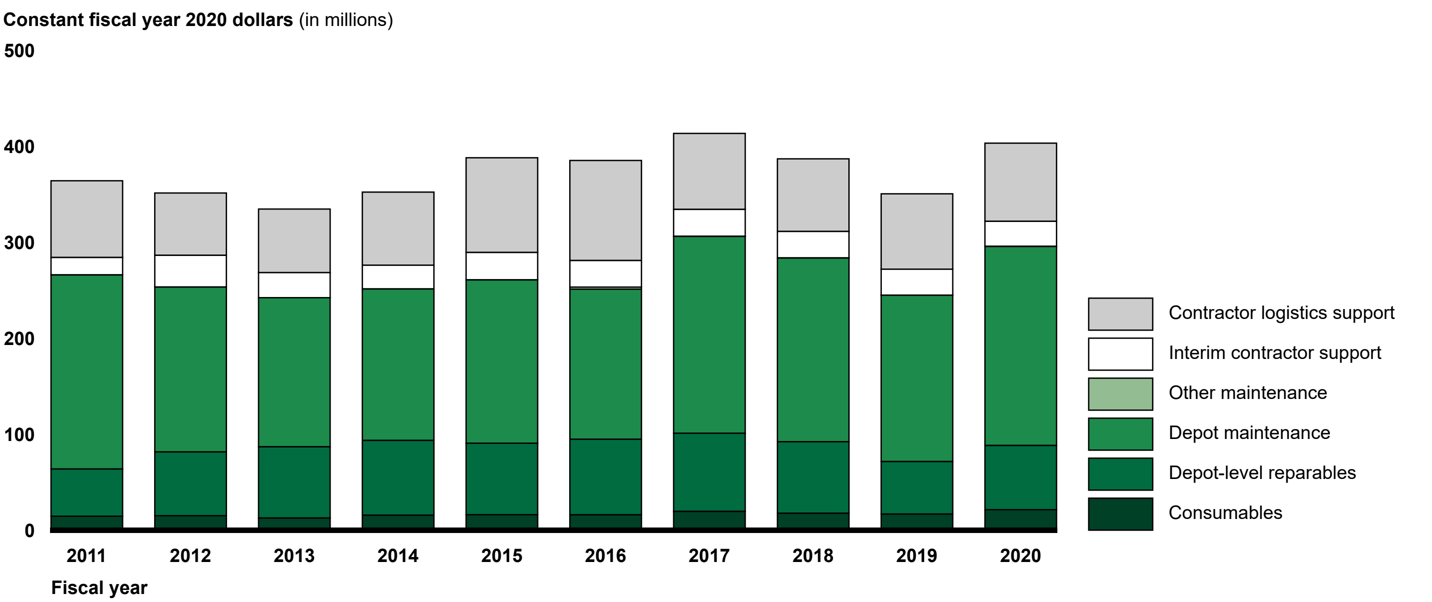
$150,741
Total costs per flying hour
+10% change from 2019

Operating and Support Costs

B-2 Total Operating and Support Costs

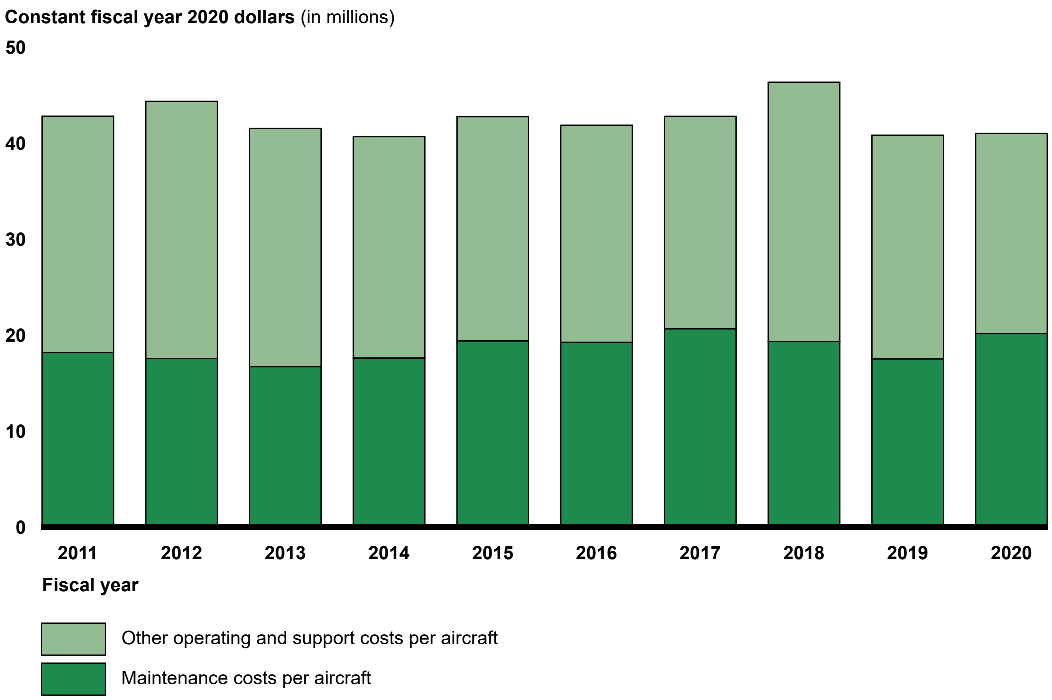


B-2 Maintenance Costs

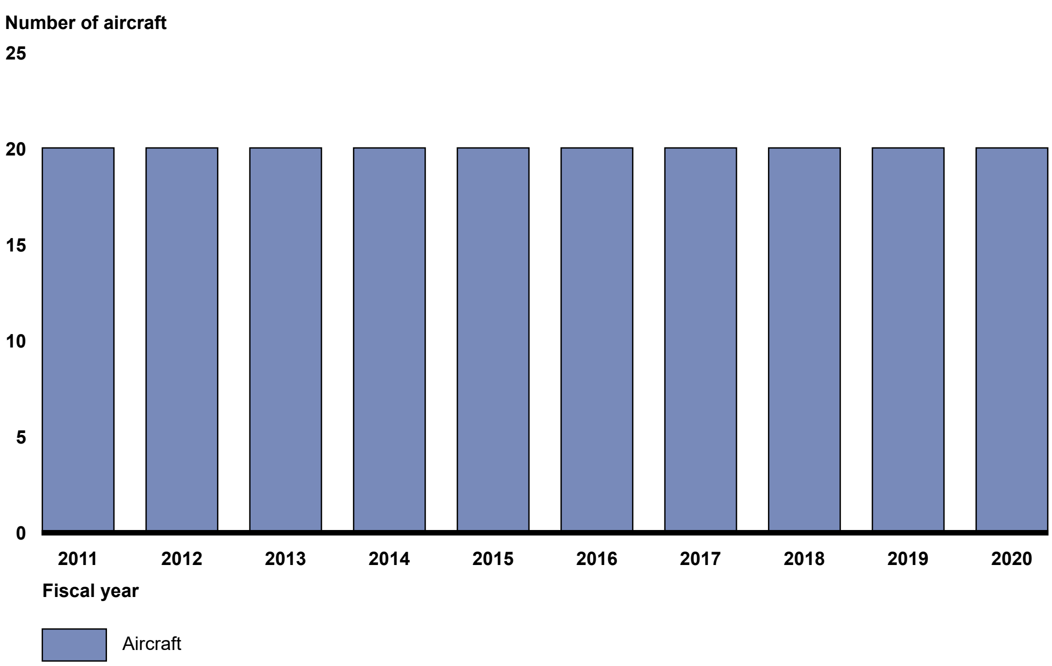


Operating and Support Costs per Aircraft

B-2 Operating and Support Costs per Aircraft

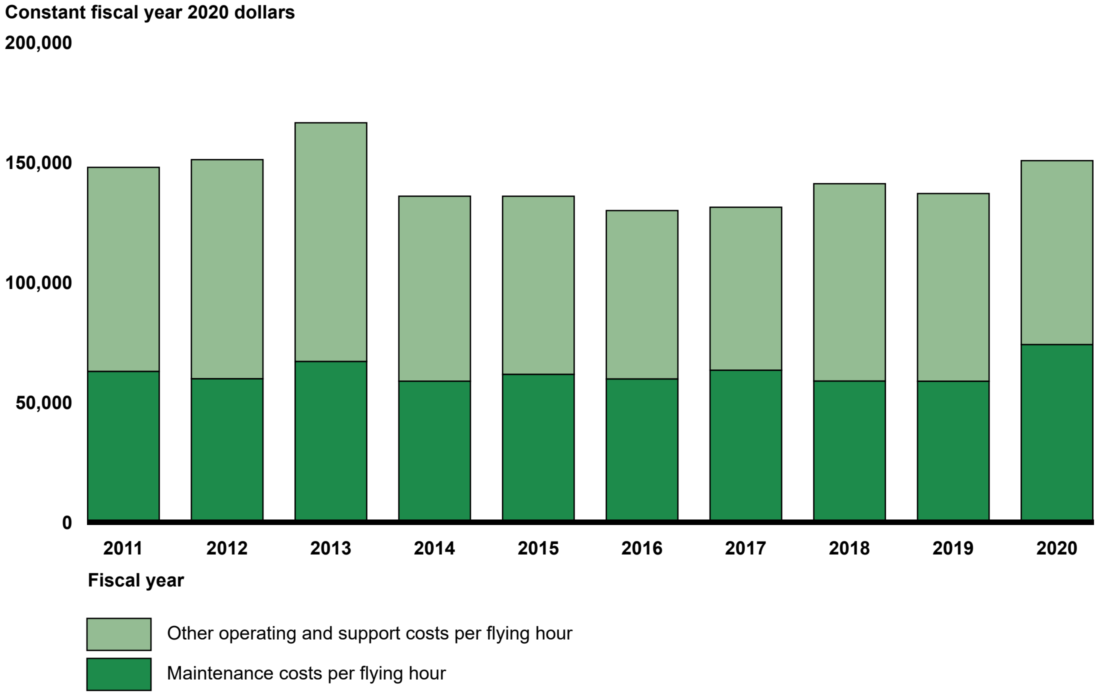


B-2 Fleet Size

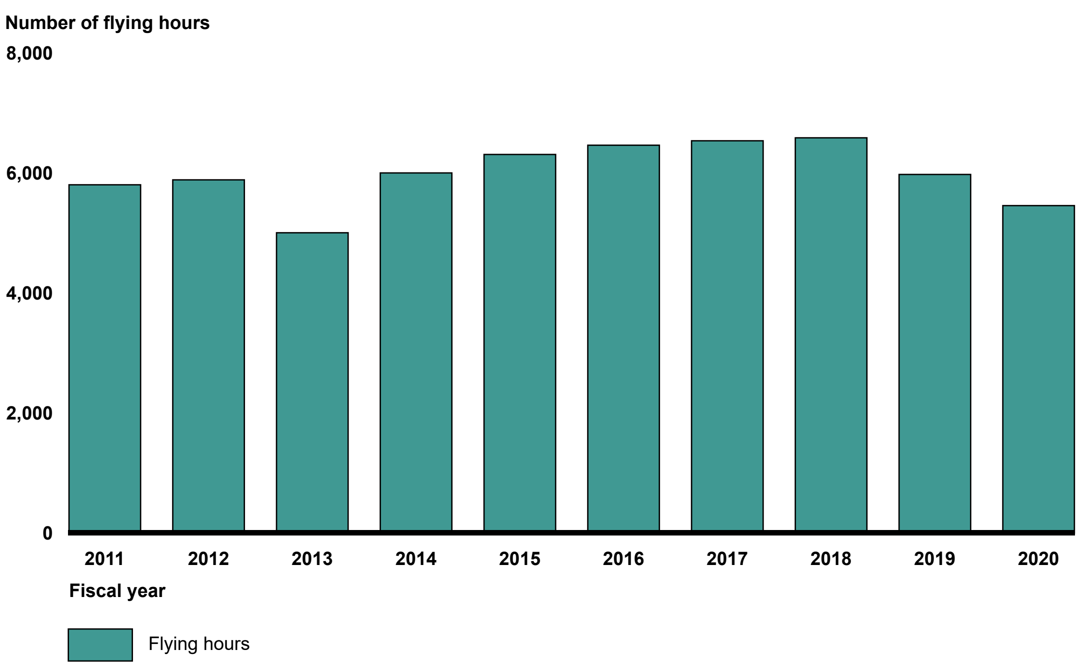


Operating and Support Costs per Flying Hour

B-2 Operating and Support Costs per Flying Hour



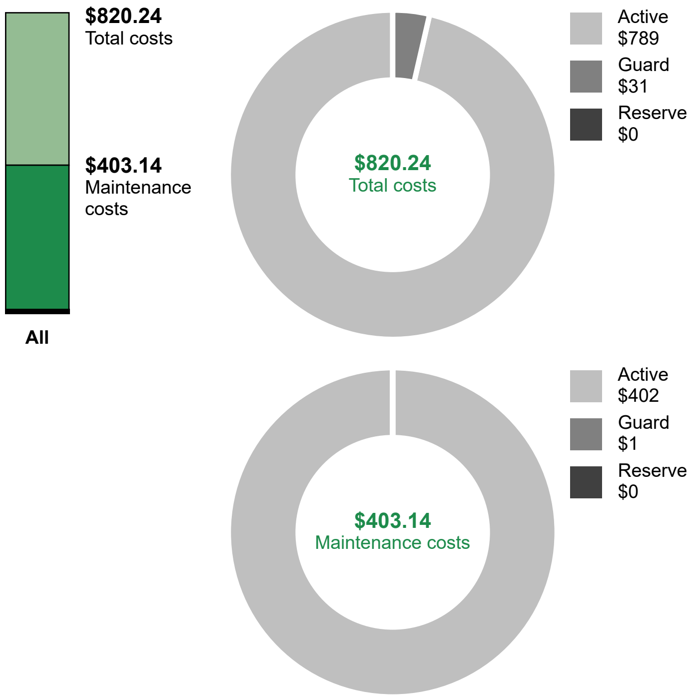
B-2 Flying Hours



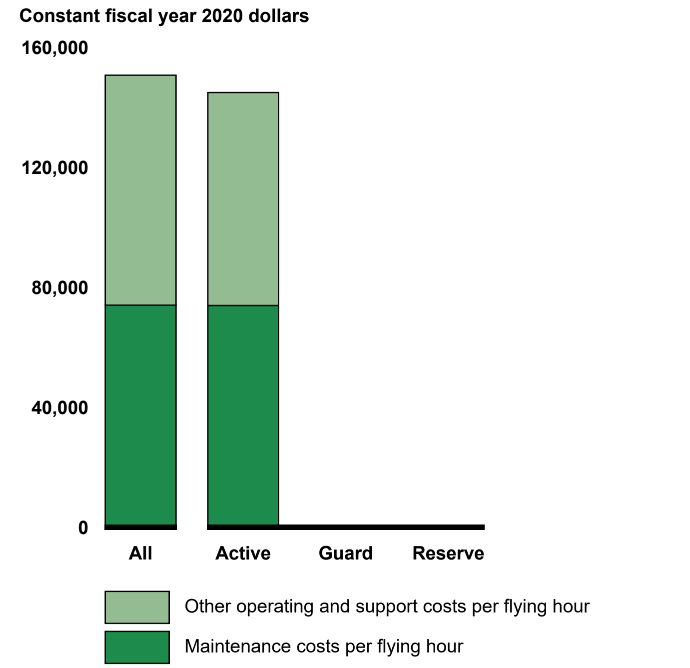
Component-Level Operating and Support Costs

B-2 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Note: The B-2 is operated by the active component, but the Air National Guard contributes towards operations and support of this program, such as through maintenance support.

Sustainment Strategy, Challenges, and Mitigation Actions

Northrop Grumman performs programmed depot maintenance on the B-2 airframe at its facility in California and is also the prime contractor for B-2 modification programs. In addition to a number of contractor facilities, all three Air Force Air Logistics Complexes perform depot repair on parts of the B-2 such as the engine, landing gear, and avionics. Supply chain management is provided by the Air Force Sustainment Center, the Defense Logistics Agency, and Northrop Grumman (for B-2 unique items). Field maintenance is primarily performed by active-duty Air Force personnel including a fully integrated Air National Guard unit, according to a B-2 program official.

B-2 Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Maintenance: The B-2 program has been experiencing delays in scheduled maintenance and increased unscheduled maintenance, according to program officials. The officials stated that the aircraft-level programmed depot maintenance process for the two most recent aircraft experienced delays of 40-plus days due to parts availability, the addition of non-standard work, and an increase in the number of aircraft in-progress at the depot. Further, they said some commodity depot-level repairs of support equipment were experiencing delays of over 1 year. Program officials also stated that many of the B-2 line replaceable units, including radar system components, are beyond their life expectancy and have been experiencing decreased mean time between repairs, leading to increased unscheduled repair requirements.

The Air Force does not own the B-2's proprietary technical data to the aircraft design and manufacturing process and the B-2 program has experienced numerous issues accessing this data, which is necessary for depot-level repairs to be performed at the Air Logistics Complexes, according to program officials. The officials said that the program office has found it necessary to take administrative actions to shift the organic depot workload to the commercial sector in order to provide adequate support to the weapon system. There are also shortages of trained maintenance personnel. For example, according to program officials, many of the B-2 commercial and organic depot repair facilities have only one person available who is trained to perform a specific type of B-2 maintenance.

Supply Support: Program office officials told us that they have had difficulty obtaining needed parts from the supply chain because the B-2 is a low-density, high-demand fleet. According to program officials, because of the age and low number of aircraft in the B-2 fleet, there are numerous diminishing manufacturing sources, parts obsolescence, and parts shortage issues. The flex cable on the fuel vent control valve is an example of a part with diminishing manufacturing sources; microcircuits and circuit card assemblies are examples of parts with obsolescence issues. The fuel vent control valve is a part with shortages.

These issues routinely lead to the practice of cannibalization—taking a working component from one aircraft to install it on another aircraft. While this process mitigates an immediate need, it is inefficient. The B-2 program office has been working to improve the availability of parts. Supply chain improvement efforts include redesigning obsolete hardware to ensure that aging parts are procurable and reparable for the future.

Low-Observable Coating: The B-2 faces sustainment challenges related to the maintenance of its low-observable coating, according to program officials. They stated that the program office has implemented a program to improve low-observable maintenance. The program has also implemented several projects aimed at maintaining the stealth capability of the B-2 by monitoring, maintaining, and enhancing the signature of the aircraft. In addition to these specific sustainment efforts, the program must assess the effect of any modifications to the low-observable coating early in the planning stages.

Program Office Comments

In commenting on a draft of this assessment, the B-2 program office said that it is focused on effective weapon system supportability that is necessary to meet U.S. Strategic Command and Air Force Global Strike Command mission readiness. Further, the program office said that it is continually seeking ways to lower life cycle costs by utilizing incremental improvements to weapon system capabilities across the range of sustainment and modernization efforts through the leveraging of innovative and existing technologies in the Low Observable and Strike family of systems.

B-52
Stratofortress

Program Essentials

Lead Service
Air Force

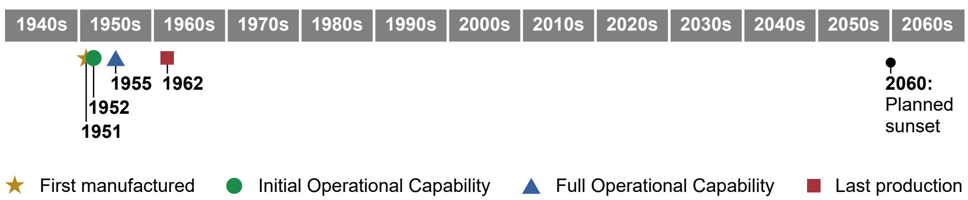
Manufacturer
Boeing

Program Office
Tinker Air Force Base, Oklahoma

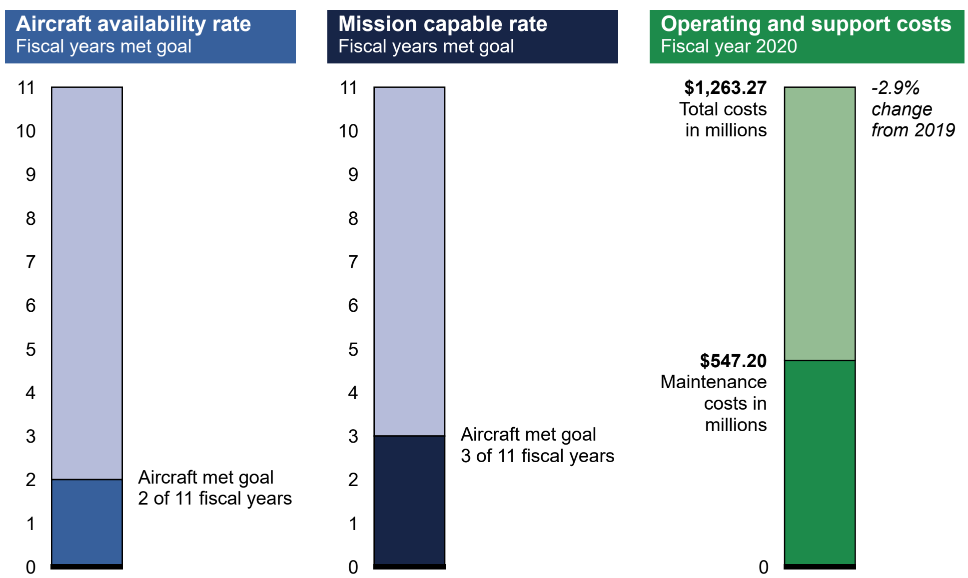
Sustainment
Programmed depot maintenance is performed at the Oklahoma City Air Logistics Complex. A combination of Air Force personnel and contractor support teams perform field maintenance.

The B-52 is a long-range, heavy bomber that can perform a variety of missions, such as strategic attack, close-air support, air interdiction, and offensive counter-air missions. It can carry nuclear or precision-guided conventional ordnance with worldwide navigation capability.

B-52 Life Cycle Timeline



B-52 Sustainment Status



Aircraft

76 total aircraft
Fiscal year 2020

61 years
Average aircraft age in fiscal year 2021

Flying hours

14,298 flying hours
Fiscal year 2020

20,193 hours
Average lifetime flying hours per aircraft in fiscal year 2021

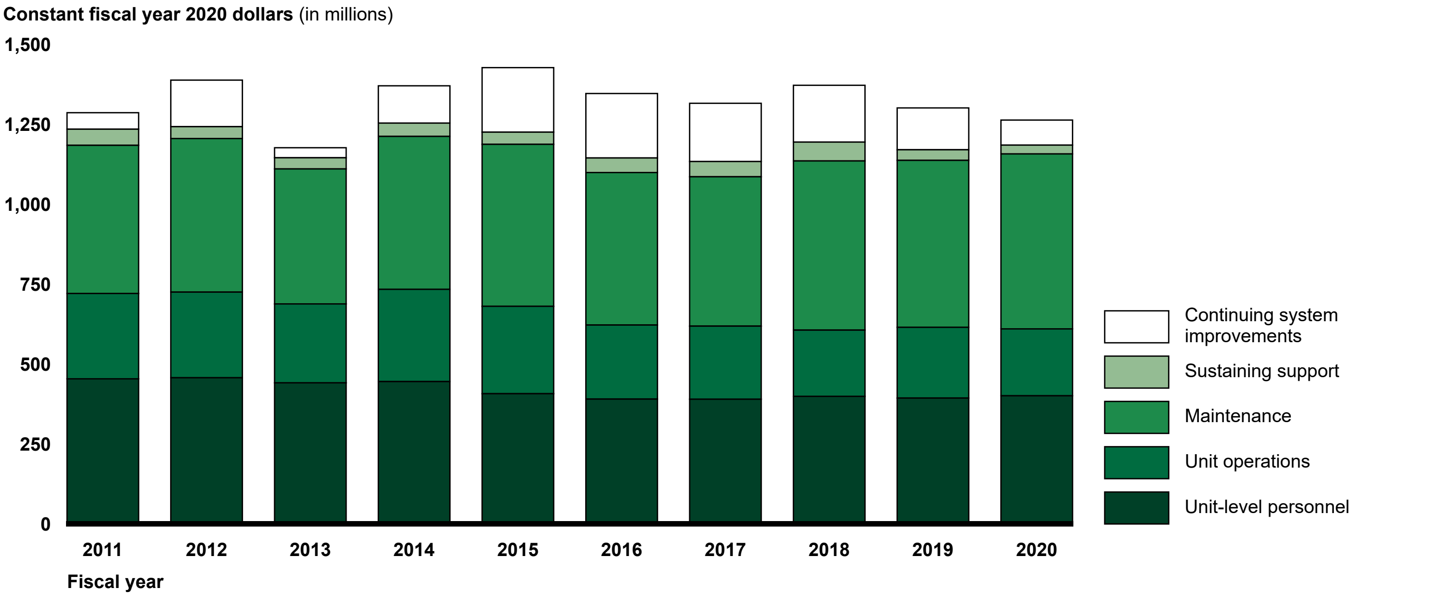
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$16.62 million
Total costs per aircraft

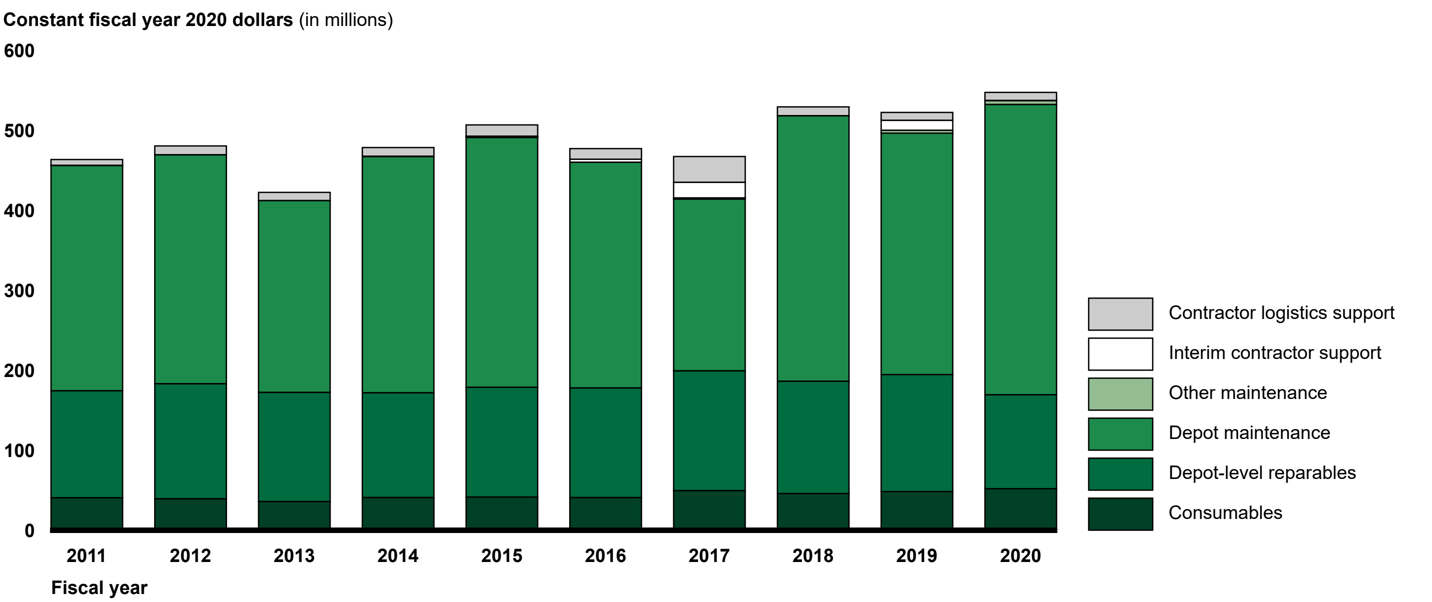
$88,354
Total costs per flying hour
+4.4% change from 2019

Operating and Support Costs

B-52 Total Operating and Support Costs

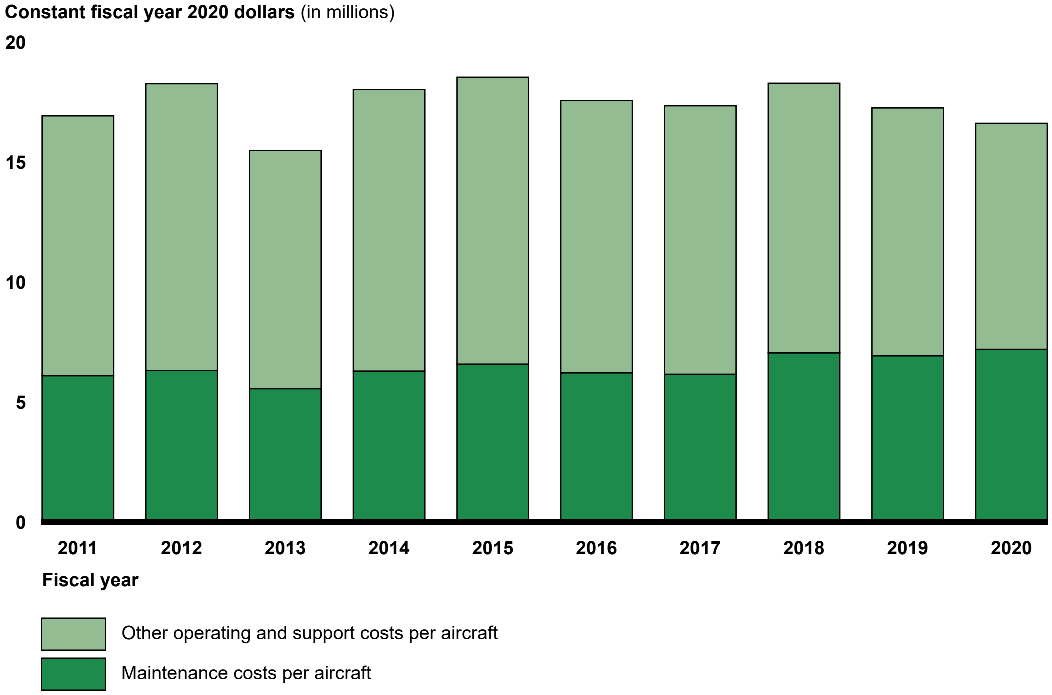


B-52 Maintenance Costs

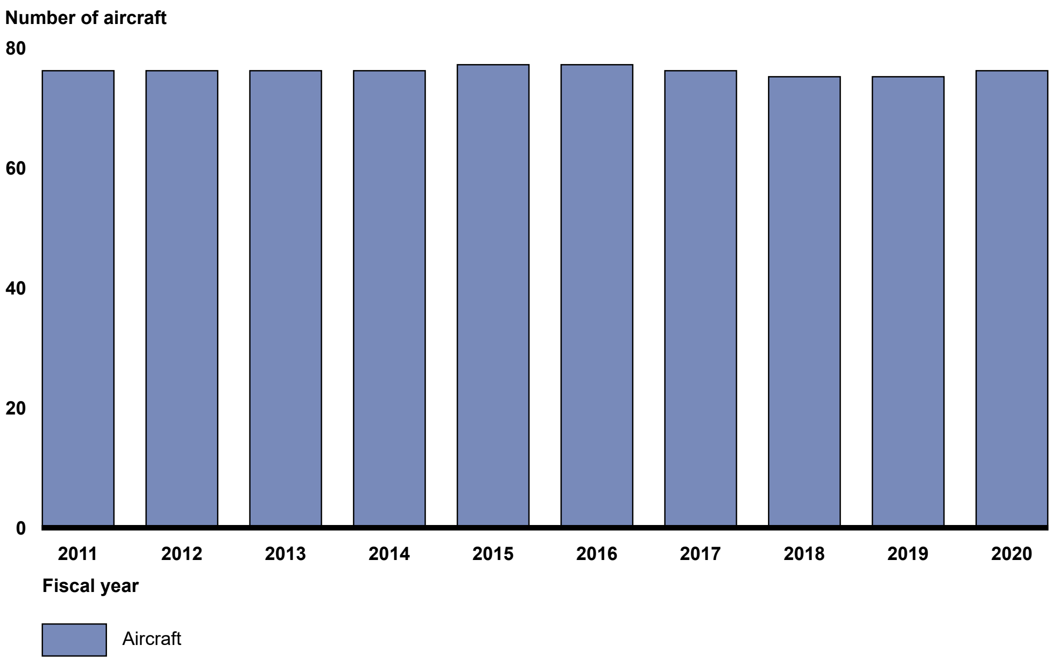


Operating and Support Costs per Aircraft

B-52 Operating and Support Costs per Aircraft

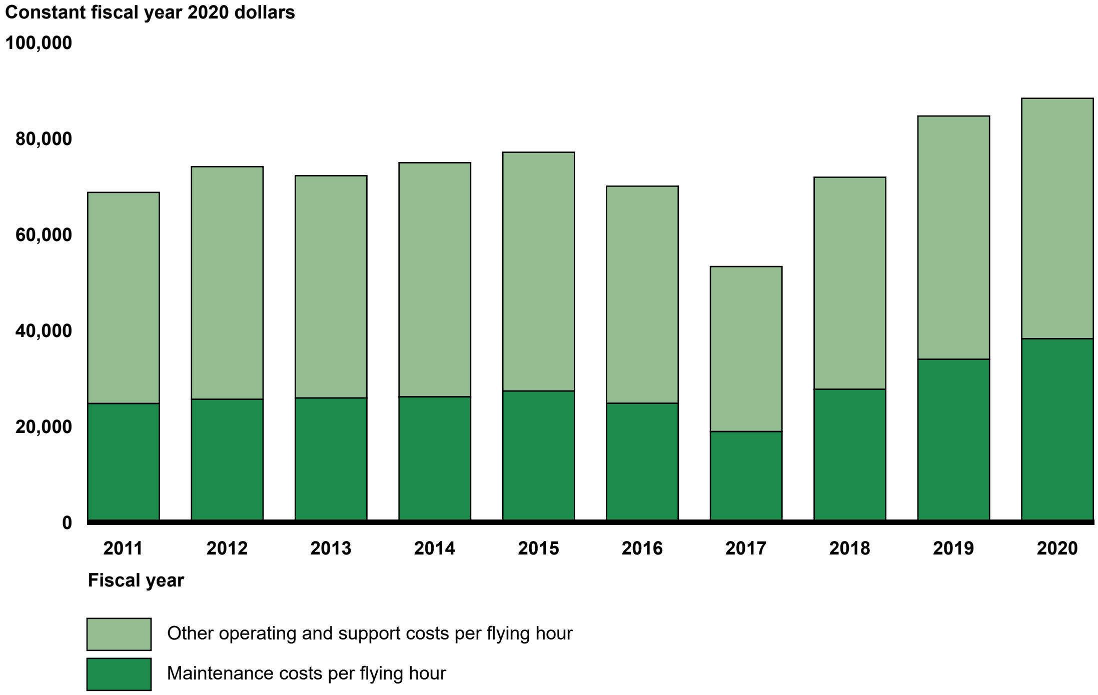


B-52 Fleet Size

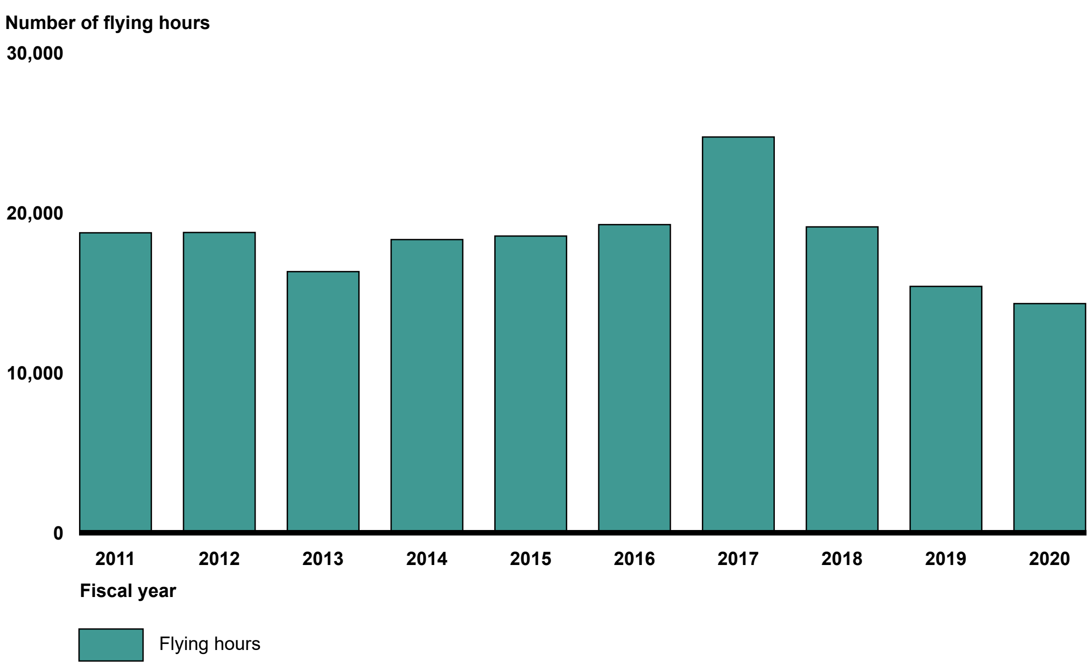


Operating and Support Costs per Flying Hour

B-52 Operating and Support Costs per Flying Hour



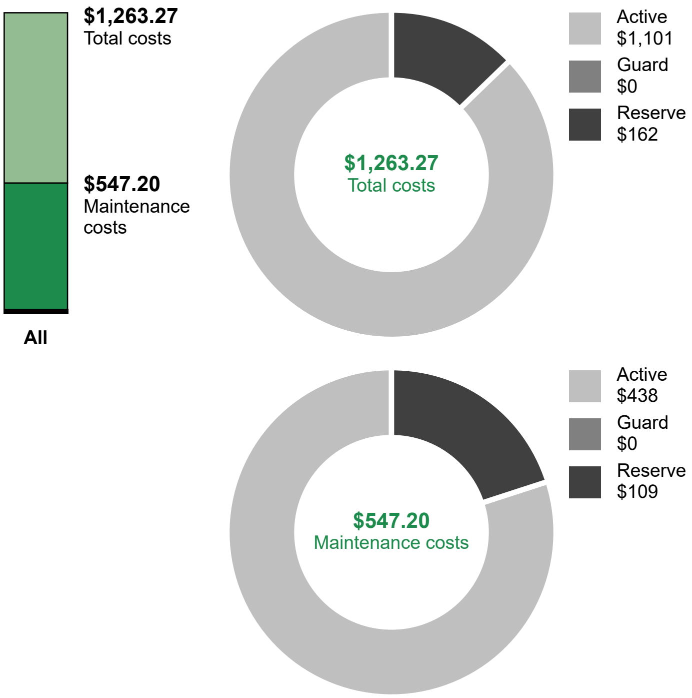
B-52 Flying Hours



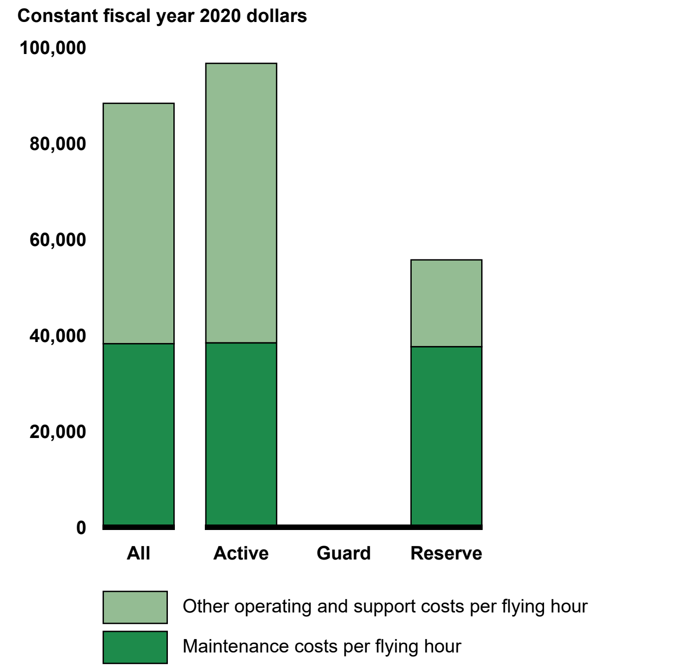
Component-Level Operating and Support Costs

B-52 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

Programmed depot maintenance on the B-52 airframe and TF33-103 engine is performed at Oklahoma City Air Logistics Complex, Oklahoma, with contractor assistance, as needed. A combination of Air Force personnel and contractor support teams respond to field maintenance requirements on the aircraft and the engines, but the majority of engine repair requirements are addressed through depot maintenance.

B-52 Sustainment Challenges

Aging Aircraft

- Delays in acquiring replacement aircraft
- Service life extension
- Unexpected replacement of parts and repairs

Maintenance

- Access to technical data
- Delays in depot maintenance
- Shortage of trained maintenance personnel
- Unscheduled maintenance

Supply Support

- Diminishing manufacturing source
- Parts obsolescence
- Parts shortage and delay

Maintenance: The B-52 is one of the oldest systems operating in the Air Force and is experiencing stress corrosion cracking, corrosion, and fatigue in its airframe and components, according to program officials. However, the officials said that the B-52 still has several thousand hours of usage before reaching its estimated economic service life. Program officials provided the following examples of ongoing and recent maintenance actions:

- The B-52 airframe structure has experienced stress corrosion cracking in aluminum parts that are getting worse with age. To address this issue, the officials said that the program office continues to update materials on a number of primary structural components, where feasible and practical. Further, program engineers constantly update B-52 drawings with alternative material options for future parts procurements to eliminate the stress corrosion cracking issue.
- The B-52 also has issues with engine stress and fatigue and, in January 2017, an engine failed in flight. To address this problem, as well as other supportability issues, the Air Force announced that it awarded a $2.6-billion contract to Rolls-Royce Corporation in 2021 to purchase new engines for the B-52 fleet. The first lot of B-52 aircraft with the new engines is expected to be delivered by the end of 2028 with the entire fleet modified by 2035.
- The original B-52 communications suite was first designed in the 1940s. The entire fleet of 76 aircraft was upgraded to a new communications system between fiscal years 2015 and 2022, requiring 7,000 work hours for installation per plane.

Supply Support: The B-52 program has experienced increasing challenges with parts shortages and delays as a result of diminishing manufacturing sources, obsolescence, and other supply support issues. For example, due to increasing parts shortages and delays, the Oklahoma City Air Logistics Complex reduced the number of B-52 aircraft that were planned for depot maintenance during fiscal year 2021 from 17 to 14 aircraft, according to program officials.

In addition to the program office's established process for mitigating obsolescence and diminishing manufacturing sources, officials said that the Air Force Sustainment Center's Strategic Alternate Sourcing Program Office has developed a draft Diminishing Manufacturing Sources and Material Shortages report for the B-52 that is intended to help the program monitor the scope of this issue. Further, the officials said that the program office continued to develop a comprehensive Diminishing Manufacturing Sources and Material Shortages Plan. According to program officials, it is an extensive project and they do not have an estimated date for completion.

B-52 officials said that the availability of certain parts and components can cause significant challenges for the program and affect depot production, aircraft availability, and the long-term viability of the B-52, if they are not available when needed. Examples of these parts are brake systems, altitude computers, and multiple flight controls, according to program officials. The officials said that the program office regularly analyzes fleet data to identify these parts and components and, if they are needed for unserviceable aircraft, they will accelerate the repair or purchase of the parts.

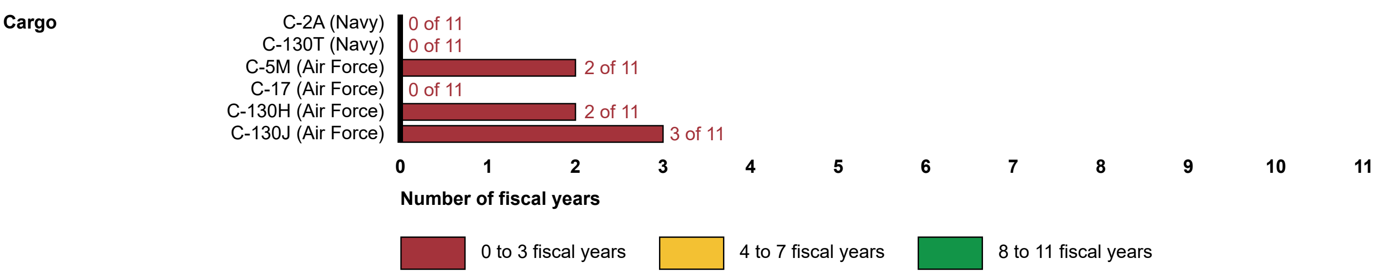
Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

Cargo Aircraft

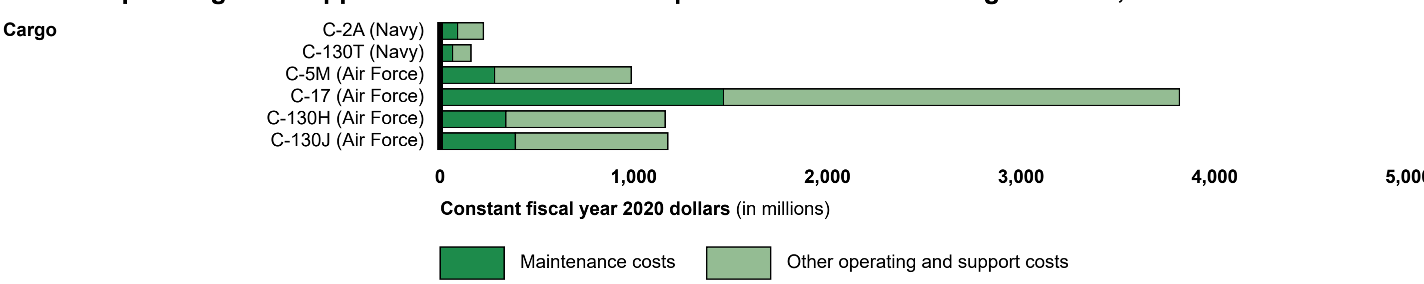
Source: U.S. Navy/Petty Officer 3rd Class Christopher Gaines. | GAO-23-106217

Number of Years Selected Aircraft Met Their Annual Mission Capable Goal, Fiscal Years 2011 through 2021



Source: GAO analysis of Navy and Air Force data. | GAO-23-106217

Annual Operating and Support Costs for Selected Department of Defense Cargo Aircraft, Fiscal Year 2020



Source: GAO analysis of Navy and Air Force data. | GAO-23-106217

C-2A
Greyhound

Program Essentials

Lead Service
Navy

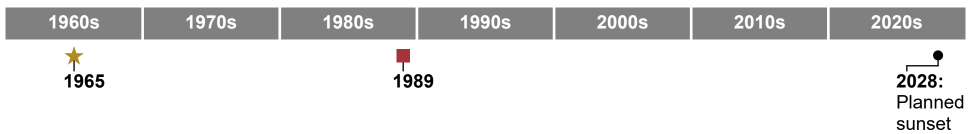
Manufacturer
Northrop Grumman Corporation

Program Office
Program Manager – Air 231,
Naval Air Systems Command,
Patuxent River, Maryland

Sustainment
The Navy's Fleet Readiness Centers East and Southwest perform depot maintenance, according to program officials. Navy personnel perform field maintenance.

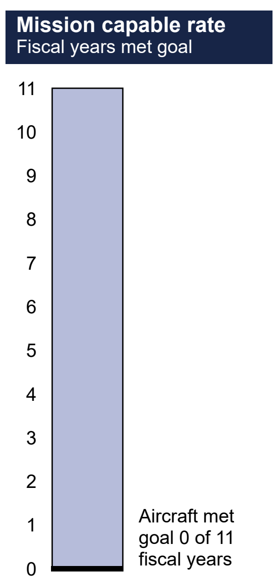
The C-2A Greyhound Logistics Aircraft is a twin-engine monoplane cargo aircraft that is designed to land on aircraft carriers and provide logistics support to Carrier Strike Groups, such as transporting high-priority cargo and passengers.

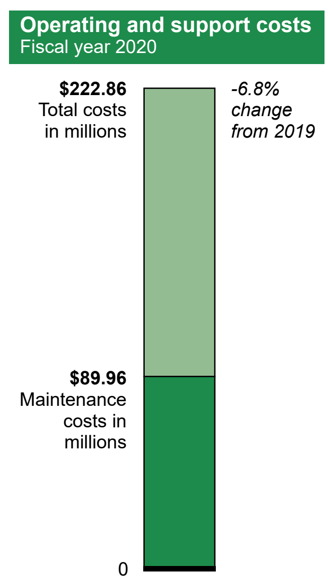
C-2A Life Cycle Timeline



Note: According to program officials, it is unknown when the C-2A reached initial and full operational capability.

C-2A Sustainment Status





Aircraft

32 total aircraft
Fiscal year 2020

34.1 years
Average aircraft age in fiscal year 2021

Flying hours

7,257 flying hours
Fiscal year 2020

11,238 hours
Average lifetime flying hours per aircraft in fiscal year 2021

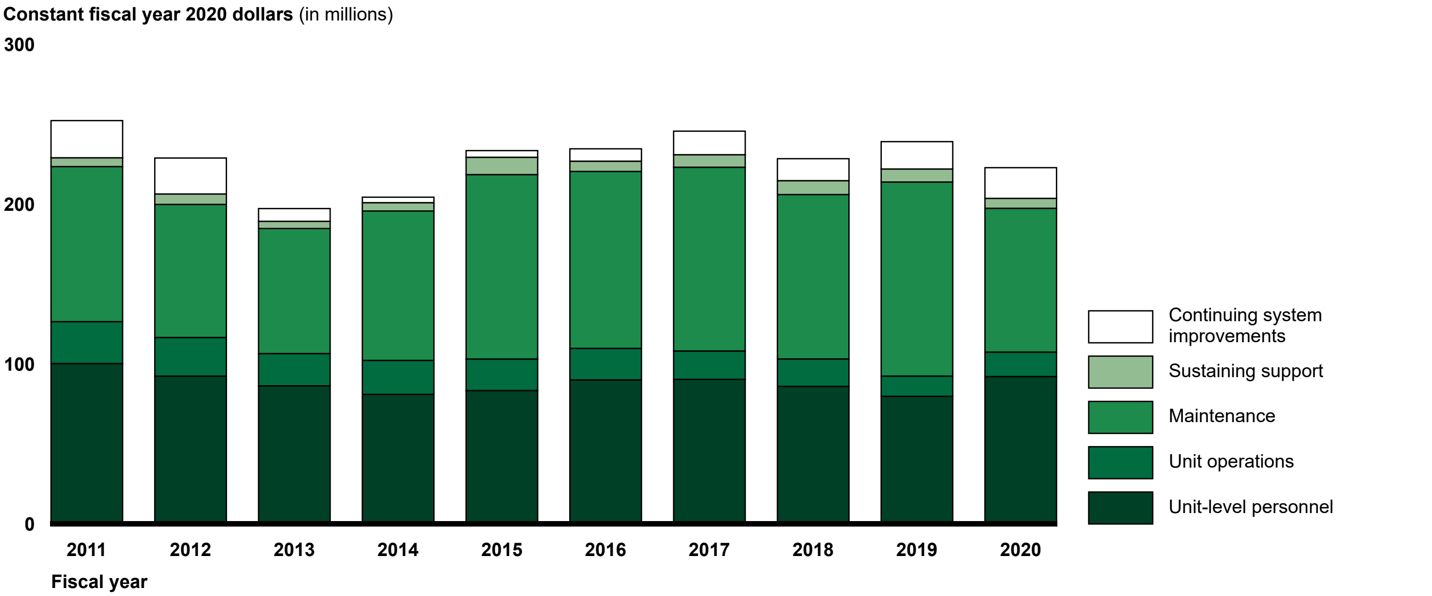
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$6.96 million
Total costs per aircraft

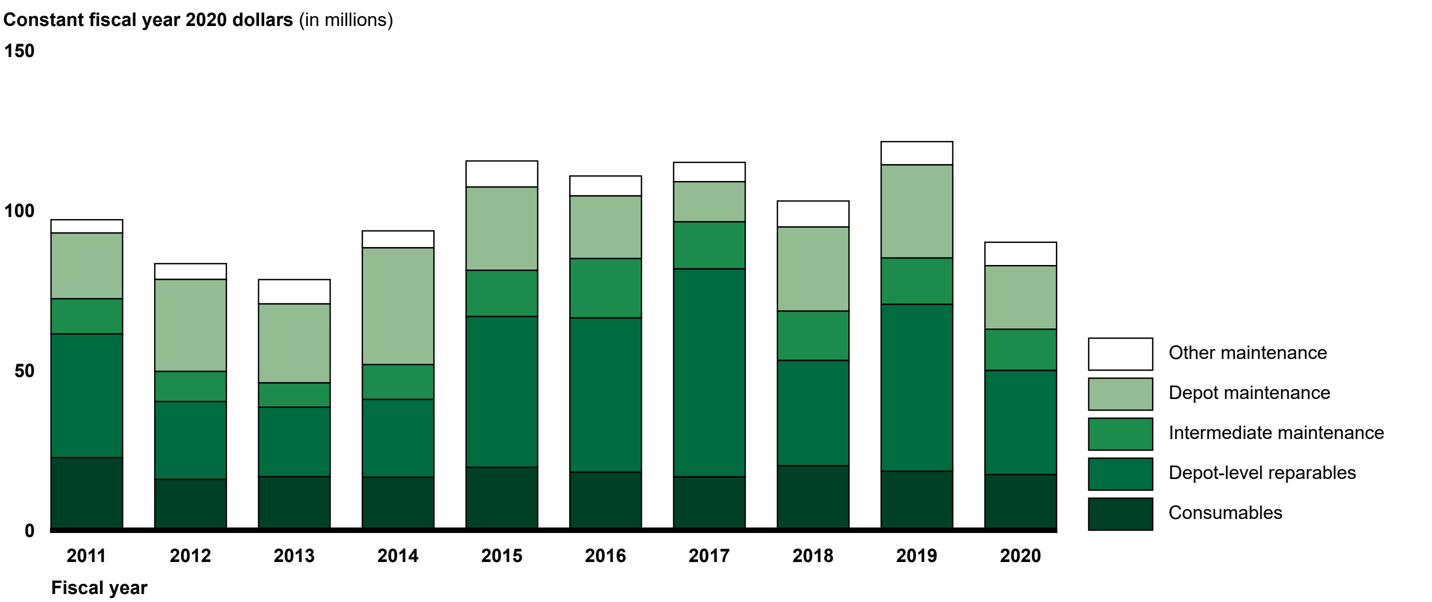
$30,710
Total costs per flying hour
-0.2% change from 2019

Operating and Support Costs

C-2A Total Operating and Support Costs

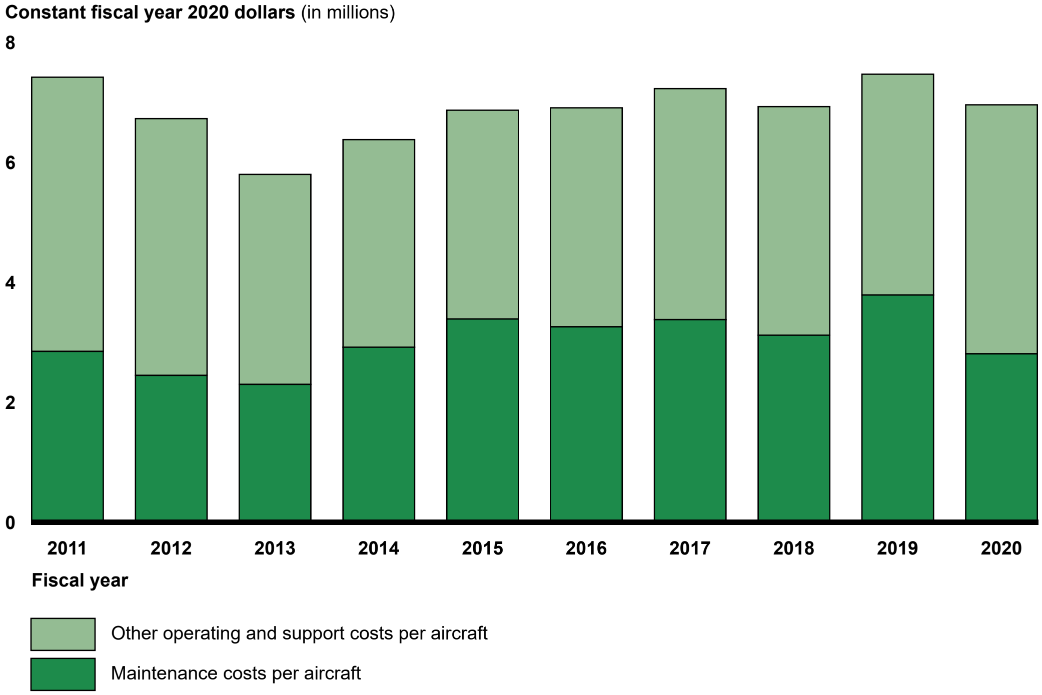


C-2A Maintenance Costs

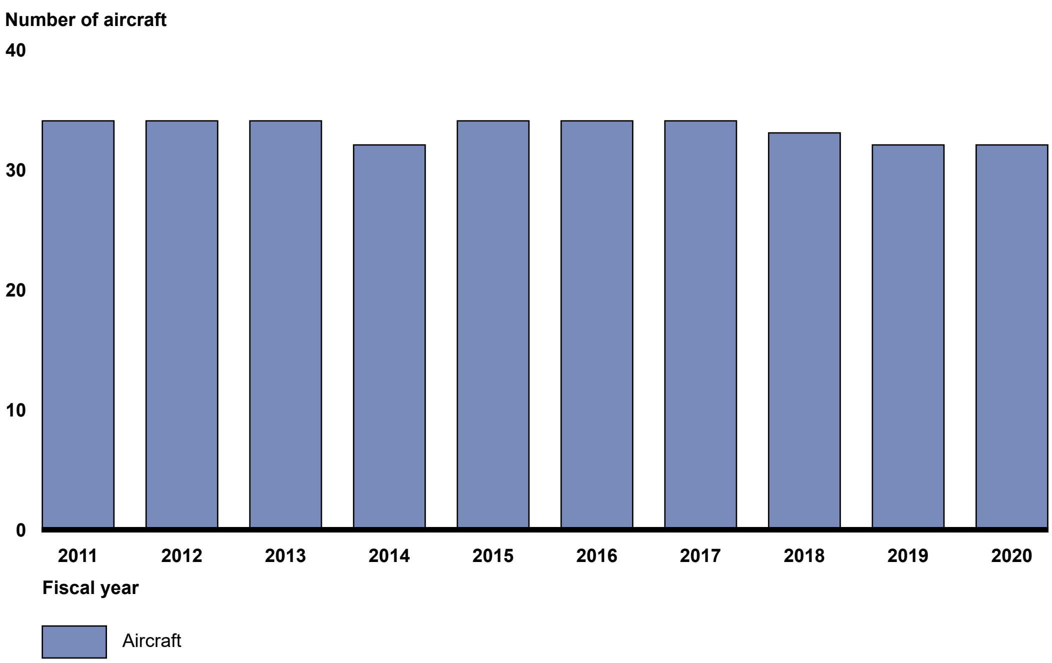


Operating and Support Costs per Aircraft

C-2A Operating and Support Costs per Aircraft

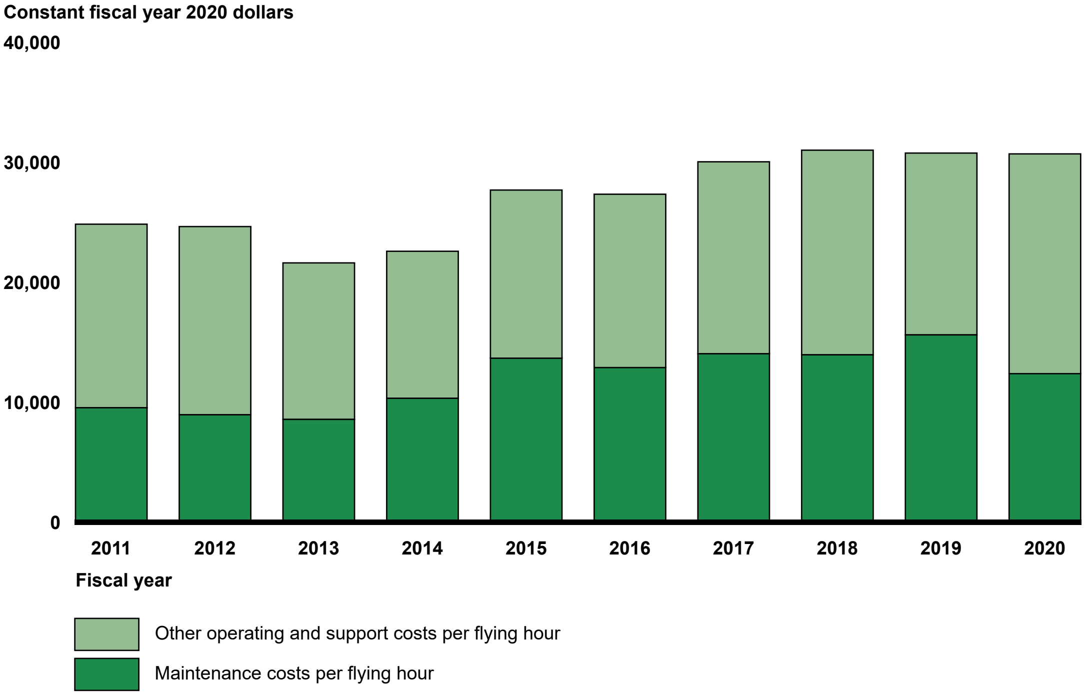


C-2A Fleet Size

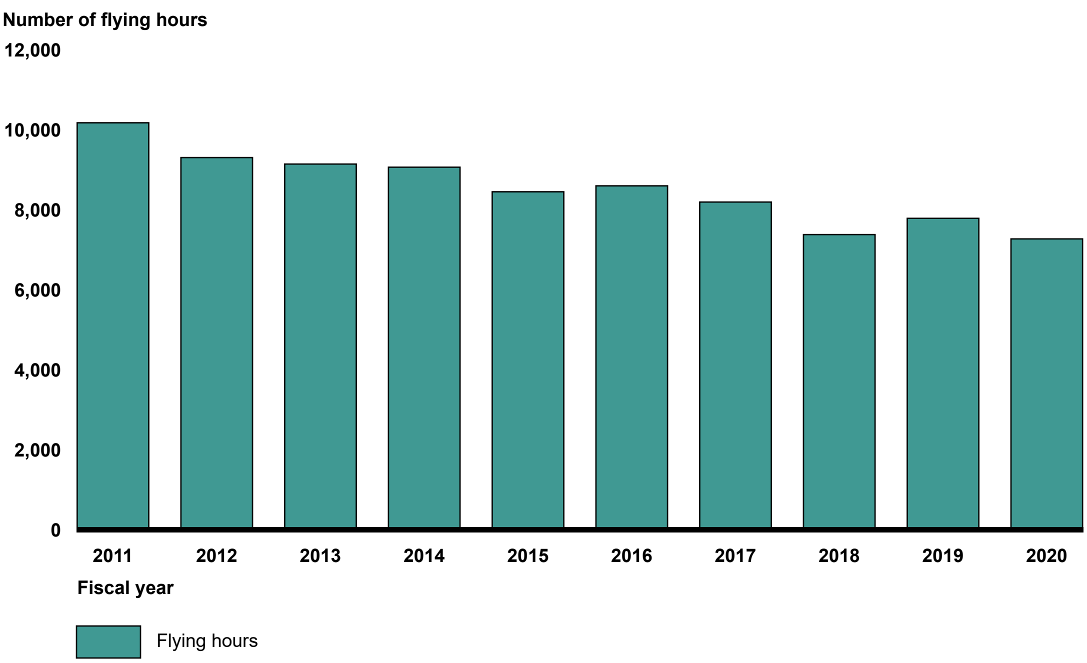


Operating and Support Costs per Flying Hour

C-2A Operating and Support Costs per Flying Hour



C-2A Flying Hours



Sustainment Strategy, Challenges, and Mitigation Actions

The Navy's Fleet Readiness Centers Southwest and East (located in California and North Carolina, respectively) perform depot maintenance on the C-2A, according to program officials. The officials stated that Rolls Royce performs depot maintenance on the aircraft's engines at its facility in Texas. Navy personnel perform field maintenance. The Naval Supply Systems Command and Defense Logistics Agency provide supply support for the C-2A fleet.

C-2A Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Maintenance: Program officials stated that the Navy is reducing the program's funding because it is removing the aircraft from service. As a result, the program's ability to improve maintenance efficiencies has decreased and the program has prioritized sustainment engineering efforts to ensure safety and critical functionality are being met. However, the program's mission capable rate improved after the fleet implemented organizational-level maintenance management improvements in fiscal year 2021, according to the officials.

Program officials also stated that planned depot maintenance ended in fiscal year 2021, so the increase in the program's not mission capable depot rate during the last few years is not expected to continue.

Finally, program officials stated that the number of fleet maintenance personnel with C-2A experience has been declining, which has resulted in an increased reliance on government sustainment engineering support. Funding this support, while the program's overall funding is declining, will remain a constant challenge through the C-2A's last years of service, according to program officials. However, the officials said that they will continue to prioritize efforts to address all mission critical support.

Supply Support: Since the C-2A fleet had been within 5 years of its sunset date, no additional modifications or upgrades were planned to address supply support challenges, such as obsolescence, according to program officials. However, they stated that the program was filling supply shortages with parts and material taken from aircraft that are no longer in service.

Program officials stated that aircraft are being removed from service as the C-2A program approaches its planned sunset date of 2028. In fiscal year 2021, a program official said that the Navy retired one aircraft, with plans to retire an additional 11 aircraft by the end of fiscal year 2022. Program officials said that as more aircraft are removed from service, the parts and material coming off those aircraft will mitigate most of the program's risk from obsolescence in the future.

Program Office Comments

In commenting on a draft of this assessment, the program office stated that the C-2A mission has been extended by 2 years recently due to delays in the replacement aircraft. Also, the program's material availability risks are being mitigated with parts coming from retiring aircraft, which is ongoing. The declining number of qualified Navy maintainers is an issue that the Navy is managing, according to the program office.

C-130T
Hercules

Program Essentials

Lead Service
Navy

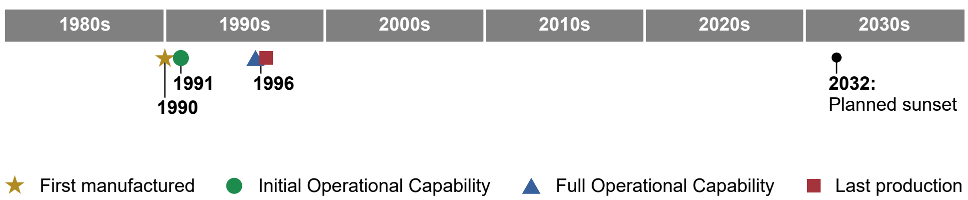
Manufacturer
Lockheed Martin

Program Office
Program Manager – Air 207, Naval Air Systems Command, Patuxent River, Maryland

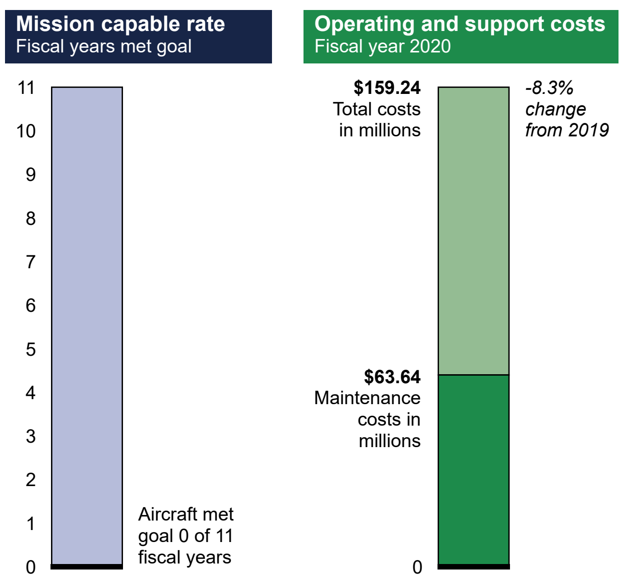
Sustainment
The Air Force's Ogden Air Logistics Complex performs depot maintenance. Navy personnel conduct field maintenance.

The C-130T Hercules is a multimission medium-lift transport aircraft capable of intratheater and intertheater airlift operations, including support operations for forward-deployed naval forces, transporting personnel and cargo for delivery in-flight via parachute or landing.

C-130T Life Cycle Timeline



C-130T Sustainment Status



Aircraft

18 total aircraft
Fiscal year 2020

27.4 years
Average aircraft age in fiscal year 2021

Flying hours

7,711 flying hours
Fiscal year 2020

19,411 hours
Average lifetime flying hours per aircraft in fiscal year 2021

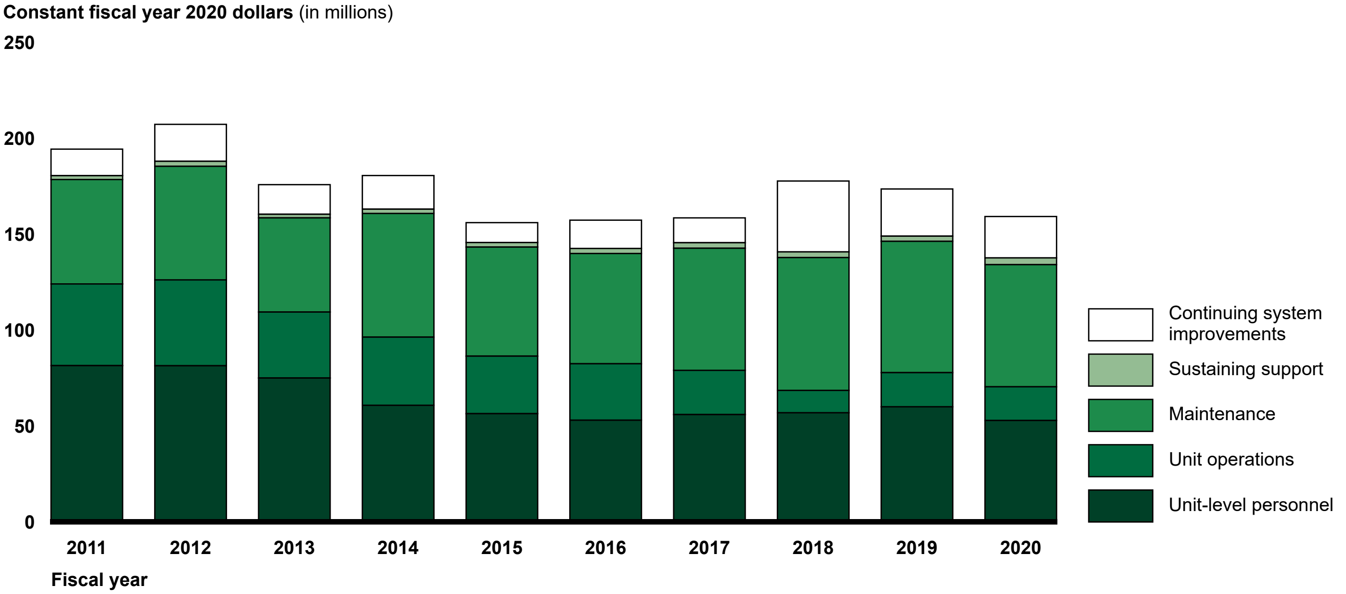
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$8.85 million
Total costs per aircraft

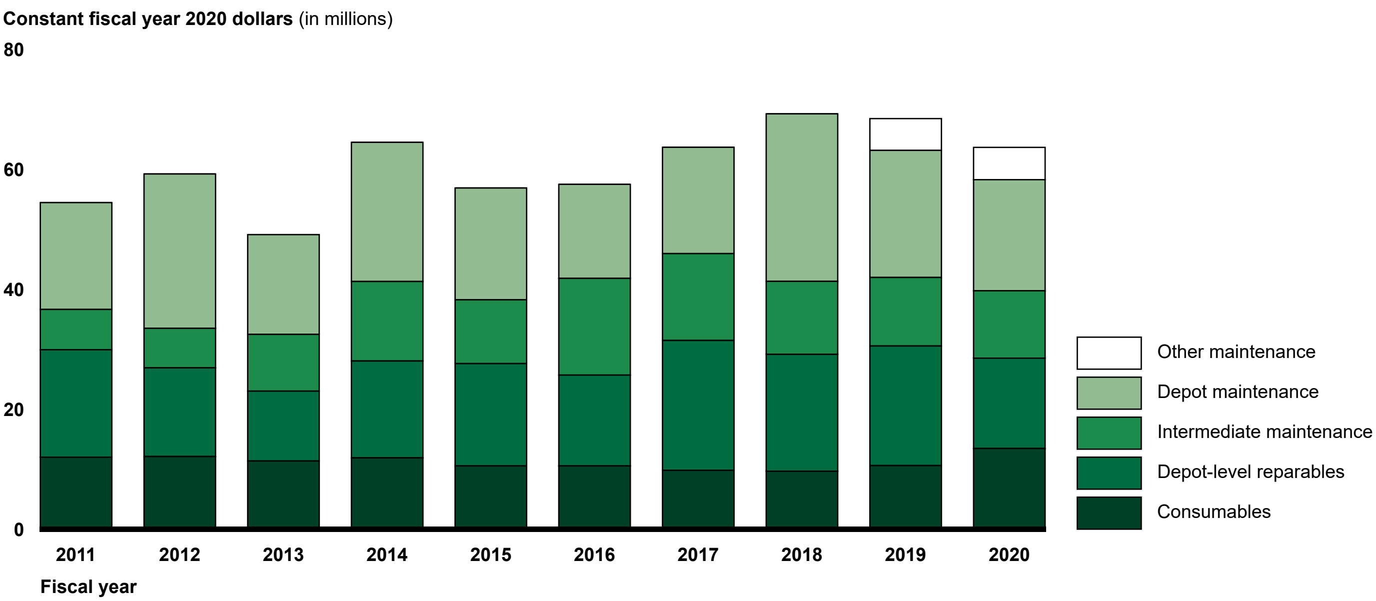
$20,651
Total costs per flying hour
-5.7% change from 2019

Operating and Support Costs

C-130T Total Operating and Support Costs

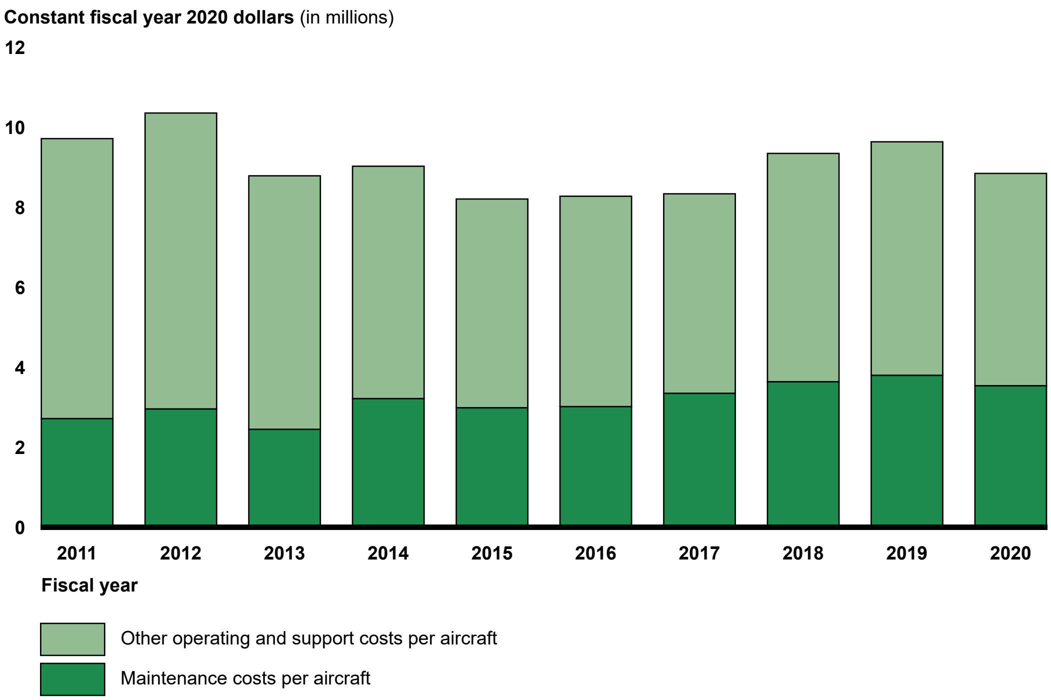


C-130T Maintenance Costs

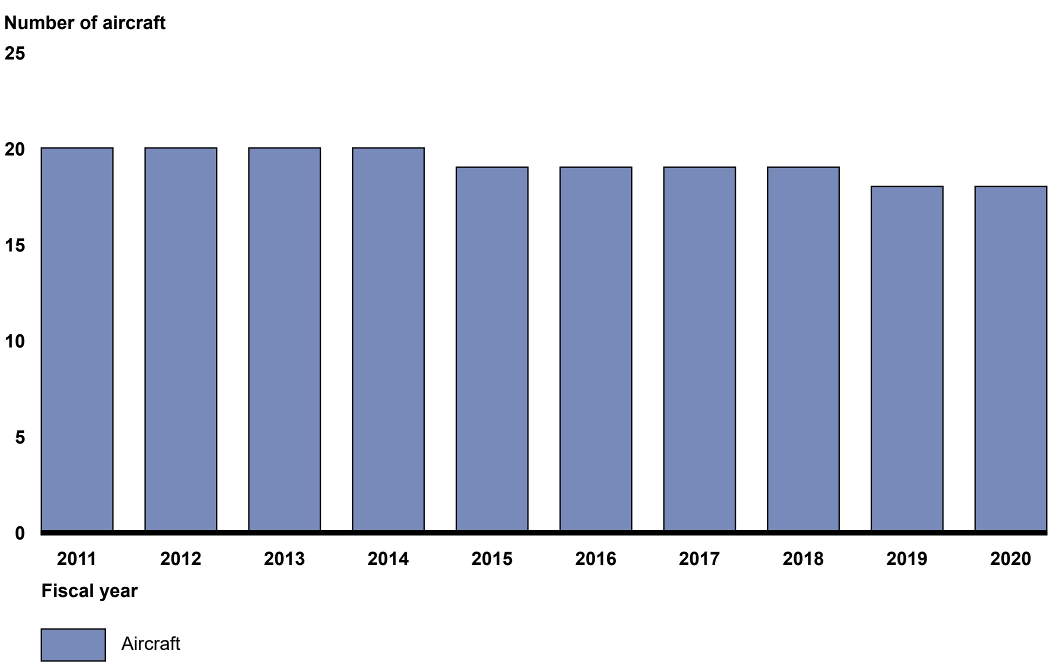


Operating and Support Costs per Aircraft

C-130T Operating and Support Costs per Aircraft

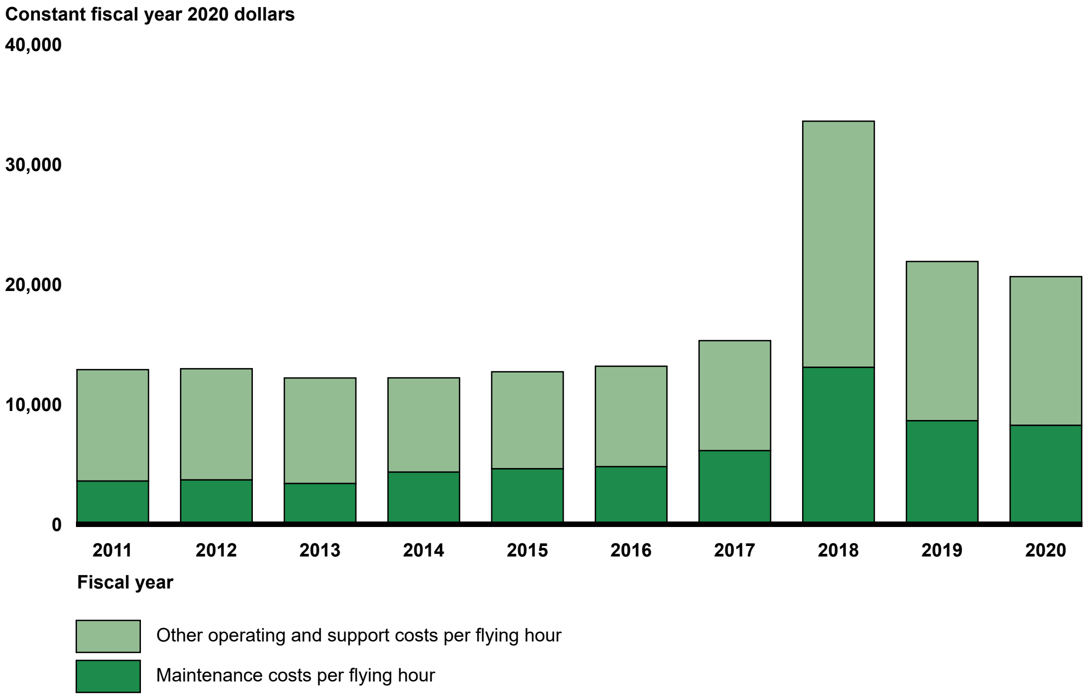


C-130T Fleet Size

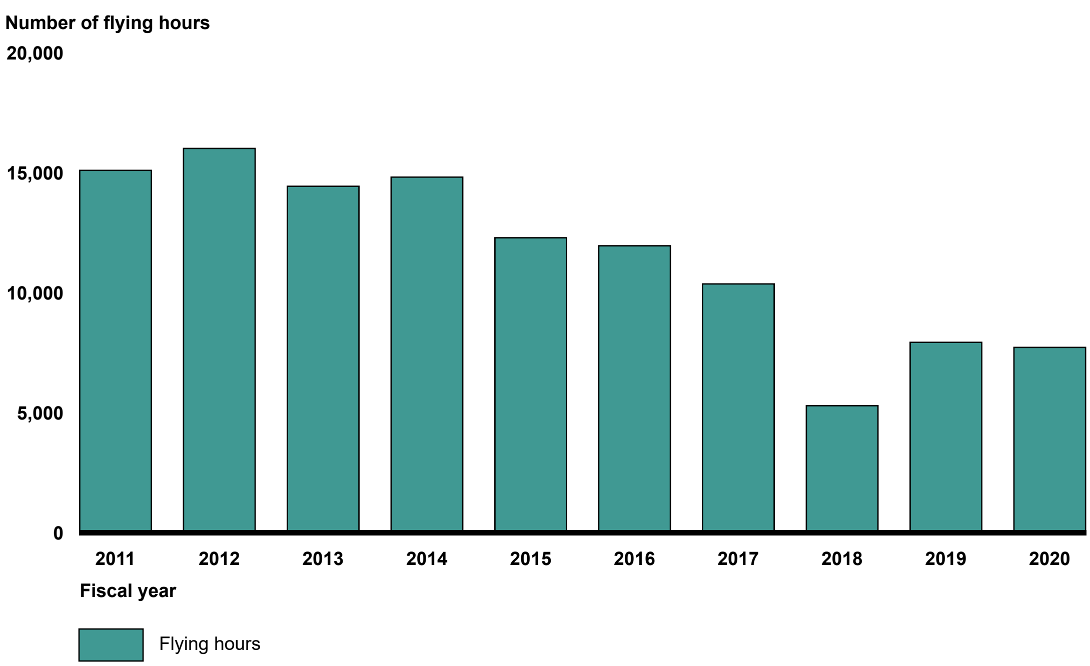


Operating and Support Costs per Flying Hour

C-130T Operating and Support Costs per Flying Hour



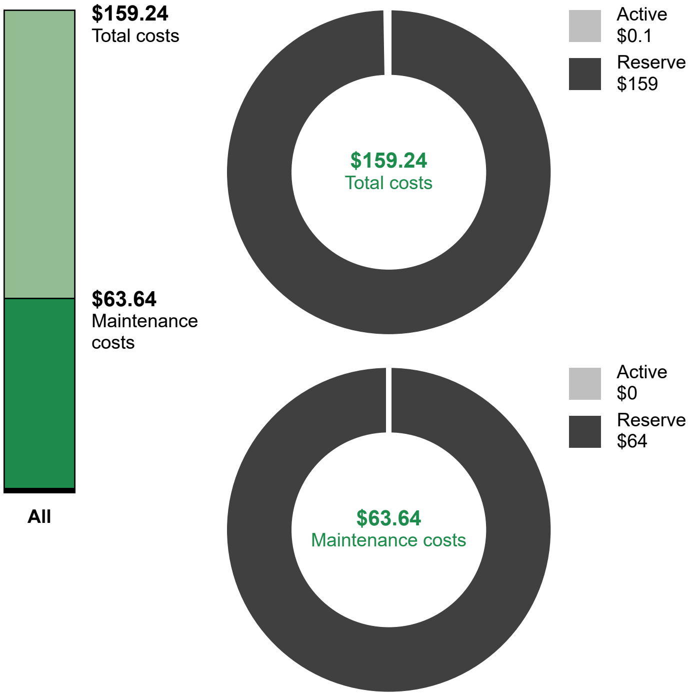
C-130T Flying Hours



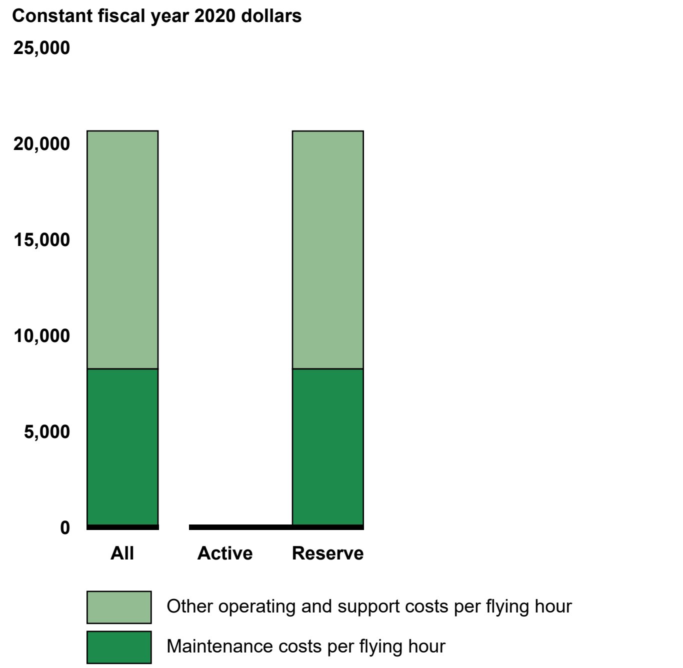
Component-Level Operating and Support Costs

C-130T Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The C-130T is a variant of the Air Force's commercially developed C-130 Hercules transport aircraft and the fleet shares a support infrastructure with other C-130 variants. The C-130T and KC-130T airframe and structural components are approximately 80 percent common with the KC-130J. Depot maintenance on the C-130T is performed by the Air Force's Ogden Air Logistics Complex in Utah, according to program officials. Navy personnel conduct field maintenance on the C-130T.

C-130T Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Aging: According to program officials, the C-130T has undergone a series of modifications to replace or enhance aging components and additional efforts are planned. Officials provided the following examples:

- An upgrade of the legacy four-blade propeller system with an eight-blade high thrust composite blade system is scheduled to be completed in 2023;

- An effort to modernize the C-130T's steel brake system with carbon brakes to provide enhanced safety and maintainability, at a reduced weight, is planned to be completed in 2022; and
- Replacement of the center wing box (i.e., where the wings join to the main fuselage of the aircraft) to extend the service life of the aircraft beyond 2060 are planned to start in 2025.

Maintenance: According to program officials, the C-130T has experienced a high rate of not mission capable maintenance primarily due to long turnaround times for scheduled maintenance. The officials attributed the long turnaround times primarily to the program's outdated sustainment baseline that does not reflect the current maintenance needs of the aircraft. A program official explained that the sustainment baseline consists of the aircraft configuration baseline and the Reliability-Centered Maintenance baseline. The Reliability-Centered Maintenance baseline, according to the official, defines the fundamental periodic maintenance tasks and inspections, and sets the frequencies of those tasks and inspections based on the known or calculated reliability of components.

Further, program officials stated that the lack of a sustainment baseline adversely affected the program office's ability to identify, evaluate, and take actions regarding changes in aircraft and support system performance as the changes occurred.

According to program officials, the C-130T's sustainment baseline was not adequately maintained and updated over time to reflect new and changing failure rates resulting from changes to the aircraft operating techniques or the increasing age of the aircraft. The officials stated that the baseline was not updated because the program's funding levels for the updates—and other program-related logistics activities—were less than the amounts required.

The program is pursuing an updated sustainment baseline for all of the Navy and Marine Corps C-130 variants, according to program officials. Officials stated that significant elements of the baselines are nearing completion, particularly for KC-130J, but work remains to be done for C-130T and KC-130T baselines.

The commonality between the KC-130T, C-130T and the KC-130J airframes will allow for some extrapolation of KC-130J sustainment data for other C-130 baselines, according to program officials. For example, they said that the available baseline data for the KC-130J has also informed proposals for the following changes to the maintenance baseline for all C-130 variants:

- updating and extending fleet and depot maintenance intervals;
- improving retail supply posture; and
- increasing organizational-level maintenance speed and effectiveness.

While the officials said that progress developing the revised sustainment baselines continues, completion dates will depend on future funding resources.

Program officials stated the program began a scheduled maintenance optimization effort in 2021 for the C-130T and KC-130T. They said that the effort is expected to reduce the overall amount of time for scheduled maintenance by expanding the intervals in between inductions and by reducing inspection requirements. According to program officials, the scheduled maintenance optimization strategy and execution plan are complete, and pending approval by an Integrated Maintenance Review Board. Implementation of the strategy, which will include maintenance schedule changes to all Navy and Marine Corps variants, is planned for first quarter of fiscal year 2023.

Supply Support: According to program officials, supply challenges continued to affect the C-130T fleet's overall readiness. The officials said that, due to the lack of a current sustainment baseline, the program has experienced unanticipated and unplanned demand signals that resulted in parts shortages and delays. The shortages and delays occurred because the unanticipated demands:

- required parts that were not previously carried in inventory;
- increased the consumption of stocked parts beyond the program's replenishment allowances; or
- reduced the inventory amounts of parts below the established safety stock levels.

According to officials, the program's ongoing sustainment baseline efforts will result in updated failure rates and frequencies for parts and components that will be used to update the related supply data to reduce unanticipated or unplanned demand signals.

The officials also said that back orders of parts and components increased in fiscal years 2020 and 2021 due to the effects of the COVID-19 pandemic and multiservice priority conflicts. They stated that they plan to mitigate additional increases with close collaboration for multiservice-supported components and by improving critical item-list allowance levels across the C-130T fleet.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

C-5M
Super Galaxy

Program Essentials

Lead Service
Air Force

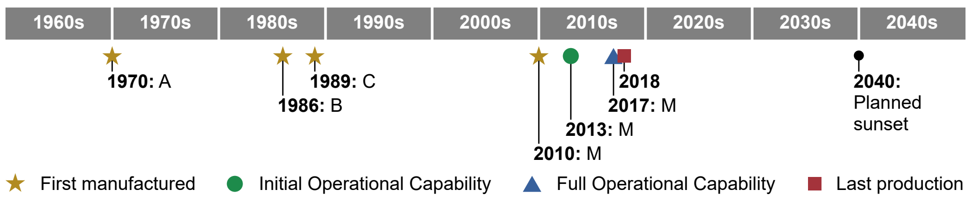
Manufacturer
Lockheed Martin-Georgia Company

Program Office
Robins Air Force Base, Georgia

Sustainment
Programmed depot maintenance is performed at the Warner Robins Air Logistics Complex. Air Force personnel perform field maintenance.

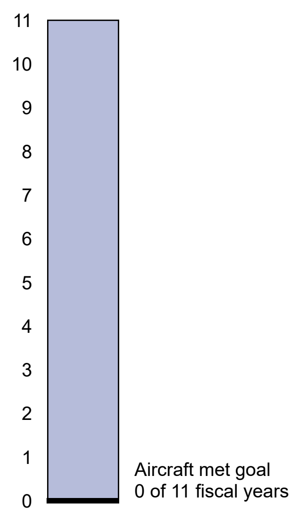
The C-5M is a strategic transport aircraft and is the largest aircraft in the Air Force inventory. Its primary mission is to transport cargo and personnel for the Department of Defense. By the end of fiscal year 2018, all legacy C-5 models had been modified and redesignated as the C-5M.

C-5M Life Cycle Timeline

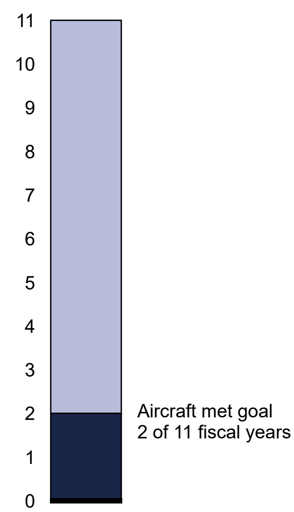


C-5M Sustainment Status

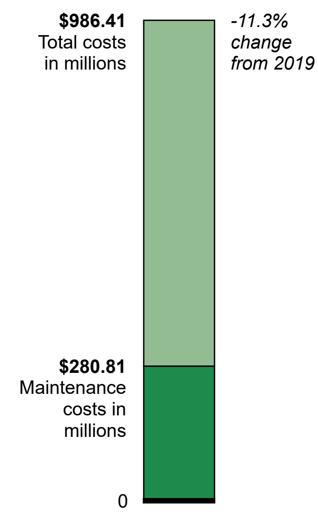
Aircraft availability rate
Fiscal years met goal



Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

52 total aircraft
Fiscal year 2020

34 years
Average aircraft age in fiscal year 2021

Flying hours

17,153 flying hours
Fiscal year 2020

22,716 hours
Average lifetime flying hours per aircraft in fiscal year 2021

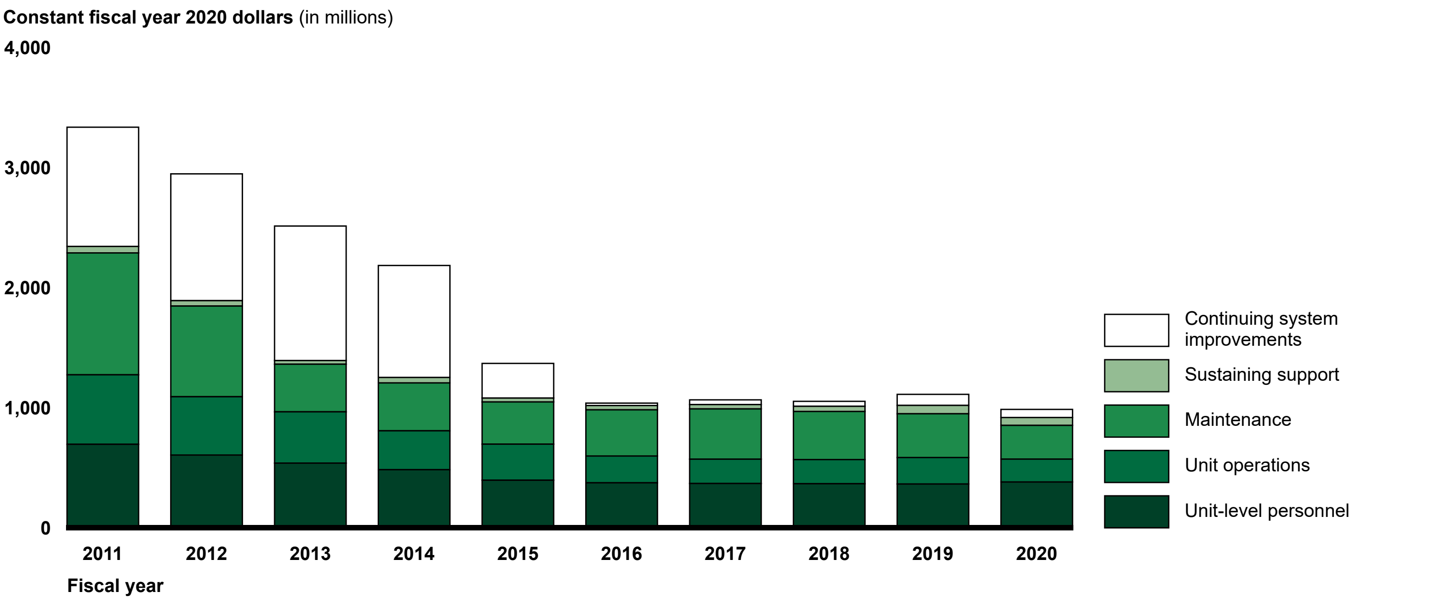
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$18.97 million
Total costs per aircraft

$57,508
Total costs per flying hour
-5.8% change from 2019

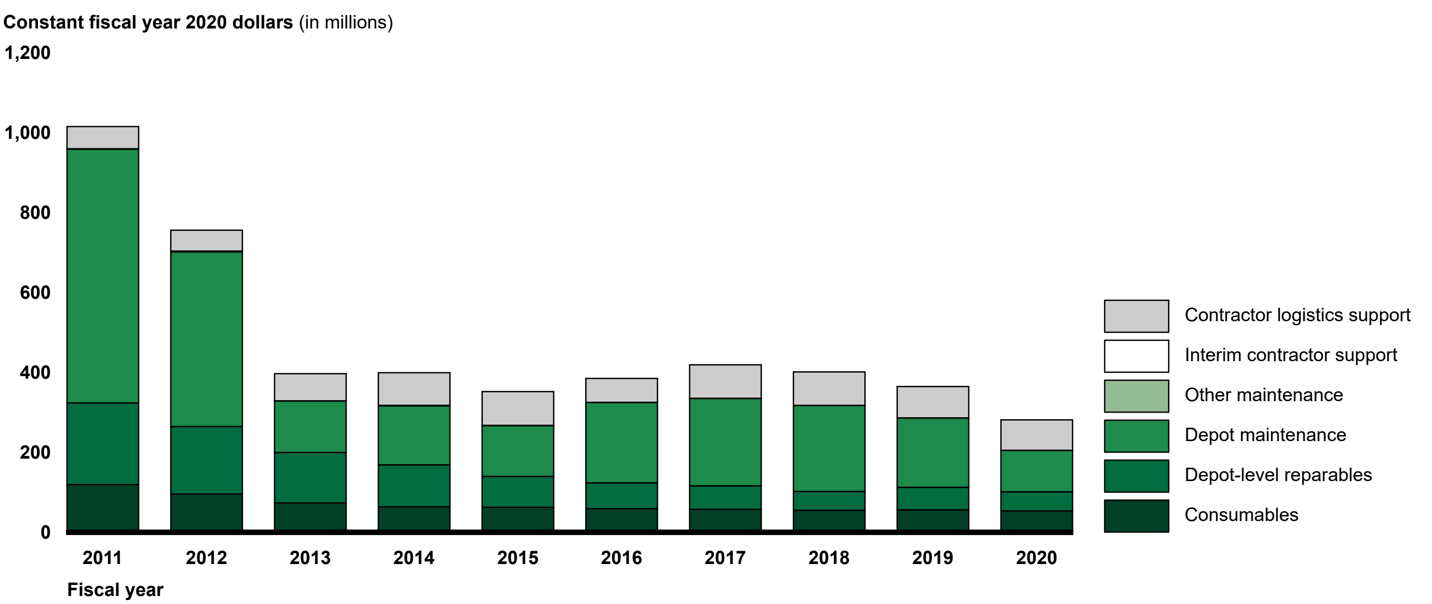
Operating and Support Costs

C-5M Total Operating and Support Costs



Note: The figure includes data for C-5A, C-5B, C-5C, and C-5M aircraft.

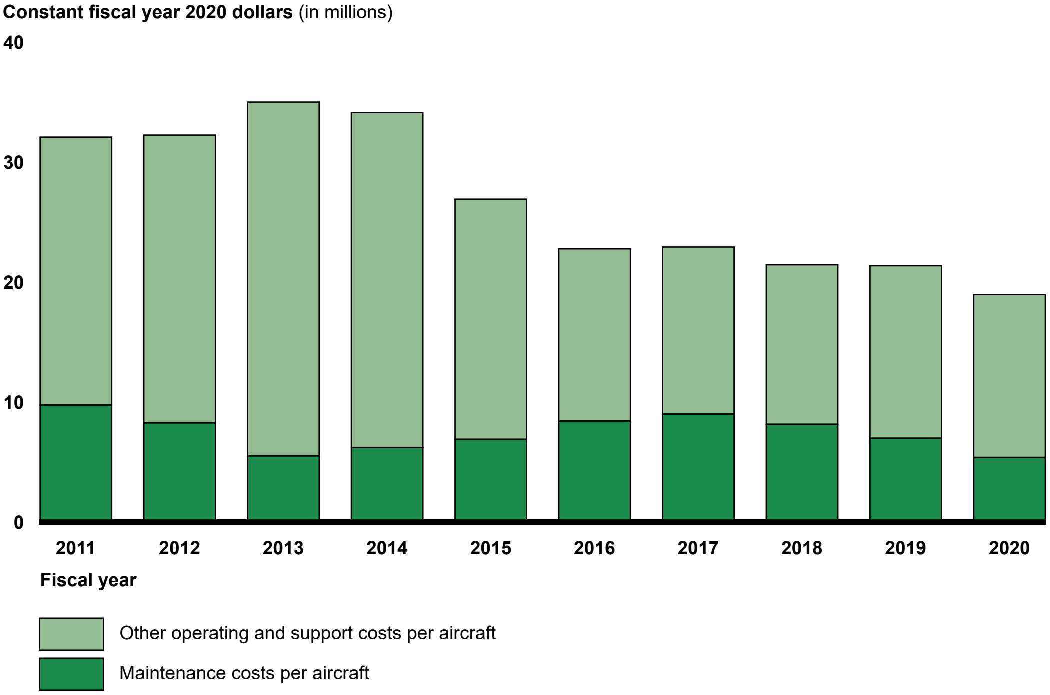
C-5M Maintenance Costs



Note: The figure includes data for C-5A, C-5B, C-5C, and C-5M aircraft.

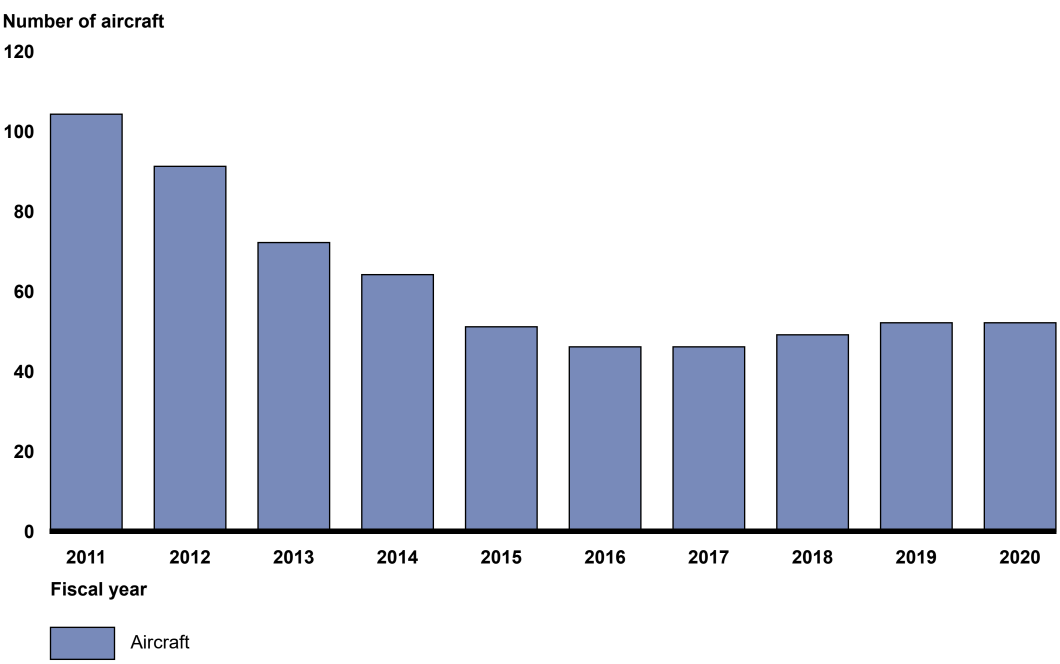
Operating and Support Costs per Aircraft

C-5M Operating and Support Costs per Aircraft



Note: The figure includes data for C-5A, C-5B, C-5C, and C-5M aircraft.

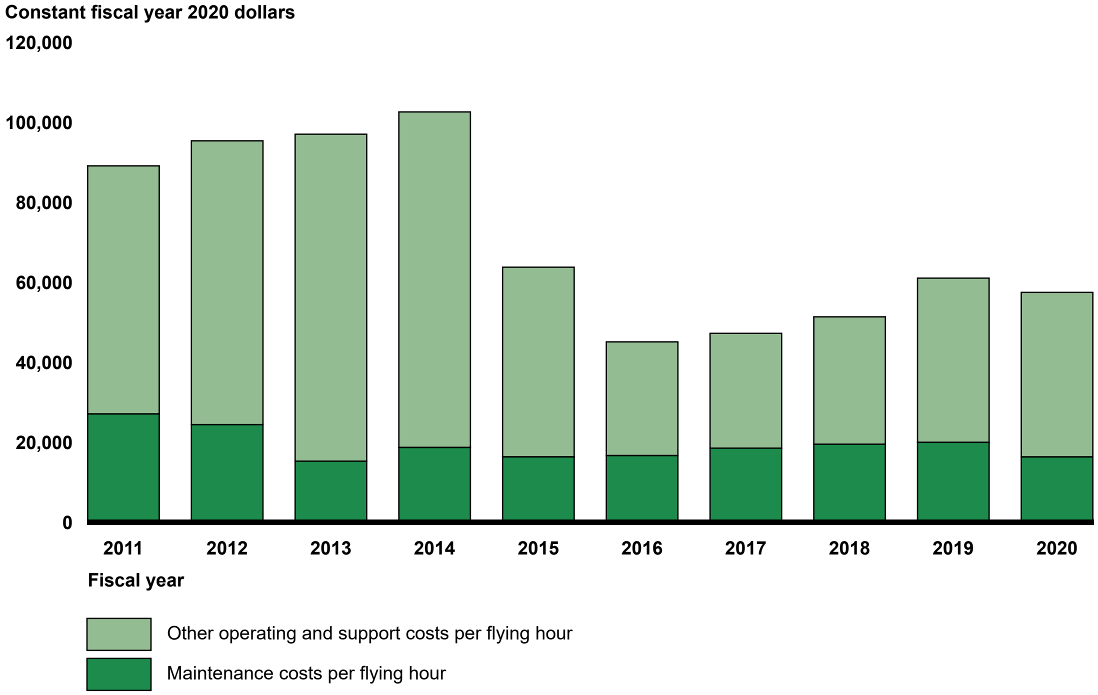
C-5M Fleet Size



Note: The figure includes data for C-5A, C-5B, C-5C, and C-5M aircraft.

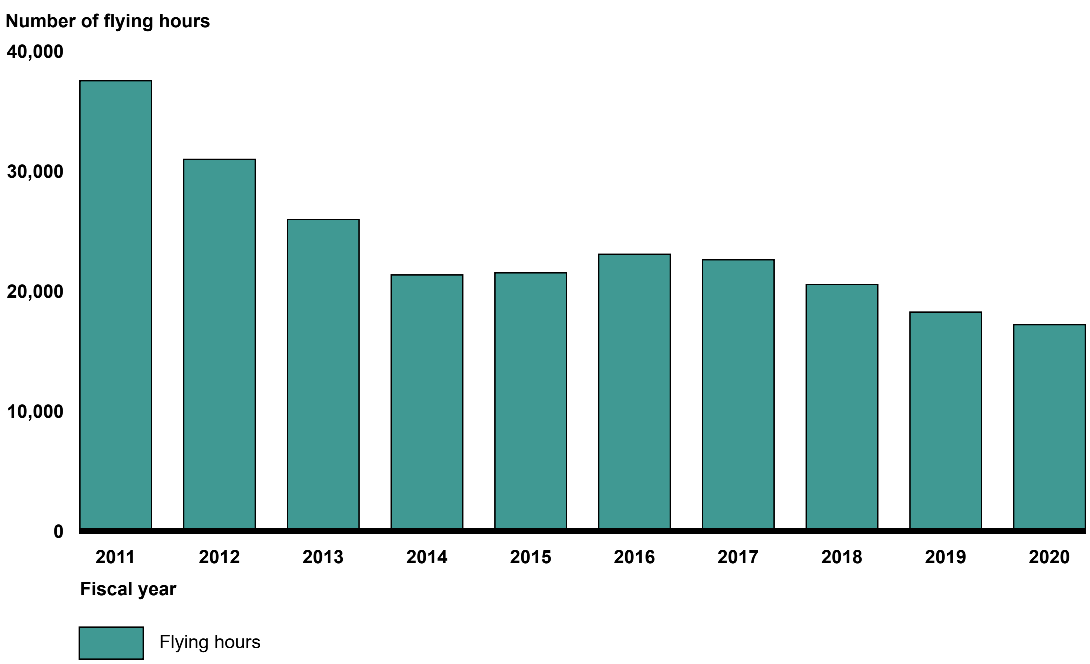
Operating and Support Costs per Flying Hour

C-5M Operating and Support Costs per Flying Hour



Note: The figure includes data for C-5A, C-5B, C-5C, and C-5M aircraft.

C-5M Flying Hours

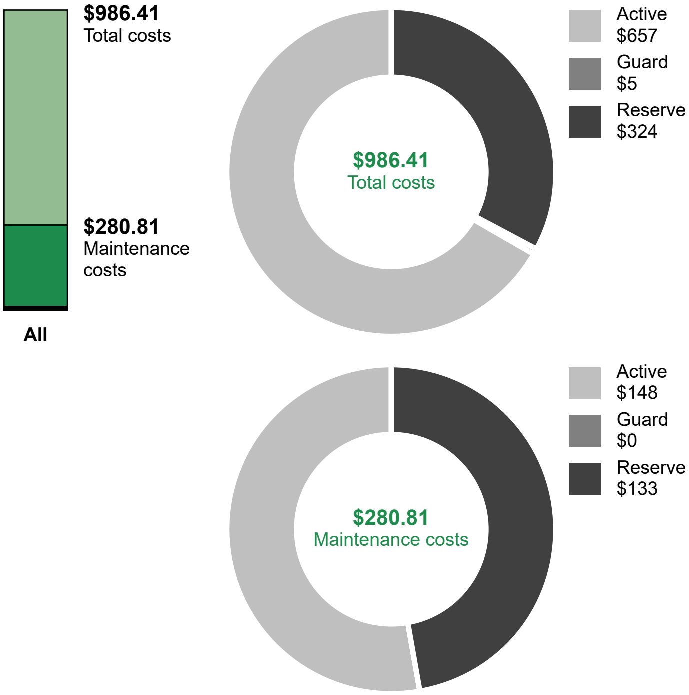


Note: The figure includes data for C-5A, C-5B, C-5C, and C-5M aircraft.

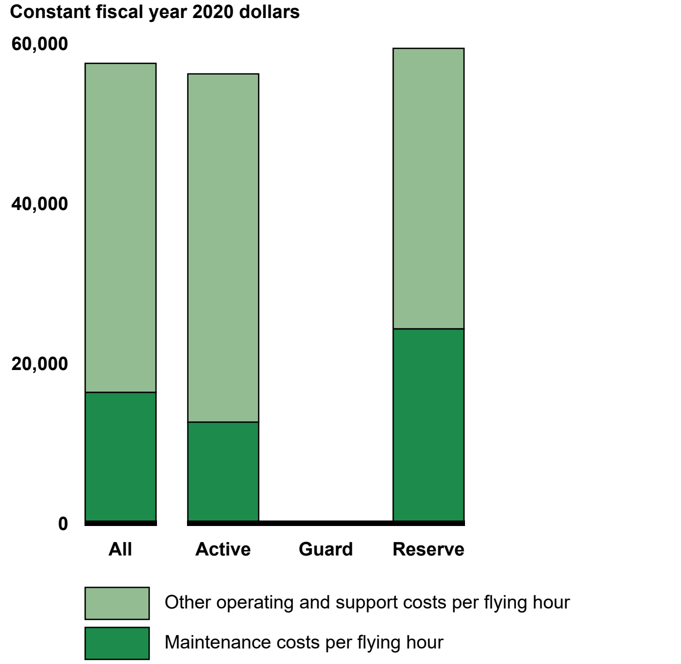
Component-Level Operating and Support Costs

C-5M Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Note: The C-5M is operated by the active component, but both the Air National Guard and Air Force Reserves contribute towards operations and support of this program, such as through maintenance support.

Sustainment Strategy, Challenges, and Mitigation Actions

The Air Force organically sustains the C-5M fleet through a maintenance schedule that includes home station checks, inspections, and programmed depot maintenance at the Warner Robins Air Logistics Complex, Georgia. Air Force active-duty and reserve maintainers conduct field-level maintenance. From 2008 through 2018, the entire fleet underwent a modification program to upgrade the aircraft's engines and other components. The Air Force's 448th Supply Chain Management Wing and the Defense Logistics Agency primarily manage the C-5M supply chain, but Lockheed Martin also provides supply support for certain avionics items.

C-5M Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Aging: The fleet is experiencing stress corrosion cracking and the program office has initiated, or plans to initiate, several major repair programs to mitigate this challenge, according to C-5M program officials:

- The C-5M Dorsal Complex Repair and Dagger Fitting Replacement program began in fiscal year 2016 to repair a crack on the tail assembly of the aircraft and the program is expected to be completed in fiscal year 2023.
- The Pylon Wing Interface program, which is planned to begin in fiscal year 2025, will repair the cracks that are occurring at the pylon-to-wing interface (i.e., the point where the engine attaches to the wing).
- The Crown Skin Replacement program, which is planned to begin in fiscal year 2024, will replace the fuselage skins on two aircraft because the legacy skins are prone to stress corrosion cracking.

In addition, according to program officials, the Replacement of Multifunction Display sustainment modification program is addressing obsolescence of the aircraft's primary flight displays.

Maintenance: Program officials told us that the amount of unscheduled maintenance and capacity to perform required scheduled maintenance remains a challenge for the C-5M fleet. Legacy aircraft components, such as the landing gear, flight controls, and the airframe are examples of the primary drivers of unscheduled maintenance actions. Additionally, the officials said that the programmed depot maintenance is taking longer, resulting in more aircraft that are at the depot and, therefore, not operational.

According to program officials, mitigation actions for these maintenance challenges included:

- Process improvement and resource management initiatives that were implemented at Warner Robins Air Logistics Complex that are designed to reduce the number of days aircraft spend in the depot. These initiatives include establishing additional capacity, improving workmanship, and executing work in a more disciplined manner.
- Continued fleet management actions taken by the program office that delay and rearrange scheduled depot inductions to reduce the number of aircraft that are in the depot at the same time.
- Continued implementation across the C-5 enterprise of Condition-Based Maintenance Plus—an initiative designed to reduce unscheduled maintenance by enabling predictive maintenance. Implementation began early in fiscal year 2019 and program officials said that they plan for this initiative to continue for the remainder of the fleet's service life.
- A future supplemental depot maintenance contract designed to augment the existing organic depot capacity and reduce the need for the inspections that are required when aircraft are not inducted for programmed depot maintenance within the allowable time frame. Program officials said that a request for industry proposals was released in May 2022.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

C-17
Globemaster III

Program Essentials

Lead Service
Air Force

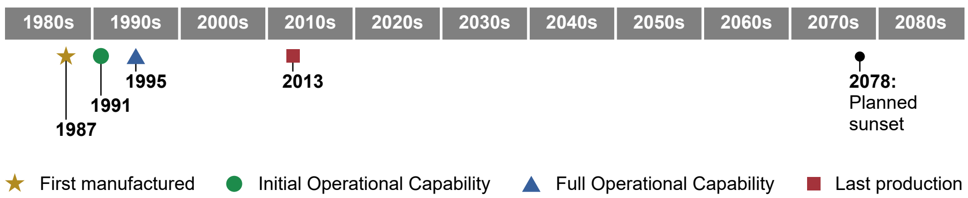
Manufacturer
Boeing

Program Office
Robins Air Force Base, Georgia and Wright-Patterson Air Force Base, Ohio

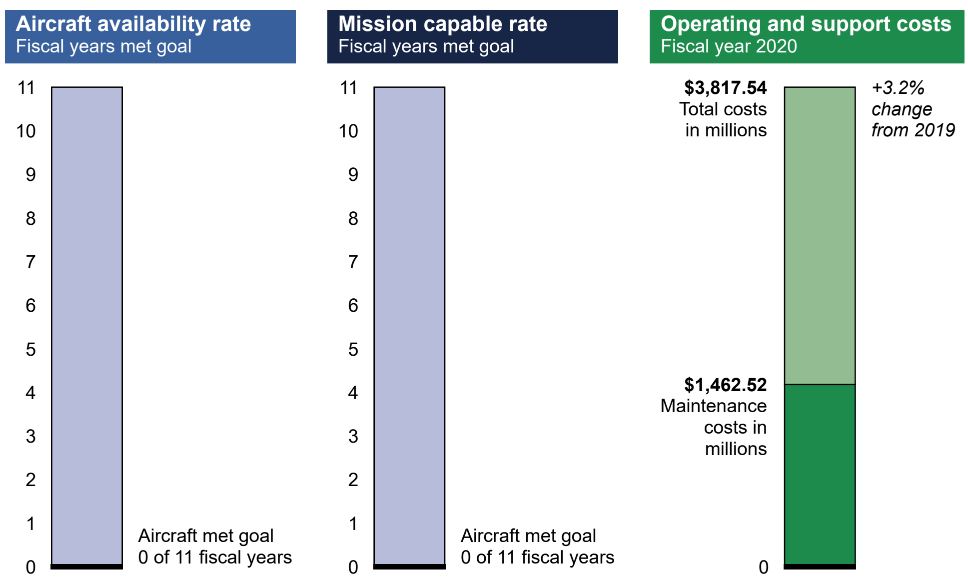
Sustainment
Boeing conducts sustainment activities such as material management and depot maintenance.

The C-17 is a high-wing, four-engine cargo aircraft with a rear-loading ramp. The C-17 has air refueling capability and is capable of rapid strategic delivery of troops and all types of cargo to main operating bases and forward bases in the deployment area.

C-17 Life Cycle Timeline



C-17 Sustainment Status



Aircraft

222 total aircraft
Fiscal year 2020

18 years
Average aircraft age in fiscal year 2021

Flying hours

125,666 flying hours
Fiscal year 2020

15,797 hours
Average lifetime flying hours per aircraft in fiscal year 2021

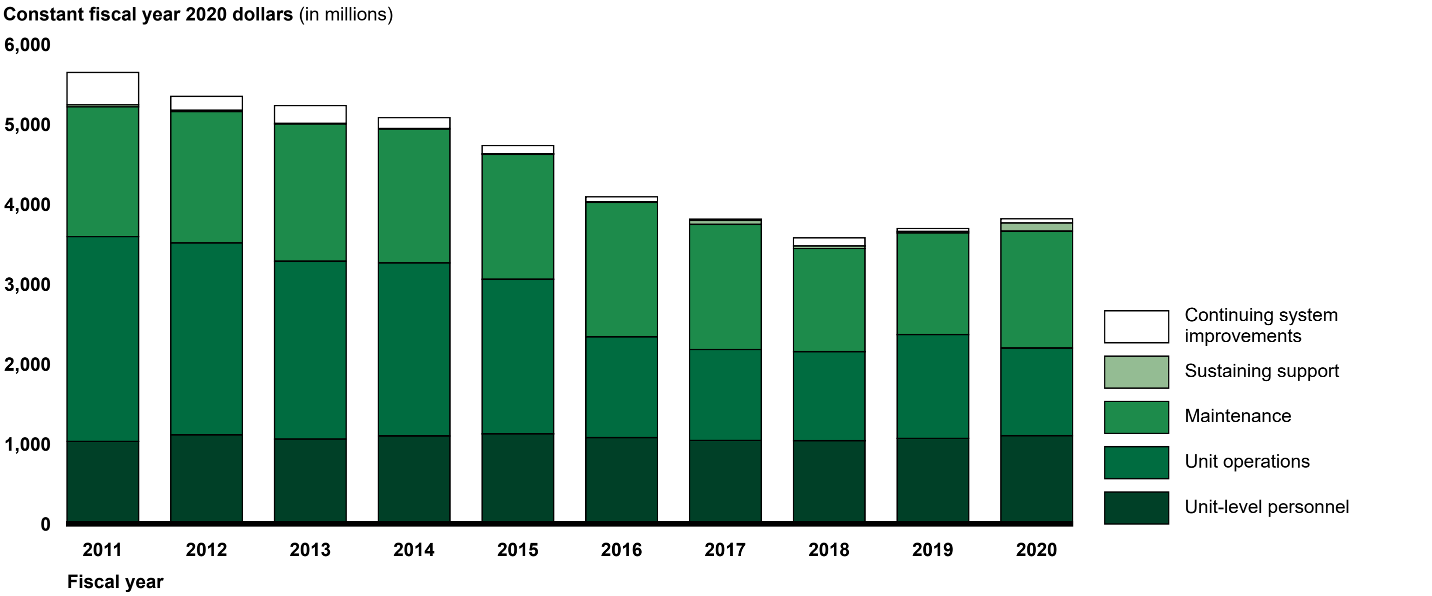
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$17.20 million
Total costs per aircraft

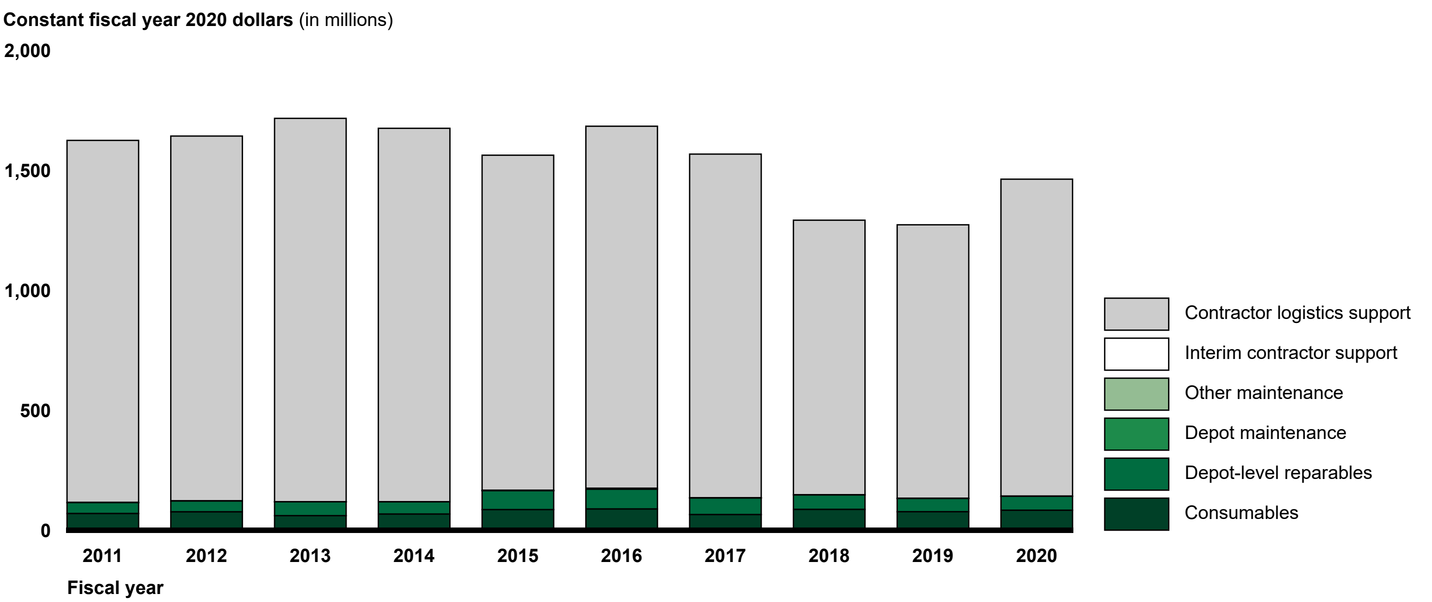
$30,378
Total costs per flying hour
+10.9% change from 2019

Operating and Support Costs

C-17 Total Operating and Support Costs

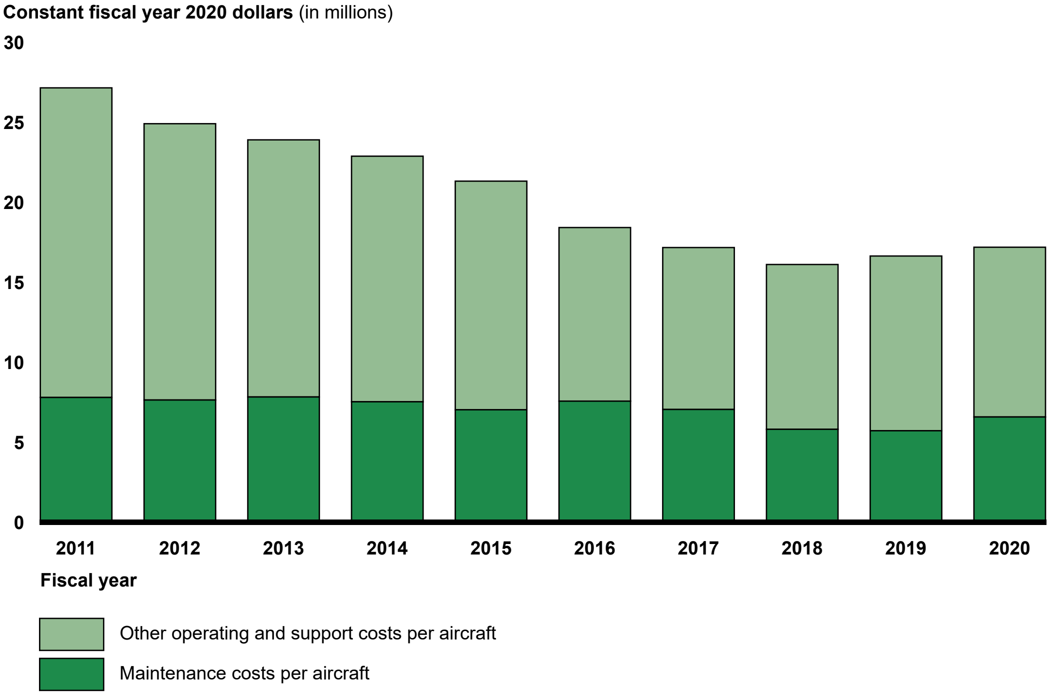


C-17 Maintenance Costs

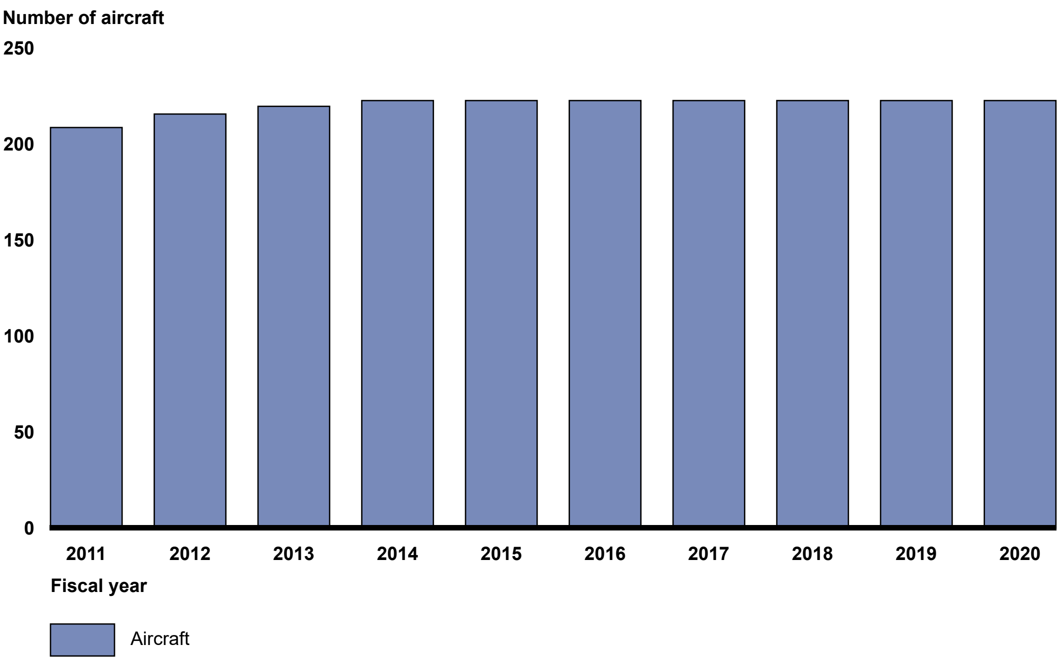


Operating and Support Costs per Aircraft

C-17 Operating and Support Costs per Aircraft

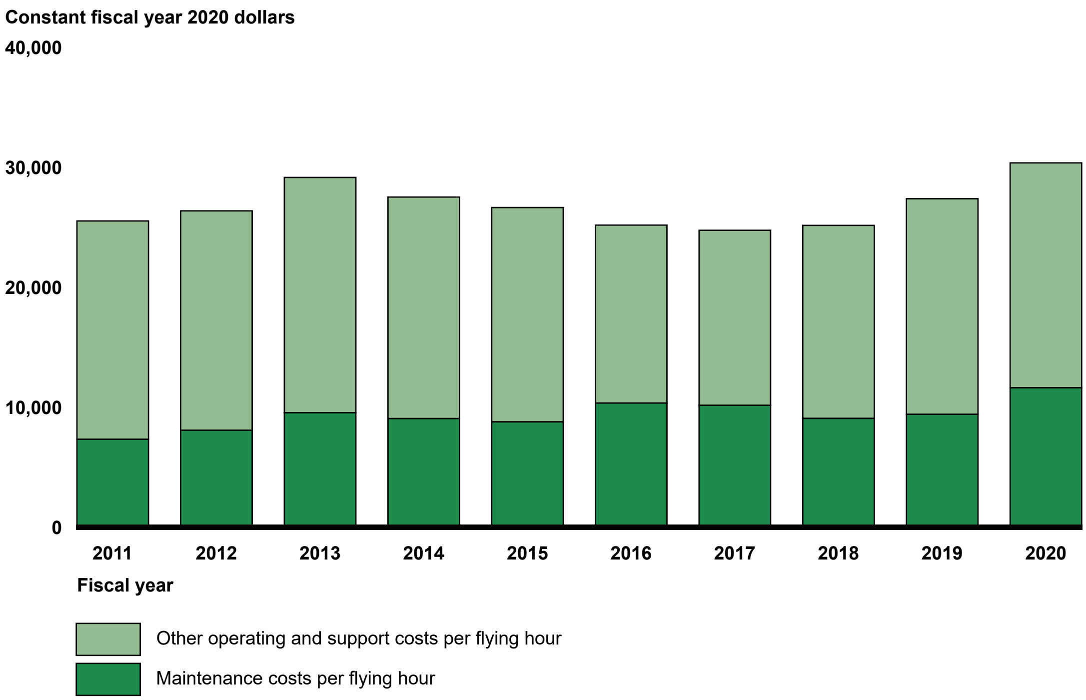


C-17 Fleet Size

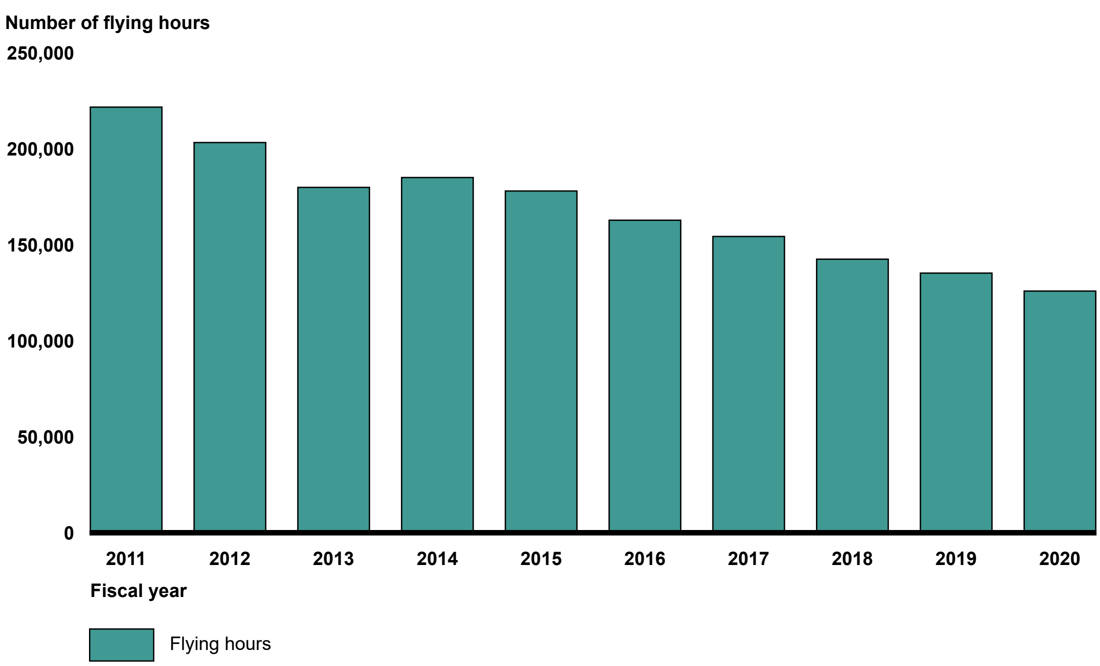


Operating and Support Costs per Flying Hour

C-17 Operating and Support Costs per Flying Hour



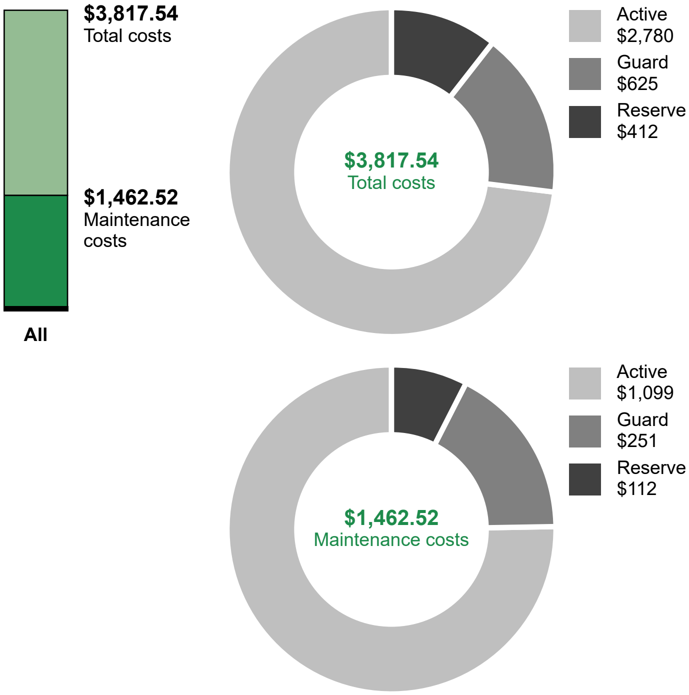
C-17 Flying Hours



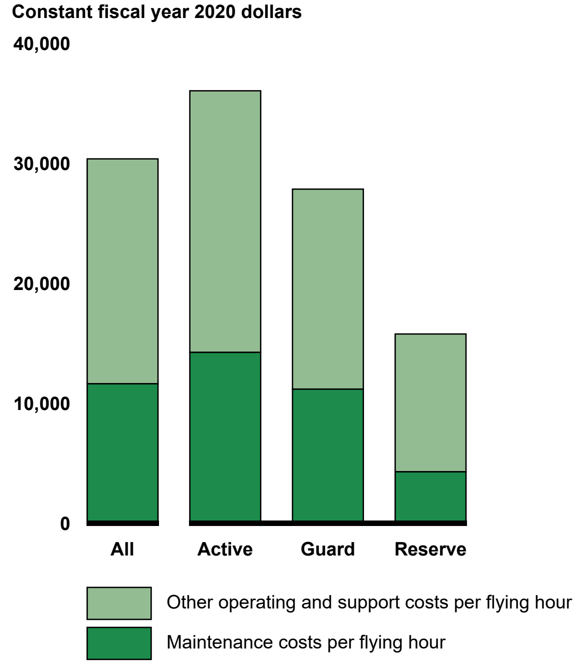
Component-Level Operating and Support Costs

C-17 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

Boeing conducts most of the C-17's sustainment activities, including material management and depot-level aircraft maintenance and modifications support as part of a performance-based logistics contract. Boeing manages the C-17 heavy depot maintenance that is conducted under a public-private partnership at Warner Robins Air Logistics Complex in Georgia and at its facility in Texas. According to program officials, Pratt & Whitney manages the engine overhauls that are completed at the Oklahoma City Air Logistics Complex in Oklahoma, at the Pratt & Whitney Repair Center in Georgia, and at a United Airlines Facility in California, under a separate contract with the Air Force.

C-17 Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Aging: Funding shortfalls are a major challenge in ensuring the C-17's aircraft structure can reach its service life or in extending the fleet's service life, according to program officials. The officials stated that funding issues have delayed the start of the upper-wing panel testing by over a year. Further, they anticipate that future funding issues will delay additional major aircraft modifications, which are necessary to ensure that the fleet can reach its service life without costly unscheduled repairs.

Corrosion is another major challenge because the effects of corrosion are not included in the C-17's structural service life limits, according to program officials. Therefore, to reach these limits, the officials said that the effects of corrosion must be identified and corrected as they are found. While the officials stated that the program has good history of identifying and correcting corrosion issues, the program has often encountered significant delays in obtaining the funding to implement corrective actions.

Maintenance: The C-17 requires depot modifications, such as upgrades to its communications systems, to keep the aircraft viable and will continue to be modified to meet its requirements, according to program officials. They stated that these modifications can reduce the time the aircraft is available for training and mission requirements.

According to program officials, unscheduled maintenance is a challenge that the program has faced. They said that the program has experienced long-term unscheduled depot maintenance related to fire damage, landing gear failures, and fuel leaks. Further, program officials said that the number of aircraft inducted for unscheduled maintenance increased in fiscal year 2020 and that they expect unscheduled maintenance requirements to continue to grow. More specifically, the officials said that fuel leaks and corrosion are expected to drive this growth in unscheduled maintenance.

Also, officials stated that the program experienced challenges associated with unexpected parts replacements and repairs. For example, the Air Force issued multiple technical orders during the end of fiscal year 2020 and in fiscal year 2021, according to program officials. They said that these technical orders resulted in numerous parts replacements via repair or new procurement, including nose landing gear actuators, brake hoses, and fuses, among others.

Officials told us that, based on program analysis, the amount of time between scheduled depot maintenance inductions was extended from 5 to 6 years, in part, to reduce aircraft downtime. Further, to minimize additional downtime, corrosion repairs—which require intensive sheet metal work—have been made when possible while the aircraft is also undergoing other heavy maintenance or repairs at a designated repair facility, according to program officials.

Supply Support: Parts shortages and delays were a challenge for the program and they have had a major effect on the C-17's mission capable rate, according to program officials. For example, the repair times for the supply of engine parts, which are managed by Boeing, have been longer than originally planned. Further, the officials said that supplier and raw materials shortages have also started to contribute to the C-17's supply support problems.

Officials stated that the program has faced challenges associated with obsolescence and diminishing manufacturing sources. For example, they cited a multifunction display, made from cathode-ray aircraft glass, as an example of a part that is no longer being manufactured due to obsolescence. Additionally, program officials said that the C-17's flight deck is based on technology from the late 1980's and needs upgrading. They said that the funding for this upgrade will be needed in the Air Force fiscal year 2024 Program Objective Memorandum to prevent reductions in the fleet's aircraft availability rate due to unscheduled maintenance.

To mitigate parts shortages, program officials said that parts were cannibalized (i.e., taken from an aircraft in the depot for use on another aircraft) to support more parts requests. However, they said that when a part was cannibalized, it often added a day or two to the total time an aircraft was not mission capable. Also, officials stated that the program office, the Air Mobility Command, and Boeing have been engaged in reducing the repair times for the supply of engine parts. Other ongoing and planned actions to mitigate parts shortages and delays include upgrading aircraft systems before they become obsolete, locating other vendor sources, redesigning parts, and purchasing additional parts to maintain supply sources, according to program officials.

Program Office Comments

The program office reviewed a draft of this assessment and did not have any comments.

C-130H
Hercules

Program Essentials

Lead Service
Air Force

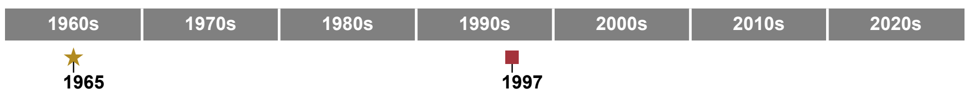
Manufacturer
Lockheed Martin

Program Office
Robins Air Force Base, Georgia and Wright-Patterson Air Force Base, Ohio

Sustainment
Programmed depot maintenance is conducted at the Warner Robins Air Logistics Complex and Air Force personnel provide organizational maintenance.

The C-130H Hercules is a four-engine turboprop aircraft. Basic and specialized versions perform a variety of missions including airlift support, aeromedical, weather reconnaissance, and natural disaster relief.

C-130H Life Cycle Timeline



★ First manufactured ● Initial Operational Capability ▲ Full Operational Capability ■ Last production

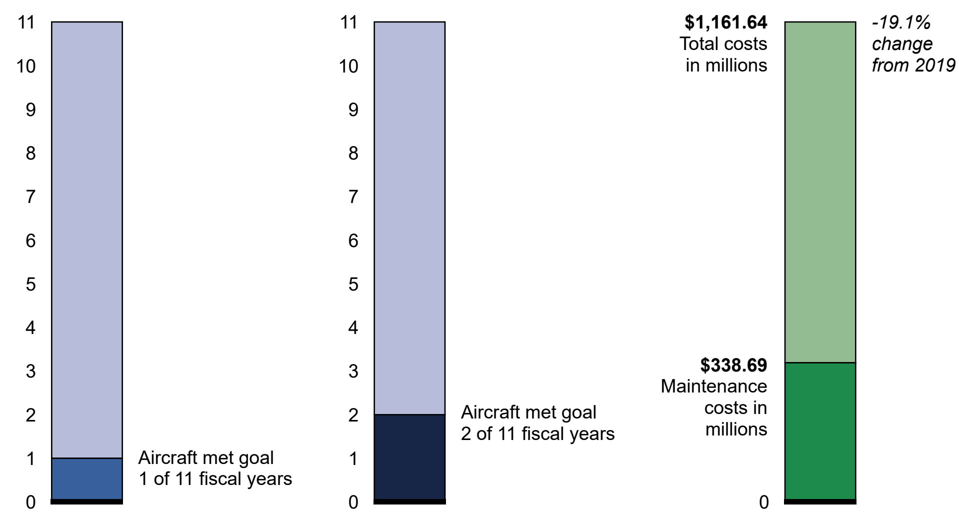
Note: According to program officials, it is unknown when the C-130H reached initial and full operating capability and there is not a projected sunset date for this aircraft.

C-130H Sustainment Status

Aircraft availability rate
Fiscal years met goal

Mission capable rate
Fiscal years met goal

Operating and support costs
Fiscal year 2020



Aircraft

169 total aircraft
Fiscal year 2020

29.4 years
Average aircraft age in fiscal year 2021

Flying hours

41,012 flying hours
Fiscal year 2020

11,710 hours
Average lifetime flying hours per aircraft in fiscal year 2021

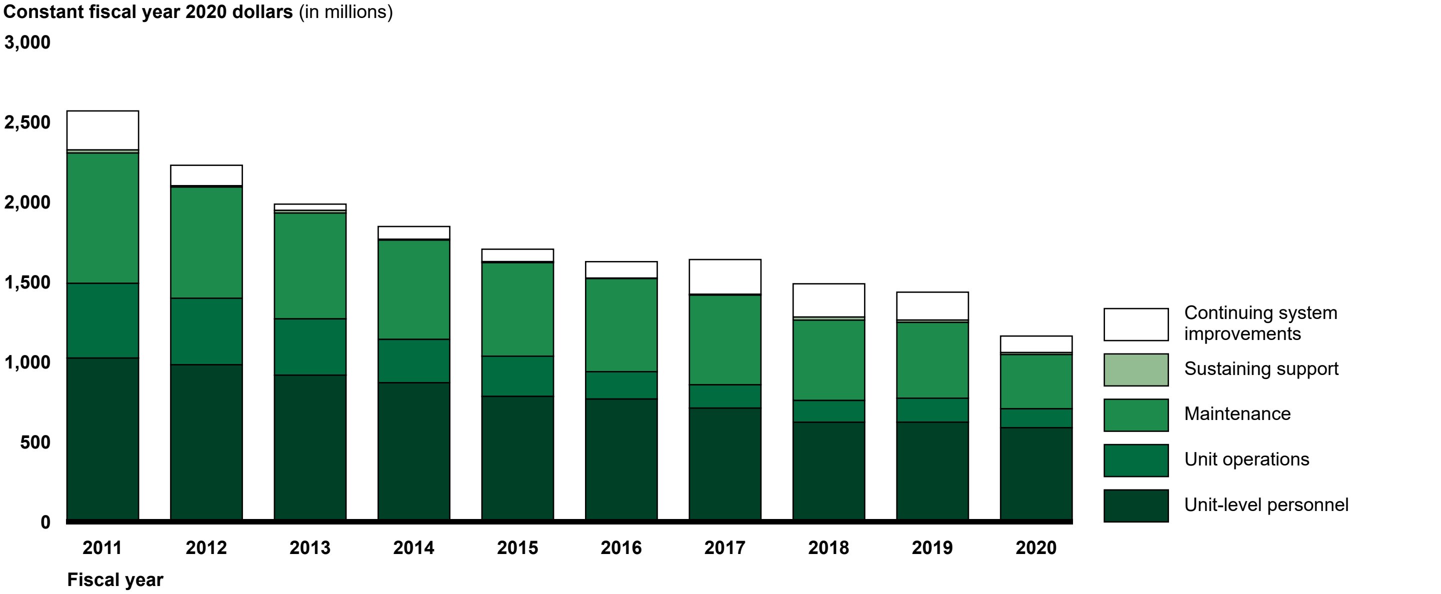
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$6.89 million
Total costs per aircraft

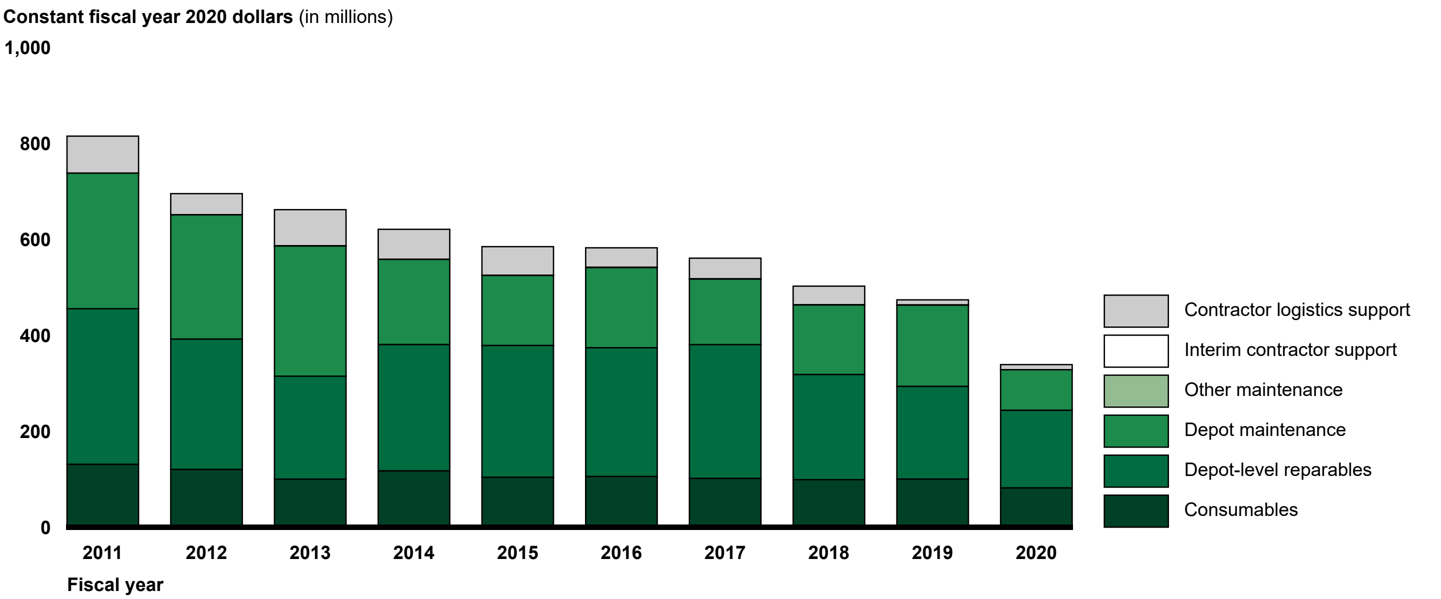
$28,324
Total costs per flying hour
-13.7% change from 2019

Operating and Support Costs

C-130H Total Operating and Support Costs

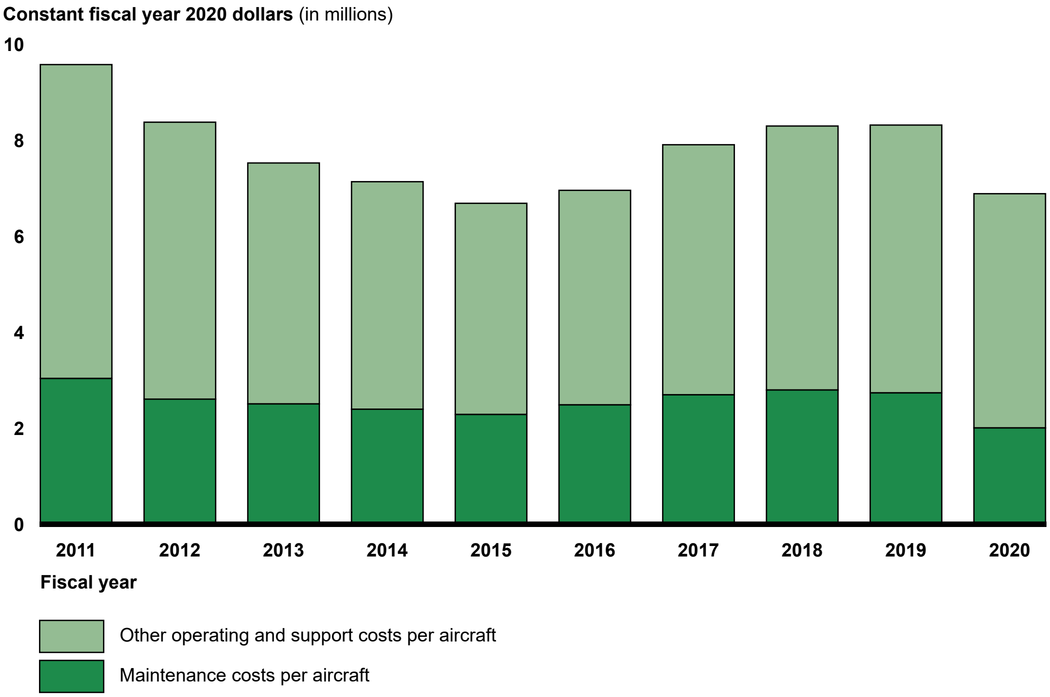


C-130H Maintenance Costs

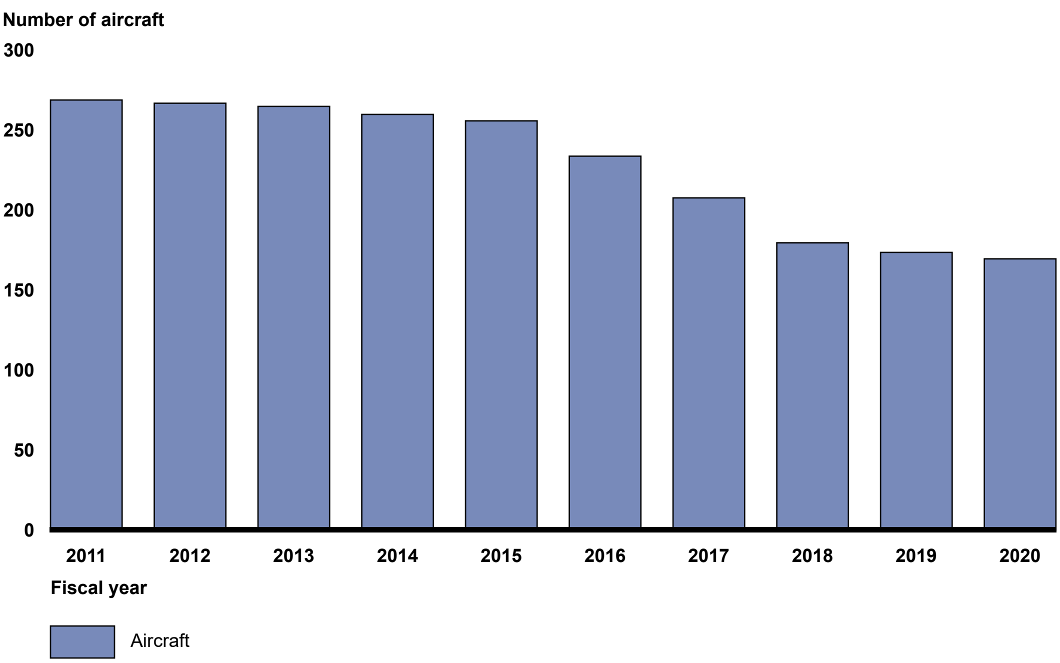


Operating and Support Costs per Aircraft

C-130H Operating and Support Costs per Aircraft

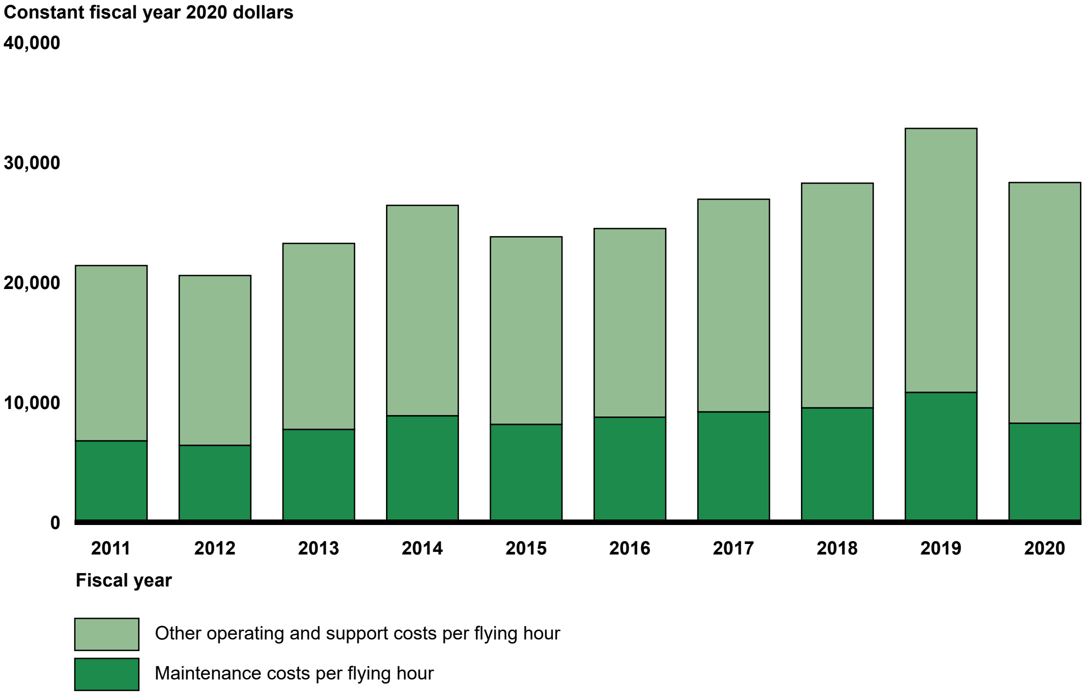


C-130H Fleet Size

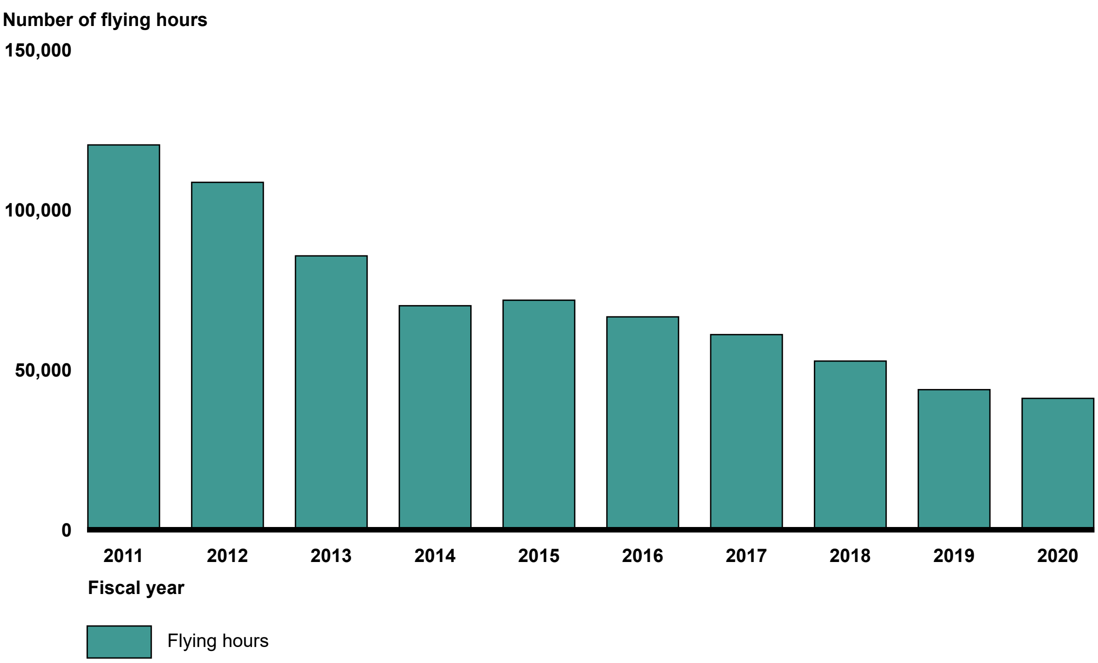


Operating and Support Costs per Flying Hour

C-130H Operating and Support Costs per Flying Hour



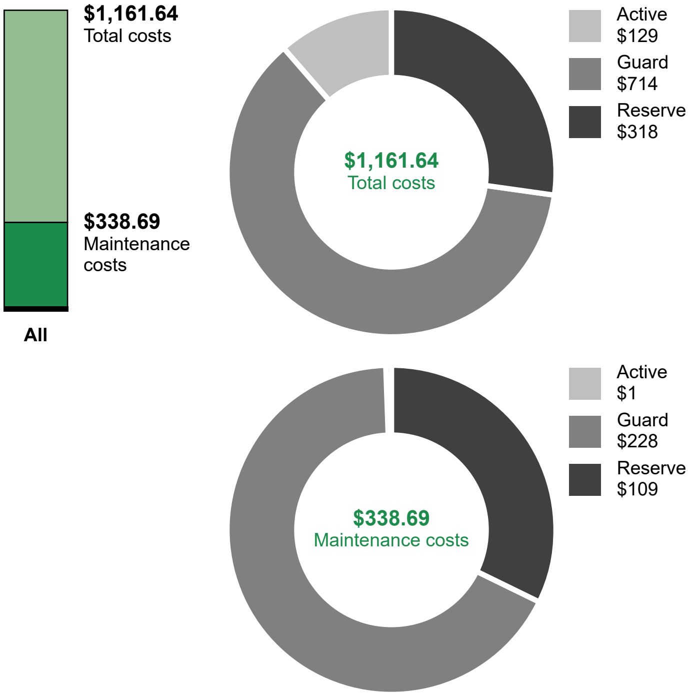
C-130H Flying Hours



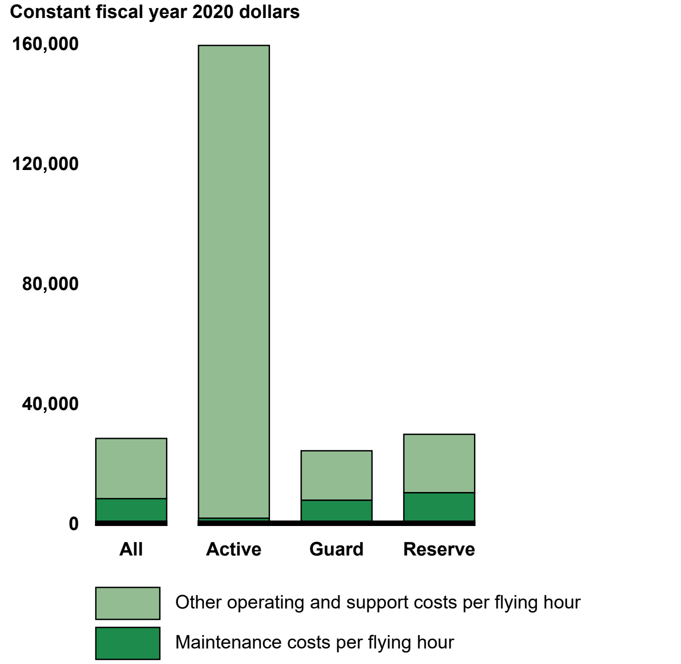
Component-Level Operating and Support Costs

C-130H Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The Air Force performs programmed depot maintenance on the C-130H at Warner Robins Air Logistics Complex, Georgia. Air Force personnel, primarily from the Air Force Reserve Command and the Air National Guard, perform organizational maintenance, according to C-130H program officials. The Defense Logistics Agency and the Air Force Sustainment Center provide supply support.

C-130H Sustainment Challenges

Aging Aircraft
- Delays in acquiring replacement aircraft
- Service life extension
- Unexpected replacement of parts and repairs

Maintenance
- Access to technical data
- Delays in depot maintenance
- Shortage of trained maintenance personnel
- Unscheduled maintenance

Supply Support
- Diminishing manufacturing source
- Parts obsolescence
- Parts shortage and delay

Maintenance: According to the Air Force's C-130J/H Aircraft Availability Improvement Program Plan for Fiscal Years 2021 through 2026, the Warner Robins Air Logistics Complex, the sole government depot supporting all C-130 heavy maintenance requirements, has not met its customer workload agreement, and workforce, capacity, and facility constraints have affected the depot's workflow. Further, program officials stated that:

- the reduction of available staff created by quarantine and isolation related to COVID-19 drove slowdown and stoppage in depot workflow and resulted in a pipeline backlog of aircraft and the program had not met its aircraft availability goal; and
- earlier-than-expected retirements of depot maintenance personnel have also occurred as a result of COVID-19, causing a shortage of trained maintenance personnel.

The depot continues to identify problem areas and has worked to resolve them and to refine the C-130’s depot time.

Additionally, the C-130J/H Aircraft Availability Improvement Program Plan stated that scheduled maintenance in the field was a significant driver of aircraft availability for both the C-130J and C-130H. Scheduled maintenance is being performed at a number of Air Reserve Component bases, which are not staffed to support multiple shift operations per day. As a result, maintenance actions can take 1.5 to 3 times as long to complete at these locations than at active-duty bases.

Supply Support: Air Force officials stated that diminishing manufacturing sources and material shortages are a challenge as the fleet ages and most of the C-130’s supply concerns are due to components with diminishing manufacturing sources. According to the C-130J/H Aircraft Availability Improvement Program Plan, the C-130H Avionics Modernization Program Increment Two modification program is a capability improvement upgrade to, among other things, improve sustainment affordability and address multiple diminishing manufacturing sources issues (though aircraft availability is expected to be negatively affected). According to the plan, approximately 9 to 32 C-130H aircraft per year will be modified from fiscal years 2023 through 2029.

According to officials, the C-130 program office started a program in 2015 to address diminishing manufacturing sources and material shortages and other production and sustainment supply-support issues.

Program Office Comments

The program office reviewed a draft of this assessment and did not have any comments.

C-130J
Super Hercules

Program Essentials

Lead Service
Air Force

Manufacturer
Lockheed Martin

Program Office
Robins Air Force Base, Georgia and Wright-Patterson Air Force Base, Ohio

Sustainment
Programmed depot maintenance is conducted at the Warner Robins Air Logistics Complex and Air Force personnel provide organizational maintenance.

The C-130J Super Hercules is a four-engine turboprop aircraft. Basic and specialized versions of the aircraft perform a variety of missions including airlift support, aeromedical, weather reconnaissance, and natural disaster relief. The C-130J is the latest addition to the C-130 fleet.

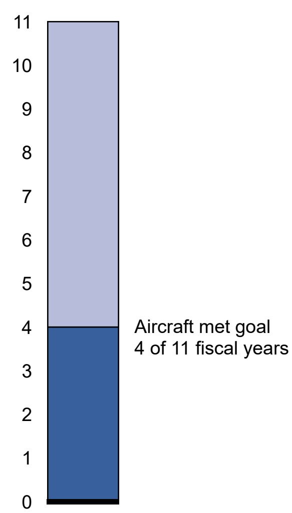
C-130J Life Cycle Timeline

★ First manufactured ● Initial Operational Capability ▲ Full Operational Capability ■ Last production

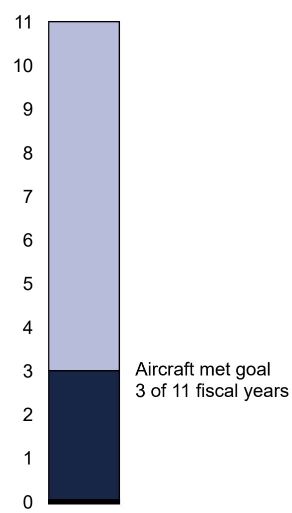
Note: According to program officials there is not a projected sunset date for this aircraft.

C-130J Sustainment Status

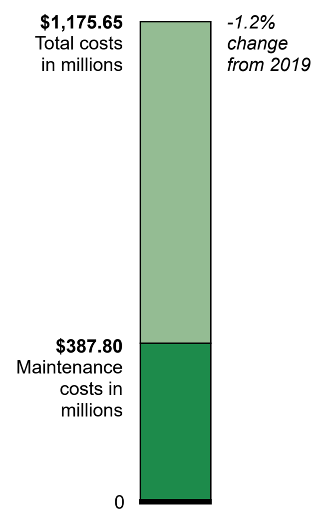
Aircraft availability rate
Fiscal years met goal



Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

134 total aircraft
Fiscal year 2020

11.2 years
Average aircraft age in fiscal year 2021

Flying hours

61,316 flying hours
Fiscal year 2020

5,329 hours
Average lifetime flying hours per aircraft in fiscal year 2021

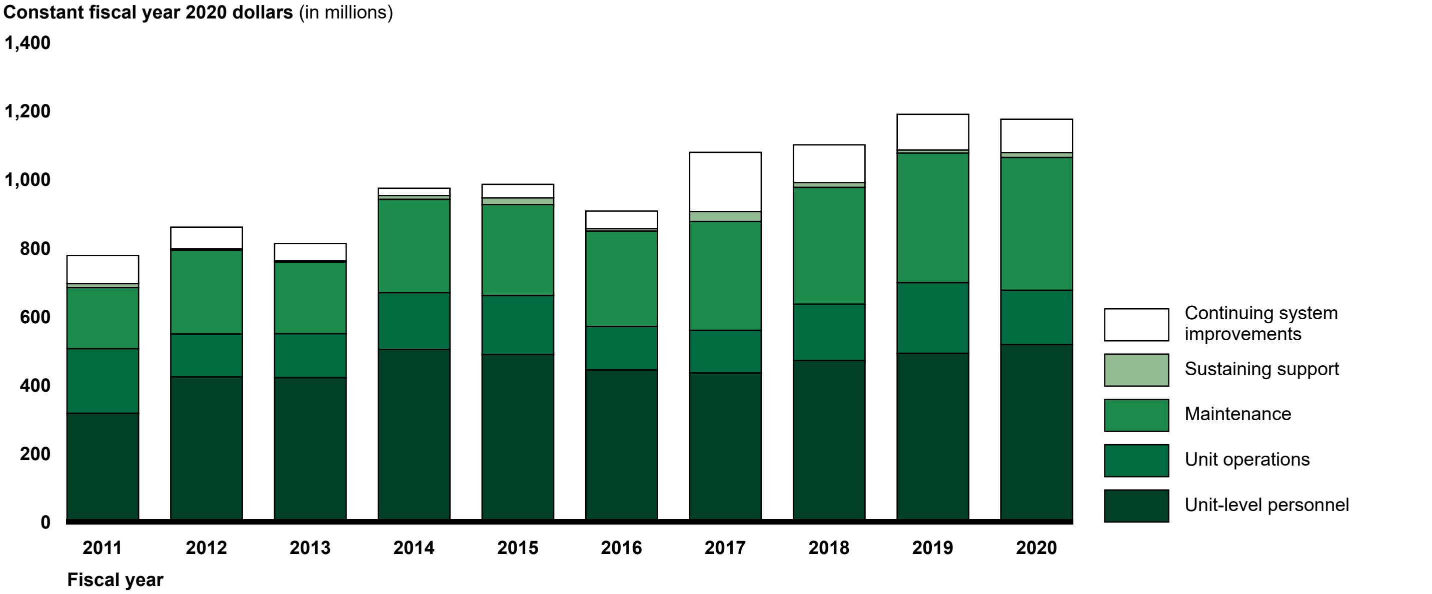
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$8.78 million
Total costs per aircraft

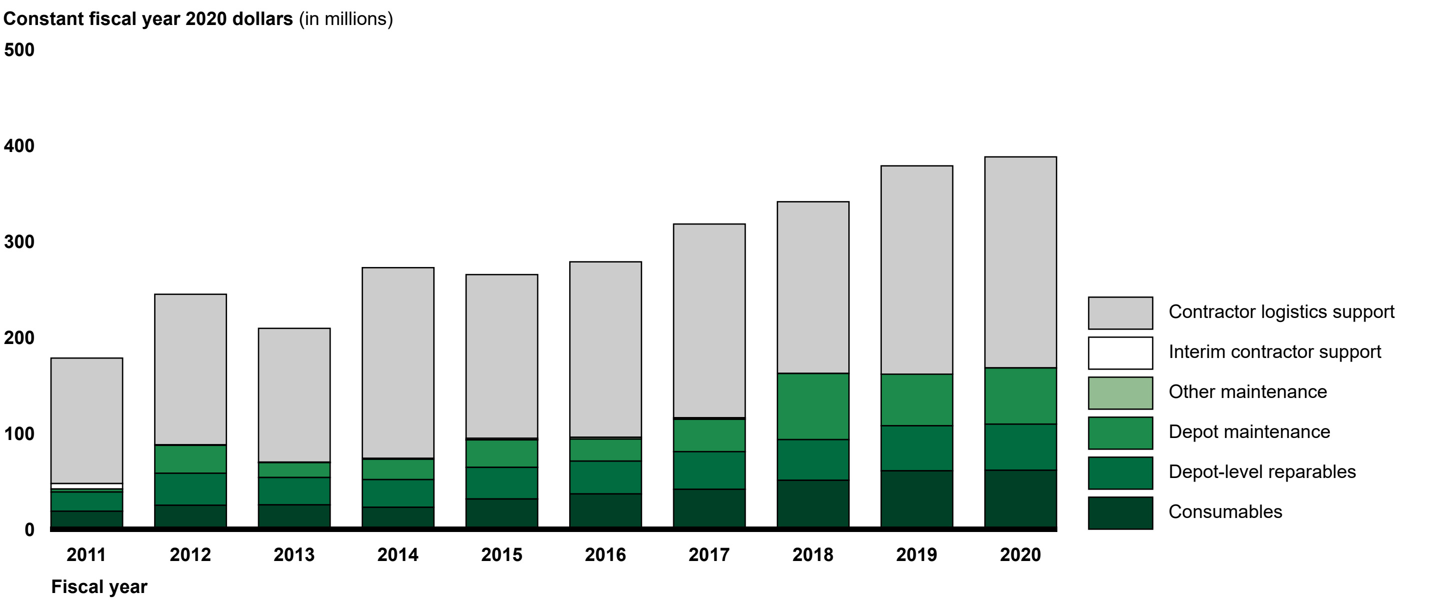
$19,174
Total costs per flying hour
+12.4% change from 2019

Operating and Support Costs

C-130J Total Operating and Support Costs

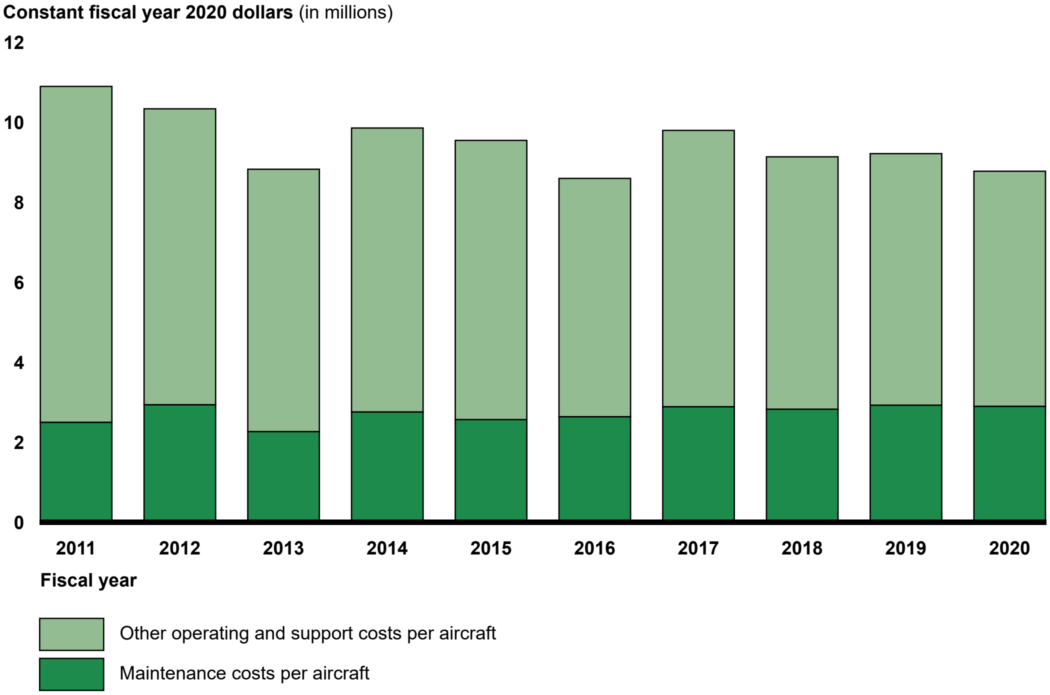


C-130J Maintenance Costs

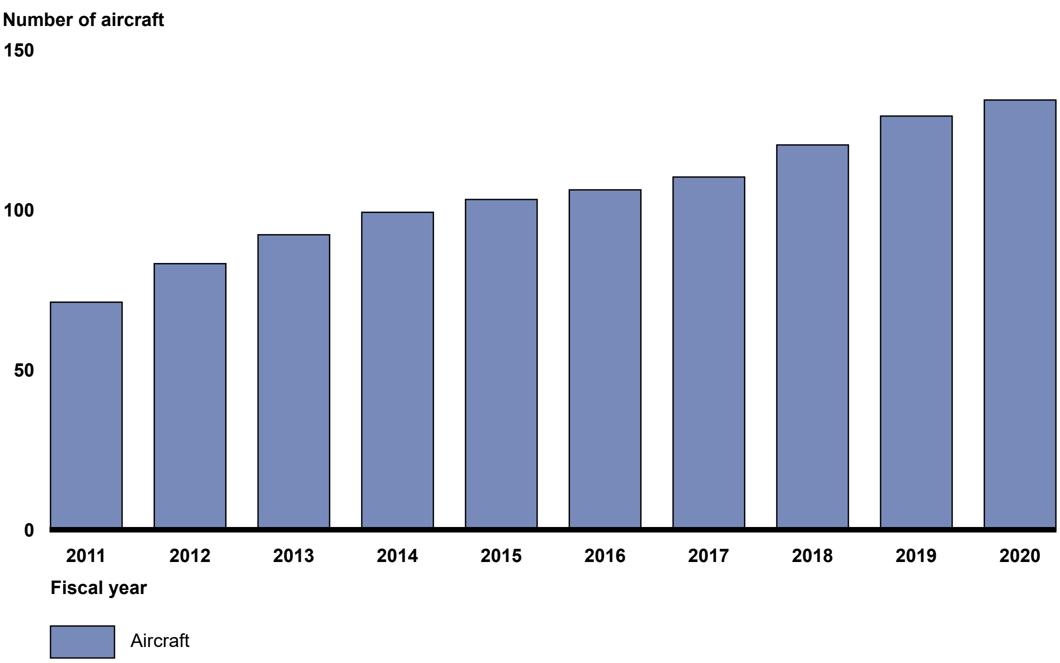


Operating and Support Costs per Aircraft

C-130J Operating and Support Costs per Aircraft

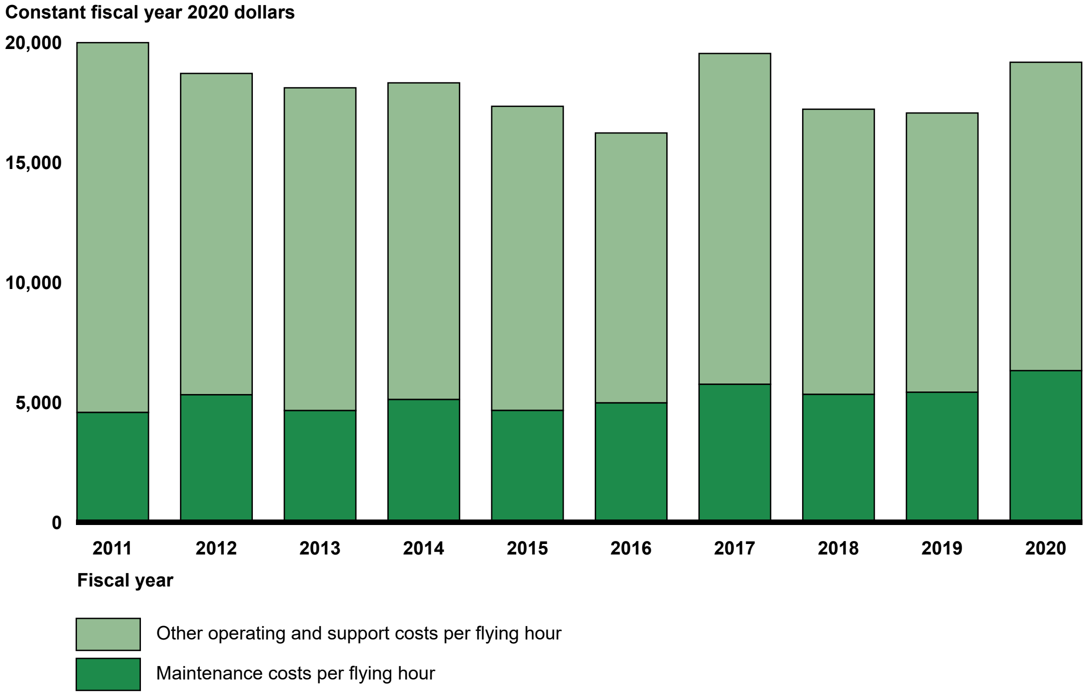


C-130J Fleet Size

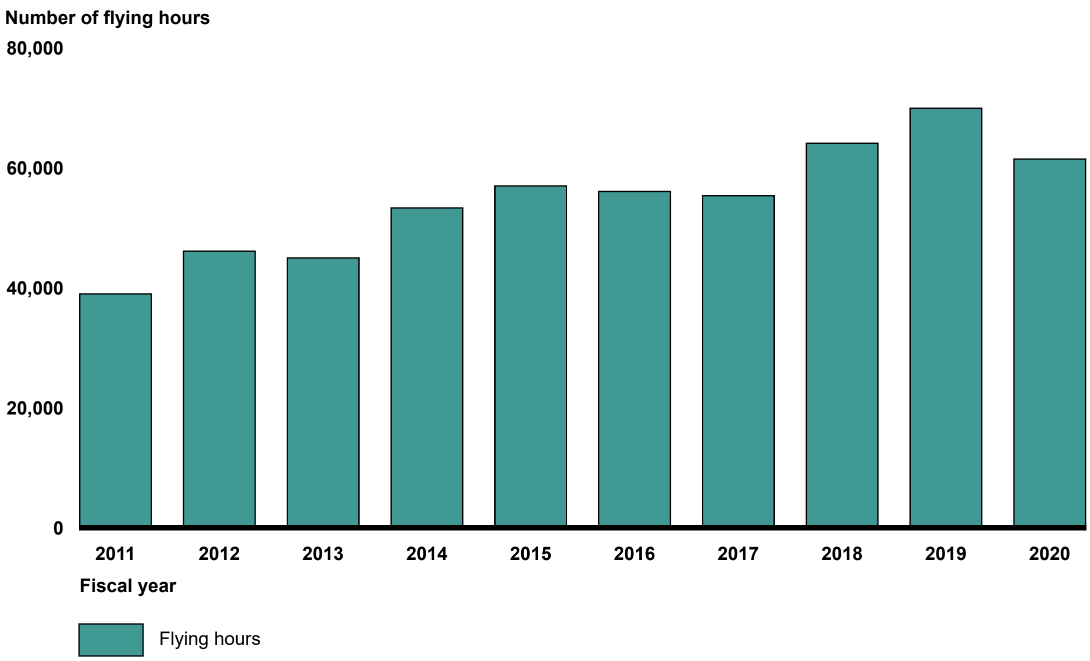


Operating and Support Costs per Flying Hour

C-130J Operating and Support Costs per Flying Hour



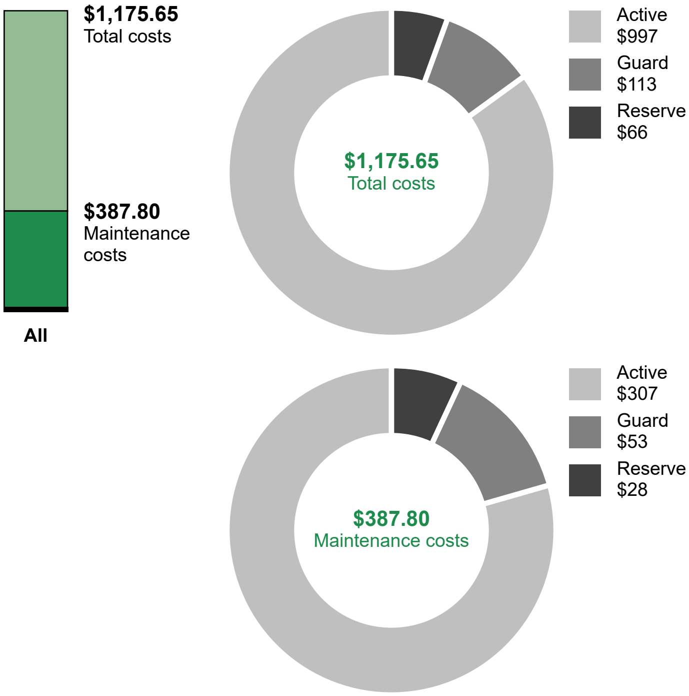
C-130J Flying Hours



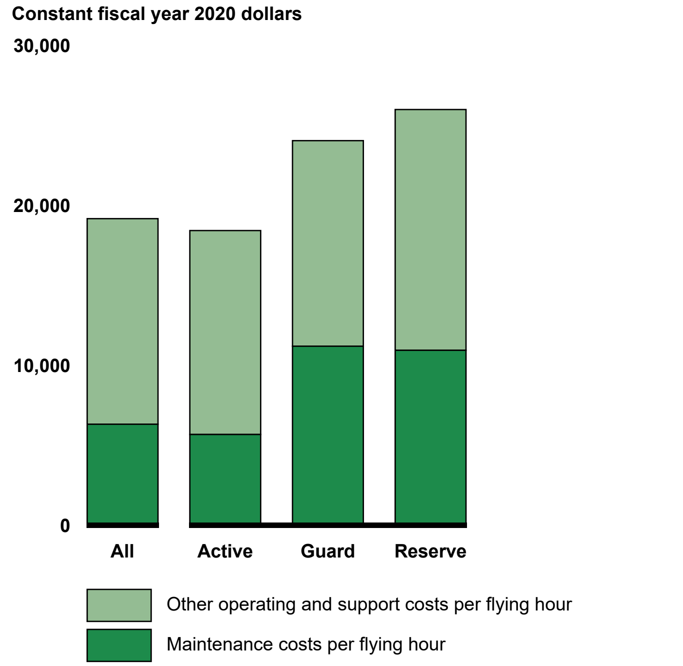
Component-Level Operating and Support Costs

C-130J Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The Air Force conducts programmed depot maintenance for the C-130J fleet at Warner Robins Air Logistics Complex. The Rolls-Royce Company performs engine and propeller maintenance and overhaul under a performance-based logistics contract, according to program officials. The Air Force Sustainment Center and the Defense Logistics Agency manage parts that are common to the C-130J, C-130H, and other DOD programs. Lockheed Martin Aerospace and Rolls Royce Company provide supply support for unique C-130J components under performance-based logistics contracts.

C-130J Sustainment Challenges

Aging Aircraft
- Delays in acquiring replacement aircraft
- Service life extension
- Unexpected replacement of parts and repairs

Maintenance
- Access to technical data
- Delays in depot maintenance
- Shortage of trained maintenance personnel
- Unscheduled maintenance

Supply Support
- Diminishing manufacturing source
- Parts obsolescence
- Parts shortage and delay

Maintenance: According to the Air Force's C-130J/H Aircraft Availability Improvement Program Plan for Fiscal Years 2021 through 2026, the Warner Robins Air Logistics Complex, the sole government depot supporting all C-130 heavy maintenance requirements, has not met its customer workload agreement and workforce, capacity, and facility constraints have affected the depot's workflow. Further, program officials said that:

- the reduction of available staff created by quarantine and isolation related to COVID-19 drove slowdown and stoppage in depot workflow and resulted in a pipeline backlog of aircraft and the program had not met its aircraft availability goal; and
- earlier-than-expected retirements of depot maintenance personnel have also occurred as a result of COVID-19, causing a shortage of trained maintenance personnel.

The depot has continued to identify problem areas and has worked to resolve them and to refine the C-130's depot time.

Additionally, the C-130J/H Aircraft Availability Improvement Program Plan stated that scheduled maintenance in the field was a significant driver of aircraft availability for both the C-130J and C-130H. Scheduled maintenance is being performed at a number of Air Reserve Component bases, which are not staffed to support multiple shift operations per day. As a result, maintenance actions can take 1.5 to 3 times as long to complete at these locations than at active-duty bases.

Supply Support: The average age of the C-130J aircraft is around 10 years, but program officials stated that diminishing manufacturing sources and material shortages have become a greater challenge as the fleet ages. Most of the C-130's supply concerns are due to diminishing manufacturing sources.

The C-130 program office started a program in 2015 to address diminishing manufacturing sources and material shortages and other production and sustainment supply-support issues, according to program officials. They also said that C-130 personnel at both Robins Air Force Base and Wright-Patterson Air Force Base have participated in broader Air Force Material Command parts efforts to identify and resolve these issues for the C-130J fleet.

Program Office Comments

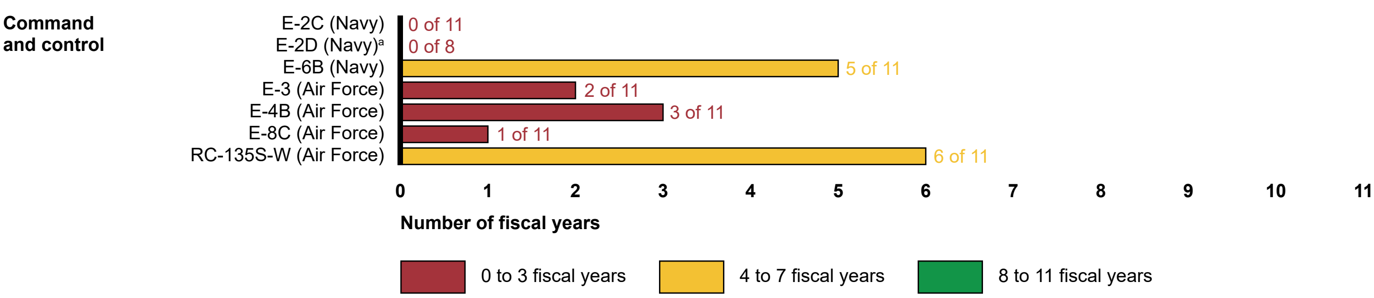
In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

Command and Control Aircraft

RC-135S-W Cobra Ball/Combat Sent/Rivet Joint

Source: U.S. Air Force/Master Sgt. William Greer. | GAO-23-106217

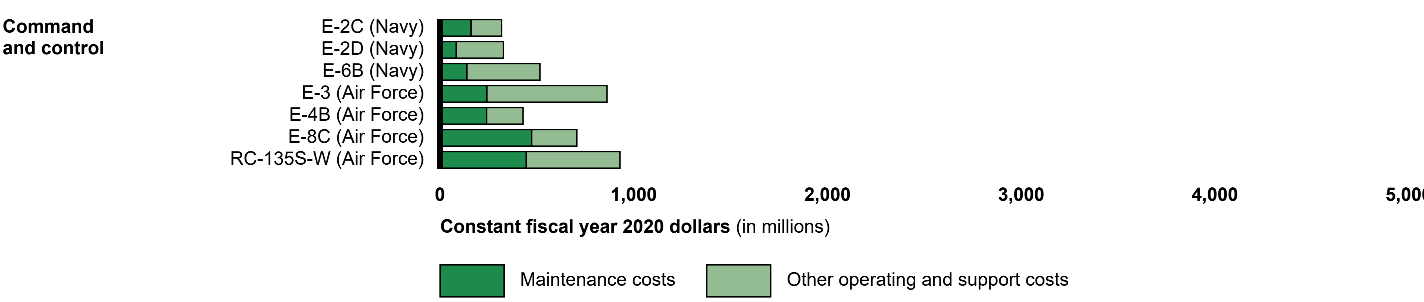
Number of Years Selected Aircraft Met Their Annual Mission Capable Goal, Fiscal Years 2011 through 2021



Source: GAO analysis of Navy and Air Force data. | GAO-23-106217

[a]For this aircraft, the military department did not provide a mission capable goal for all eleven years.

Annual Operating and Support Costs for Selected Department of Defense Command and Control Aircraft, Fiscal Year 2020



Source: GAO analysis of Navy and Air Force data. | GAO-23-106217

E-2C
Hawkeye

Program Essentials

Lead Service
Navy

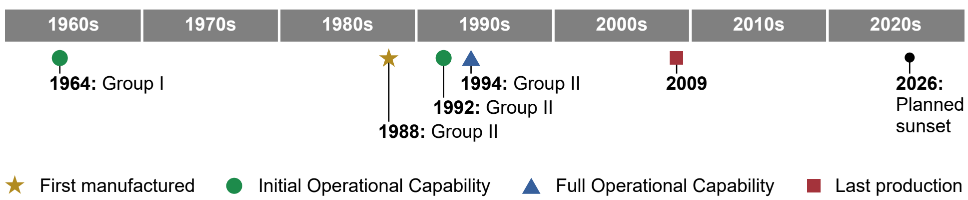
Manufacturer
Northrop Grumman Corporation

Program Office
Program Manager – Air 231,
Naval Air Systems Command,
Patuxent River, Maryland

Sustainment
The Navy's Fleet Readiness Centers East and Mid-Atlantic perform depot maintenance. Navy personnel perform field maintenance.

The E-2C is the Navy's all-weather, carrier-based, tactical-battle management, and airborne early-warning, command and control aircraft. It is a twin-engine, five-crewmember, high-wing turboprop aircraft with a 24-foot diameter radar attached to the upper fuselage of the aircraft.

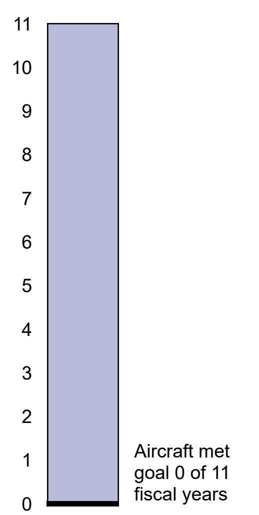
E-2C Life Cycle Timeline



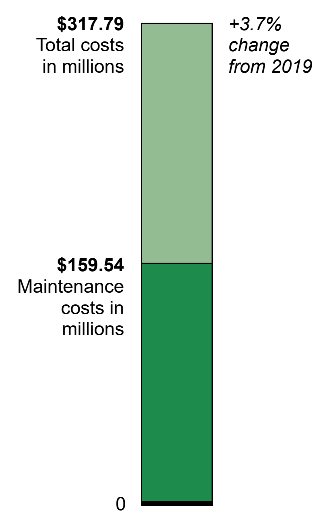
Note: According to program officials, it is unknown when E-2C Group I was first manufactured and reached full operational capability.

E-2C Sustainment Status

Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

26 total aircraft
Fiscal year 2020

17.6 years
Average aircraft age in fiscal year 2021

Flying hours

8,122 flying hours
Fiscal year 2020

6,249 hours
Average lifetime flying hours per aircraft in fiscal year 2021

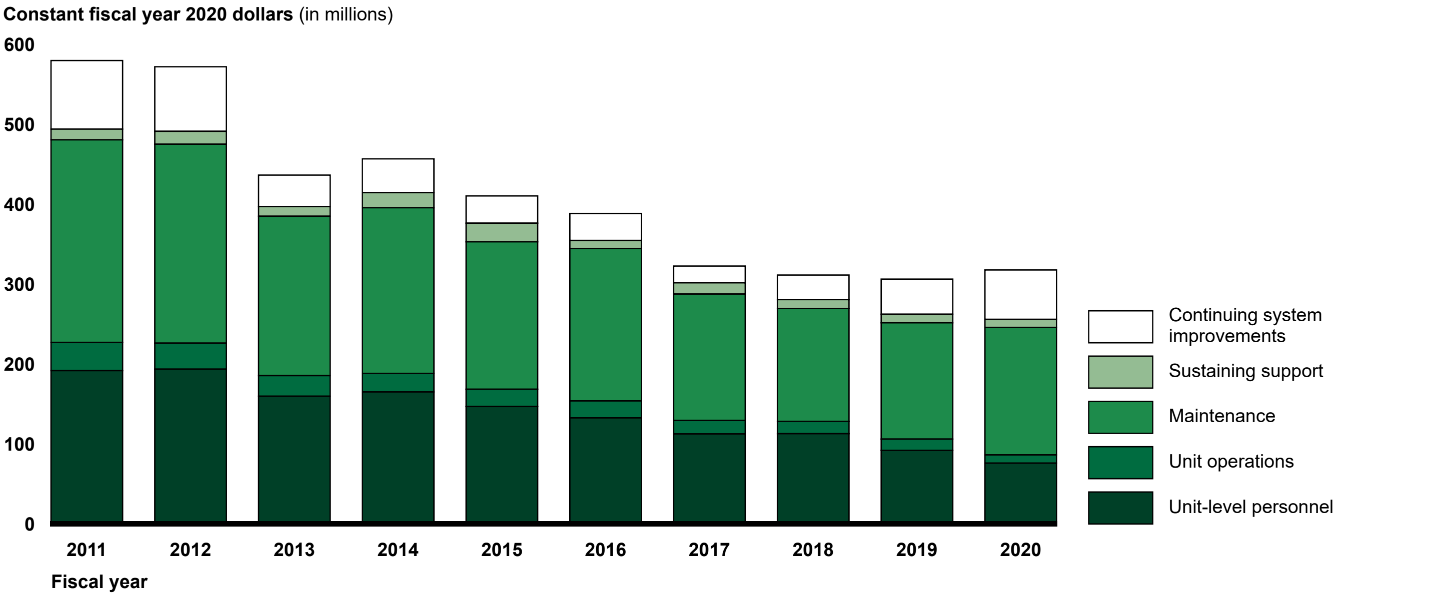
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$12.22 million
Total costs per aircraft

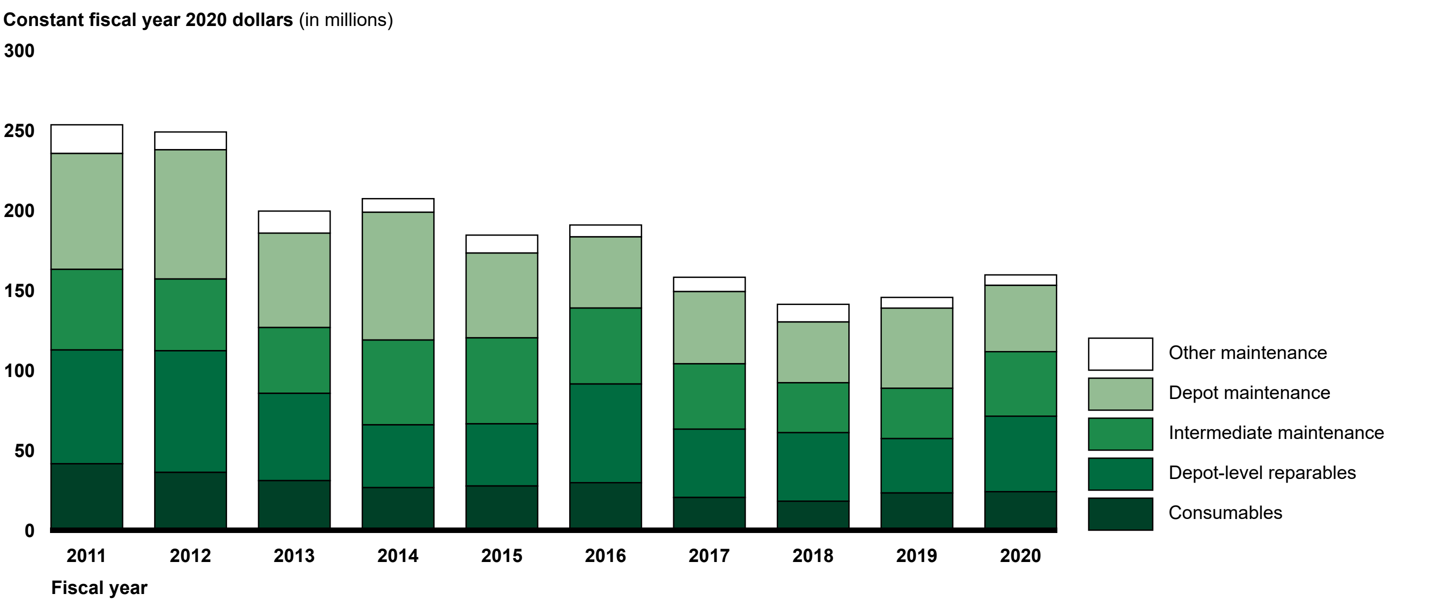
$39,127
Total costs per flying hour
+19.7% change from 2019

Operating and Support Costs

E-2C Total Operating and Support Costs

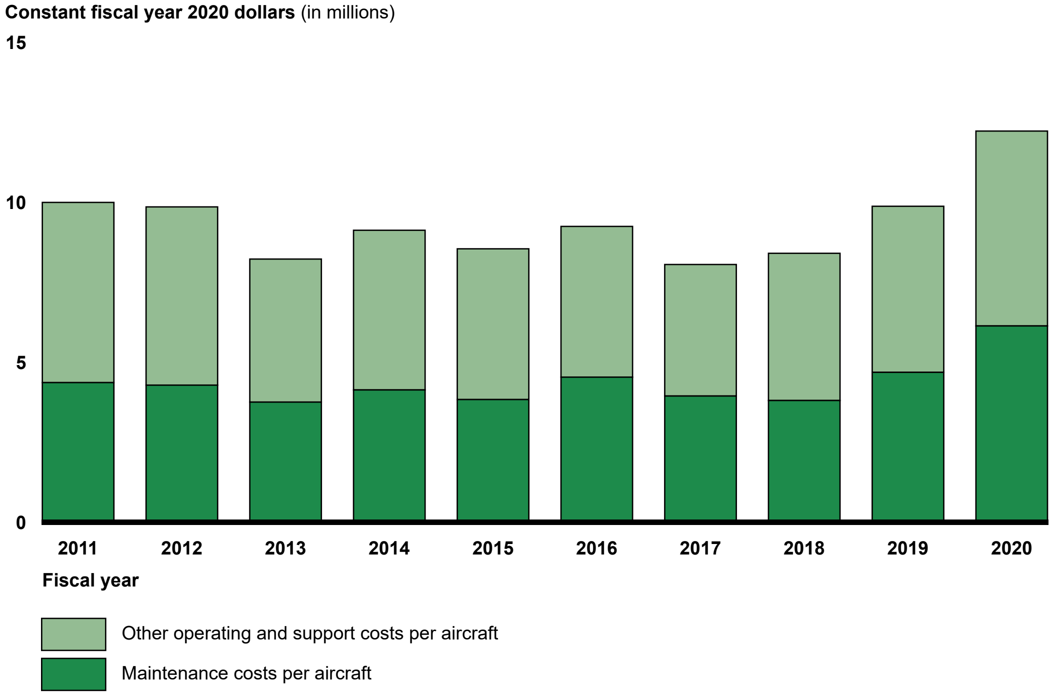


E-2C Maintenance Costs

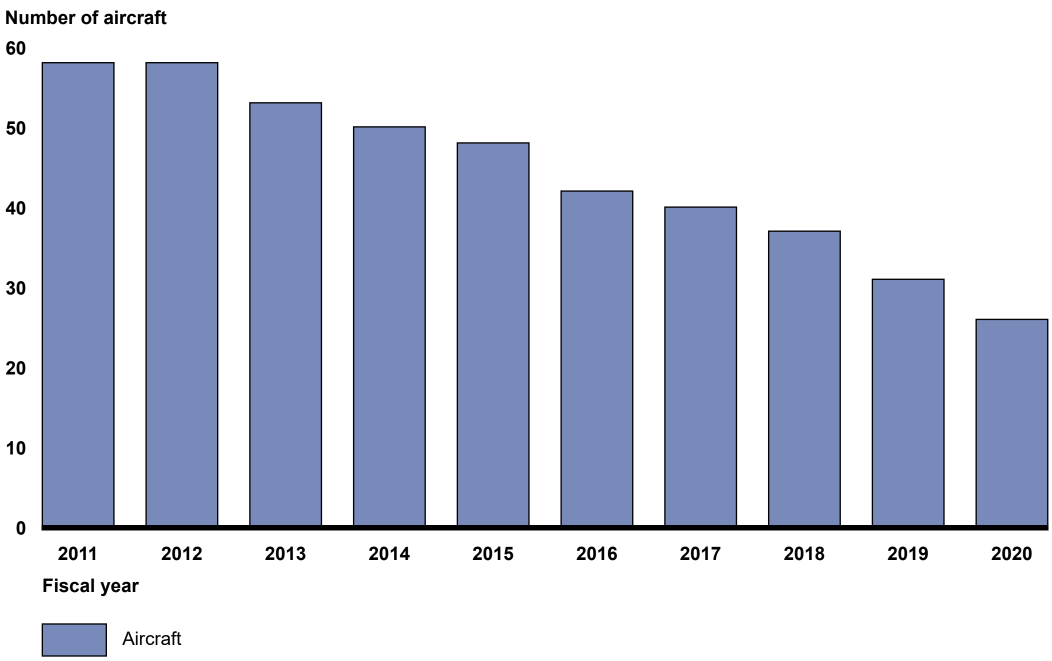


Operating and Support Costs per Aircraft

E-2C Operating and Support Costs per Aircraft

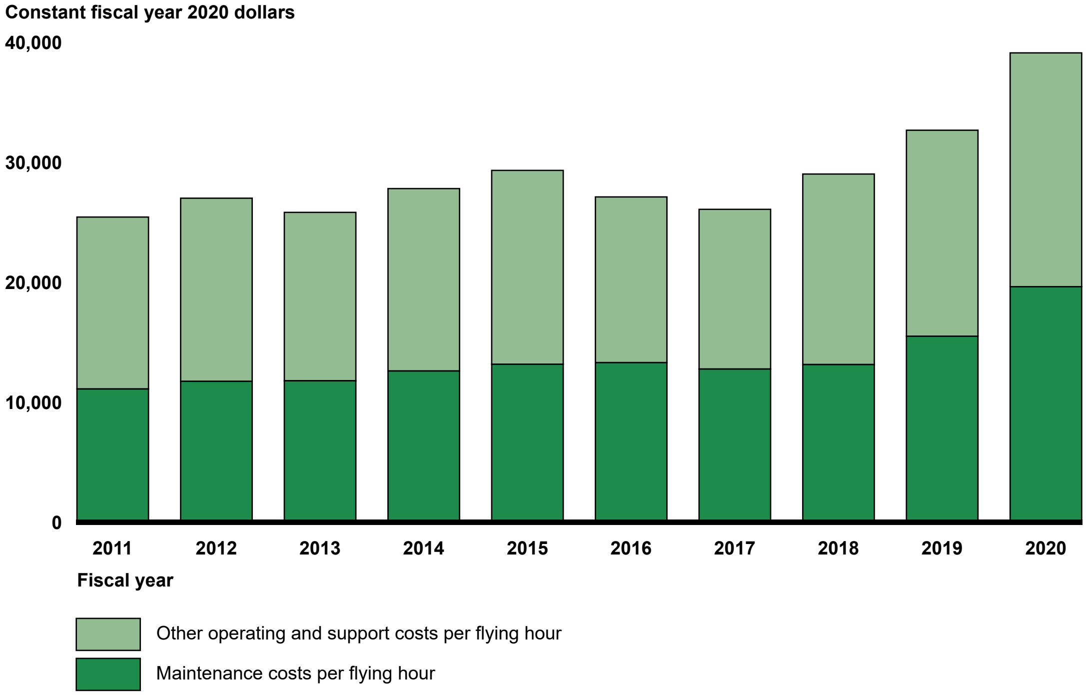


E-2C Fleet Size

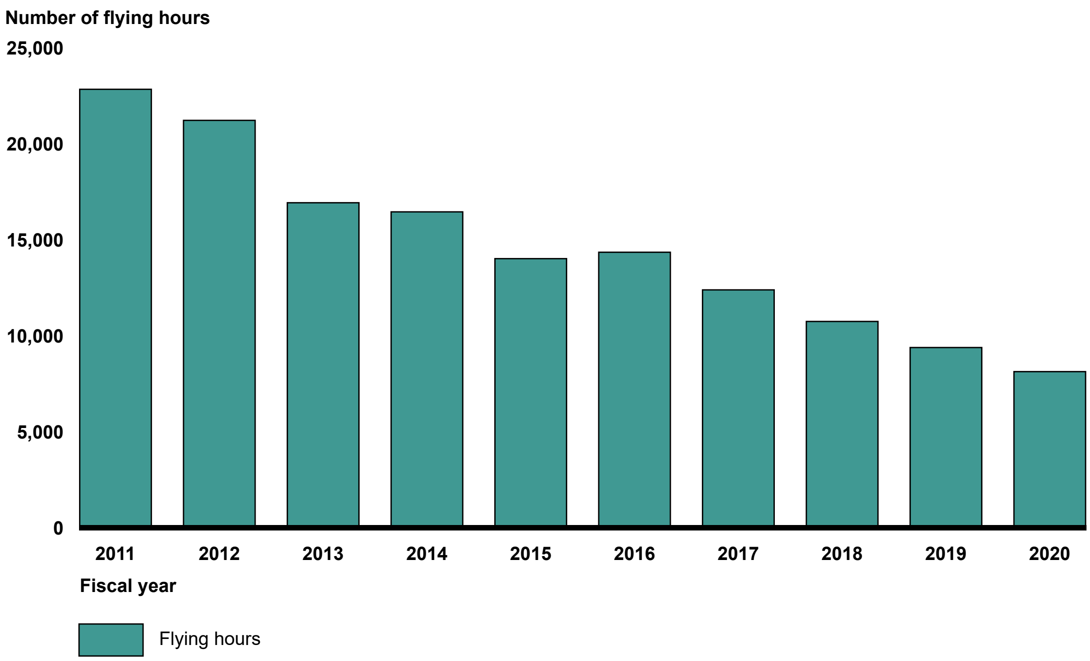


Operating and Support Costs per Flying Hour

E-2C Operating and Support Costs per Flying Hour



E-2C Flying Hours



Sustainment Strategy, Challenges, and Mitigation Actions

Navy personnel perform E-2C depot maintenance at the Navy's Fleet Readiness Center Southwest in California and Fleet Readiness Center Mid-Atlantic in North Carolina. Rolls Royce performs engine depot maintenance at its facility in Texas. Planned depot maintenance will end in fiscal year 2022. Navy personnel perform the E-2C's field maintenance at squadron locations. The Naval Supply Systems Command and the Defense Logistics Agency provide supply support.

E-2C Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Aging: According to officials, the average age of E-2C aircraft in the fleet as of at the end of fiscal year 2021 was about 17.6 years, but there was a wide variance in the age of the aircraft with aircraft age ranging from 12 to 30 years. Program officials did not identify any sustainment challenges related to the age of the aircraft in the fleet. The Navy plans to permanently transition the E-2C aircraft out of service and E-2C squadrons are transitioning to the replacement E-2D aircraft. The E-2C has a planned sunset date of 2026, when the last of the E-2D replacement aircraft will be delivered. In fiscal year 2021, the officials said that the Navy retired four aircraft, with plans to retire an additional six aircraft by the end of fiscal year 2022.

Maintenance: According to program officials, a shrinking number of civilian government and fleet personnel with long-term experience in sustaining the E-2C aircraft will be a constant challenge as the fleet's sunset date gets closer. To mitigate this challenge, officials said that the program office is actively incorporating experienced E-2C government engineering, logistics, and depot personnel into the workforce to ensure that E-2C support skills are maintained through the fleet's retirement.

Further, the shortage of skilled E-2C personnel has increased, according to a program official, which has increased reliance on government sustainment engineering support. The official said that the program will continue to prioritize key government services to address all mission critical support and the Navy will have sufficient E-2C expertise available through the last years of service.

The officials said program funding reductions, which are typical for a program within 5 years of retirement, have reduced the program office's ability to improve maintenance efficiencies. Instead, the program is prioritizing sustainment engineering efforts to ensure safety and critical functionality are being met, according to program officials. Officials stated the program office also implemented improvements in organizational-level maintenance management in fiscal year 2021.

Due to continued limited funding, the E-2C squadrons have performed more cannibalizations to keep aircraft availability numbers at requirements, according to program officials. The officials said that this priority management strategy caused the program's rate of not mission capable for maintenance to rise, because the fleet repairs only the required number of aircraft to meet priority requirements.

Supply Support: Program officials stated that the E-2C program has been experiencing shortages and delays of some parts and components due to obsolescence. Since the E-2C is within 5 years of its sunset date, program officials said that no more modifications or upgrades were planned to address obsolescence.

However, they said squadrons have been filling these shortages by taking parts from other E-2C aircraft that were removed from service.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

E-2D
Advanced Hawkeye

Program Essentials

Lead Service
Navy

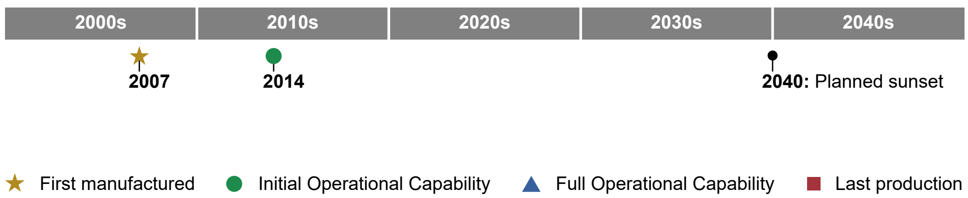
Manufacturer
Northrop Grumman Corporation

Program Office
Program Manager – Air 231,
Naval Air Systems Command,
Patuxent River, Maryland

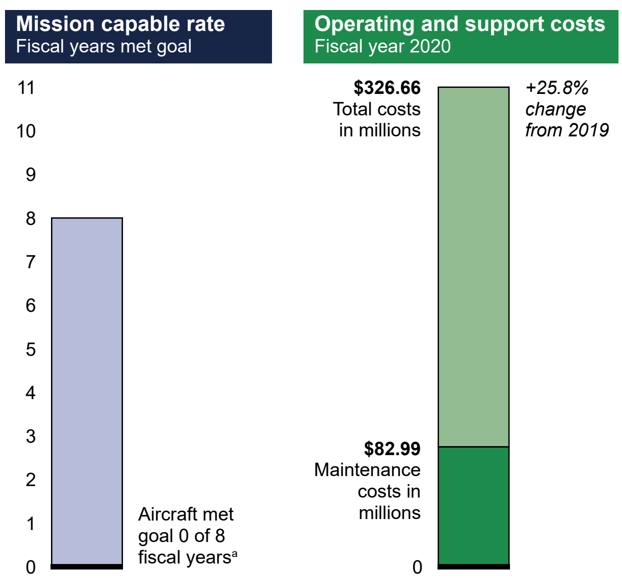
Sustainment
The Navy's Fleet Readiness Centers Southwest, East, and Southeast perform depot maintenance. Navy personnel perform field maintenance, with contractor support.

The E-2D is the newest variant of the E-2 aircraft platform, which will replace the E-2C Hawkeye. The E-2D has a state-of-the-art radar and key objectives include improved battle space target detection, situational awareness, and increased operational availability.

E-2D Life Cycle Timeline



E-2D Sustainment Status



Aircraft

36 total aircraft
Fiscal year 2020

5.5 years
Average aircraft age in fiscal year 2021

Flying hours

10,811 flying hours
Fiscal year 2020

1,676 hours
Average lifetime flying hours per aircraft in fiscal year 2021

Operating and support costs per aircraft and flying hour
Fiscal year 2020

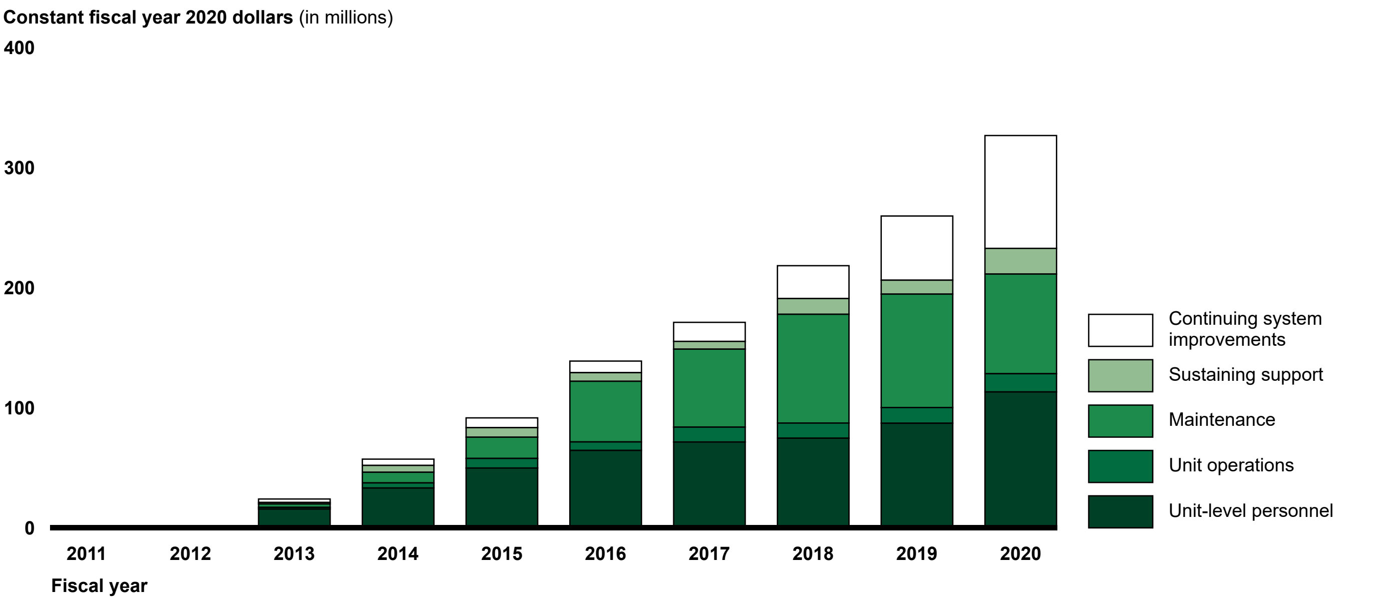
$9.07 million
Total costs per aircraft

$30,216
Total costs per flying hour
+24.6% change from 2019

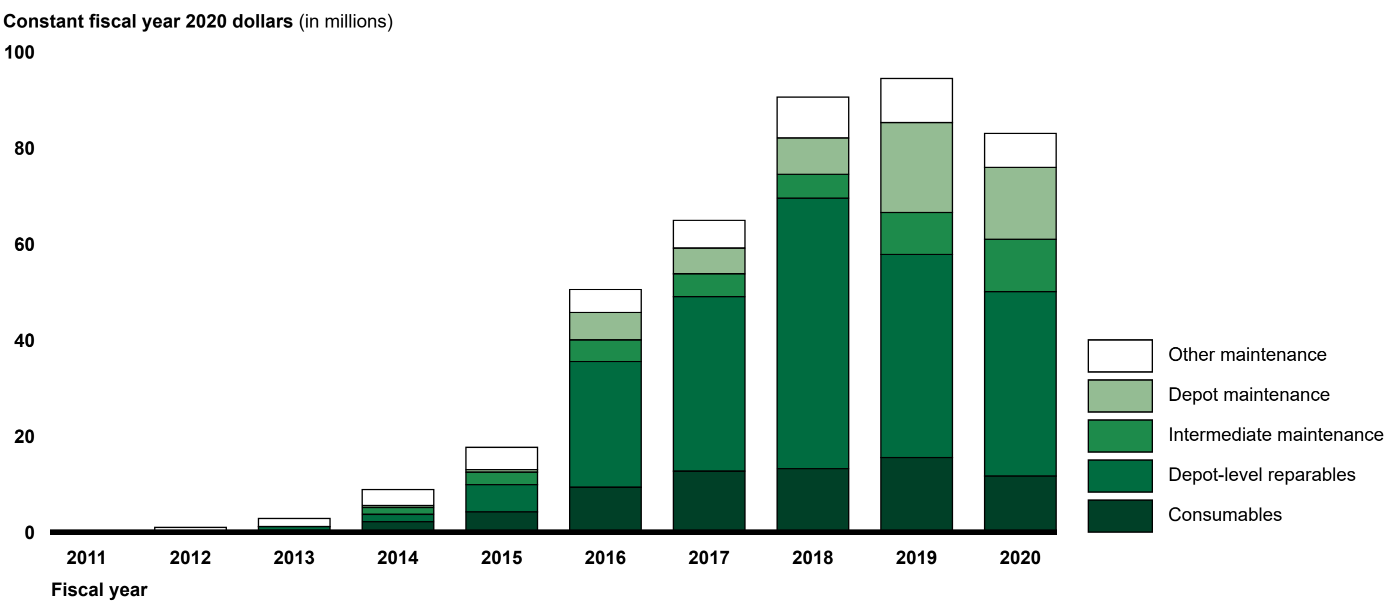
[a]For this aircraft, the military department did not provide a mission capable goal for all eleven years.

Operating and Support Costs

E-2D Total Operating and Support Costs

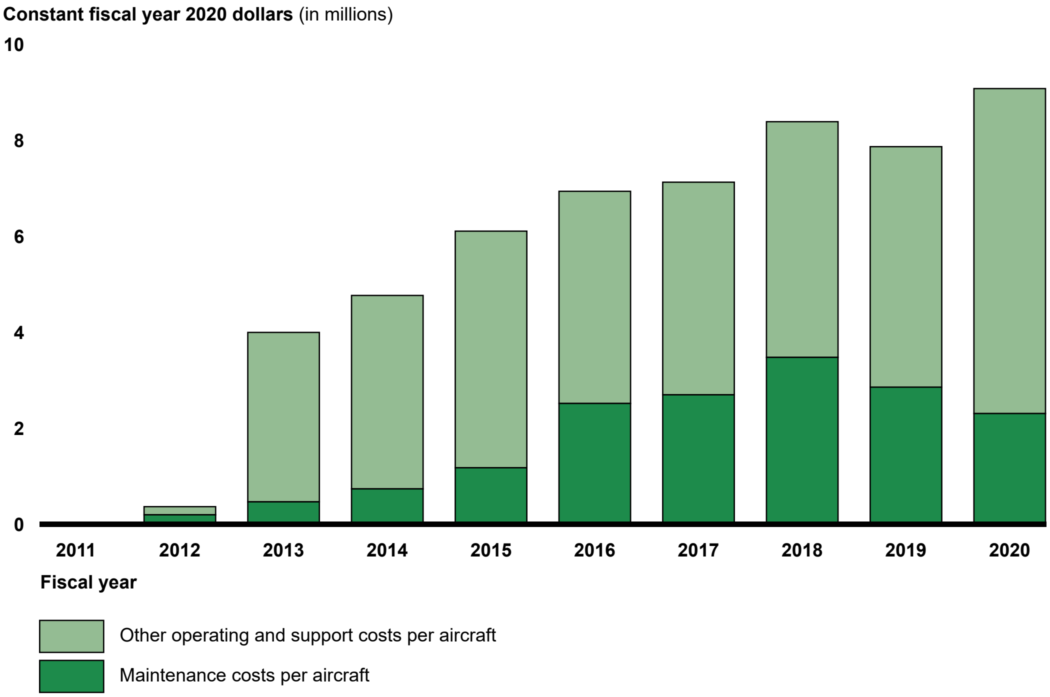


E-2D Maintenance Costs

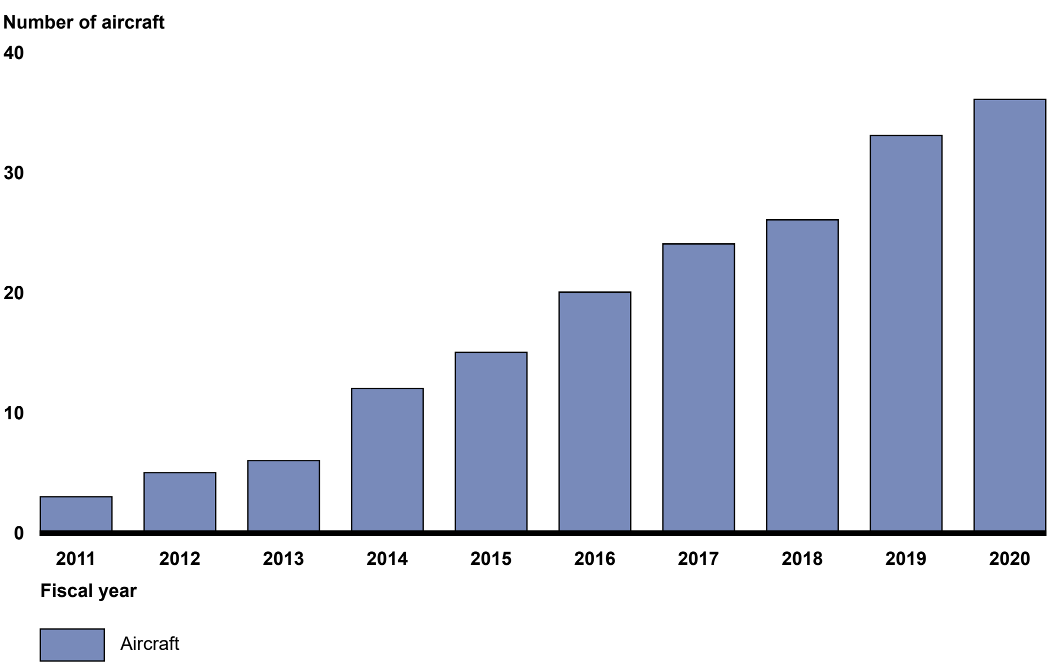


Operating and Support Costs per Aircraft

E-2D Operating and Support Costs per Aircraft

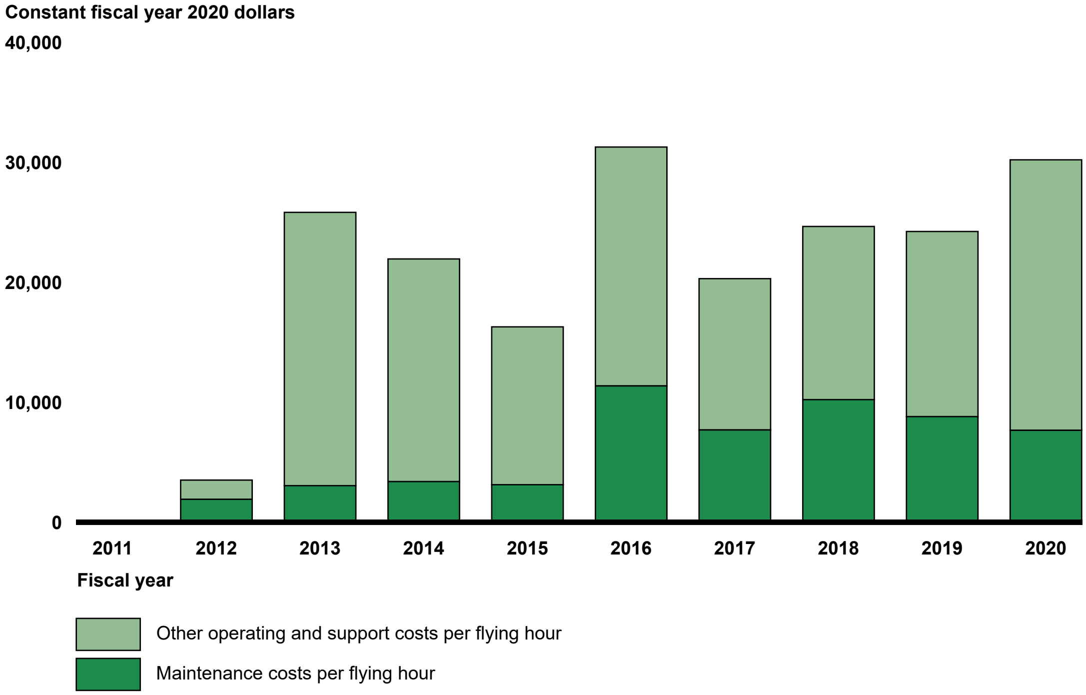


E-2D Fleet Size

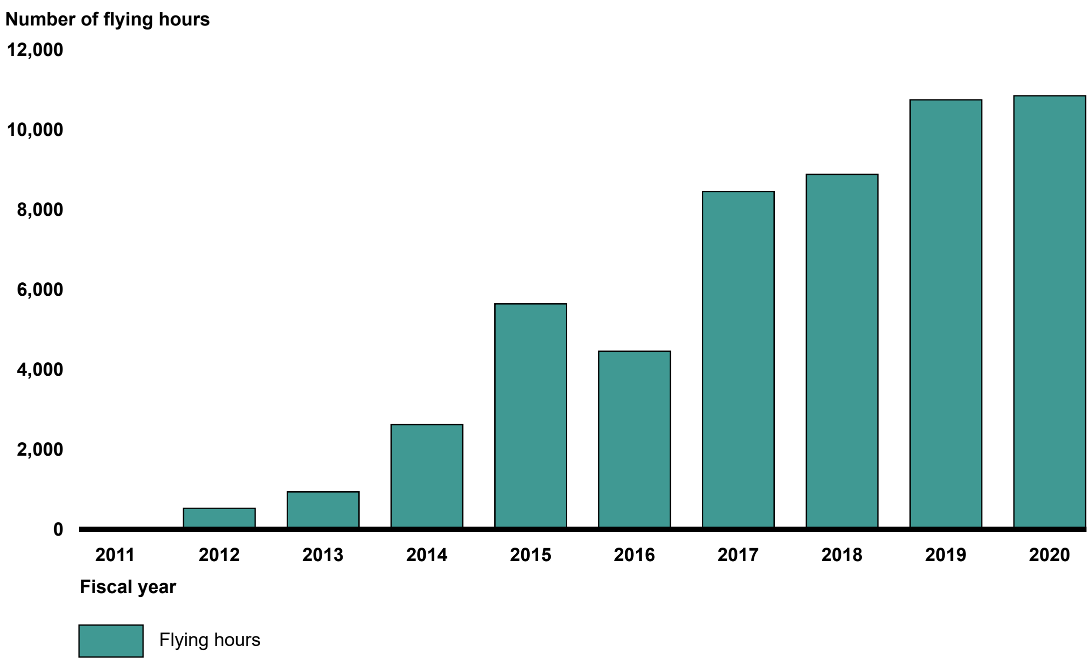


Operating and Support Costs per Flying Hour

E-2D Operating and Support Costs per Flying Hour



E-2D Flying Hours



Sustainment Strategy, Challenges, and Mitigation Actions

Navy personnel perform E-2D depot maintenance at the Navy's Fleet Readiness Centers Southwest, East, and Southeast in California, North Carolina, and Florida, respectively. Navy personnel perform field maintenance with contractor field technical support services provided by Northrop Grumman Systems Corporation-Aerospace Systems, according to program officials. Naval Supply Systems Command and the Defense Logistics Agency provide supply support.

E-2D Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Maintenance: According to officials, the Navy has taken steps to improve the reliability of components that initially caused an increase in the amount of unscheduled maintenance. As a result, the officials said that the amount of unscheduled maintenance that the program has performed due to higher than expected failure rates was decreasing and the fleet's material availability had improved. However, program officials said that this improvement may eventually be offset because of unscheduled maintenance related to an increase in modifications to the aircraft. This tends to increase the rate of not mission capable for maintenance, according to officials.

Program officials also stated that there were still not sufficient numbers of E-2D qualified maintainers to fulfill maintenance personnel requirements, but the situation has improved as the numbers of aircraft increased. The deficit in trained maintenance personnel was due to the pause in the E-2C to E-2D transition for several years, according to program officials, and they expect that this challenge will be resolved as the number of E-2D aircraft increases and the replacement of E-2C aircraft is completed.

To mitigate this challenge, officials said that the program has a contract with the aircraft manufacturer to provide field technician support to the squadrons. The E-2D plans to transition to an entirely Navy maintenance infrastructure as skills are established, according to program officials.

Supply Support: According to program office officials, the program experienced supply support challenges due to parts obsolescence and diminishing manufacturing sources and material shortages, among other reasons. For example, program officials said that the aircraft has experienced some shortages because the vendors stopped producing the parts or components, even though the E-2D aircraft is still in production. They stated that this was due to the low number of aircraft in the fleet, which often has not generated enough demand for unique E-2D parts and components for manufacturers to keep production lines open.

Officials said that they plan to mitigate this challenge with lifetime buys of E-2D unique parts and components that are at risk due to diminishing manufacturing sources. A lifetime buy is the purchase of sufficient numbers of parts or components to satisfy all of the fleet's projected demands during the life cycle of the aircraft. Further, the officials stated that as the numbers of higher technology components increase, the aircraft typically requires more frequent upgrades and more extensive obsolescence planning. Program officials stated that they were planning for increased E-2D modification schedules and also lifetime buys of parts and components.

Program Office Comments

In commenting on a draft of this assessment, the program office stated that the E-2D's "depot peculiar" support equipment acquisitions for the standup of repair/maintenance capabilities at the Navy depots are in a critical funding acquisition stage. According to the program office, these support equipment acquisitions will yield more material availability and insight at the Navy depots into the root causes of failures, which will improve scheduled maintenance and safety. In addition, the program office stated that it now has sufficient maintenance historical data to reassess the E-2D's maintenance plans, including the levels of repair, to identify potential cost and readiness improvements. Maintenance level of repair analyses are currently in the business case analysis phase to determine if additional intermediate-level repair capabilities, if funded, can improve the E-2D's total life-cycle costs.

E-6B
Mercury

Program Essentials

Lead Service
Navy

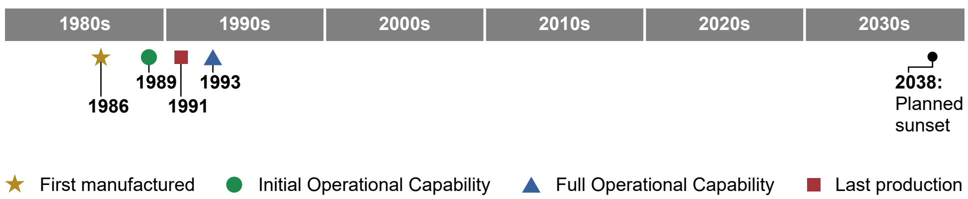
Manufacturer
Boeing

Program Office
Program Manager – Air 271, Naval Air Systems Command, Patuxent River, Maryland

Sustainment
The Oklahoma City Air Logistics Complex performs depot maintenance. Navy personnel perform field maintenance.

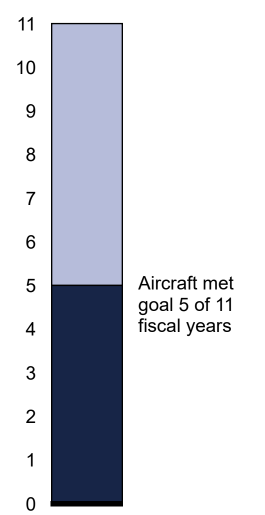
The E-6B Mercury aircraft provides airborne command, control, and communications between the National Command Authority and U.S. forces, such as naval ballistic missile forces during times of crisis.

E-6B Life Cycle Timeline

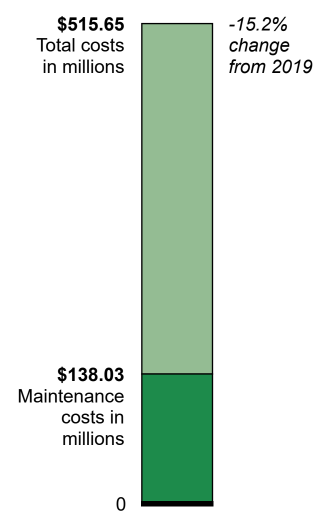


E-6B Sustainment Status

Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

16 total aircraft
Fiscal year 2020

30.8 years
Average aircraft age in fiscal year 2021

Flying hours

9,403 flying hours
Fiscal year 2020

26,281 hours
Average lifetime flying hours per aircraft in fiscal year 2021

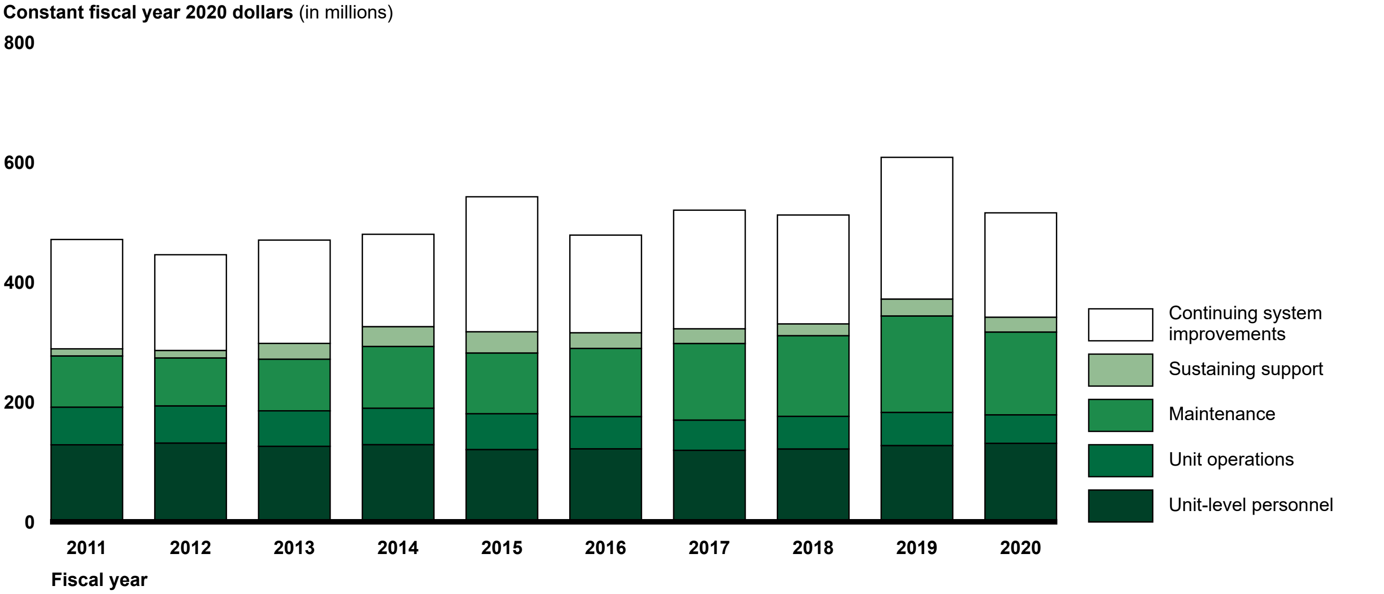
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$32.23 million
Total costs per aircraft

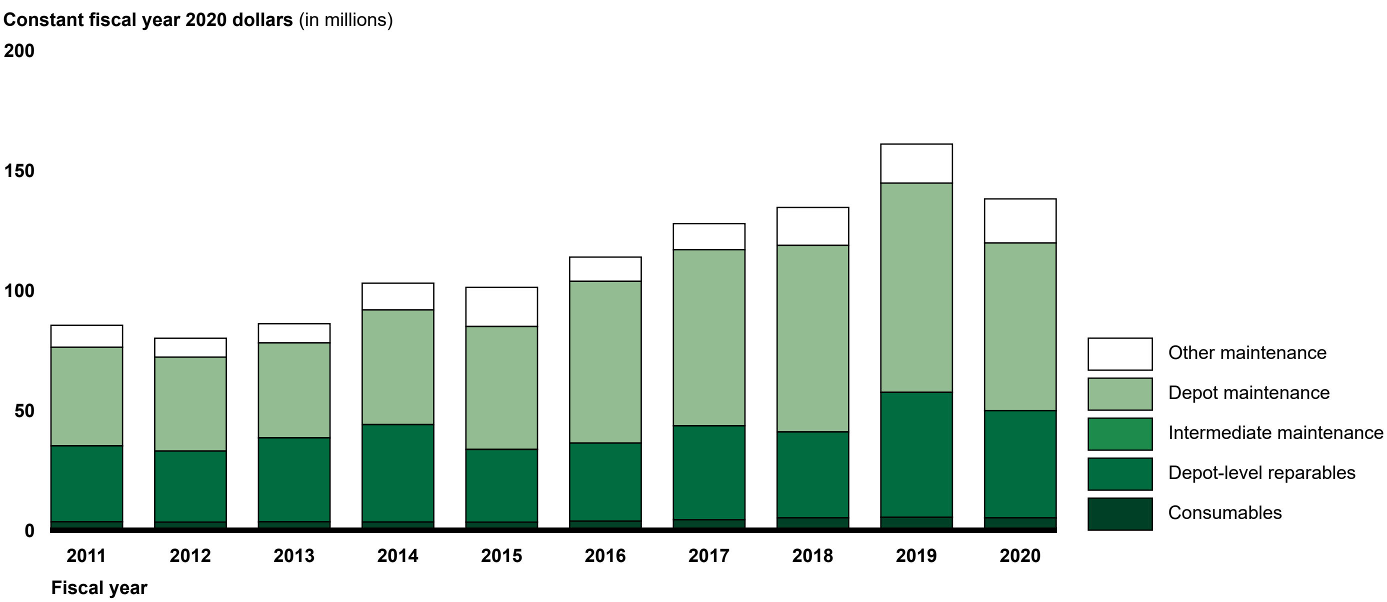
$54,839
Total costs per flying hour
-2.5% change from 2019

Operating and Support Costs

E-6B Total Operating and Support Costs

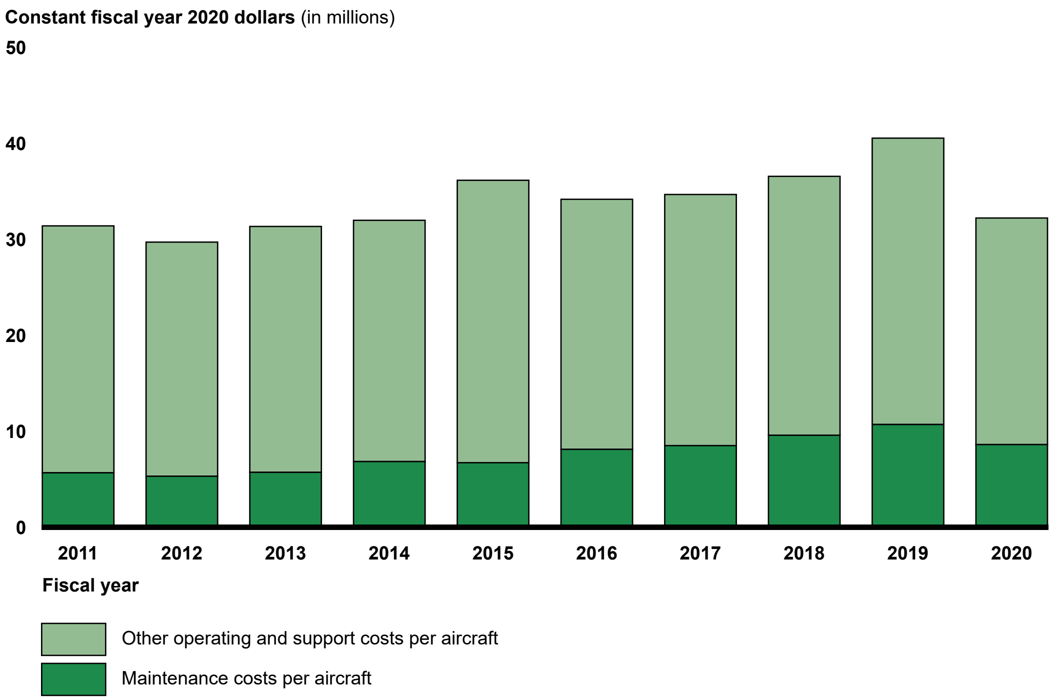


E-6B Maintenance Costs

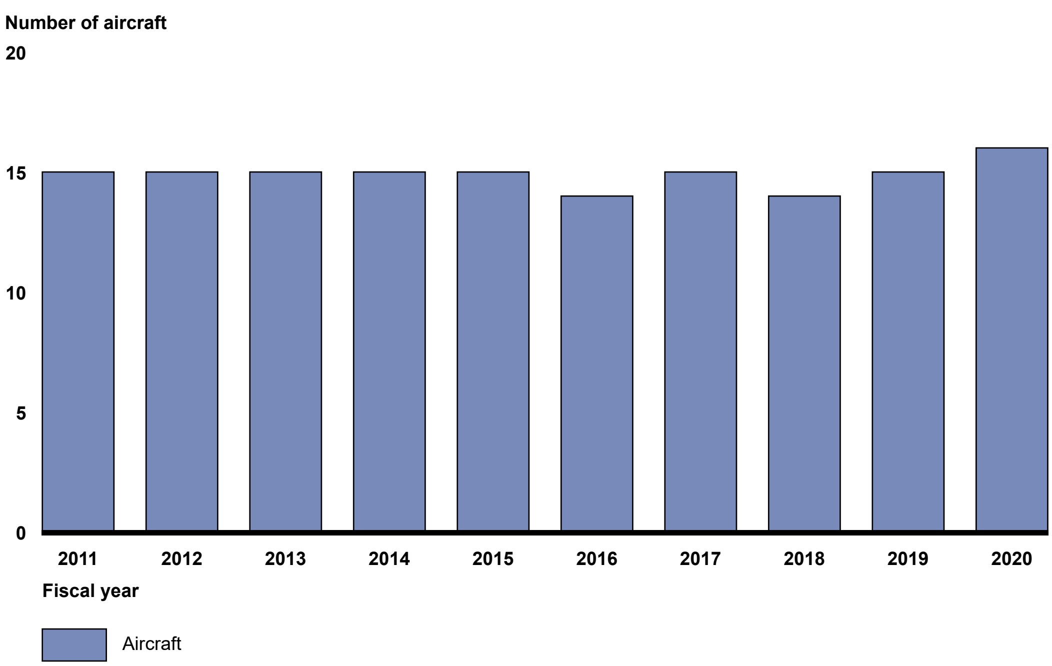


Operating and Support Costs per Aircraft

E-6B Operating and Support Costs per Aircraft

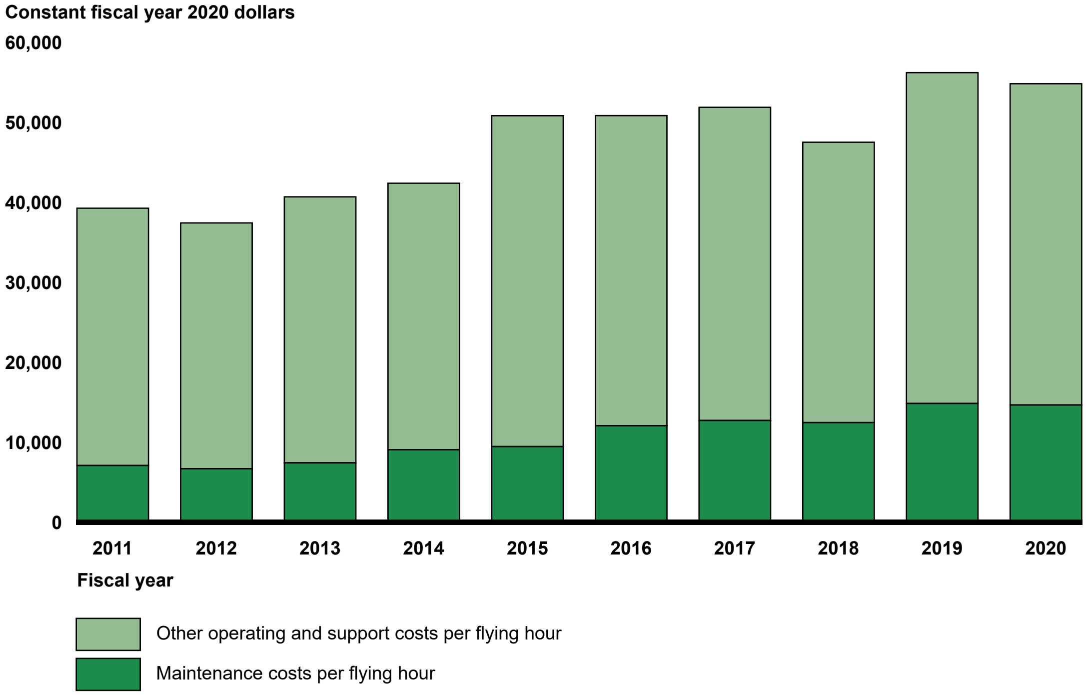


E-6B Fleet Size

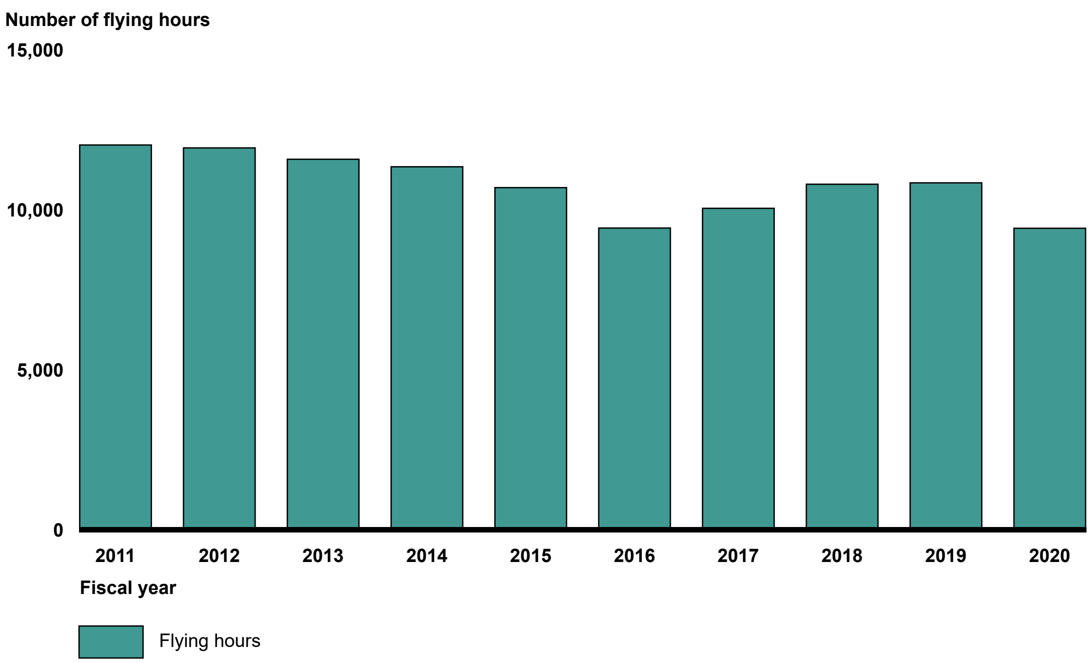


Operating and Support Costs per Flying Hour

E-6B Operating and Support Costs per Flying Hour



E-6B Flying Hours



Sustainment Strategy, Challenges, and Mitigation Actions

The Air Force's Oklahoma City Air Logistics Complex in Oklahoma performs depot maintenance on the E-6B. Navy personnel perform field maintenance. According to an official, the Defense Logistics Agency and Vertex Aerospace provide supply support for the aircraft.

E-6B Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Maintenance: The E-6B program has experienced challenges with unscheduled maintenance events and associated delays in depot maintenance. According to program officials, examples of recent unscheduled maintenance events include wing spar (i.e., primary structural components of the wing) corrosion and tail damage.

The program officials stated that inspections found corrosion and cracking on the wing spar of three aircraft that required multiple in-service repairs to correct and were not previously planned, resulting in significant not mission capable maintenance time in fiscal year 2020. Program officials said that since additional aircraft would also require these repairs, they were being scheduled to coincide with each aircraft's scheduled depot induction periods to mitigate the negative effect on the fleet's mission capable rate. An official commented that five aircraft required repairs for corrosion and wing spar in 2020 and 2021. As of March 2022, three had been repaired with two more planned in fiscal year 2022, according to program officials.

Program officials stated they needed to schedule repairs to coincide with scheduled depot induction periods after an E-6B struck a hangar while being towed. The aircraft required hours of extensive, unplanned depot-level repairs and was out of service for an extended period of time. This also delayed planned depot maintenance for other aircraft in the fleet.

Program officials also stated that the fleet began implementing an organizational-level maintenance management initiative in April 2021 designed to reduce phase-scheduled maintenance. The officials said that they expect the initiative to reduce the E-6B program's not mission capable maintenance rate. For example, a preliminary study estimated about a 16 percent (or 2 day) reduction in phase maintenance periods, meaning the aircraft would be available to operate more, according to program officials.

Supply Support: The E-6B program experienced challenges, including:

- access to technical data,
- parts shortages and delays,
- diminishing manufacturing sources, and
- obsolescence.

For example, program officials reported that Boeing-proprietary parts for the 707 airframe such as spar chords, slats, spoilers, and flaps often take years to purchase, making it more difficult to mitigate shortages and delays related to these parts. Officials said that purchasing these parts requires long lead times and additional costs because Boeing has not maintained its own technical data or production processes. The program office cannot purchase most of Boeing’s proprietary parts from any other vendors, according to program officials. To obtain these parts, the program office typically funds Boeing’s efforts to update the technical data necessary to produce the parts and to restart the production processes.

The program office established the E-6B Reliability Control Board in April 2020 to address other parts shortages and delays. Officials attribute the reduction in the program’s not mission capable supply rate for fiscal year 2020 to the board’s resolution of several long lead time items shortly after the board’s establishment. Further, officials stated that the program’s Readiness and Supportability team has tracked and worked to mitigate 90 active cases of obsolescence or diminishing manufacturing sources and material shortages for E-6B system components.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate. The program office noted that the E-6B’s depot maintenance turn-around times are also the result of increases to the number of tasks in its Enhanced Phase Maintenance-Heavy (Depot) task package. The addition of more tasks and the inclusion of additional modifications (such as the fuel tank sealant upgrade) has increased overall maintenance work hours substantially and overall flow time, according to program officials. The program office said that it has a team working aggressively to mitigate increasing flow times by engaging in multiple Rapid Improvement Events with the Air Logistics Complex.

E-3
Sentry

Program Essentials

Lead Service
Air Force

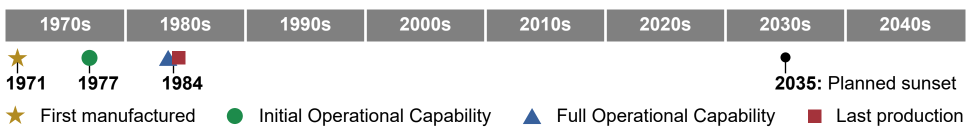
Manufacturer
Boeing

Program Office
Tinker Air Force Base, Oklahoma and Hanscom Air Force Base, Massachusetts

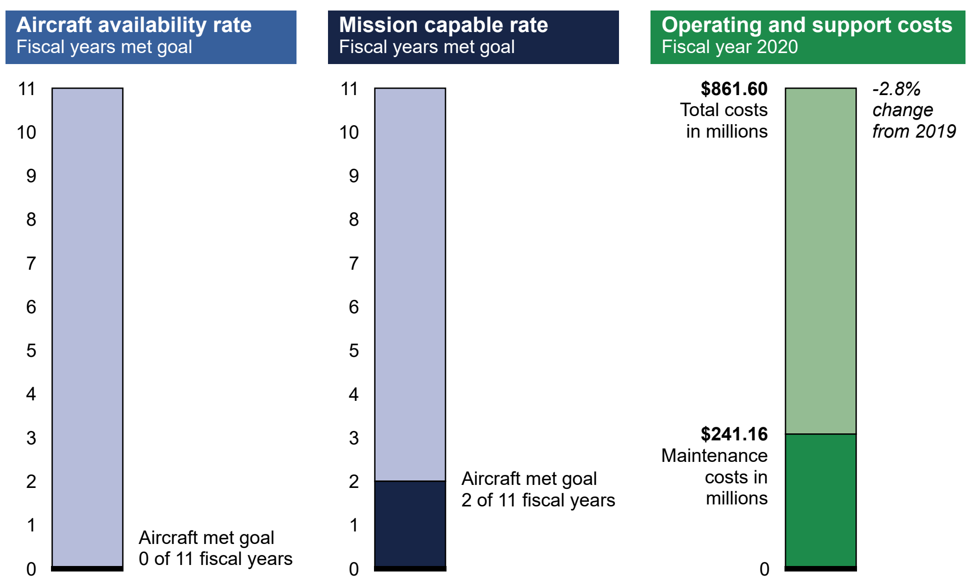
Sustainment
Programmed depot maintenance is performed at the Oklahoma City Air Logistics Complex. Air Force personnel perform field maintenance.

The E-3 is a modified Boeing 707/320 commercial airframe with a rotating radar dome and an integrated command and control battle management, surveillance, target detection, and tracking platform. It provides all-altitude and all-weather surveillance of the battle space.

E-3 Life Cycle Timeline



E-3 Sustainment Status



Aircraft

29 total aircraft
Fiscal year 2020

42 years
Average aircraft age in fiscal year 2021

Flying hours

13,030 flying hours
Fiscal year 2020

29,380 hours
Average lifetime flying hours per aircraft in fiscal year 2021

Operating and support costs per aircraft and flying hour
Fiscal year 2020

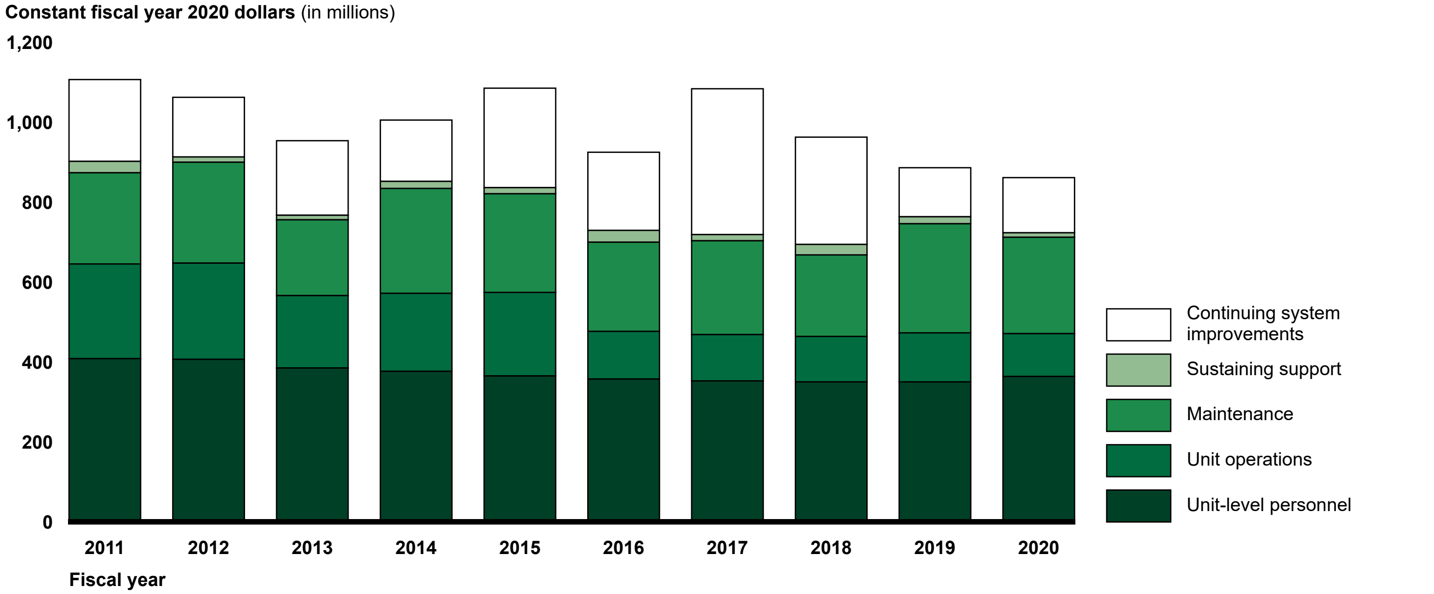
$29.92 million
Total costs per aircraft

$66,126
Total costs per flying hour
+4.5% change from 2019

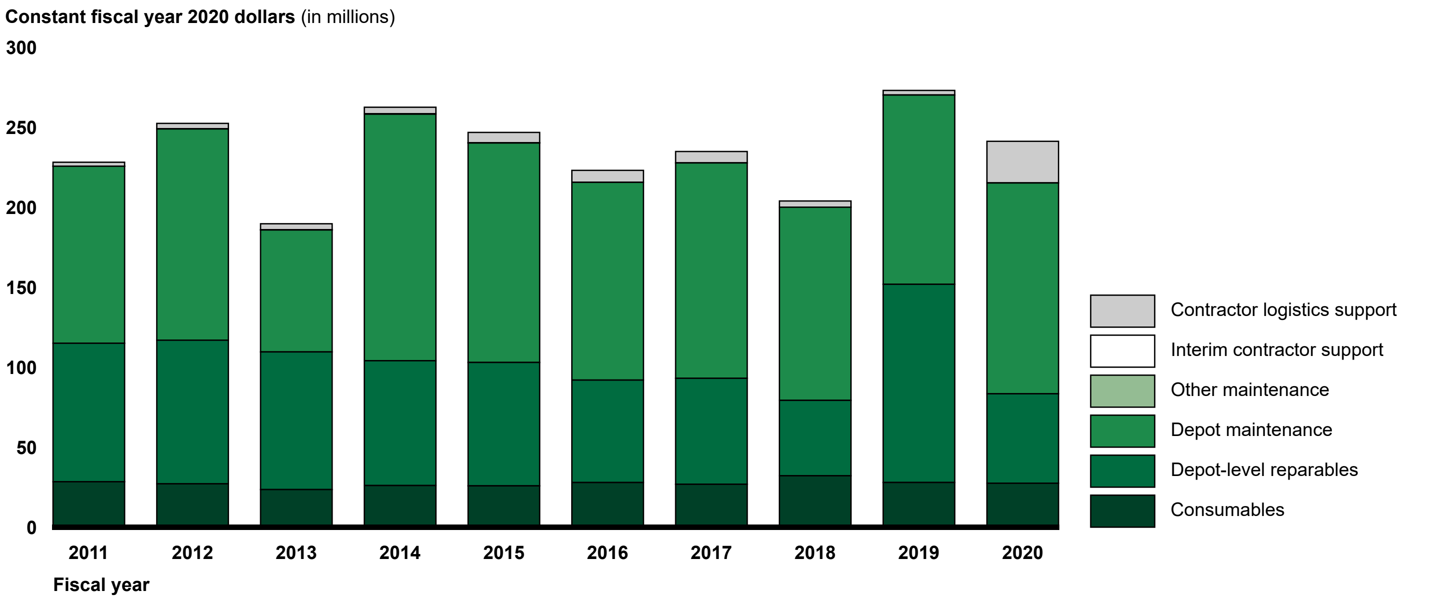
Note: According to program officials, the E-3 fleet size was 31 total aircraft in fiscal year 2020, but the aircraft that were undergoing the initial conversion to Block 40/45 were temporarily excluded from the total aircraft inventory.

Operating and Support Costs

E-3 Total Operating and Support Costs

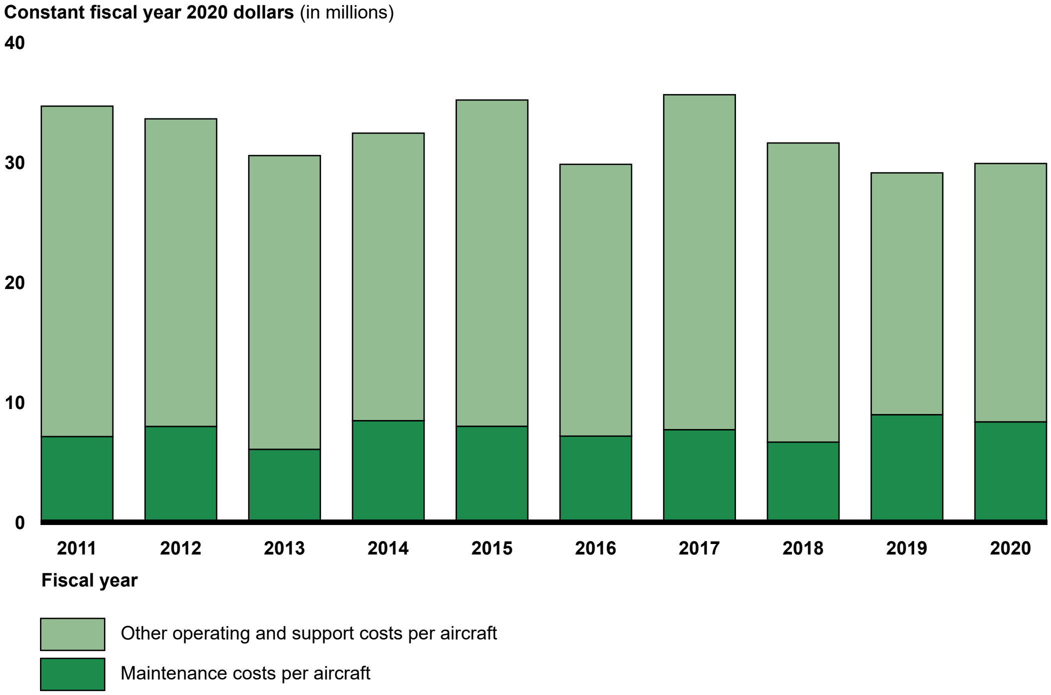


E-3 Maintenance Costs

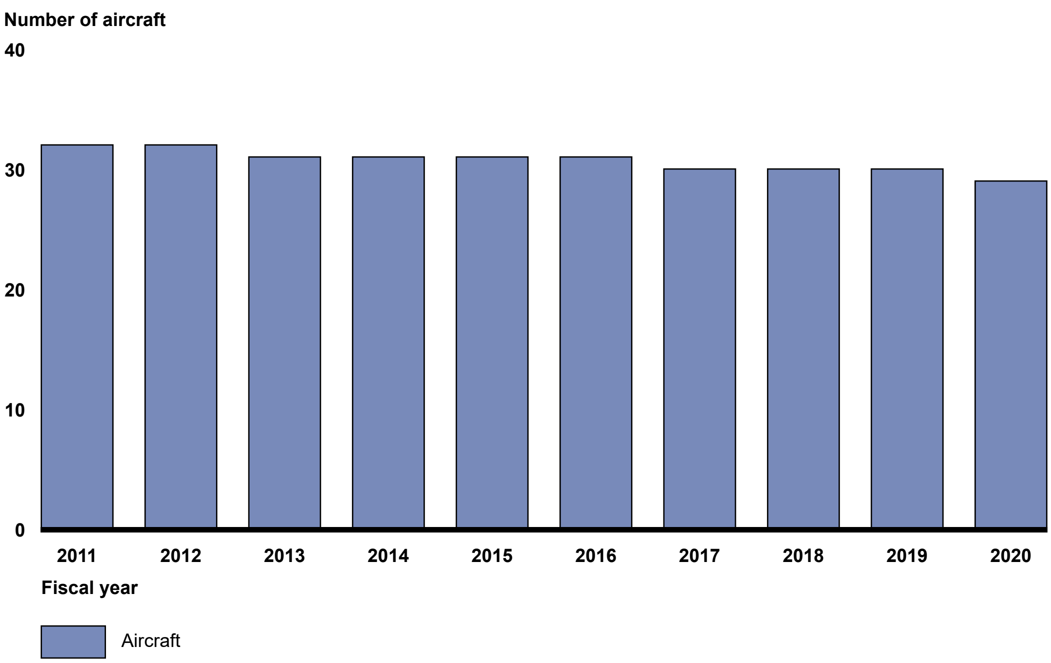


Operating and Support Costs per Aircraft

E-3 Operating and Support Costs per Aircraft



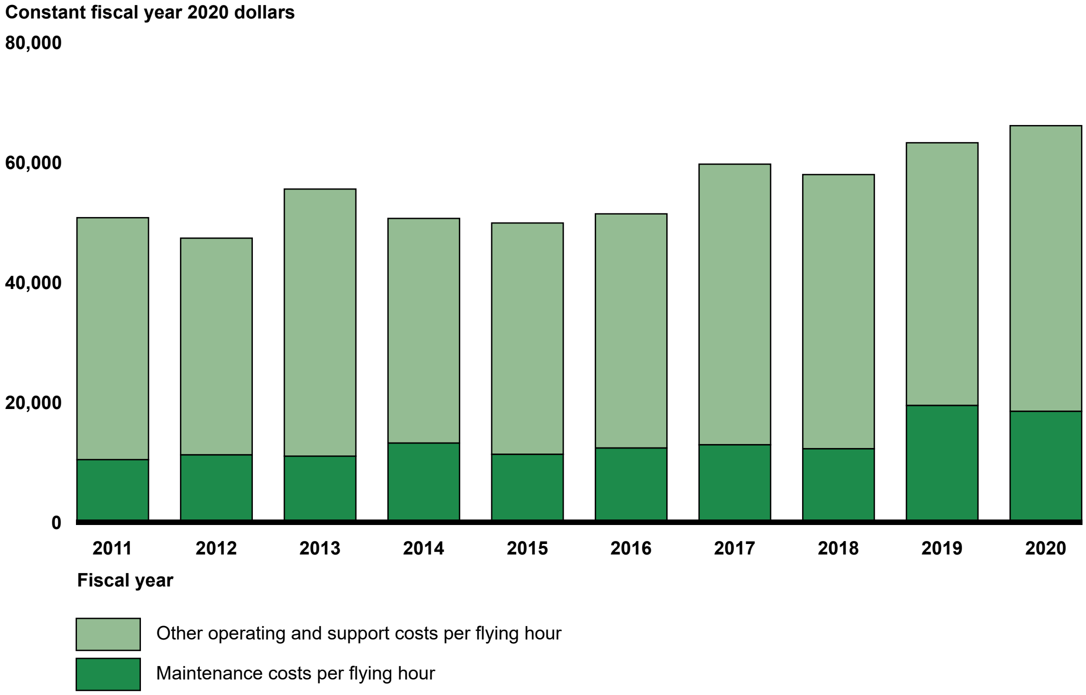
E-3 Fleet Size



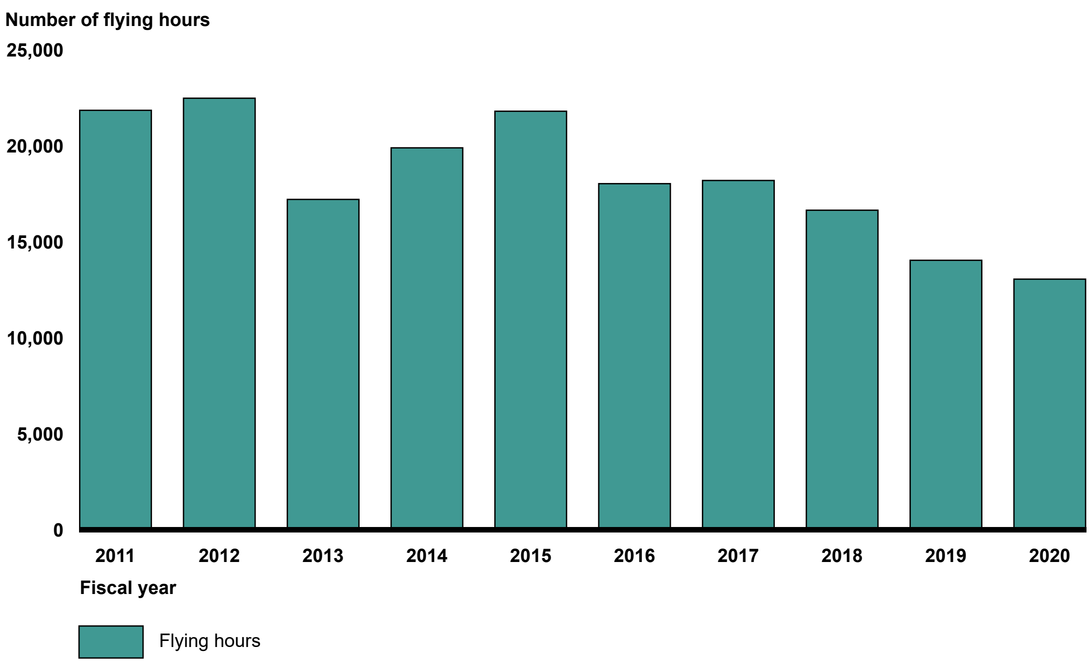
Note: According to program officials, the E-3 fleet size was 31 total aircraft in fiscal year 2020, but the aircraft that were undergoing the initial conversion to Block 40/45 were temporarily excluded from the total aircraft inventory.

Operating and Support Costs per Flying Hour

E-3 Operating and Support Costs per Flying Hour



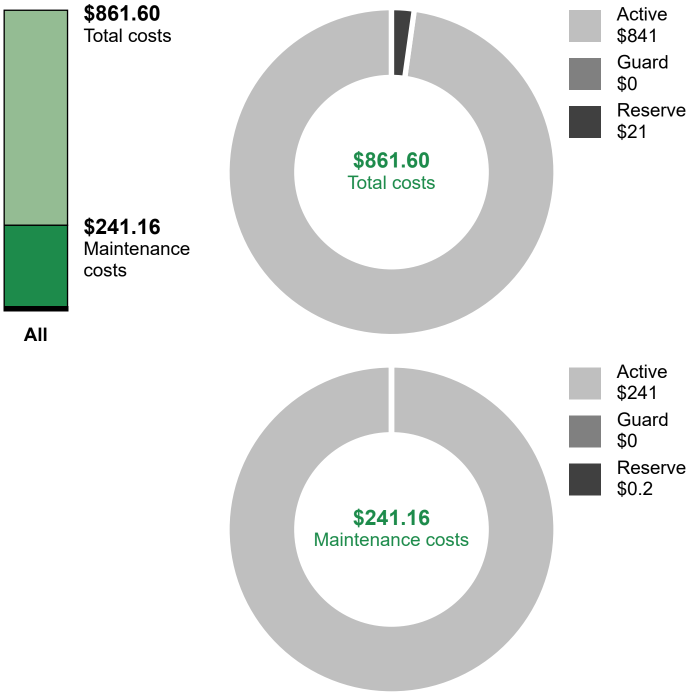
E-3 Flying Hours



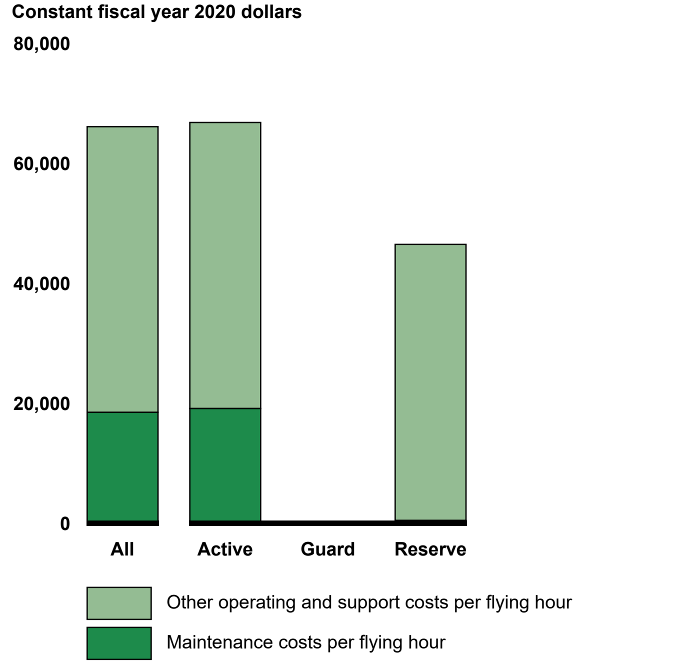
Component-Level Operating and Support Costs

E-3 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The Air Force performs the E-3's programmed depot maintenance, engine depot maintenance, and software maintenance at the Oklahoma City Air Logistics Complex in Oklahoma. Several modifications are supported via interim contractor support. Active-duty Air Force personnel perform field maintenance. The Defense Logistics Agency and the Air Force Sustainment Center provide most of the E-3's supply support. Northrop-Grumman provides supply support for the Block 40/45 modification under a performance-based logistics contract.

E-3 Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Aging and Maintenance: According to program officials, the aging E-3 airframe is prone to corrosion and fatigue damage. Program officials stated that the aircraft is inspected for this damage, and repairs have been completed when needed. Officials also noted that the systems on the aircraft are aging and require additional maintenance to restore mission capability. Additionally, program officials have found several components for which more detailed overhaul or even new parts are required.

Further, the E-3 has experienced programmed depot maintenance delays and unexpected replacement of parts and repairs. For example, program officials stated that the delays were due to a shortage of serviceable engines and to difficulties that were encountered during flights to check for the correct airborne functioning of the aircraft's systems.

According to officials, the program completed unscheduled engine removals in response to a safety technical order that was issued after an E-8 aircraft experienced an engine failure and the E-3 program found that it had a seized engine with a similar problem. They said that the order required that engines with certain thin turbine nozzle cases be removed and the cases replaced with thicker cases that will not rupture if the cooling holes become blocked.

Supply Support: Diminishing manufacturing sources continue to be an ongoing sustainment challenge across the E-3 platform. According to program officials, it is common for contractors not to want to restart production of parts for small quantities. For example, officials noted that no commercial vendors have made some parts for several years, and the program has experienced a shortage of serviceable engines.

Officials stated that the program has been seeking expanded ability to address the situation with engine parts through an Integrated Product Team that plans to visit vendors to encourage open competition for new parts. In addition, many radar parts are obsolete, and there have been issues with parts shortages and delays. This has resulted in the practice of cannibalization—removing a working component from one aircraft to install on another aircraft—which is generally an inefficient approach to conducting maintenance.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

E-4B
National Airborne Operations Center

Program Essentials

Lead Service
Air Force

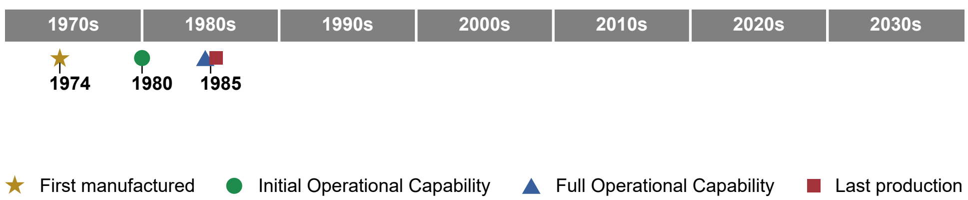
Manufacturer
Boeing

Program Office
Tinker Air Force Base, Oklahoma

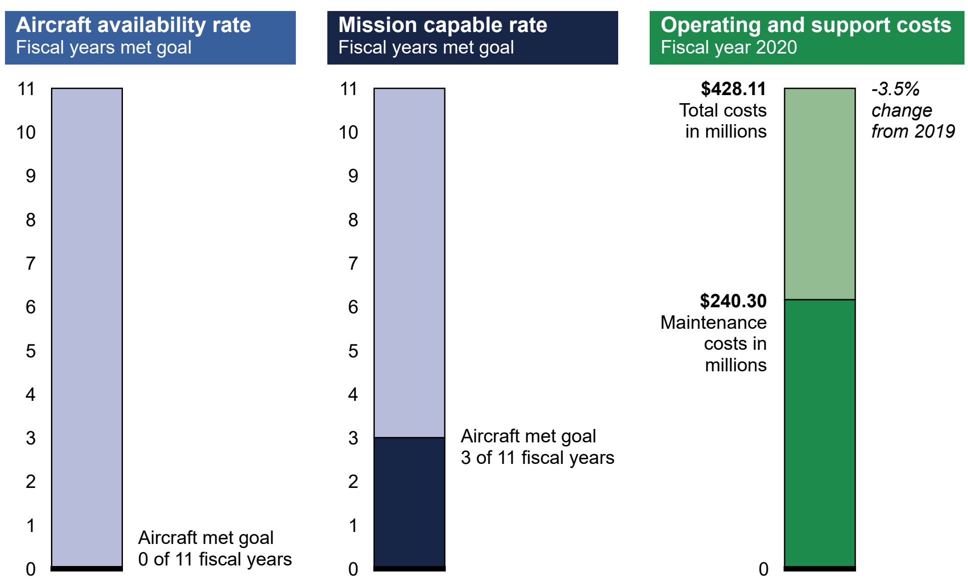
Sustainment
A contractor provides depot maintenance and Air Force personnel provide field maintenance.

The E-4B is a militarized version of the Boeing 747-200 that serves as the National Airborne Operations Center, a key component of the National Military Command System that can be used to direct U.S. forces, execute emergency war orders and coordinate actions by civil authorities.

E-4B Life Cycle Timeline



E-4B Sustainment Status



Aircraft

4 total aircraft
Fiscal year 2020

47 years
Average aircraft age in fiscal year 2021

Flying hours

1,149 flying hours
Fiscal year 2020

19,177 hours
Average lifetime flying hours per aircraft in fiscal year 2021

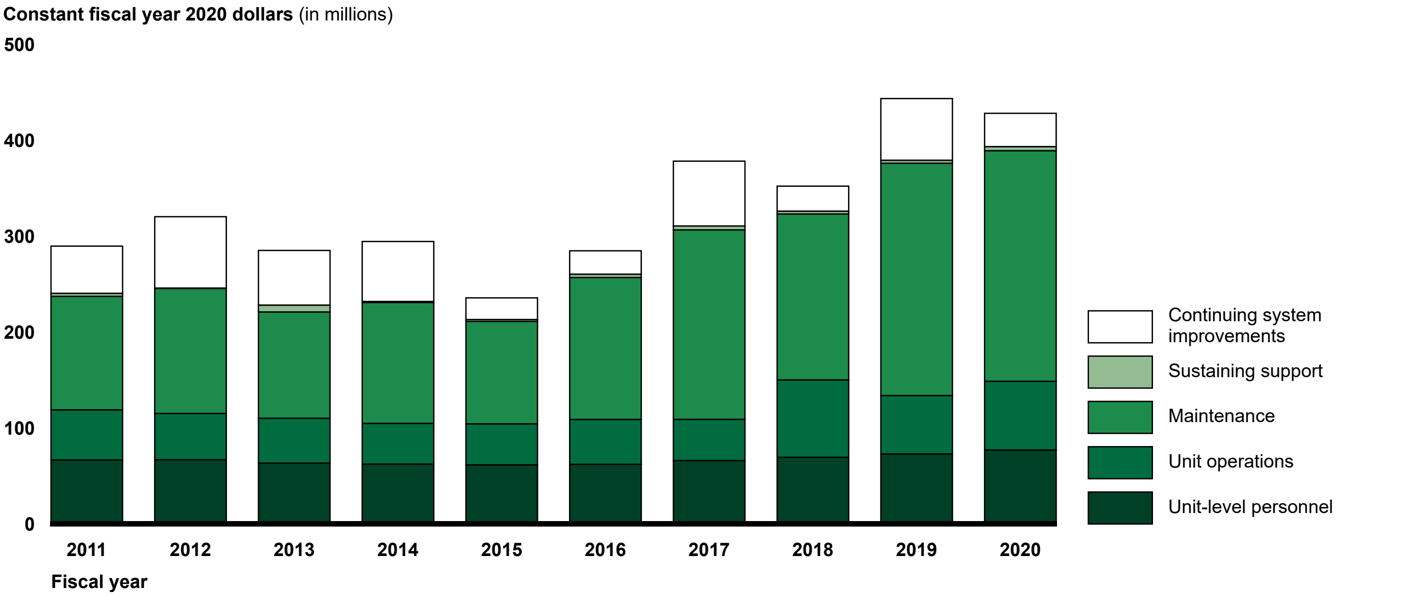
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$107.03 million
Total costs per aircraft

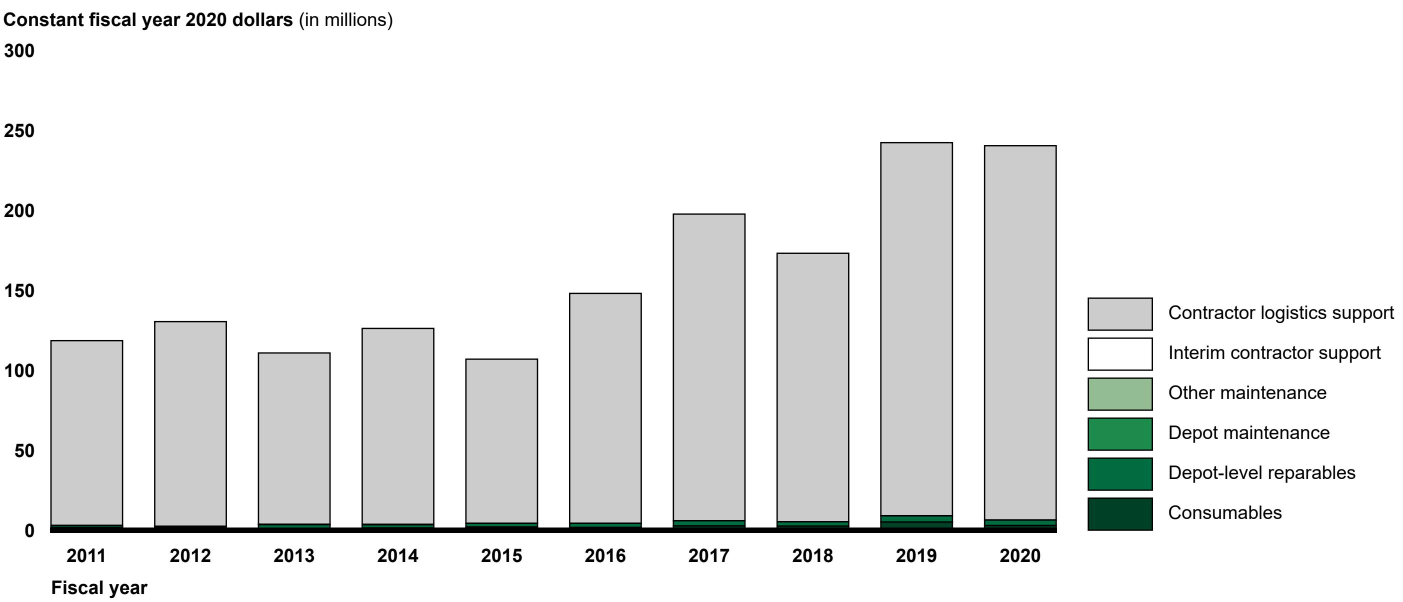
$372,496
Total costs per flying hour
+14.9% change from 2019

Operating and Support Costs

E-4B Total Operating and Support Costs

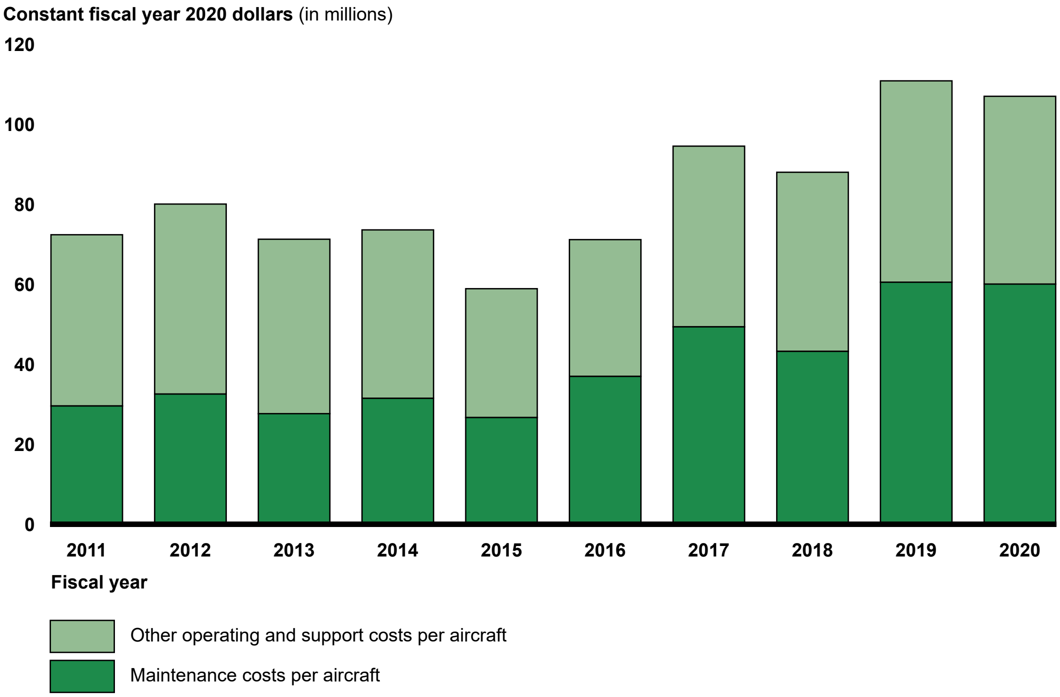


E-4B Maintenance Costs

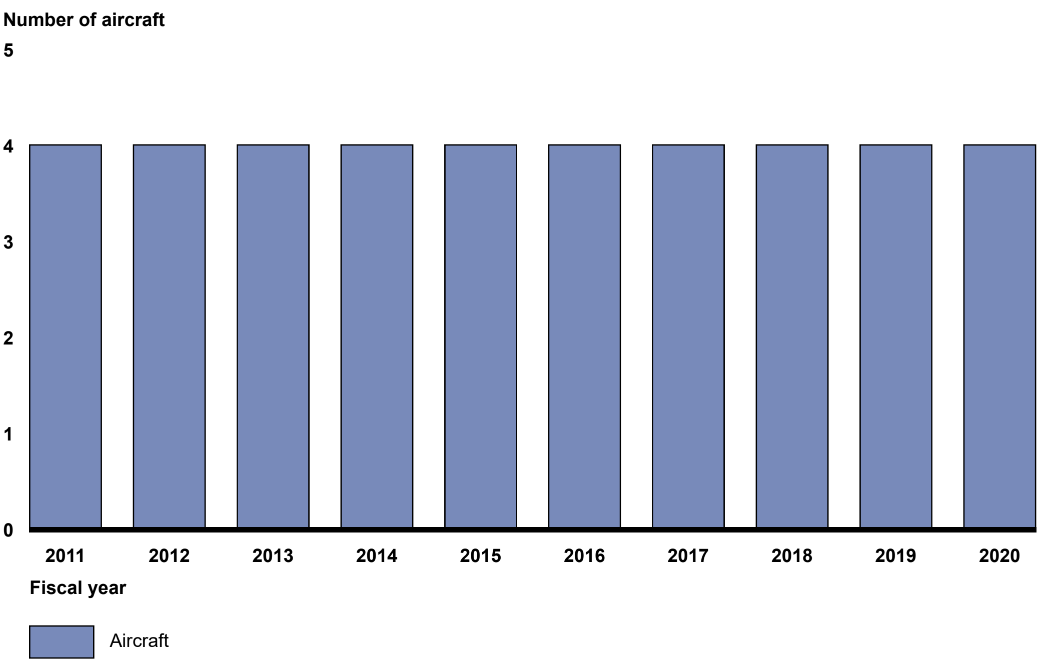


Operating and Support Costs per Aircraft

E-4B Operating and Support Costs per Aircraft

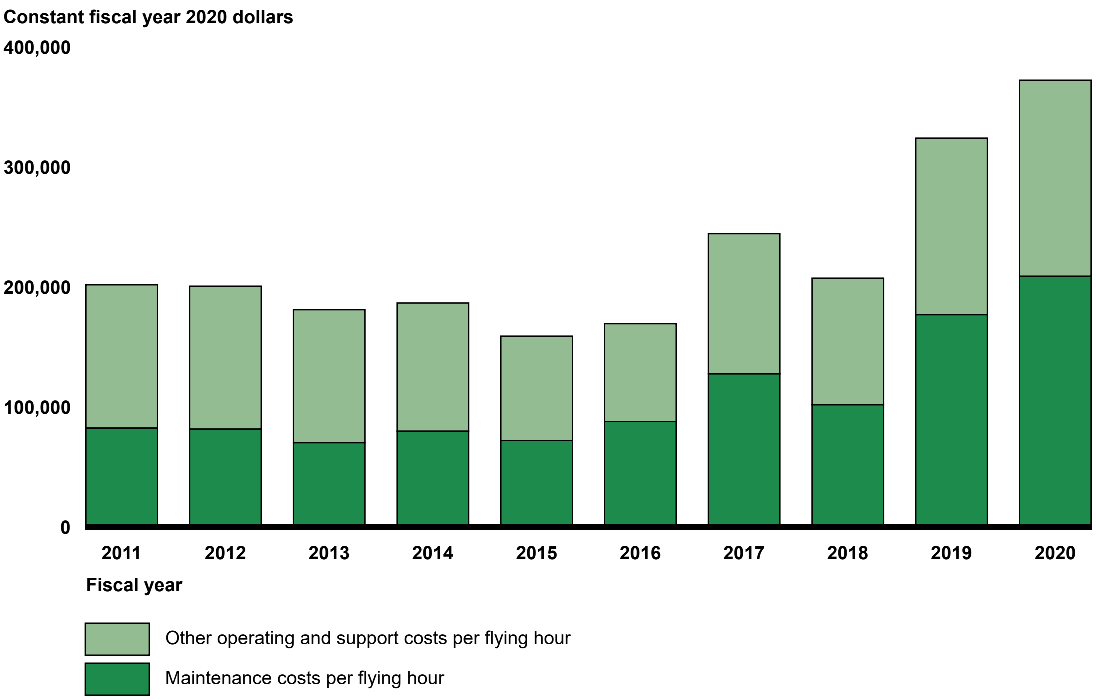


E-4B Fleet Size

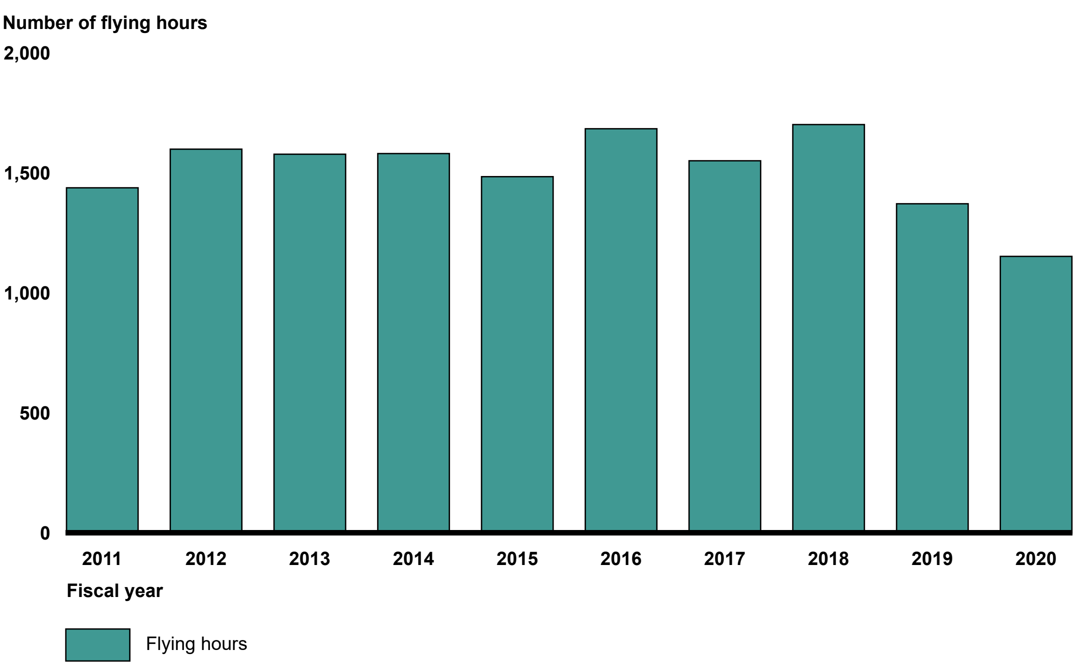


Operating and Support Costs per Flying Hour

E-4B Operating and Support Costs per Flying Hour



E-4B Flying Hours



Sustainment Strategy, Challenges, and Mitigation Actions

The Air Force sustains the E-4B with a contractor logistics support system that is based on a “two level-plus” maintenance concept. At one level, Air Force personnel perform organizational-level maintenance that is augmented by limited intermediate-level contractor repair capabilities. Boeing Field Service Representatives provide technical assistance, as needed. Boeing personnel perform another level of maintenance—depot-level maintenance—at its facility in Texas. Boeing also provides sustaining engineering and most of the supply chain management for the E-4B, according to a program official.

E-4B Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Maintenance: Extended programmed depot maintenance downtime continued to be a challenge that reduced the operational availability of the E-4B fleet, according to program officials. The officials stated that the last two programmed depot maintenance cycles were extended due to the discovery and treatment of corrosion, which necessitated replacing the aircraft skins and stringers (i.e., the material that the aircraft skins are fastened to.) To minimize future depot maintenance delays due to the discovery of similar corrosion, the officials said that the contractor has moved corrosion inspections to earlier in the programmed depot maintenance process and the program office has purchased additional skins and stringers to have on hand to facilitate the repairs.

Before these delays occurred, officials stated that the program office had initiated other efforts to reduce aircraft downtime due to depot maintenance. Specifically, in fiscal year 2020 the program office began to include monetary incentives in the programmed depot maintenance contracts for completing the work by certain milestones, according to a program official. The official said that the contractor did not meet the requirements to receive a full bonus until fiscal year 2022.

Downtime for scheduled organizational-level maintenance also has been a challenge that has increased the not mission capable maintenance rate of the E-4B fleet, according to program officials. For example, program officials said that a 2019 flood at Offutt Air Force Base closed the main E-4B hangar. Also, the officials stated that COVID restrictions in fiscal year 2020 limited the workforce and increased scheduled maintenance times. The officials said that essentially half of the work force was isolated at any time to maintain the health of mission required personnel. In March 2021, the runway at Offutt Air Force Base closed for an extensive replacement project, which required that E-4B scheduled maintenance be performed offsite by officials on temporary duty. The officials said that they expect the runway to reopen at the end of fiscal year 2022.

Aging and Supply Support: The E-4B program has experienced challenges with diminishing manufacturing sources and parts obsolescence due to the age of the aircraft—47 years on average as of the end of fiscal year 2021—and the small fleet of four aircraft, according to program officials. The officials stated that purchasing spare parts and finding sources of repair for components has been increasingly difficult. They said that they have found that manufacturers have been unwilling to restart production for parts that belong to such a small fleet as it is usually not cost-effective. The anticipated sunset date for the E-4B program is 2032, but the Air Force has not yet identified a follow-on program to replace the E-4B and the process has experienced delays, according to the program officials.

At the time of our review, program officials stated that Boeing had been trying to obtain 93 parts for over a year and 51 parts for over 2 years. A program official told us that Boeing coordinates with the program office to track, report and prepare recommendations to resolve obsolescence issues, and is contractually required to report the progress with corrective actions to the program office on a monthly basis. The program office and Boeing also meet monthly to discuss emerging diminishing manufacturing sources and materiel shortages issues and the status of any actions to resolve these issues, as well as to explore indicators of future issues based on forecasted failures, according to the program official.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

E-8C
Joint Surveillance Target Attack Radar System

Program Essentials

Lead Service
Air Force

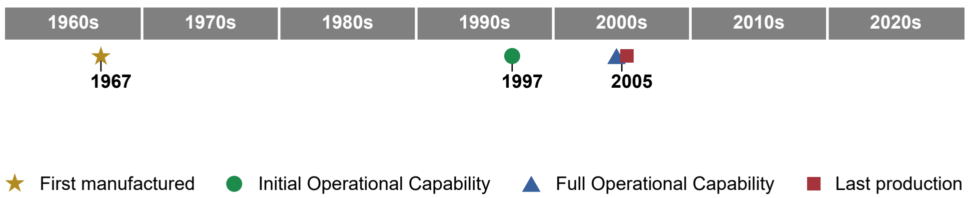
Manufacturer
Northrop Grumman

Program Office
Robins Air Force Base, Georgia

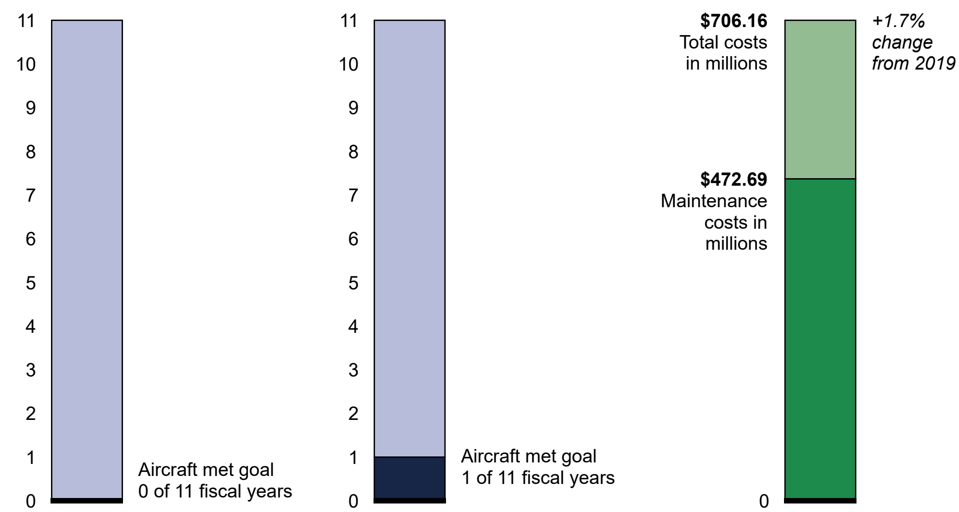
Sustainment
Programmed depot maintenance is performed at Warner Robins Air Logistics Complex and at a contractor's facility. Primarily Air Force personnel perform field maintenance.

The E-8C is a joint Air Force and Army weapon system that includes airborne radar, operations and control, and communication subsystems, as well as two ground-based subsystems. The primary mission of the E-8C is to provide theater commanders with ground surveillance.

E-8C Life Cycle Timeline



E-8C Sustainment Status



Aircraft

16 total aircraft
Fiscal year 2020

53.3 years
Average aircraft age in fiscal year 2021

Flying hours

5,878 flying hours
Fiscal year 2020

61,288 hours
Average lifetime flying hours per aircraft in fiscal year 2021

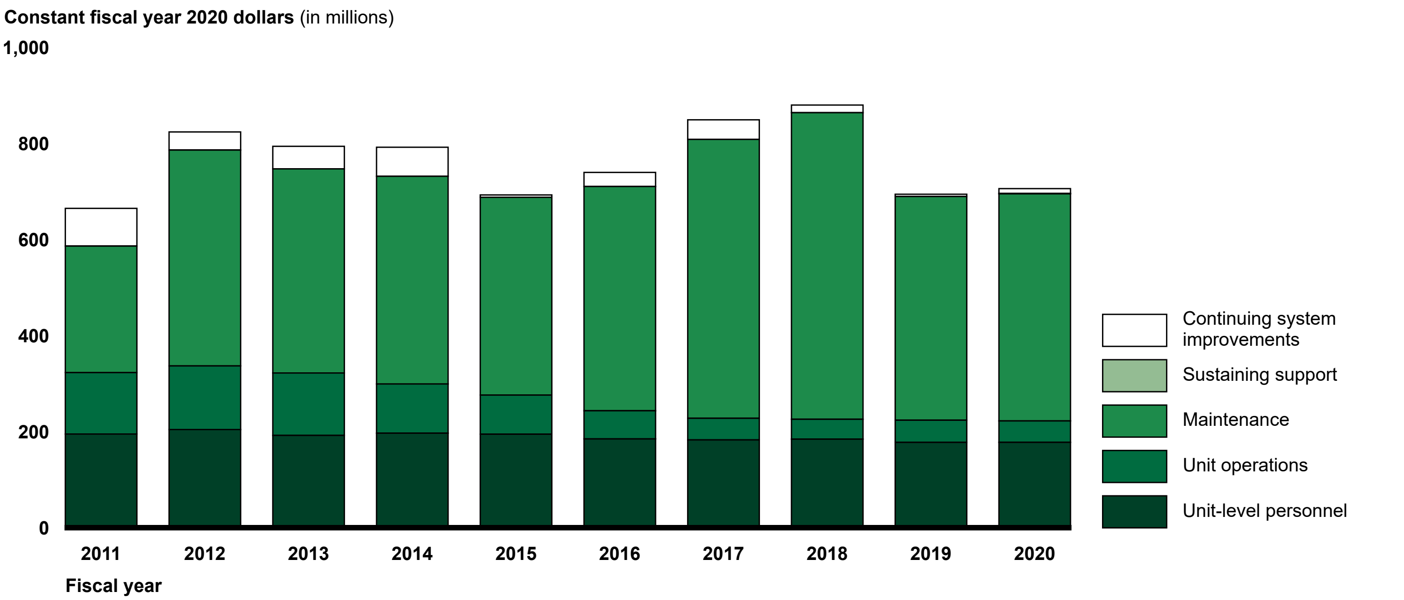
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$44.14 million
Total costs per aircraft

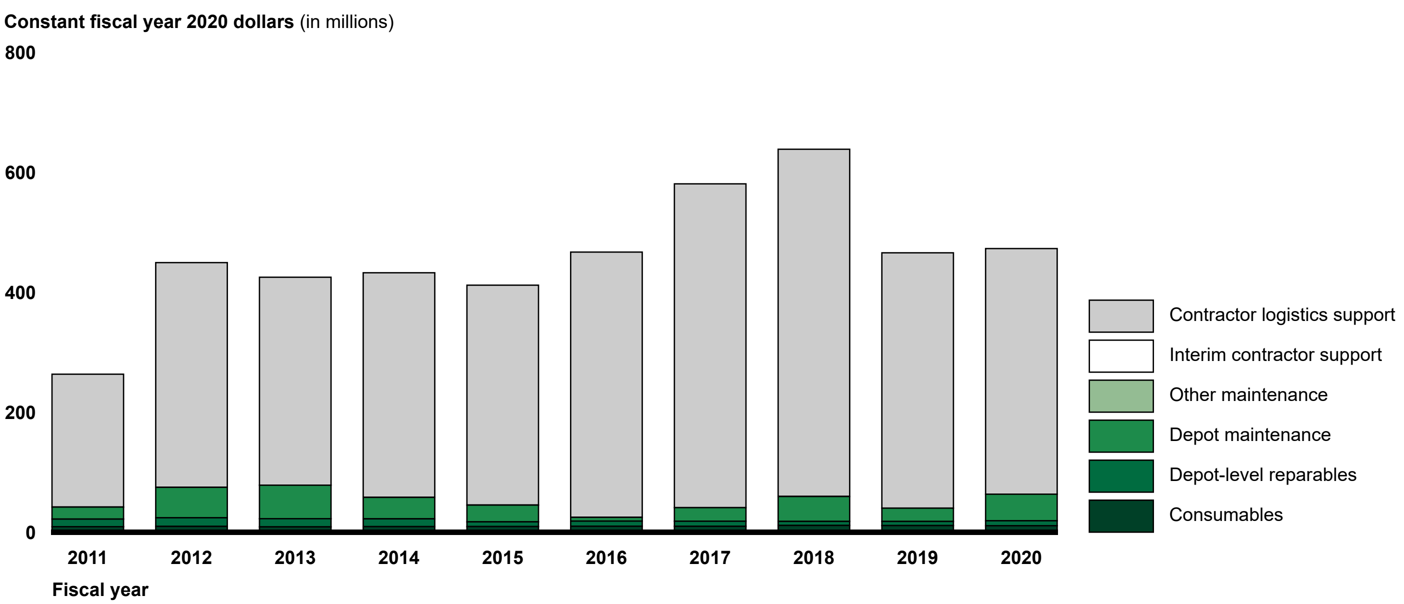
$120,137
Total costs per flying hour
+14.7% change from 2019

Operating and Support Costs

E-8C Total Operating and Support Costs

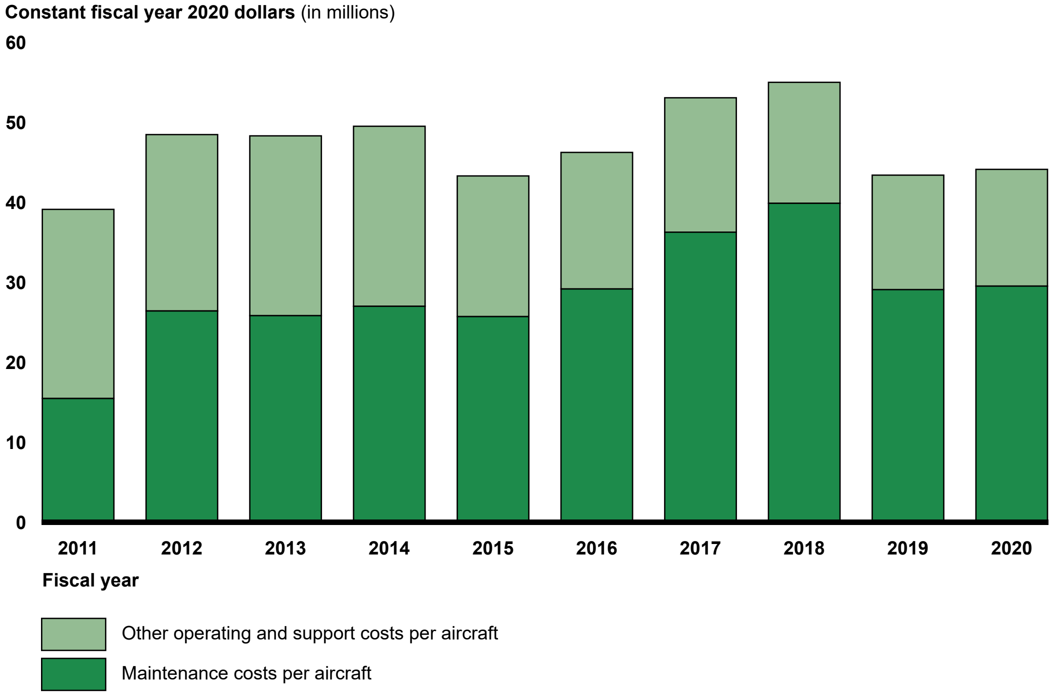


E-8C Maintenance Costs

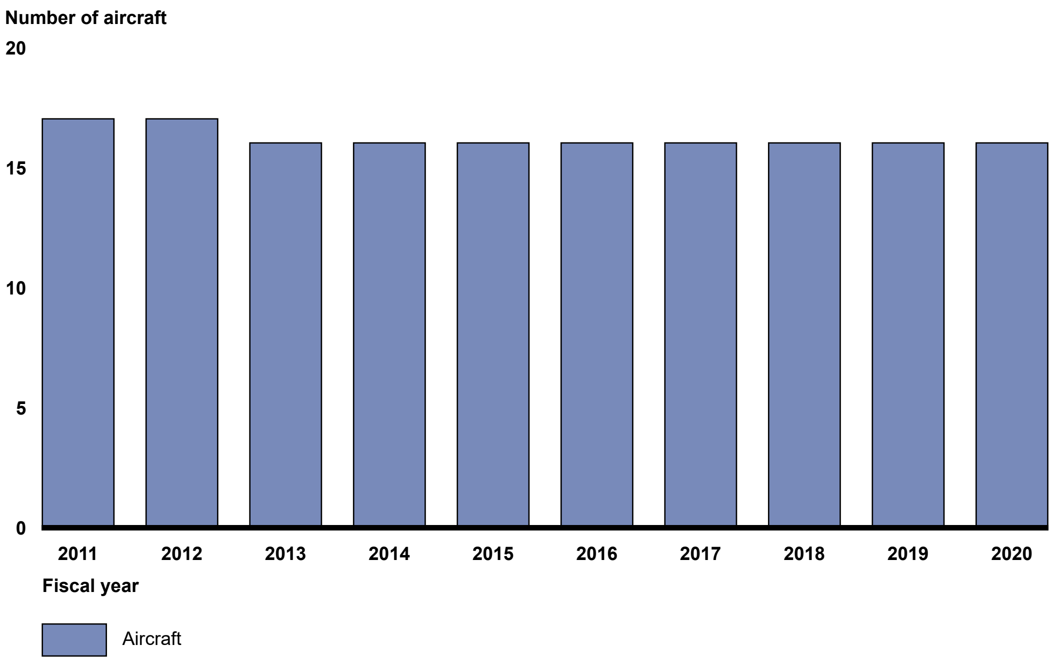


Operating and Support Costs per Aircraft

E-8C Operating and Support Costs per Aircraft

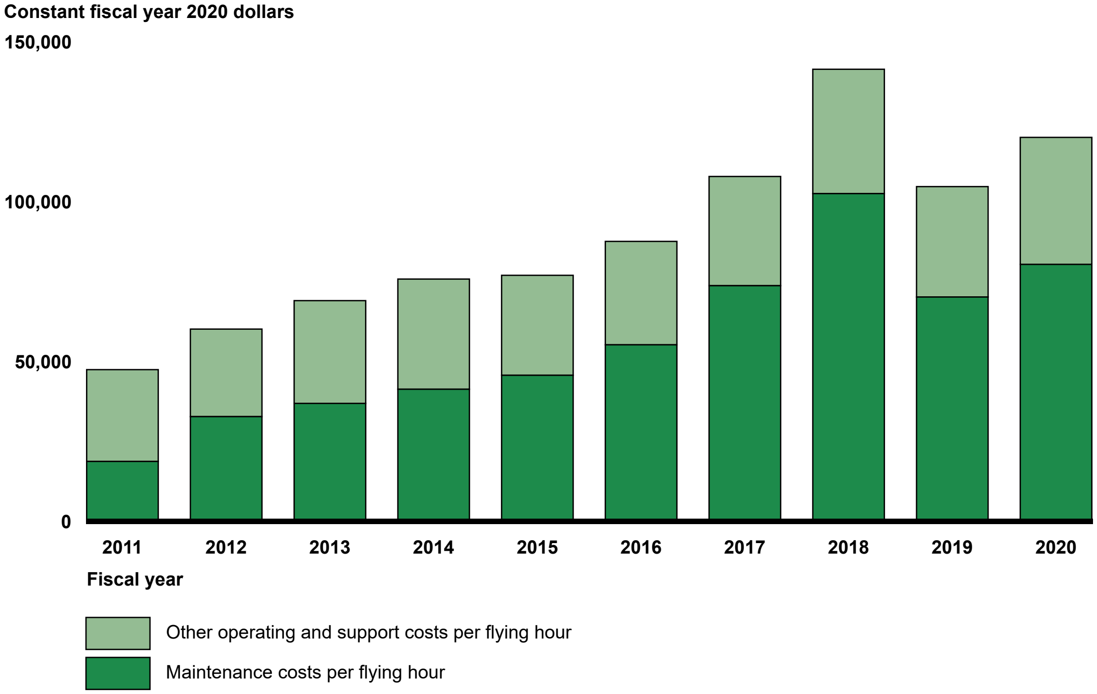


E-8C Fleet Size

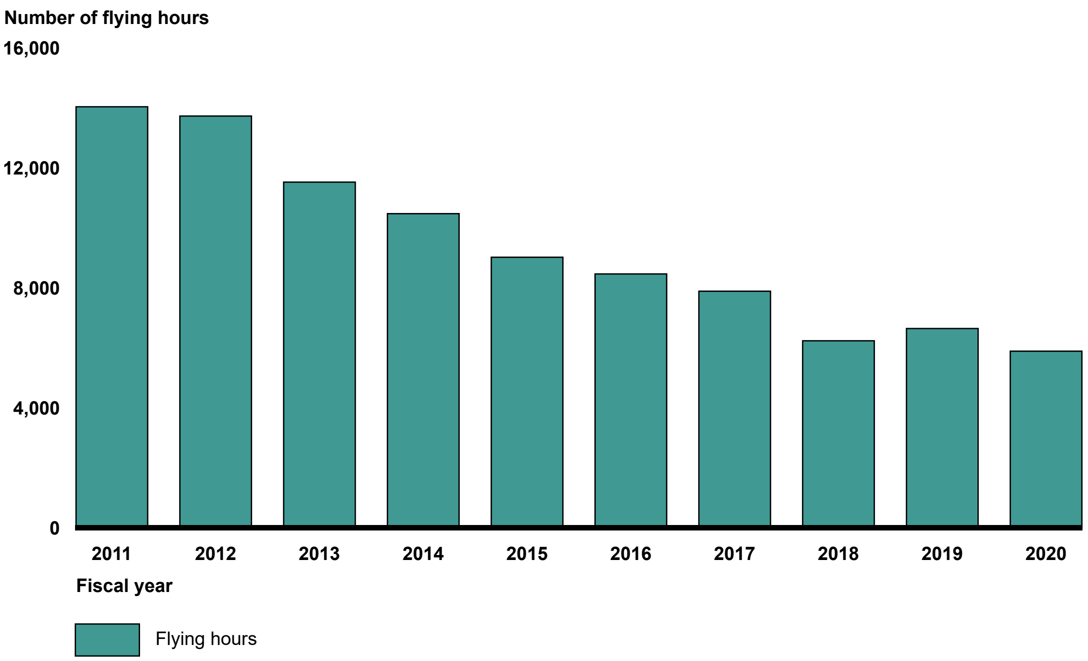


Operating and Support Costs per Flying Hour

E-8C Operating and Support Costs per Flying Hour



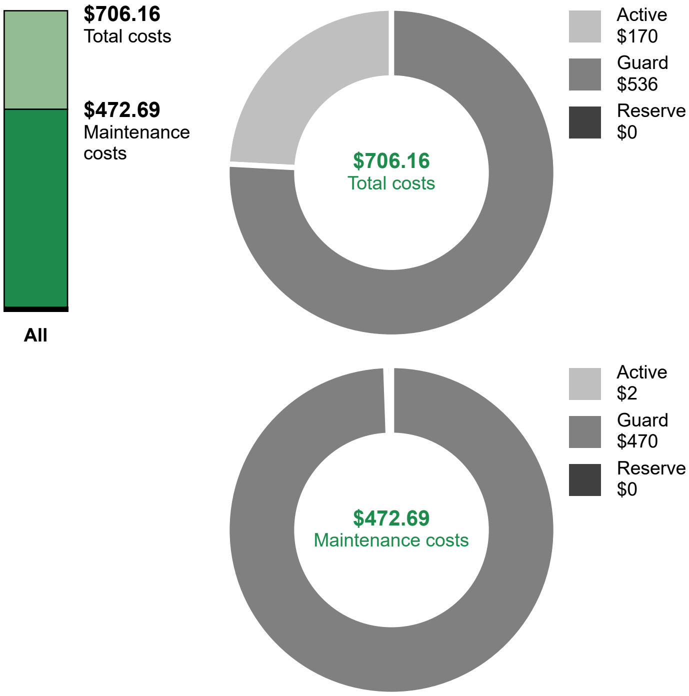
E-8C Flying Hours



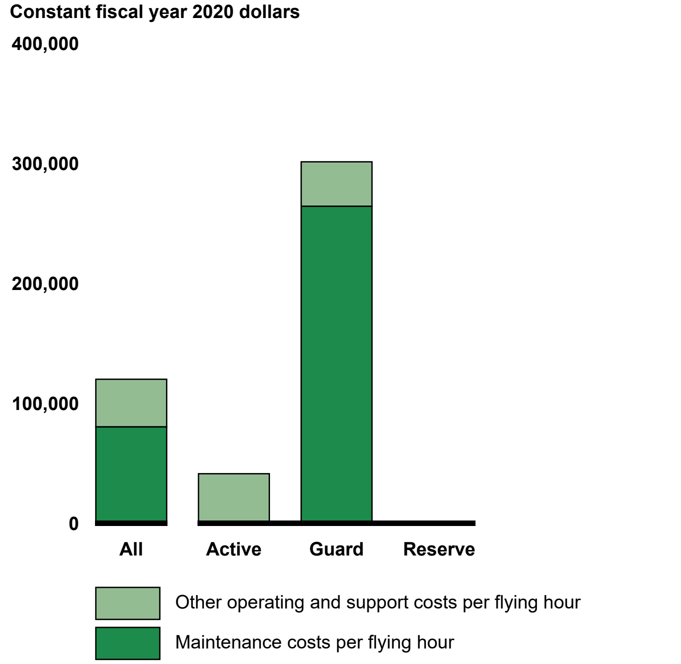
Component-Level Operating and Support Costs

E-8C Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Note: The E-8C is operated exclusively by the Air National Guard, but the active component also has some operating and support expenditures, such as for oversight and management of the program.

Sustainment Strategy, Challenges, and Mitigation Actions

Northrop Grumman provides depot maintenance and supply chain management for E-8C-specific items, among other elements of support, under a contractor logistics support contract, according to program officials. The officials stated that the Air Force's Warner Robins Air Logistics Complex was approved in 2019 as a designated source of repair. Field maintenance is performed primarily by active-duty Air Force and Air National Guard personnel.

E-8C Sustainment Challenges

Aging Aircraft

- Delays in acquiring replacement aircraft
- Service life extension
- Unexpected replacement of parts and repairs

Maintenance

- Access to technical data
- Delays in depot maintenance
- Shortage of trained maintenance personnel
- Unscheduled maintenance

Supply Support

- Diminishing manufacturing source
- Parts obsolescence
- Parts shortage and delay

Aging: An Air Force Chief of Staff memorandum requires that all E-8 Joint STARS be retired by Fiscal Year 2024, according to program officials. While the official retirement schedule had not yet been finalized, officials said that the current version of the schedule as of February 2022 shows the last four aircraft retiring in fiscal year 2024. Although the Air Force plans to retire this system, as of October 2021 program officials stated that it has not published an unclassified plan of how capabilities will be replaced.

The E-8C airframe has been in operation commercially since the 1960s, and corrosion is prevalent with the system. According to Air Force officials, the military use of the E-8C exposes the fleet to more extreme circumstances than commercial use, causing corrosion to be more problematic. Further, program officials stated that the original E-8C Corrosion Prevention and Control Program was based on commercial standards and was ineffective for sustaining a military weapon system. As a result, program officials completed a rewrite of the E-8C's Corrosion Prevention and Control Program in February 2019.

Maintenance: According to Air Force officials, the E-8C continued to face extended downtime and reduced aircraft availability as a result of depot maintenance delays. To mitigate this issue, E-8C program officials explained that they rewrote the E-8C programmed depot maintenance plan over the past several years to align with best practices of commercial airlines and better suit the E-8C fleet of aging aircraft with a long service life.

The E-8C program had fully implemented the new programmed depot maintenance plan before the Air Force Chief of Staff issued the memorandum in December 2021 to retire the E-8C, according to a program official. The program official stated that, as of April 2022, the Air Force depot and the contractor's facility have each completed one aircraft, and have one aircraft in process, under the new programmed depot maintenance plan. Further, the official said that no additional aircraft are scheduled for programmed depot maintenance due to the program's retirement.

Supply Support: Program officials stated that repair of pylons, which connect the engine to the airframe of an aircraft, remained one of the top drivers for delays in depot maintenance. The program took a number of steps, including converting KC-135 pylons for use on the E-8C and upgrading the E-8C's legacy pylons, to mitigate the pylon issue. However, officials stated that, after these pylons were installed on two aircraft, the program terminated the plan to install them because of the Air Force plans to retire the fleet.

Program officials said that challenges with other key parts such as stabilizer trim actuators (i.e., the hydraulic motors that power the stabilizer trim, which aids in controlling the pitch of the aircraft) have also driven increases in the fleet's not mission capable rate. The officials said that they have been able to eliminate or reduce issues related to these items by increasing communication about the operational effects that were occurring as a result of the specific parts shortages or delays.

Engines: The E-8C's TF33 engines have been the leading cause of the aircraft being designated as not mission capable. In July 2021, program officials said that the system program office awarded a task order to Pratt & Whitney to develop ways to improve the reliability and sustainability of the TF-33 engine. According to the officials, the program intended to implement the recommended changes to the fleet of TF-33 engines during the scheduled maintenance of the aircraft and the depot repair of the engines. However, the program officials stated that, as a result of the divestiture, the task order was being terminated for convenience by the government.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

RC-135S-W
Cobra Ball, Combat Sent, Rivet Joint

Program Essentials

Lead Service
Air Force

Manufacturer
Boeing/L3Harris

Program Office
Wright-Patterson Air Force Base, Ohio

Sustainment
A contractor performs programmed depot maintenance. Air Force personnel perform organizational maintenance, with support from contractor personnel, according to program officials.

The RC-135S-W reconnaissance aircraft have different missions. The RC-135V/W collects on-scene intelligence, in near-real time. The RC-135S collects optical and electronic data on ballistic targets, and the RC-135U collects foreign military radar signals.

RC-135S-W Life Cycle Timeline

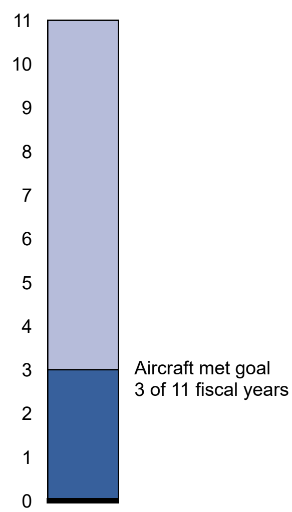
1960s	1970s	1980s	1990s	2000s	2010s	2020s

1964: First manufactured: U, Full Operational Capability and last production: U and V/W
1962: First manufactured: V/W, Full Operational Capability and last production: S
1961: S

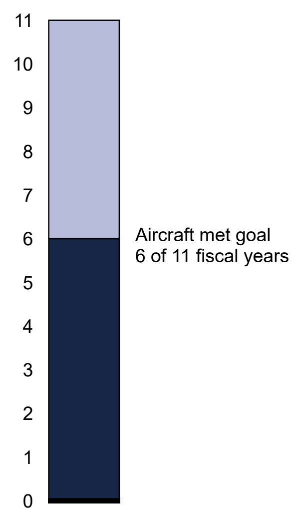
★ First manufactured ● Initial Operational Capability ▲ Full Operational Capability ■ Last production

RC-135S-W Sustainment Status

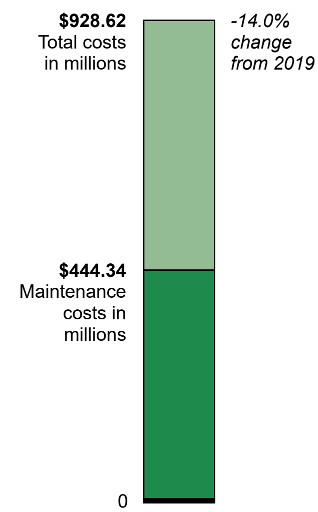
Aircraft availability rate
Fiscal years met goal



Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

22 total aircraft
Fiscal year 2020

58.2 years
Average aircraft age in fiscal year 2021

Flying hours

9,740 flying hours
Fiscal year 2020

S: 36,318 / U: 29,932 / V: 42,692 / W: 51,924
Average lifetime flying hours in fiscal year 2021

Operating and support costs per aircraft and flying hour
Fiscal year 2020

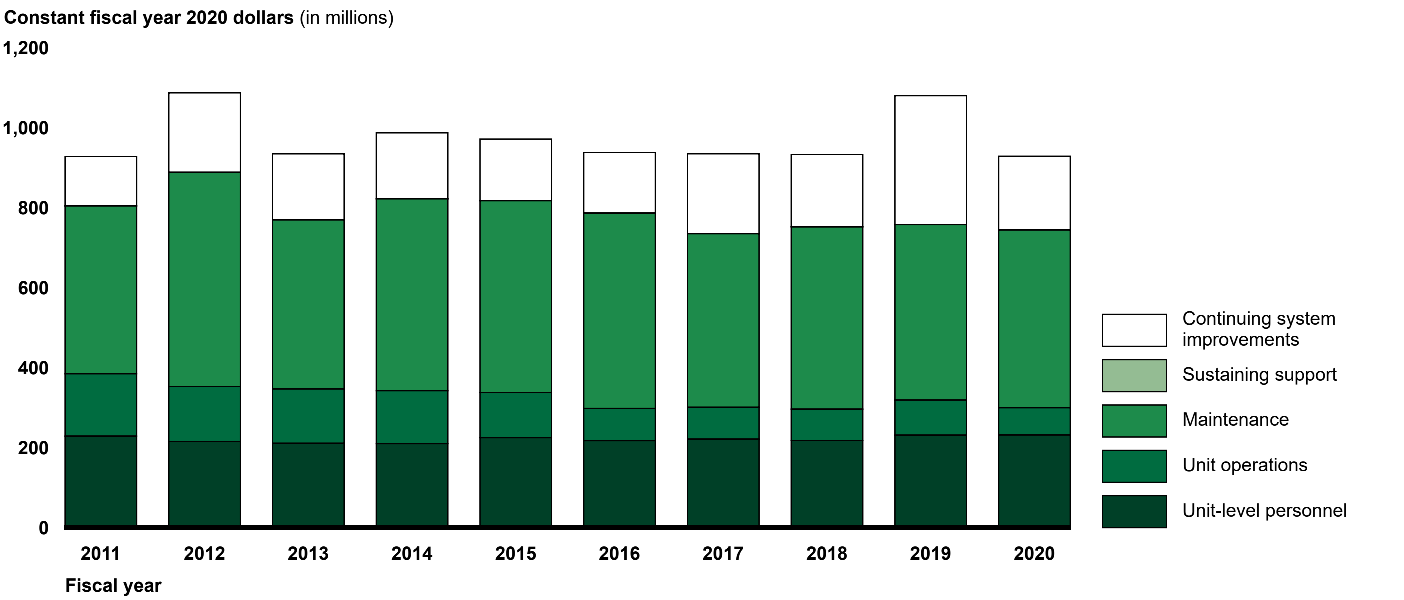
$42.21 million
Total costs per aircraft

$95,339
Total costs per flying hour
+2.9% change from 2019

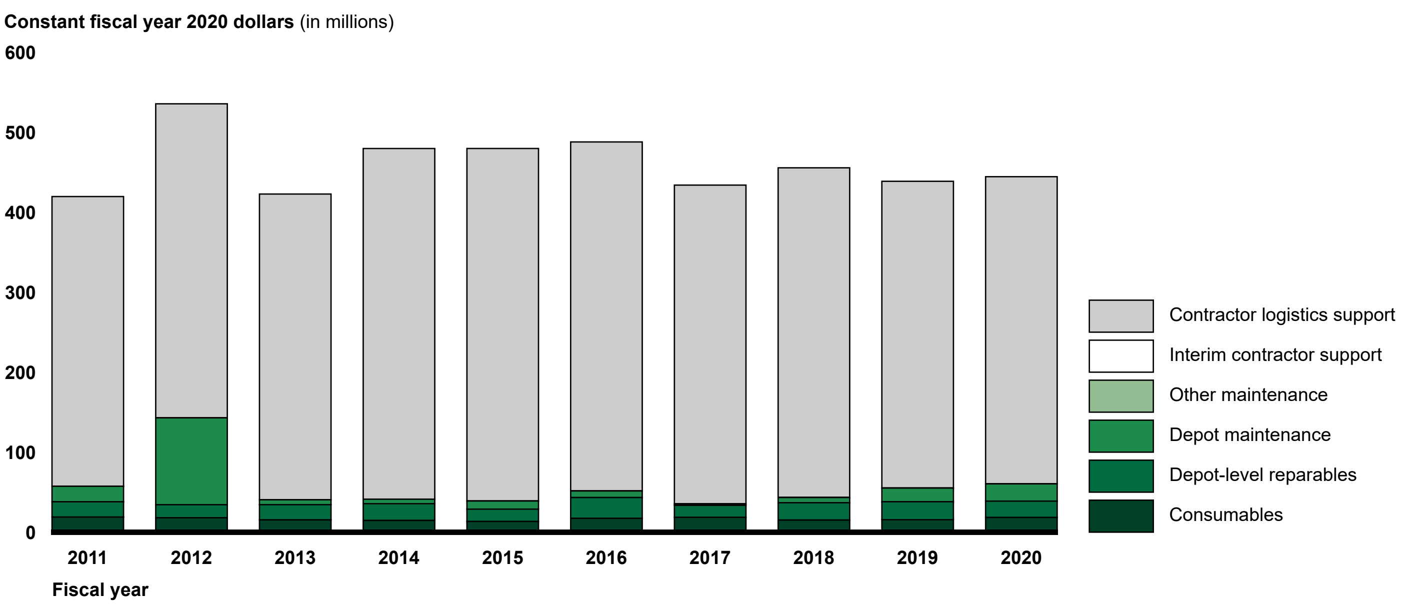
Note: According to program office officials, although the Air Force did operate an RC-135T in the past, the Air Force does not currently operate any RC-135T aircraft.

Operating and Support Costs

RC-135S-W Total Operating and Support Costs

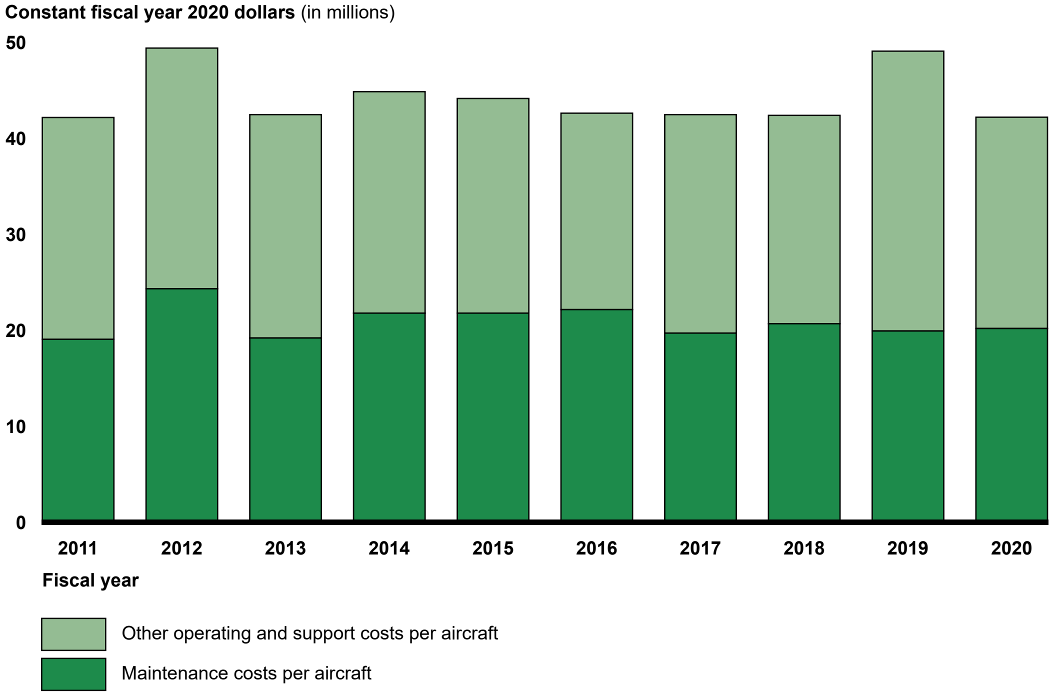


RC-135S-W Maintenance Costs

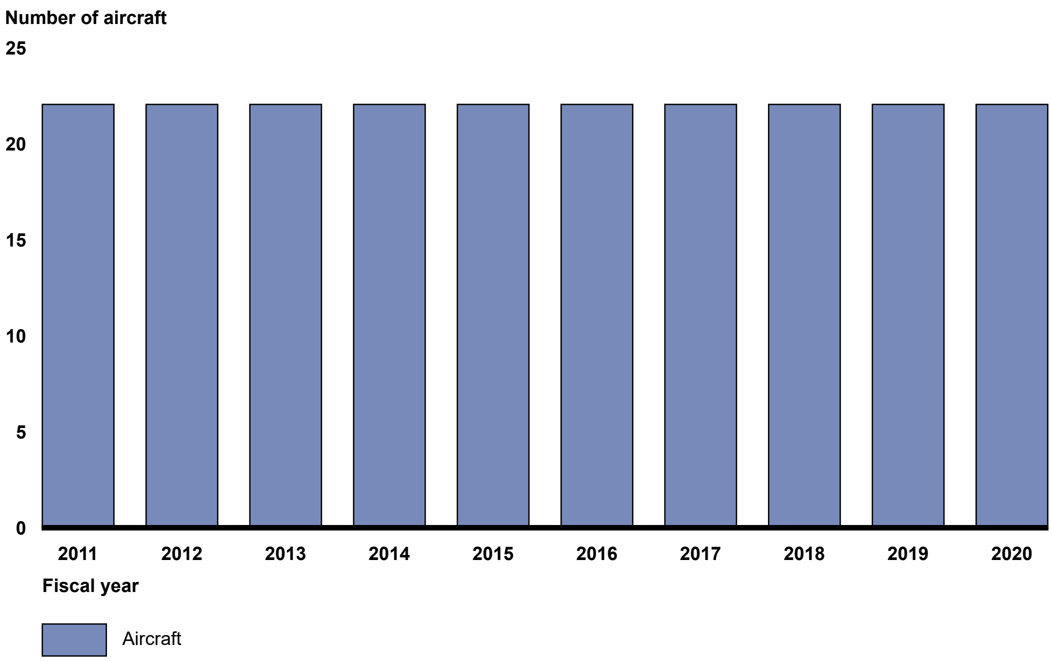


Operating and Support Costs per Aircraft

RC-135S-W Operating and Support Costs per Aircraft

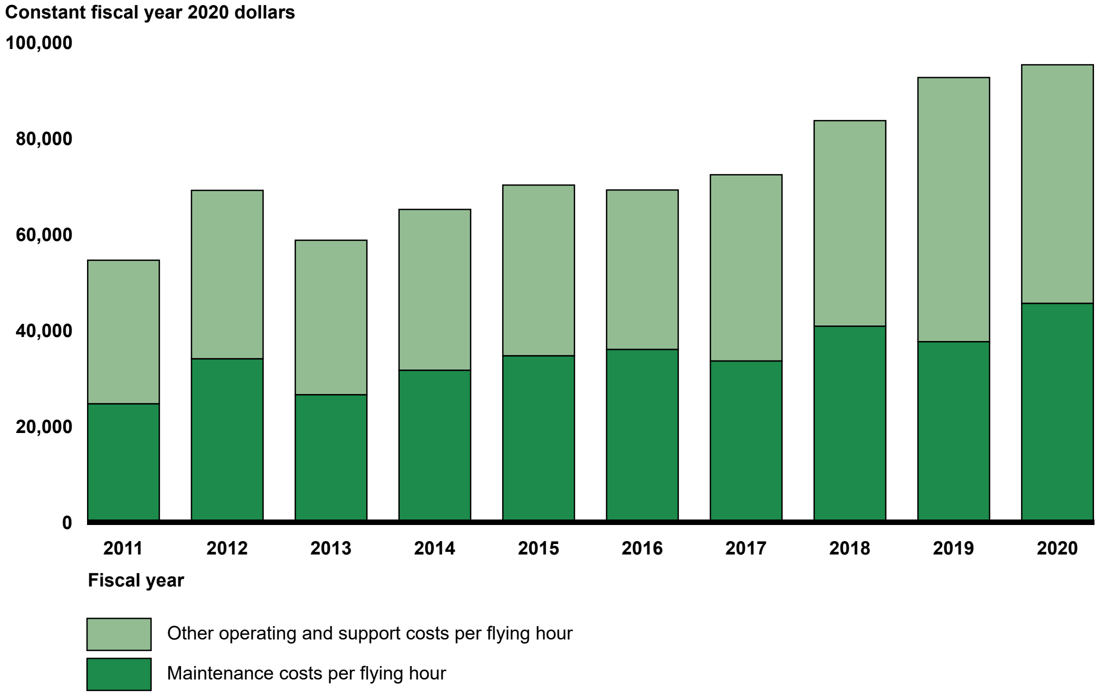


RC-135S-W Fleet Size

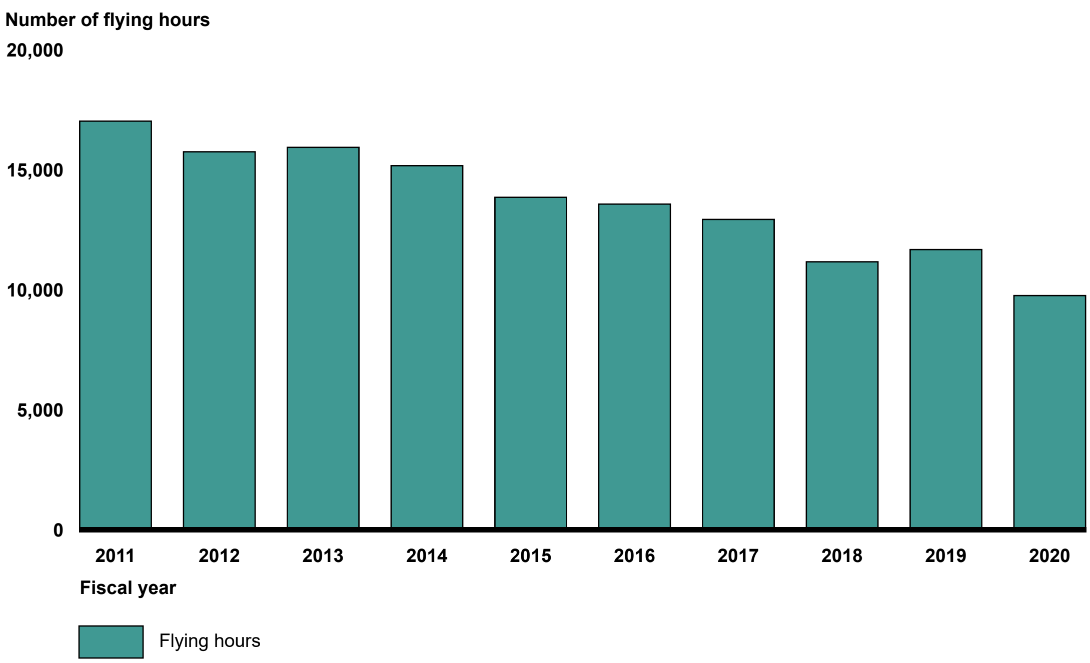


Operating and Support Costs per Flying Hour

RC-135S-W Operating and Support Costs per Flying Hour



RC-135S-W Flying Hours



Sustainment Strategy, Challenges, and Mitigation Actions

L3Harris—the prime contractor—performs programmed depot maintenance and most modifications at its facility located in Texas. Program officials said that Air Force personnel perform airframe organizational maintenance and a mix of Air Force and contractor personnel perform mission system organizational maintenance, but contractor personnel are primarily advisory. The officials also said that the Air Force Supply Chain Management Wing and the Defense Logistics Agency provide supply support for items that are common among KC/RC/TC/WC-135 aircraft and a contractor—L3Harris—provides supply support for items that are specific to the RC-135 models.

RC-135S-W Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Aging: Program officials said that corrosion has been the primary driver for the vast majority of structural repairs or replacements performed on RC-135S-W aircraft in the depot. The number of major structural repairs required during depot maintenance has been trending upward on RC-135S-W aircraft, according to program officials. Officials stated that the program office actively seeks to minimize the effects of corrosion through the selection of materials, fabrication techniques, sealants, protective coatings, and design features. Additionally, they stated that they proactively work to develop repair processes and procure parts for structural components that show the potential for replacement due to corrosion. Further, 6 of the 22 RC-135S-W aircraft are approaching their certified service life limit of 60,000 flight hours, according to the program officials. To mitigate this challenge, the officials stated that an effort is underway to reevaluate the service life limit and that effort will be completed in 2022. The program officials told us that the next component that limits the life of the airframe reaches its limit at times ranging from 60,000-80,000 flight hours. The first aircraft is projected to reach the limit for that component in 2044, according to the officials, and a service life extension beyond this limit will require a complete teardown inspection of at least one aircraft to assess the condition.

Maintenance: Personnel shortages in critical maintenance positions and specialties have contributed to increased aircraft repair and downtime, according to RC-135S-W program officials. The officials stated that the program has fewer maintenance staff than a May 2018 Air Force Manpower Analysis Agency assessment determined were required to support the RC-135S-W fleet.

Program officials said that they have continued to include the positions required for the current maintenance staffing level in the program's annual Program Objective Memorandum budget request, but the Air Force had not funded all such positions. As a mitigation, the RC-135S-W program has been using, or plans to use, programs that were designed to optimize existing personnel, such as cross-utilization training, according to officials.

Supply Support: The overseas locations that the RC-135S-W aircraft operate from are at the far end of the logistics/supply chain network, according to program officials, so they have had to wait additional days for the arrival of parts from the continental United States and even some overseas locations. Further, the officials stated that the timely transportation of parts to RC-135S-W aircraft at forward-operating and other locations has also been problematic due to the availability of military transport and customs issues at the receiving countries.

Both the Air Combat Command and program officials have monitored high-priority parts that were shipped to overseas locations, and in some cases they have helped to expedite shipments, according to program officials. Additionally, the Air Combat Command plans to add critical parts for key components such as landing gear, engines, fuel lines, and avionics, to deployment kits with the goal of having the part immediately available when needed. Officials said that kit reviews are accomplished annually or when a new system is added.

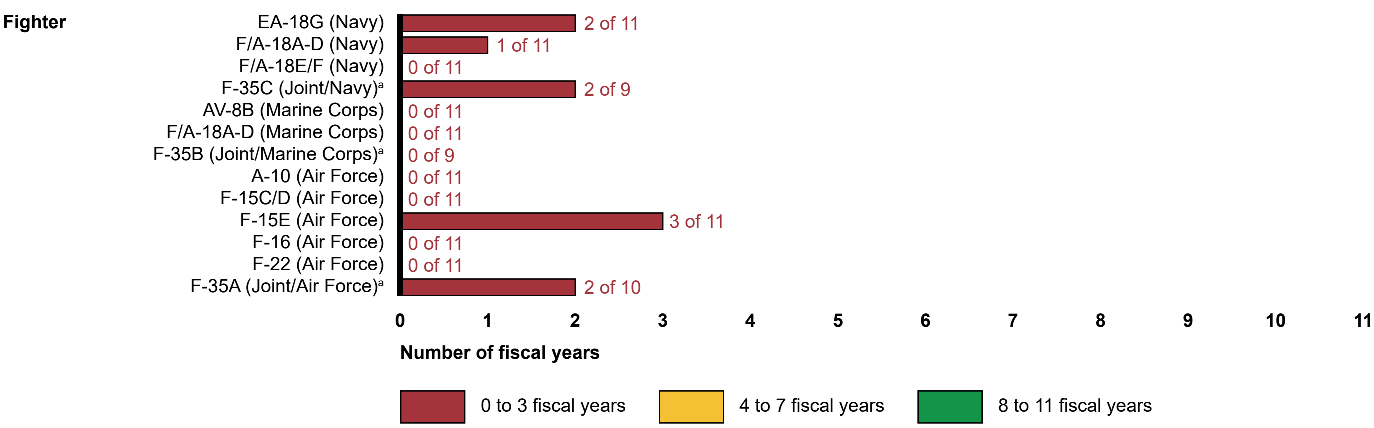
Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

Fighter Aircraft

Source: U.S. Navy/Elizabeth A. Wolter. | GAO-23-106217

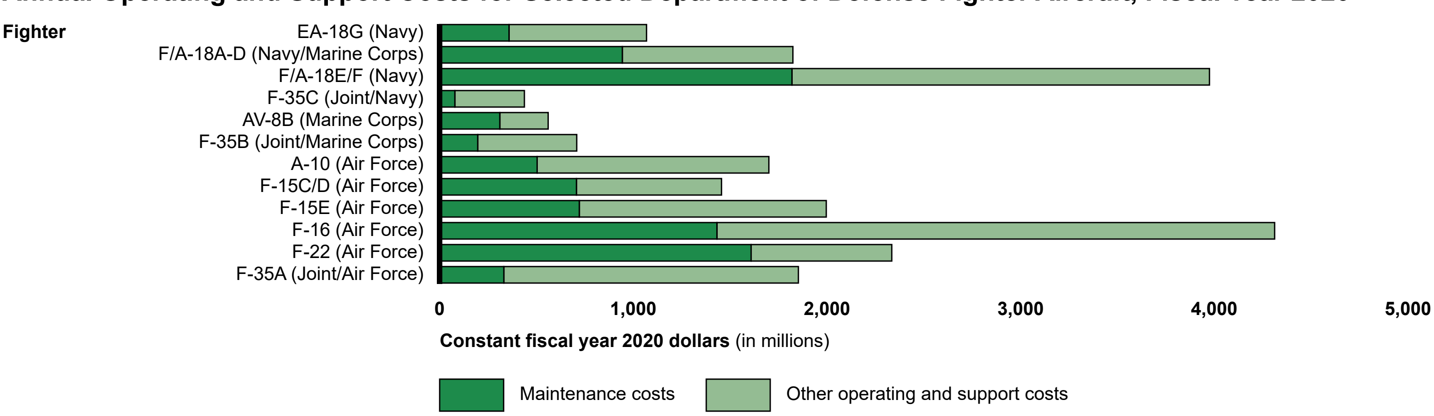
Number of Years Selected Aircraft Met Their Annual Mission Capable Goal, Fiscal Years 2011 through 2021



Source: GAO analysis of Navy and Air Force data. | GAO-23-106217

[a]For this aircraft, the military department did not provide a mission capable goal for all eleven years.

Annual Operating and Support Costs for Selected Department of Defense Fighter Aircraft, Fiscal Year 2020



Source: GAO analysis of Navy and Air Force data. | GAO-23-106217

EA-18G
Growler

Program Essentials

Lead Service
Navy

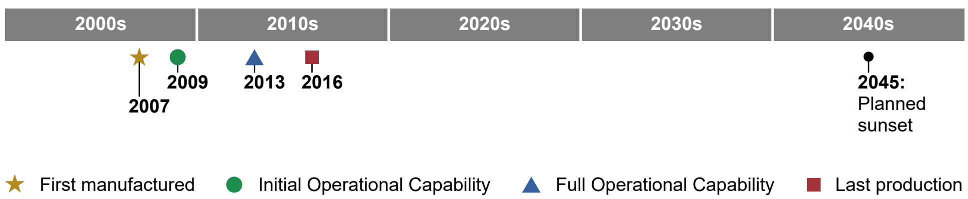
Manufacturer
Boeing

Program Office
Program Manager – Air 265, Naval Air Systems Command, Paxtuxent River, Maryland

Sustainment
The Navy's Fleet Readiness Centers Southwest, Southeast, and Western Pacific, and field sites at Naval Air Stations, perform depot maintenance. Navy personnel perform field maintenance.

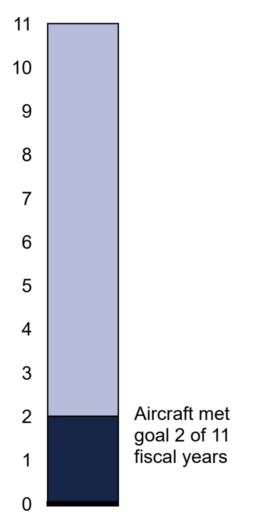
The EA-18G Growler is the fourth major variant of the F/A-18 family of aircraft. The EA-18G combines the F/A-18 Super Hornet platform with an advanced electronic warfare suite.

EA-18G Life Cycle Timeline

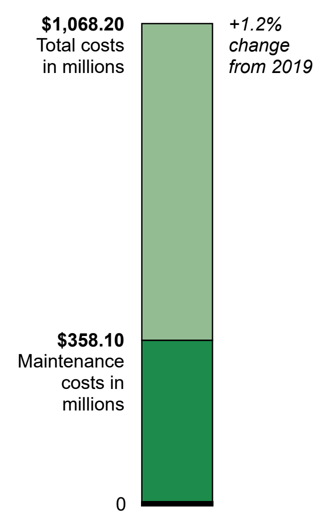


EA-18G Sustainment Status

Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

131 total aircraft
Fiscal year 2020

8.4 years
Average aircraft age in fiscal year 2021

Flying hours

39,551 flying hours
Fiscal year 2020

2,375 hours
Average lifetime flying hours per aircraft in fiscal year 2021

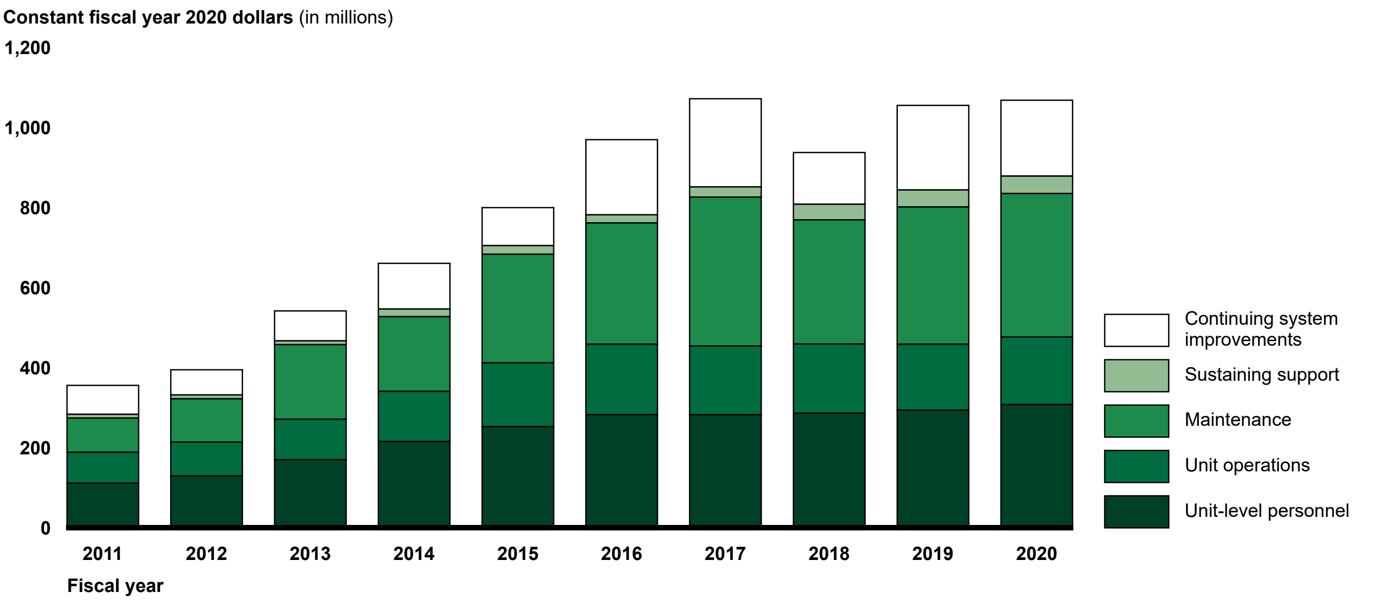
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$8.15 million
Total costs per aircraft

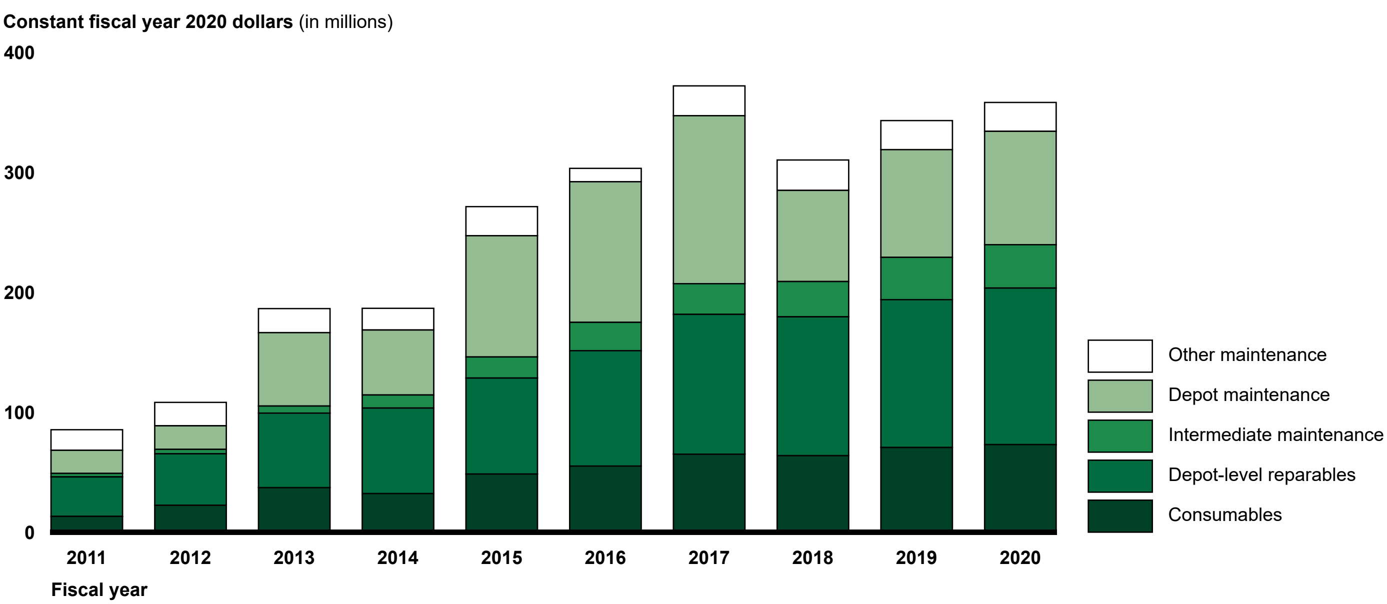
$27,008
Total costs per flying hour
+2.1% change from 2019

Operating and Support Costs

EA-18G Total Operating and Support Costs

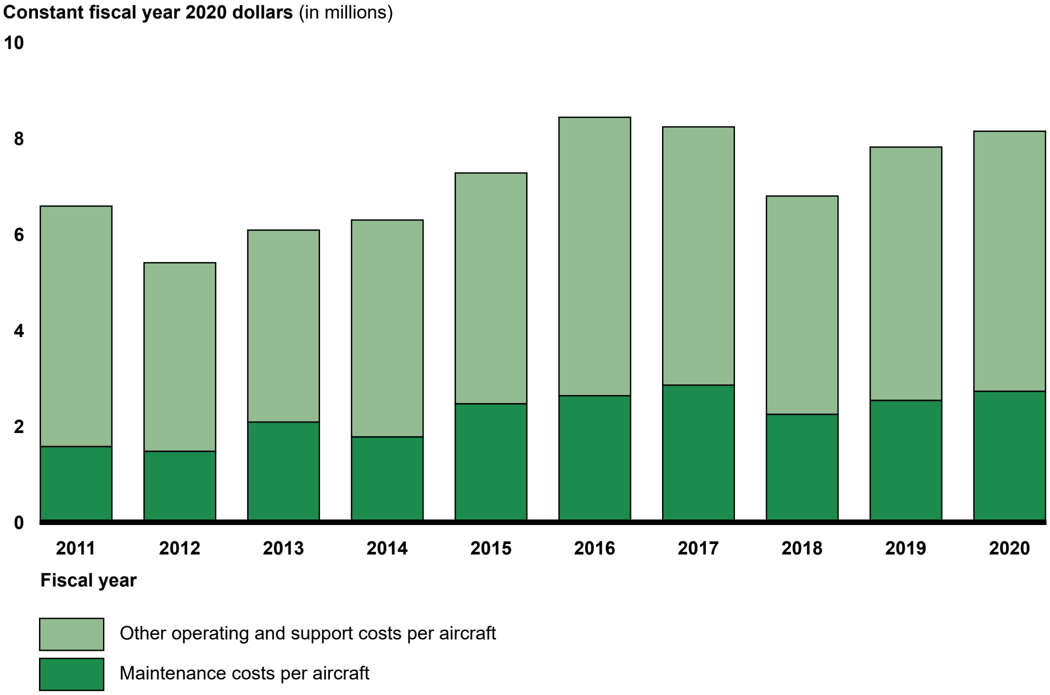


EA-18G Maintenance Costs

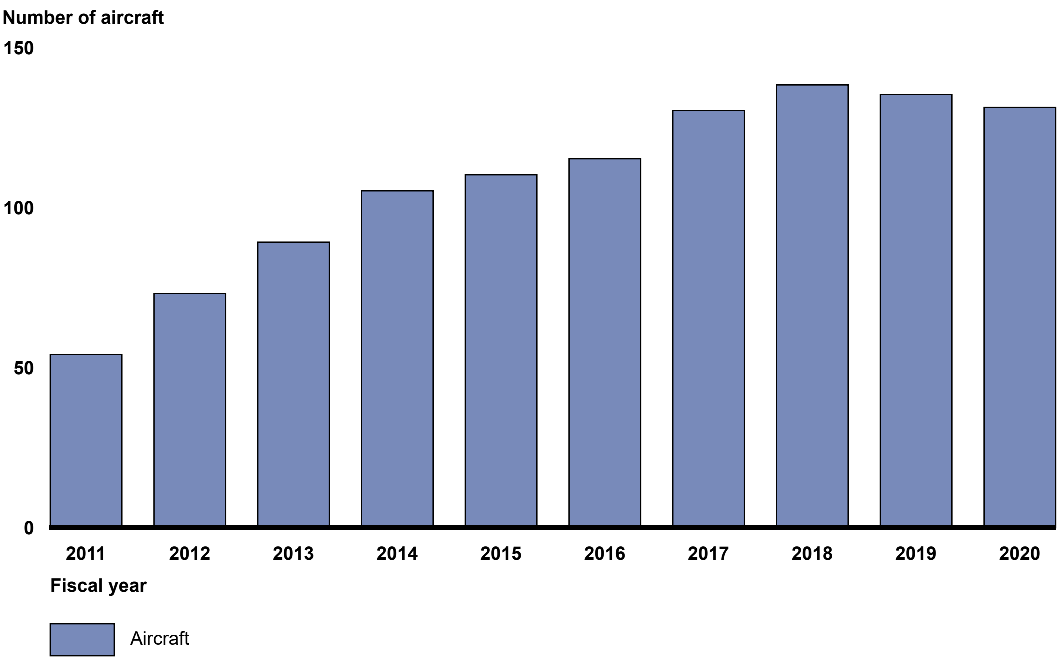


Operating and Support Costs per Aircraft

EA-18G Operating and Support Costs per Aircraft

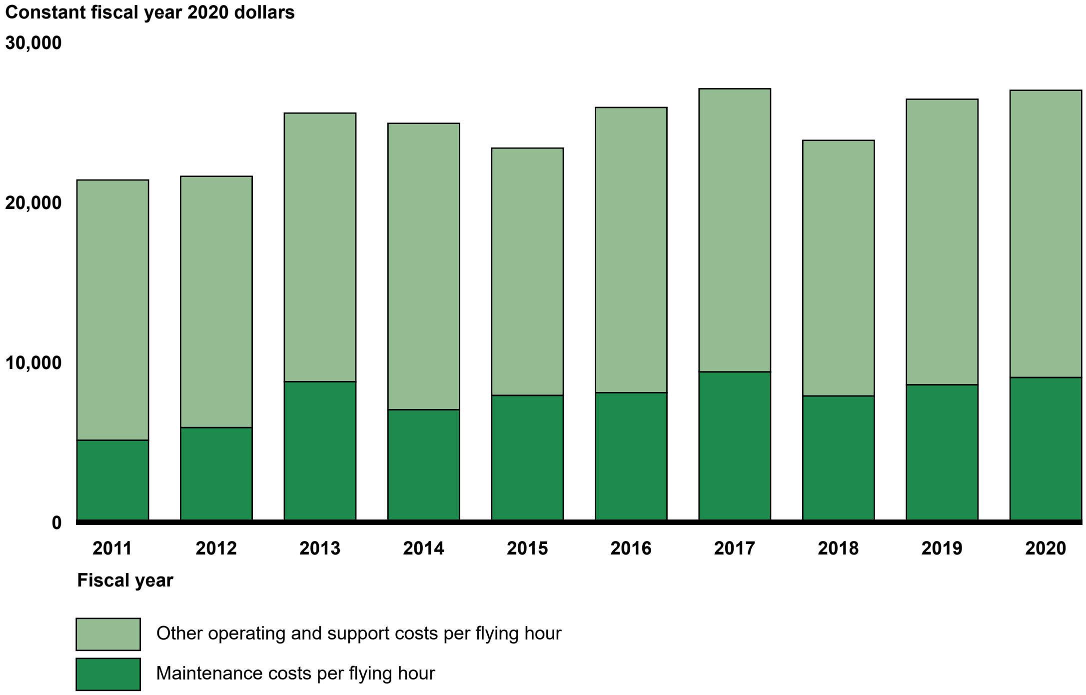


EA-18G Fleet Size

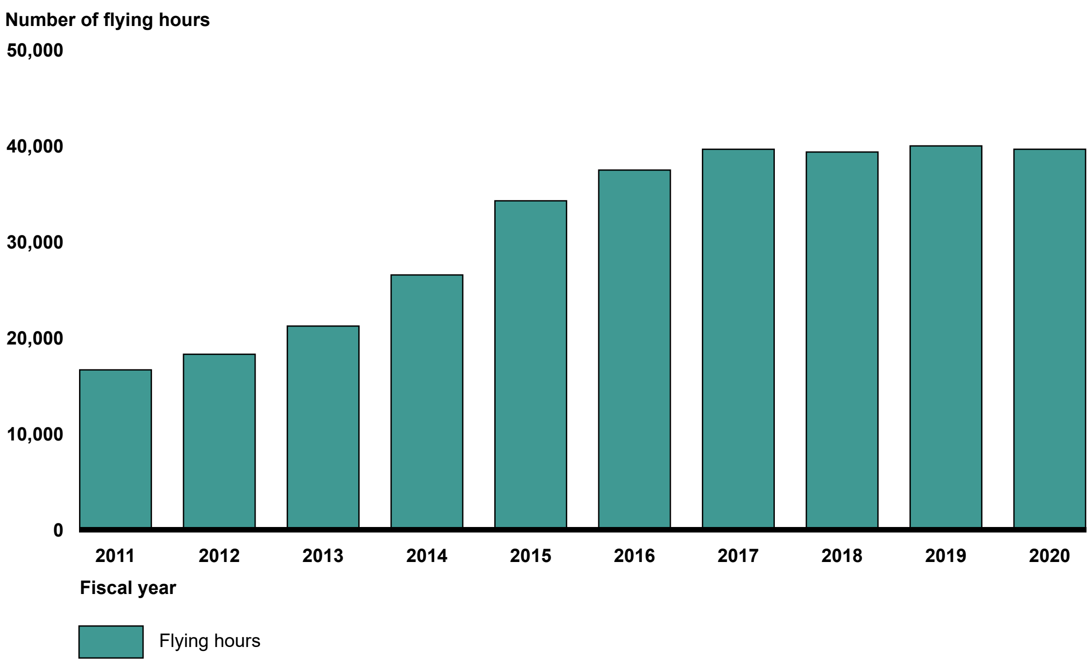


Operating and Support Costs per Flying Hour

EA-18G Operating and Support Costs per Flying Hour



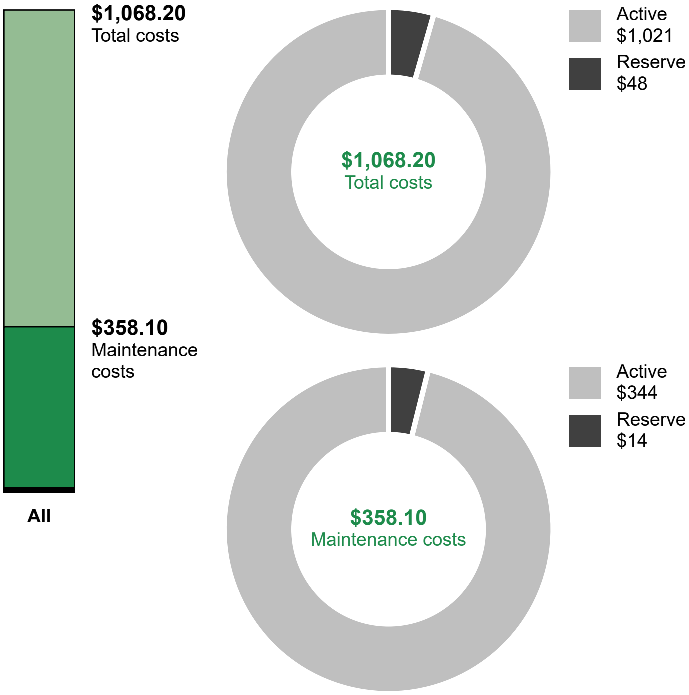
EA-18G Flying Hours



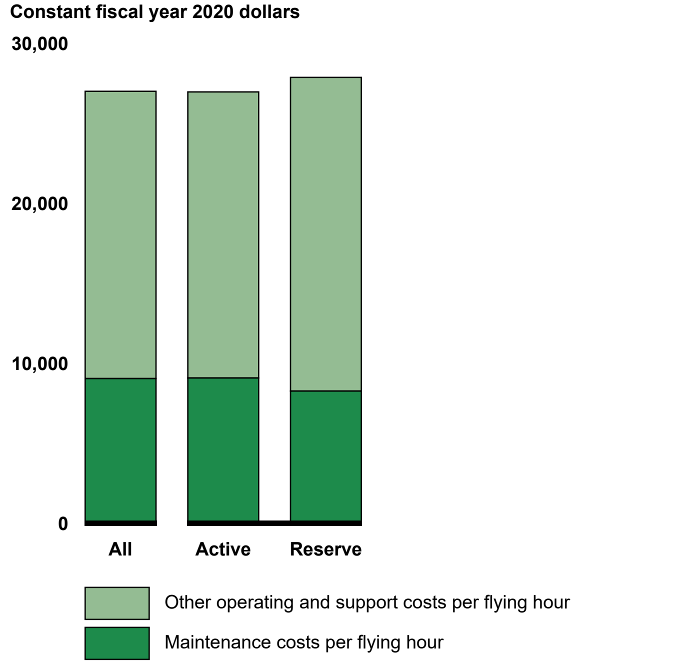
Component-Level Operating and Support Costs

EA-18G Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The Navy's Fleet Readiness Centers Southwest, Southeast, and Western Pacific (in California, Florida, and Japan, respectively) and field sites at Naval Air Stations (in California, Virginia, and Washington) perform depot maintenance on EA-18G aircraft. Navy personnel perform the field maintenance at the fleet's squadron locations. The Navy partners with Boeing to provide wholesale supply and depot repair support for major EA-18G components, such as the engine.

EA-18G Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Aging: The program office plans to begin service life modifications in fiscal year 2029, according to program officials, with one aircraft planned for modification in that fiscal year and an additional three aircraft in fiscal year 2030. The officials stated that the program office and the Commander, Electronic Attack Wing Pacific, are working together to validate the assumptions that were used to develop the Service Life Analysis Plan Roadmap, and modify the plan, if necessary.

Maintenance: The EA-18G has been experiencing several maintenance challenges. First, program officials stated that the EA-18G has experienced intermediate-level component repair delays. According to program officials, the majority of the fleet's squadrons are located at Naval Air Station Whidbey Island in Washington State, but most of the component repairs are performed at Fleet Readiness Center West in California. The officials stated that this component repair strategy was implemented to save costs; however, the transportation requirements extended the overall times for intermediate-level component repairs, adding to some delays that have occurred due to repair capacity constraints at Fleet Readiness Center West.

To address this challenge, the program office increased common-component repair capability for the EA-18G and F/A-18E/F in Washington, and efforts continue to identify candidates for additional capability. For example, the program added generator repair capability at Fleet Readiness Center Northwest to eliminate the need to send the heavy, high-use units to California, and to reduce the logistics delay time and costs.

Second, the EA-18G has experienced depot and field maintenance personnel shortages and inadequate training for maintenance personnel, according to program officials. The officials stated that the program has experienced a shortage of trained depot and field maintenance personnel due to attrition caused by the overall high demand for these employees in the private and public sectors, including elsewhere in DOD.

According to program officials, the mitigation efforts that are underway or planned to address this challenge include:

- implementing the Naval Sustainment Systems approach to leverage best practices in the maintenance industry;
- establishing additional maintenance support for systems on the EA-18G, such as the electronic warfare system;
- increasing space at depots for aircraft repair;
- training depot and field maintainers to be proficient in additional types of repairs; and
- allowing depot and field maintainers to work overtime when necessary.

Third, program officials stated that the EA-18G program has experienced unplanned maintenance caused by corrosion of the air vehicle structure. Mitigation efforts include improved training and realignment of schedule-based inspections, among others, according to the officials.

Fourth, the officials said that the program has inadequate access to technical data for repairs, which has also proven to be a challenge. The program has access to technical data through the original equipment manufacturers' system, but the data is currently only available for selected vendors, according to program officials.

Supply Support: Program officials said that the EA-18G has experienced parts shortages and delays due to diminishing manufacturing sources and obsolescence. For example, due to obsolescence, the program must implement a new design for the aircraft's AN/ALQ-227 communication countermeasure suite to address:

- the latest information assurance standards and capability;
- documented limitations of throughput and system memory;
- future emerging threats; and
- future repair supportability.

The program is pursuing funding for the new countermeasure set. If the design is not implemented, the officials said that the EA-18G will lose key performance functionality starting in fiscal year 2028.

To address supply challenges, the program office established a team in fiscal year 2020 to address diminishing manufacturing sources and parts obsolescence, according to program officials. The officials stated that the team identifies and mitigates current and future issues due to industrial supply chain effects and reviews technology advances that are outpacing integration into the platform.

Additionally, the officials said that the program office created the Integrated Supply Chain Management Team. The team was created in fiscal year 2020 to provide solutions to integrated supply chain challenges that are constraints to achieving and sustaining affordability and availability objectives within the Naval Aviation Enterprise.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

F/A-18A-D
Hornet

Program Essentials

Lead Service
Navy and Marine Corps

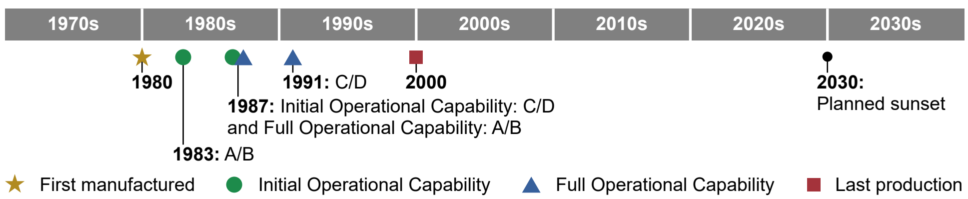
Manufacturer
McDonnell Douglas and Boeing

Program Office
Program Manager – Air 265, Naval Air Systems Command, Patuxent River, Maryland

Sustainment
The Navy's Fleet Readiness Centers Southwest and Southeast, field sites at Marine Corps Air Stations, and a contractor perform depot maintenance. Navy and Marine Corps personnel perform field maintenance.

The F/A-18A-D is a twin-engine, mid-wing, multi-mission, tactical aircraft. In fighter mode, it is used primarily as a fighter escort and for fleet air defense. When in attack mode, it is used for interdiction and air support.

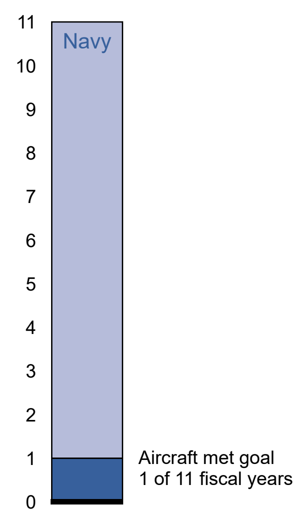
F/A-18A-D Life Cycle Timeline



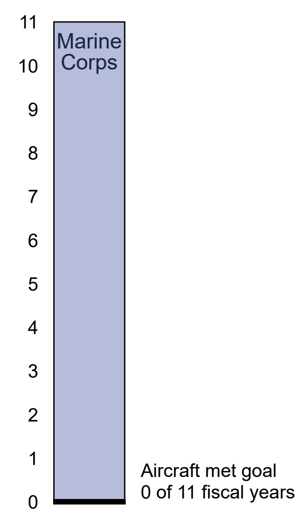
Note: All F/A-18B aircraft were retired in fiscal year 2021, according to program officials.

F/A-18A-D Sustainment Status

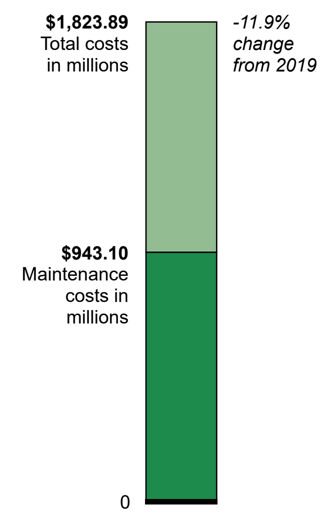
Mission capable rate
Fiscal years met goal



Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

305 total aircraft
Fiscal year 2020

28.2 years
Average aircraft age in fiscal year 2021

Flying hours

35,896 flying hours
Fiscal year 2020

7,652 hours
Average lifetime flying hours per aircraft in fiscal year 2021

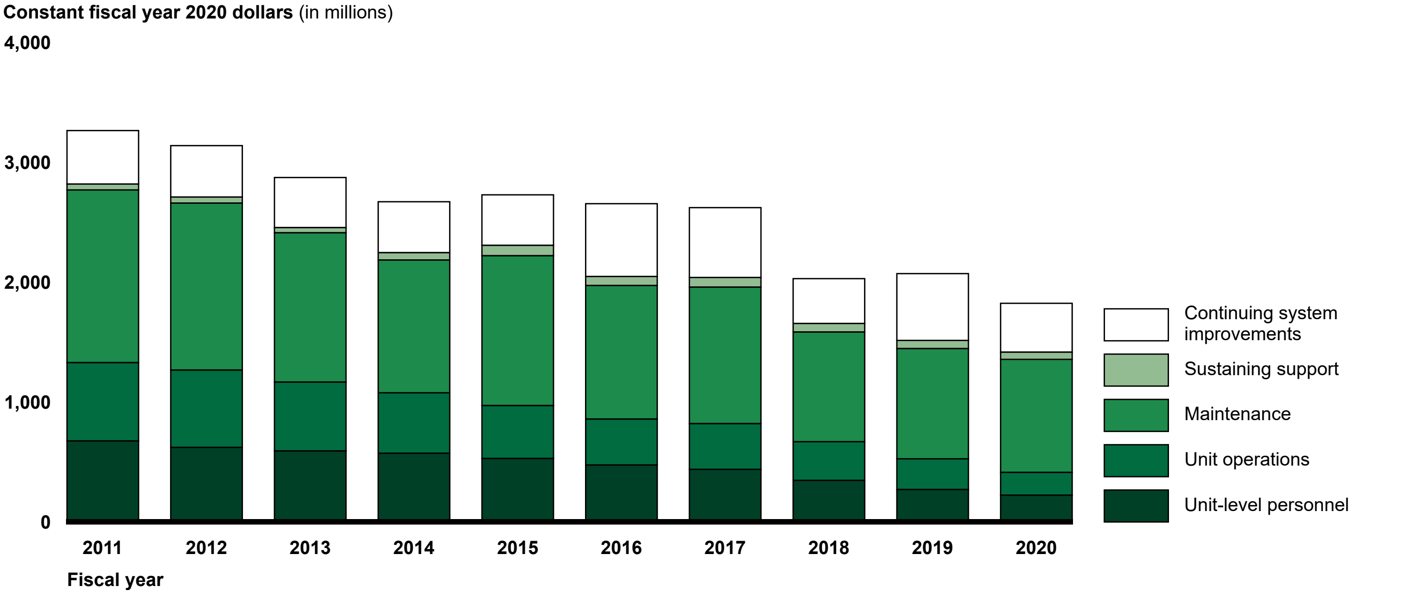
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$5.98 million
Total costs per aircraft

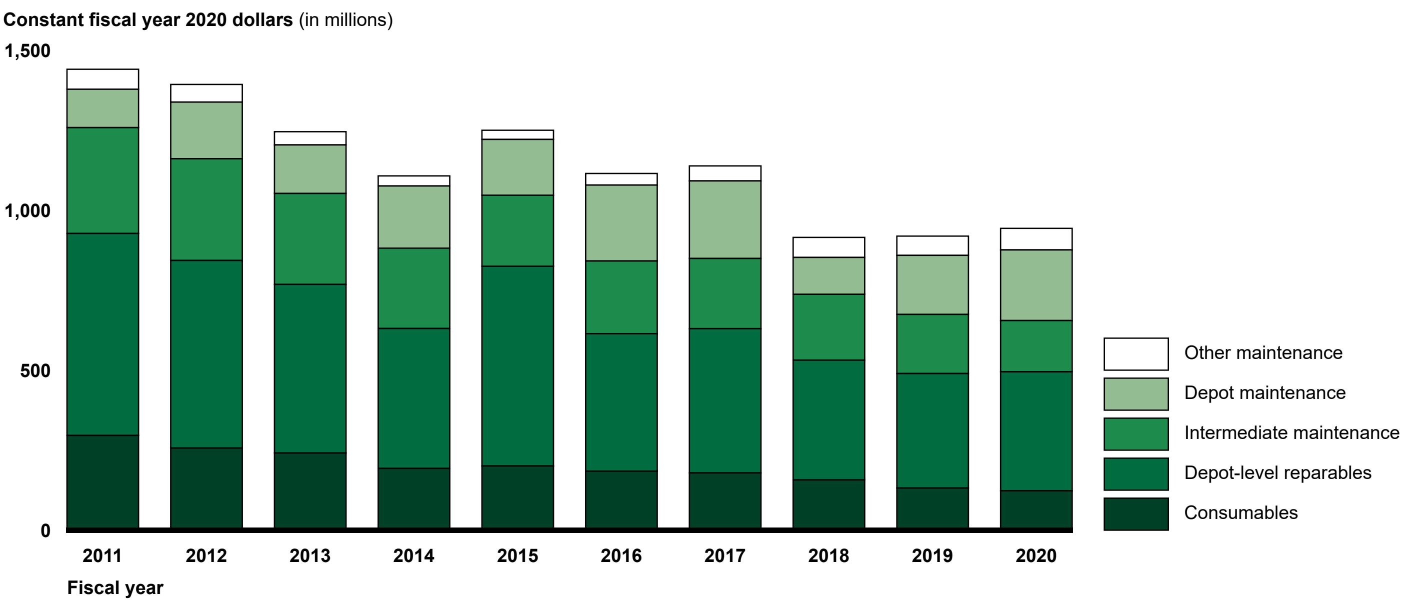
$50,810
Total costs per flying hour
+4.7% change from 2019

Operating and Support Costs

F/A-18A-D Total Operating and Support Costs

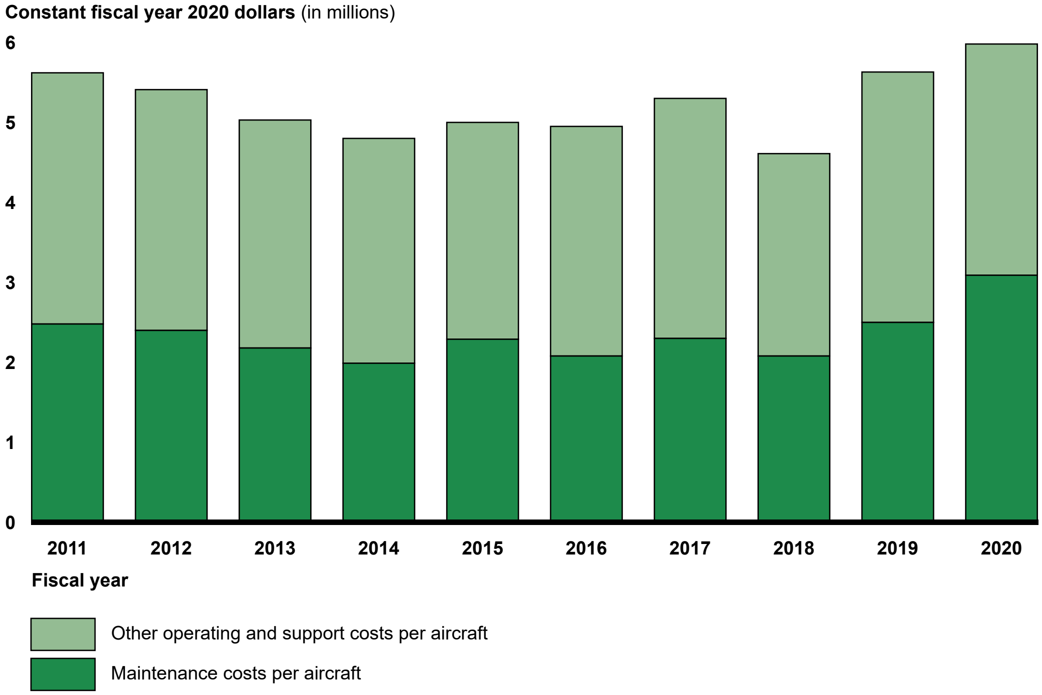


F/A-18A-D Maintenance Costs

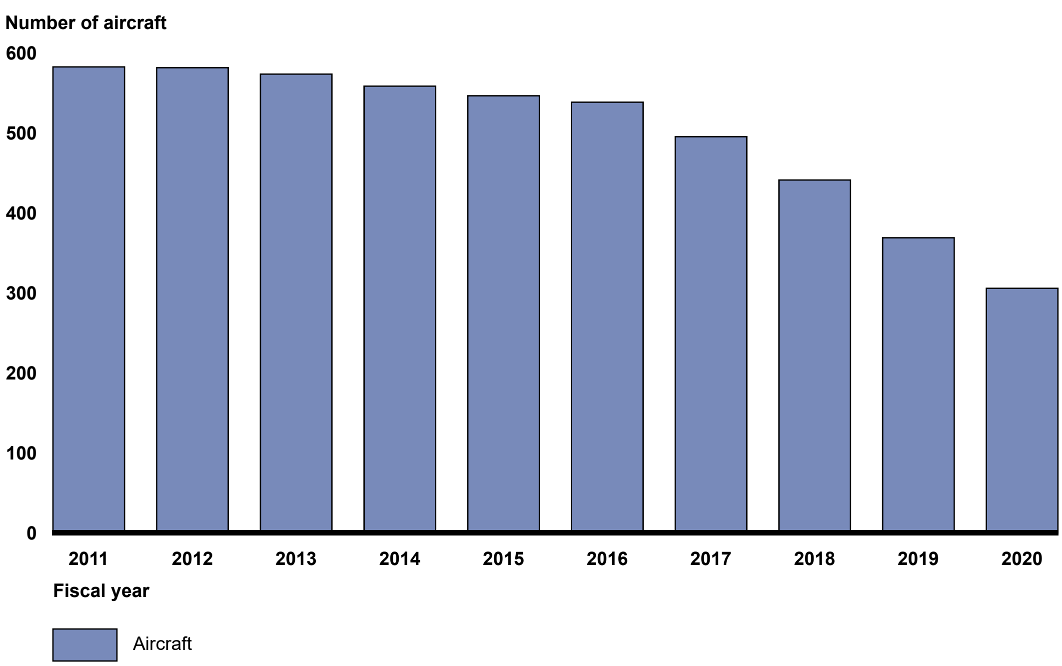


Operating and Support Costs per Aircraft

F/A-18A-D Operating and Support Costs per Aircraft

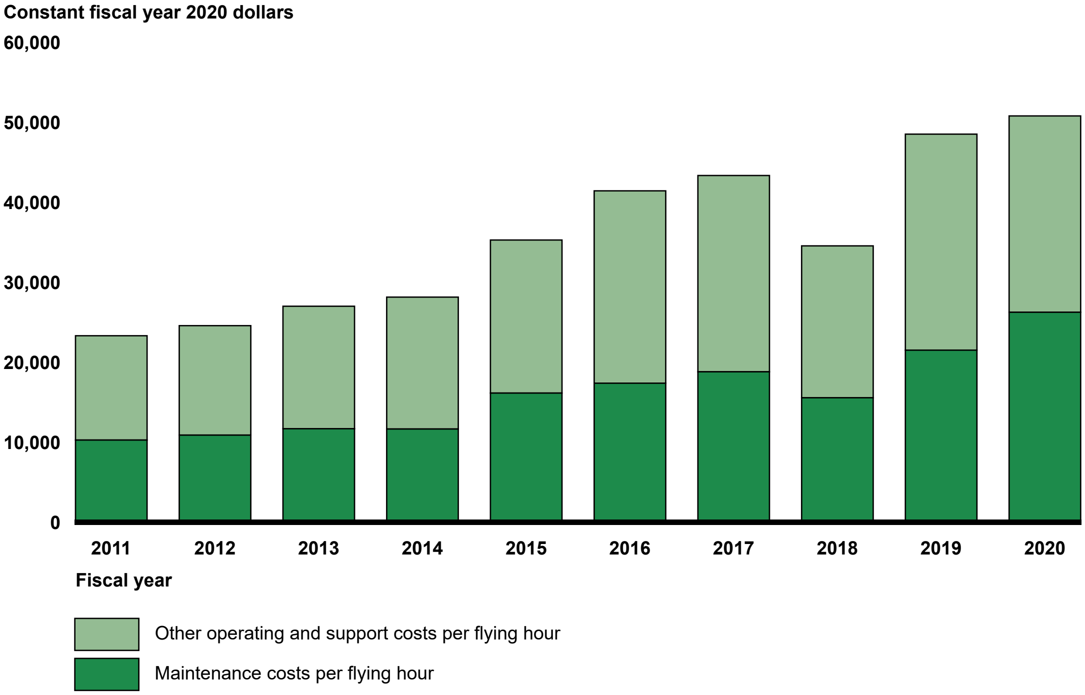


F/A-18A-D Fleet Size

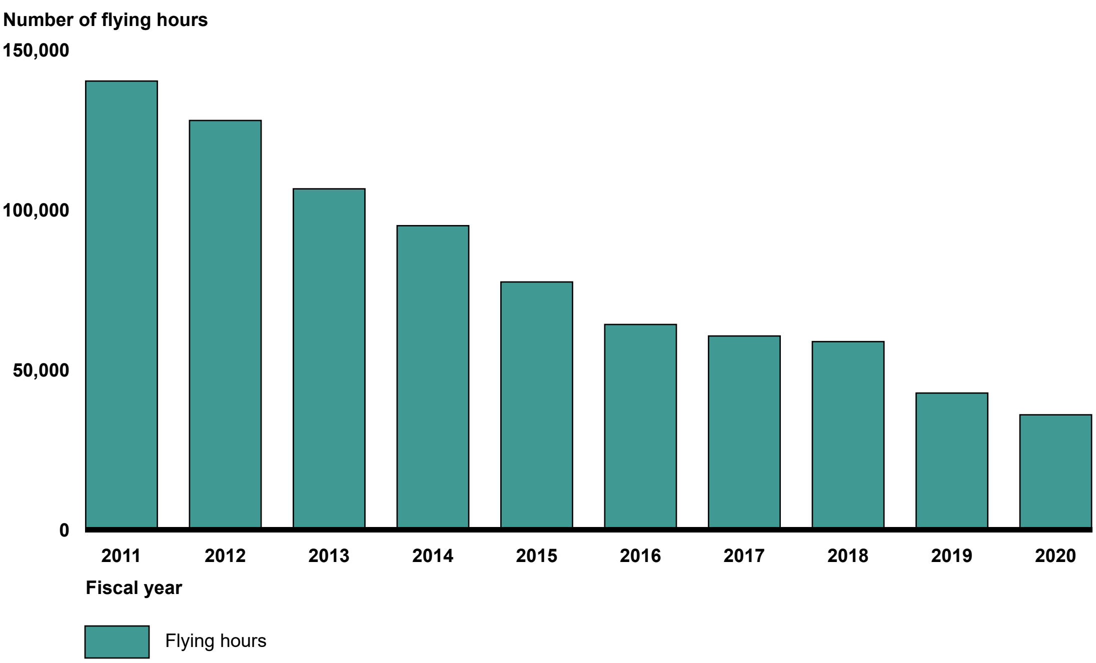


Operating and Support Costs per Flying Hour

F/A-18A-D Operating and Support Costs per Flying Hour



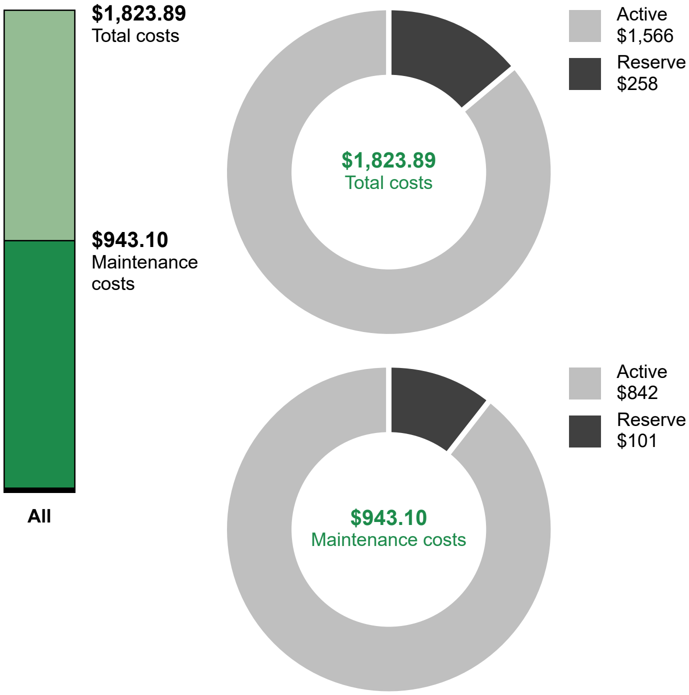
F/A-18A-D Flying Hours



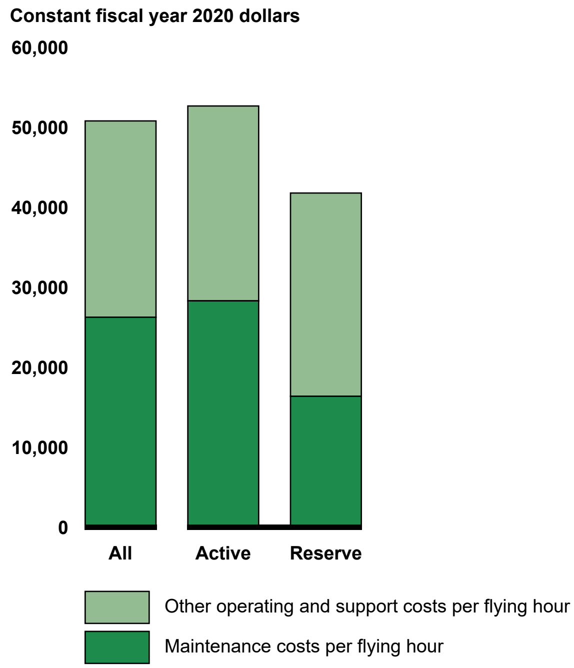
Component-Level Operating and Support Costs

F/A-18A-D Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The Navy's Fleet Readiness Centers Southwest and Southeast (in California and Florida) and field sites at Marine Corps Air Stations (in California and South Carolina) perform depot maintenance on the F/A-18A-D aircraft, according to program officials. The officials stated that Boeing also performs depot maintenance on the aircraft in its facility in Florida. Further, program officials said that Navy and Marine Corps personnel perform field maintenance at F/A-18A-D squadron locations, and the Naval Supply Systems Command and the Defense Logistics Agency provide supply support for the aircraft.

F/A-18A-D Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Aging: As the fleet continues to age, some F/A-18A-D aircraft have been permanently removed from service and the Navy plans to transition aircraft to training and support organizations, according to program officials, decreasing the number of operational aircraft that are available for missions. Program officials stated that the Navy's operational use of the F/A-18 A-D will sunset in fiscal year 2022 and the remaining Navy aircraft will be used for training, and developmental and operational testing, to support the Marine Corps operation of the F/A-18C/D until that aircraft's planned sunset in 2030.

To mitigate the aging aircraft challenge, the Marine Corps is extending the service life of its aircraft through the High Flight Hour program and moving aircraft between squadrons to meet the requirements of deploying missions, according to program officials. The officials said that the Navy implemented the High Flight Hour program in 2006 to extend the service life of Navy and Marine Corps F/A18A-D aircraft from 8,000 to 10,000 flight hours by inspecting and repairing airframes, and replacing major components and parts. As of the end of fiscal year 2021, 271 of the 321 planned aircraft have been completed, with 50 Marine Corps F/A-18C/D aircraft remaining.

Maintenance: The Navy's and Marine Corps' F/A-18A-D aircraft continued to require additional maintenance for repairs that were not originally planned, such as repairs for corrosion, as the aircraft age beyond their designed service lives, according to program officials. The officials stated that this additional unplanned maintenance has:

- created engineering challenges and caused maintenance activities to take longer to be performed; and
- constrained the fleet's maintenance workforce.

According to officials, actions to improve maintenance and address the continued unplanned maintenance workload include:

- training depot and field maintainers to be proficient in repairing parts of the aircraft outside their assigned position; and
- allowing depot and field maintainers to work overtime to keep up with maintenance schedules.

Further, program officials said that the program implemented a Reliability Control Board in 2019 for the F/A-18 platform with an initial focus on efforts for not mission capable degraders, and expanded the board's focus in fiscal year 2020 to partially mission capable, support equipment, and systemic degraders.

Program officials said that maintenance personnel shortages also continued to be a challenge for both the Navy and the Marine Corps as a result of the workforce attrition rates and the Marine Corps' transition to the F-35. However, the officials stated that both the Navy and Marine Corps maintenance workforces have been augmented with contractor support to mitigate the shortages.

The program also has inadequate access to technical data for repairs, which has proven to be a challenge, according to program officials. The officials said that the program has access to technical data through the original equipment manufacturers' system, but the data is currently only available for selected vendors.

Supply Support: Obsolescence remains one of the top drivers of F/A-18A-D readiness issues, according to program officials. The officials stated that, due to the retirement of a large number of aircraft and the reduction in operational sites, the quantity of parts available is generally not an issue. However, the officials explained that certain components are no longer procurable, which leads to supply challenges that are not easily forecastable or predictable. Each issue must be adjudicated individually and requires unique solutions that are normally not repeatable, according to the program officials.

The program office has taken several actions recently to mitigate diminishing manufacturing sources and obsolescence, according to program officials. For example, the officials said that the program office:

- established a diminishing manufacturing sources and obsolescence team in fiscal year 2020 for the F/A-18 platform. The team's purpose is to identify and mitigate both current and forthcoming issues that are due to industrial supply chain effects, technology advances that outpace integration in the platform, and other issues;

- contracted with the Army Combat Capabilities Development Command team in fiscal year 2021 to provide additional support for resolving diminishing manufacturing sources and obsolescence issues; and
- added a lead position for diminishing manufacturing sources within the program office in fiscal year 2021.

Also, the Integrated Supply Chain Management Team was created in fiscal year 2020, according to program officials, and the F/A18 and EA-18G program office is responsible for the team's activities. The officials stated that the purpose of the team is to provide solutions to the Naval Aviation Enterprise's integrated supply chain challenges. The F/A-18A-D has seen a 28-percent reduction in not mission capable supply aircraft since fiscal year 2020, according to program officials, due to the efforts of both the Integrated Supply Chain Management Team and the Reliability Control Board.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

F/A-18E/F
Super Hornet

Program Essentials

Lead Service
Navy

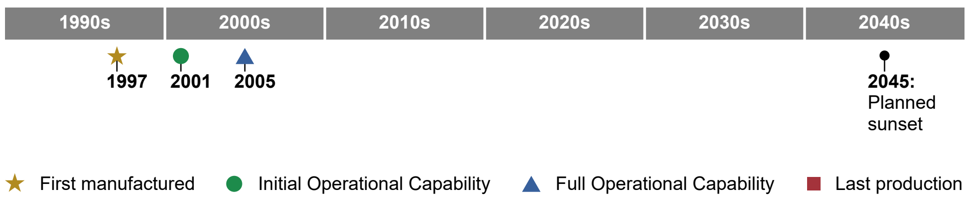
Manufacturer
The Boeing Company, Northrop Grumman Corporation

Program Office
Program Manager – Air 265, Naval Air Systems Command, Paxtuxent River, Maryland

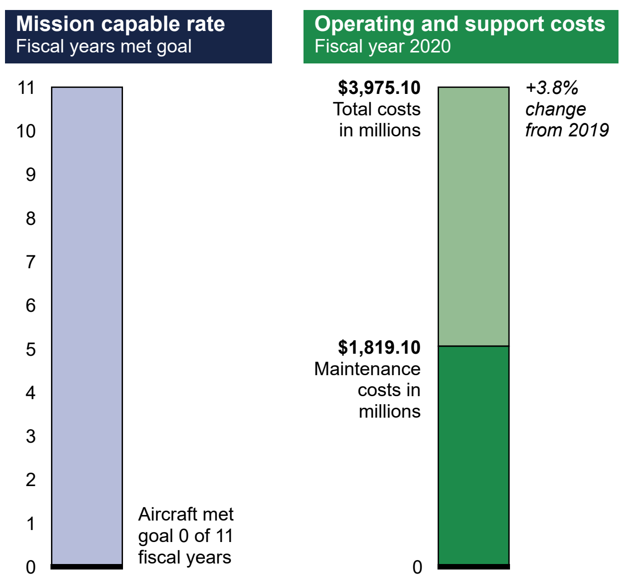
Sustainment
The Navy's Fleet Readiness Centers Southwest, Southeast, and Western Pacific, field teams located at Naval Air Stations, and a contractor perform depot maintenance. Navy personnel perform field maintenance.

The F/A-18E/F is a twin-engine, mid-wing, tactical aircraft. In fighter mode, the aircraft is used primarily as a fighter escort and for fleet air defense. When in attack mode, the aircraft is used for force projection, interdiction, and air support.

F/A-18E/F Life Cycle Timeline



F/A-18E/F Sustainment Status



Aircraft

530 total aircraft
Fiscal year 2020

13.5 years
Average aircraft age in fiscal year 2021

Flying hours

130,743 flying hours
Fiscal year 2020

3,922 hours
Average lifetime flying hours per aircraft in fiscal year 2021

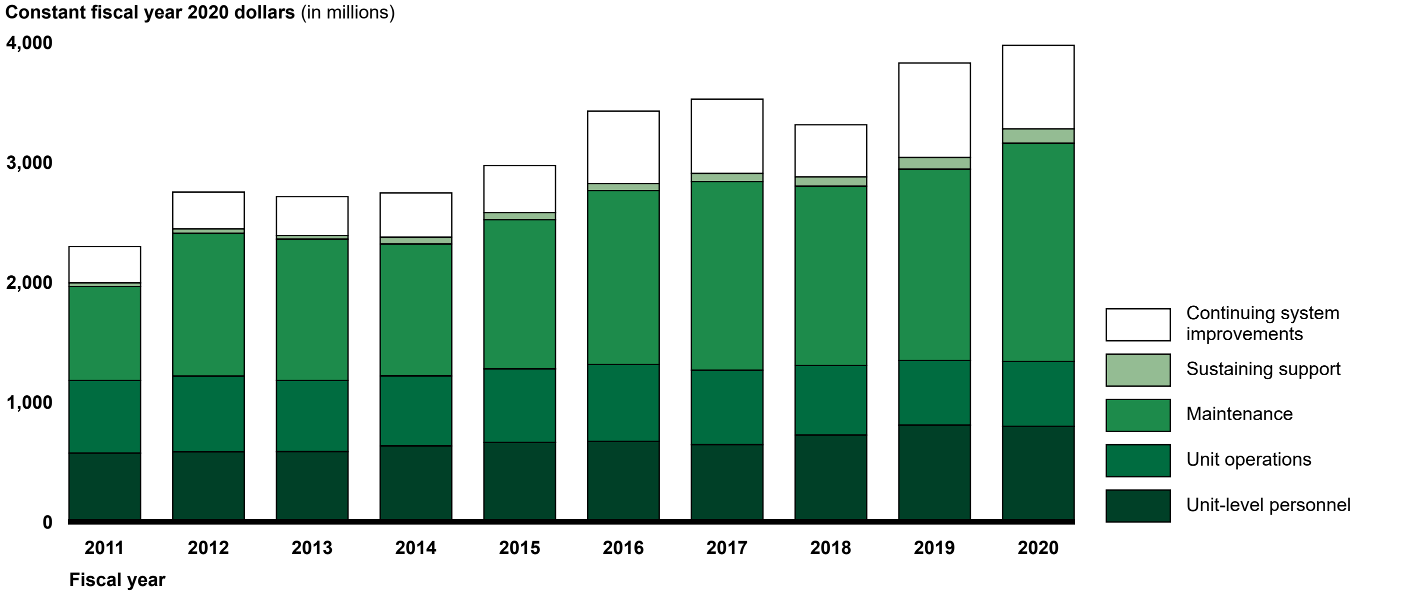
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$7.50 million
Total costs per aircraft

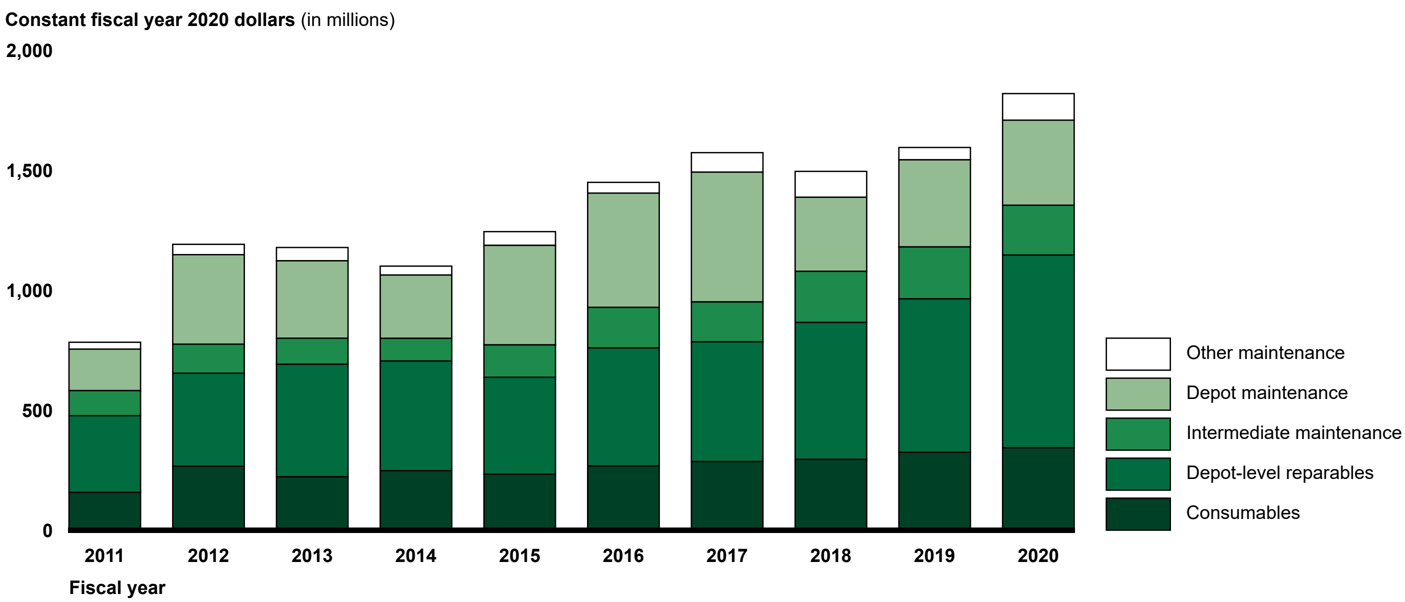
$30,404
Total costs per flying hour
+7.2% change from 2019

Operating and Support Costs

F/A-18E/F Total Operating and Support Costs

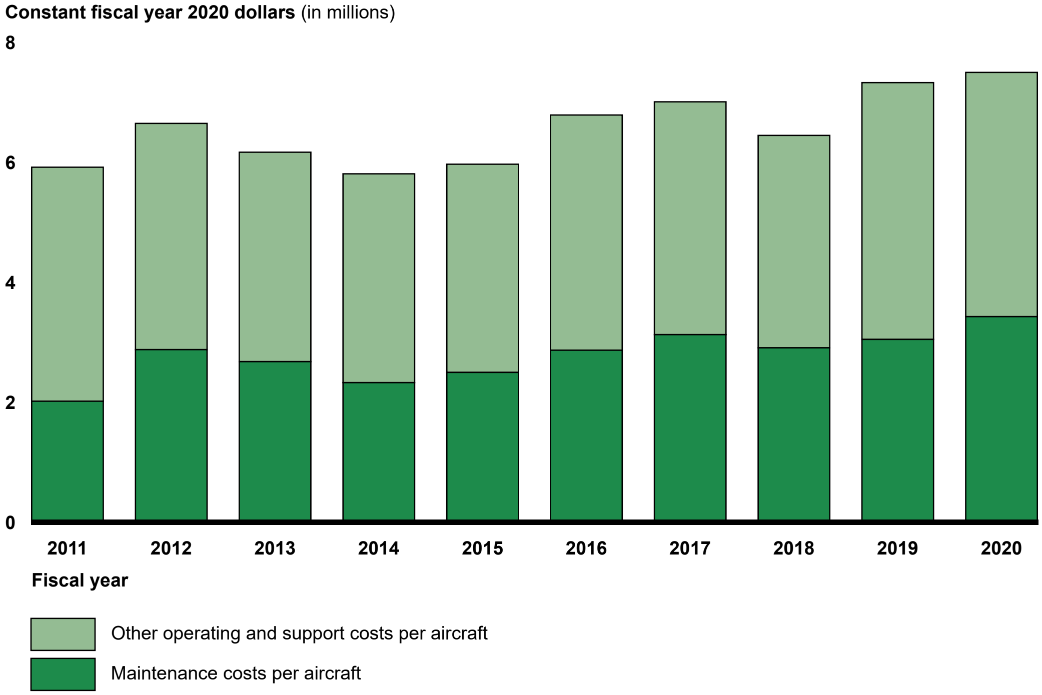


F/A-18E/F Maintenance Costs

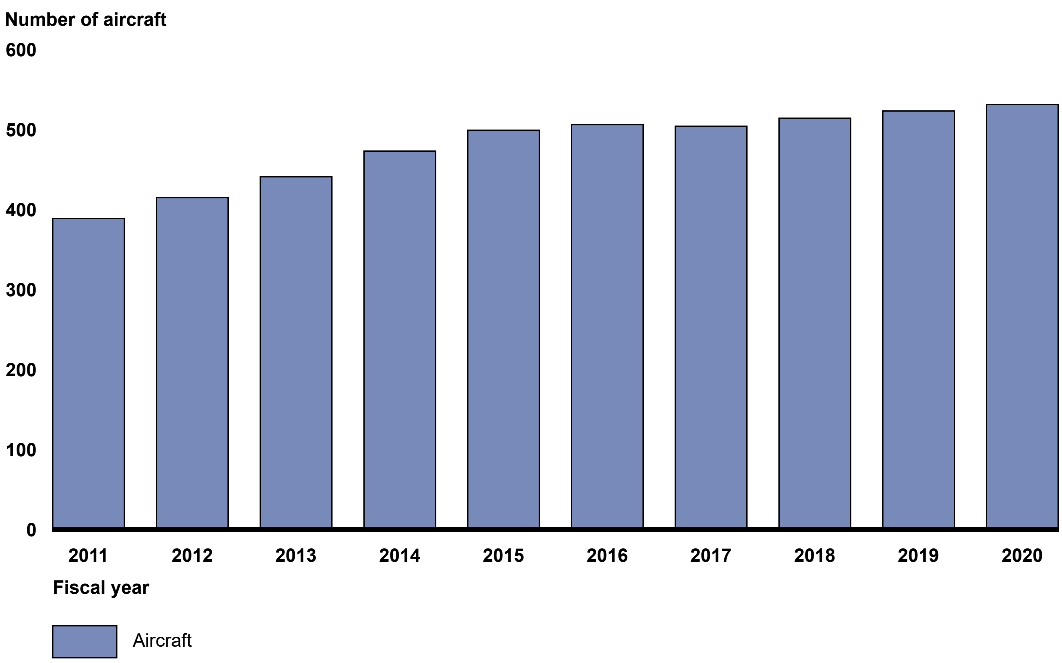


Operating and Support Costs per Aircraft

F/A-18E/F Operating and Support Costs per Aircraft

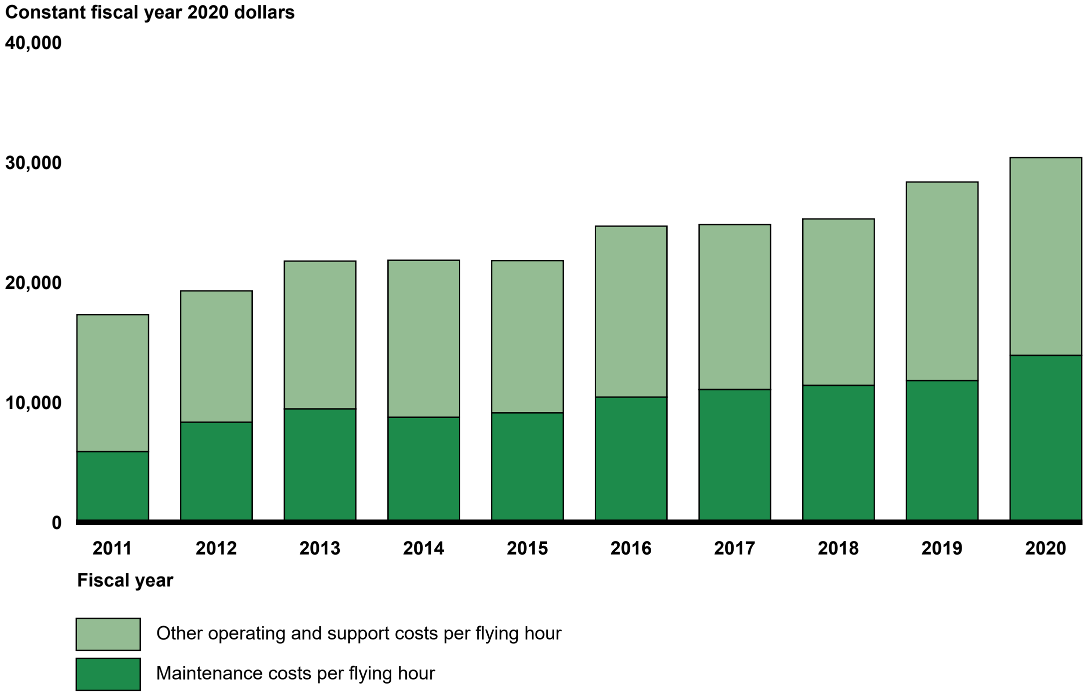


F/A-18E/F Fleet Size

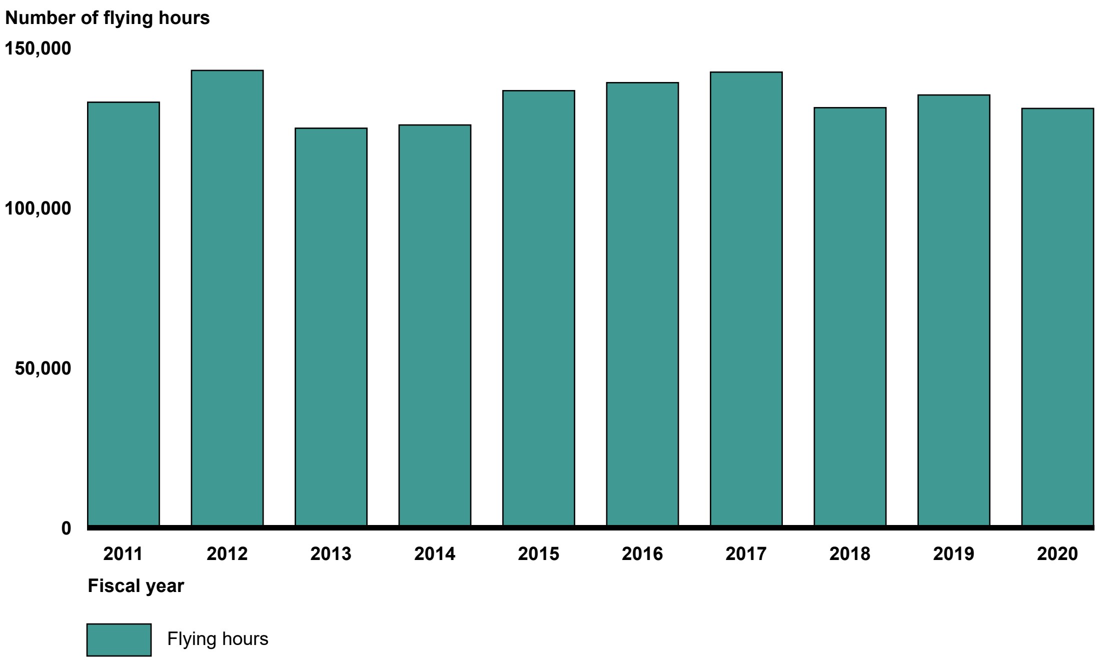


Operating and Support Costs per Flying Hour

F/A-18E/F Operating and Support Costs per Flying Hour



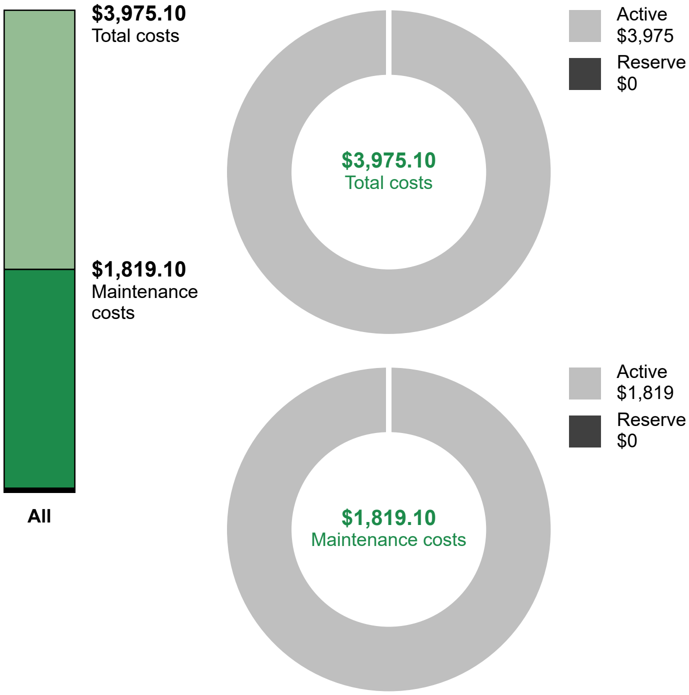
F/A-18E/F Flying Hours



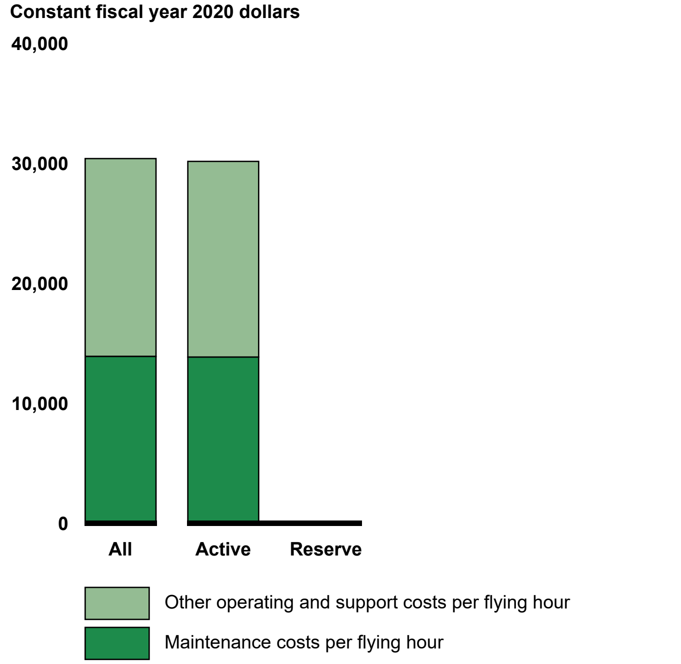
Component-Level Operating and Support Costs

F/A-18E/F Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The Navy's Fleet Readiness Centers Southwest, Southeast, and Western Pacific (in California, Florida, and Japan, respectively) and field teams located at Naval Air Stations (in Virginia, California, and Washington) perform depot maintenance on the F/A-18E/F, according to program officials. The officials stated that Boeing also performs depot maintenance on the F/A-18E/F at its facilities in Florida, Missouri, and Texas; the maintenance performed in Missouri and Texas is for Service Life Modification. Navy personnel perform field maintenance at the fleet's squadron locations. The Naval Supply Systems Command and the Defense Logistics Agency provide supply support for the aircraft, according to program officials.

F/A-18E/F Sustainment Challenges

Aging Aircraft
- Delays in acquiring replacement aircraft
- Service life extension
- Unexpected replacement of parts and repairs

Maintenance
- Access to technical data
- Delays in depot maintenance
- Shortage of trained maintenance personnel
- Unscheduled maintenance

Supply Support
- Diminishing manufacturing source
- Parts obsolescence
- Parts shortage and delay

Aging: The Navy is extending the service life of approximately 350 F/A-18E/F aircraft through a Service Life Modification effort that began in 2018, according to program officials. Program officials said that a service life extension is required for the F/A18E/F to remain a viable weapon system because the Navy used the aircraft frequently over the past decade to support contingency operations.

Based upon the Navy's assessment of the number of flight hours the aircraft can safely continue to fly, the F/A18E/F began a Service Life Modification program to extend the service life of the aircraft from 6,000 to 10,000 flight hours, according to program officials. The officials stated that the Navy has a contract with Boeing to modify the aircraft and, as of the end of fiscal year 2021, nine aircraft had completed service life extensions to 7,500 hours. These aircraft will be reinducted in fiscal year 2023 to complete the remaining work for the full extension to 10,000 hours, according to program officials.

Program officials also stated that corrosion continues to be an issue for the air vehicle structure and that a number of mitigations are currently in place, such as improved maintenance training, realignment of schedule based inspections, and the maintenance reset initiative.

Maintenance: The numbers of F/A-18E/F aircraft that were not mission capable for maintenance and inconsistent sustainment funding levels continued to be challenges faced by the F/A-18E/F program, according to officials. The officials said that the following actions have been taken to improve the readiness and material condition of the aircraft:

- In 2019, the program office implemented a Reliability Control Board for the F/A-18 platform with an initial focus on efforts for not mission capable degraders, and expanded the board's focus in fiscal year 2020 to partially mission capable, support equipment, and systemic degraders.
- In 2020, the Navy started a F/A18E/F Maintenance Reset and Optimization effort and, as of April 2022, 82 aircraft had completed reset, and 19 aircraft were in process. As a result of the aircraft evaluations performed as part of this effort, maintainers were authorized to extend scheduled maintenance intervals, which allowed the Navy to reallocate 285 maintenance work hours per aircraft per year.
- The Naval Air Systems Command is working with Navy Leadership to develop a process to combine Program Related Logistics and Program Related Engineering, two separate Navy sustainment funding streams, for requirements generation and distribution.

Program officials also noted that the program has inadequate access to technical data for repairs, which has proven to be a challenge. The program has access to technical data through the original equipment manufacturers' system, but the data is currently only available for selected vendors, according to program officials.

Supply Support: Although the F/A-18E/F is still in production and at mid-life in terms of sustainment, the program is experiencing shortages of parts that suppliers are no longer producing (i.e., parts obsolescence). Also, according to officials, a number of suppliers have been slow in providing parts, which increases maintenance wait times.

The program office has taken several actions to mitigate supply challenges and individual supply issues and reduce the not mission capable supply rate, according to program officials. For example, the officials said that the program office:

- established the diminishing manufacturing sources and obsolescence team in fiscal year 2020 for the entire F/A-18 platform. The purpose of the team is to identify and mitigate both current and forthcoming issues that are due to industrial supply chain effects, technology advances that outpace integration in the platform, and other issues.
- contracted with the Army Combat Capabilities Development Command team to provide additional support for resolving diminishing manufacturing source and obsolescence issues and added a lead position within the program office in fiscal year 2021.

- created the Integrated Supply Chain Management Team in fiscal year 2020 to provide solutions to integrated supply chain challenges that are constraints to achieving and sustaining affordability and availability objectives within the Naval Aviation Enterprise. Program officials said that the number of F/A18-E/F not mission capable supply aircraft decreased by 33 percent during the 12 months preceding April 2022 due to the efforts of both the Integrated Supply Chain Management Team and the Reliability Control Board.
- located alternative supply sources, reverse engineered parts, and cannibalized parts (i.e., removing serviceable parts from one aircraft and installing them in another aircraft) when necessary to address the supply issues that occurred.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

F-35A/B/C
Lightning II
Joint Strike
Fighter

Program Essentials

Lead Service
Joint (Navy, Marine Corps, and Air Force)

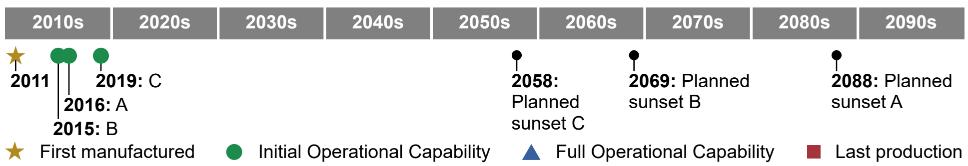
Manufacturer
Lockheed Martin (Air Vehicle); Pratt & Whitney (Propulsion Engine)

Program Office
Joint Program Office, Arlington, Virginia

Sustainment
The F-35 sustainment program is a hybrid Global Support Solution that leverages both U.S. government capabilities and commercial prime contractor support, according to program officials. Lockheed Martin manages the depot maintenance planning for U.S. F-35 aircraft, but most of the major depot-level repair and overhaul for the aircraft and engine are performed by the military service depots. Military service personnel generally conduct the organizational-level maintenance.

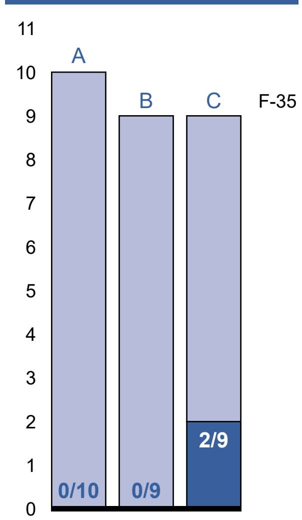
The F-35 Lightning II is a 5th-generation strike fighter aircraft that integrates advanced capabilities to meet the operational needs of the U.S. military services. Currently, the Air Force (F-35A), the Navy (F-35C), and the Marine Corps (F-35B and C) all operate variants of the F-35.

F-35A/B/C Life Cycle Timeline

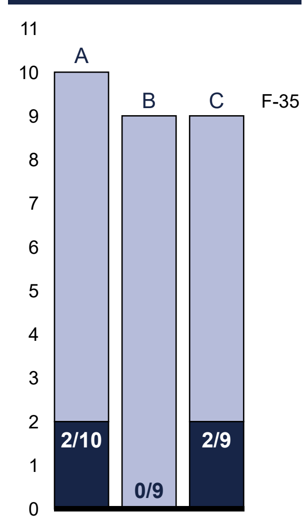


F-35A/B/C Sustainment Status

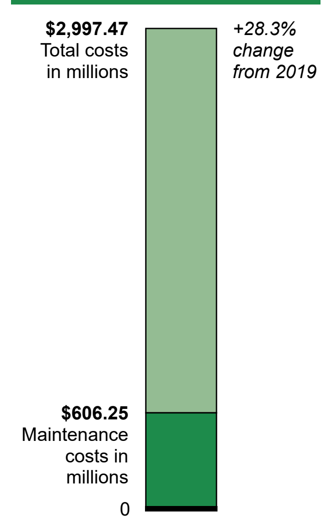
Aircraft availability rate
Fiscal years met goal[a]



Mission capable rate
Fiscal years met goal[a]



Operating and support costs
Fiscal year 2020



Aircraft

365 total aircraft
A: 231 / B: 91 / C: 43
Fiscal year 2020

A: 3.8 / B: 4.3 / C: 4.3
Average aircraft age in years in fiscal year 2021

Flying hours

71,392 flying hours
Fiscal year 2020

A: 696 / B: 666 / C: 895
Average lifetime flying hours per aircraft in fiscal year 2021

Operating and support costs per aircraft and flying hour
Fiscal year 2020

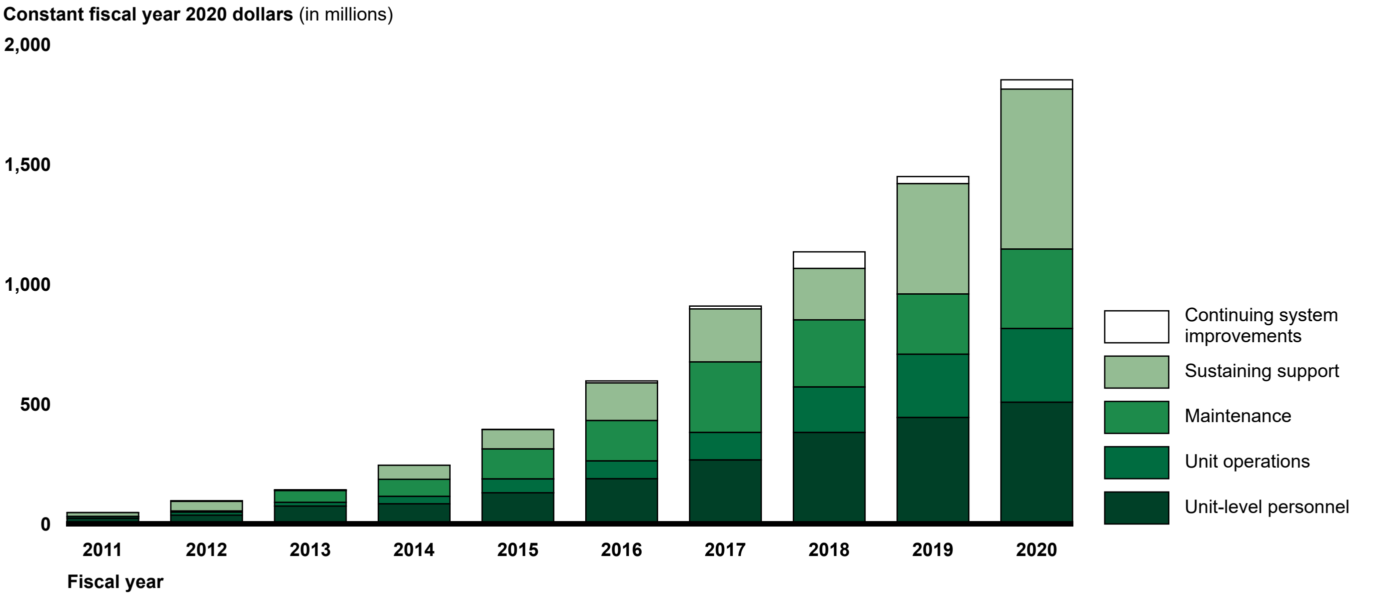
$8.22 million
Total costs per aircraft

$41,986
Total costs per flying hour
-2.3% change from 2019

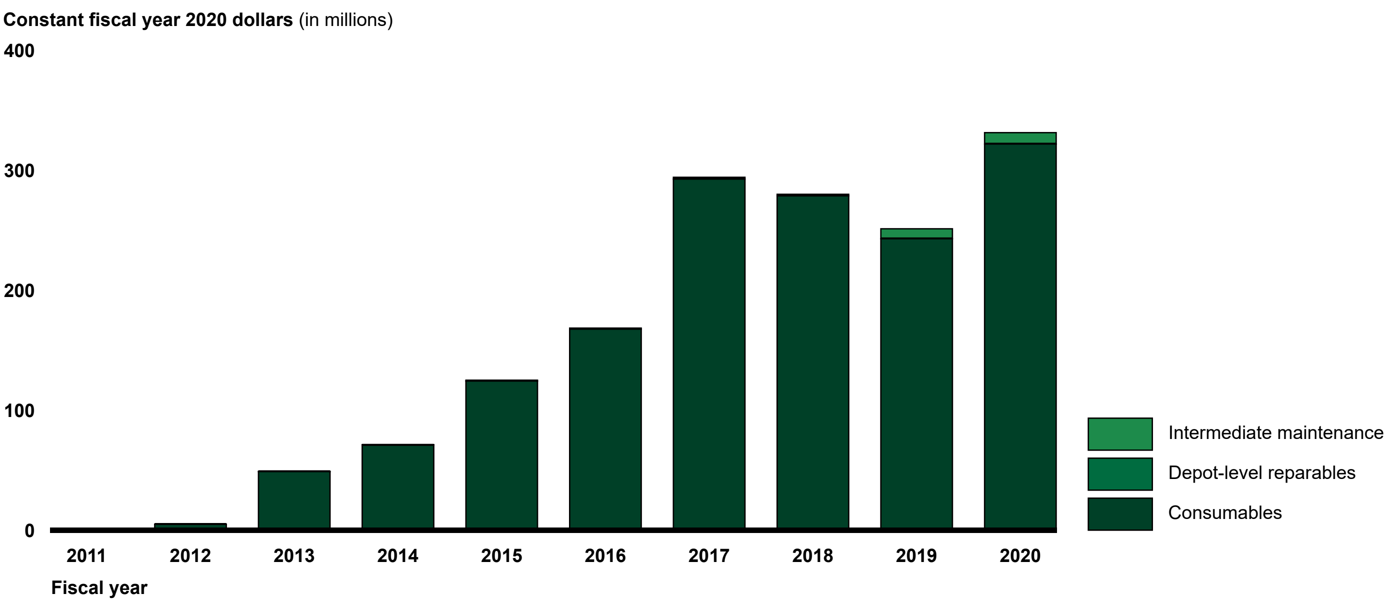
[a]For these aircraft, the military departments did not provide a mission capable goal for all eleven years.

Operating and Support Costs

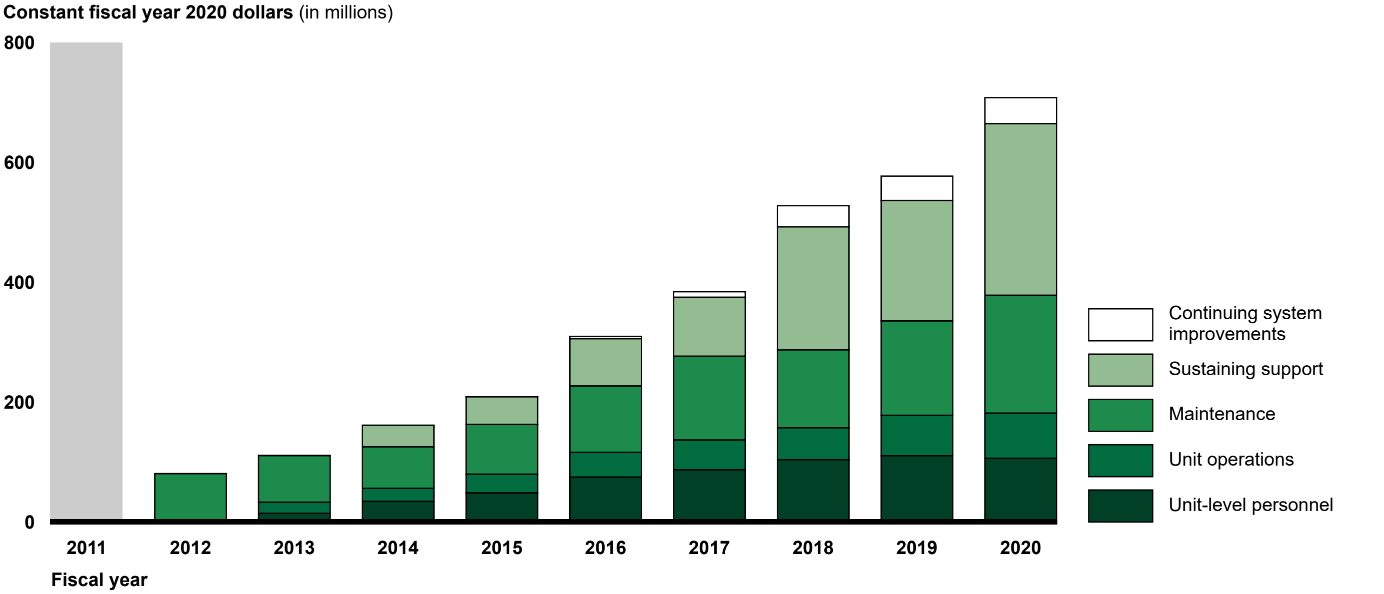
F-35A Total Operating and Support Costs



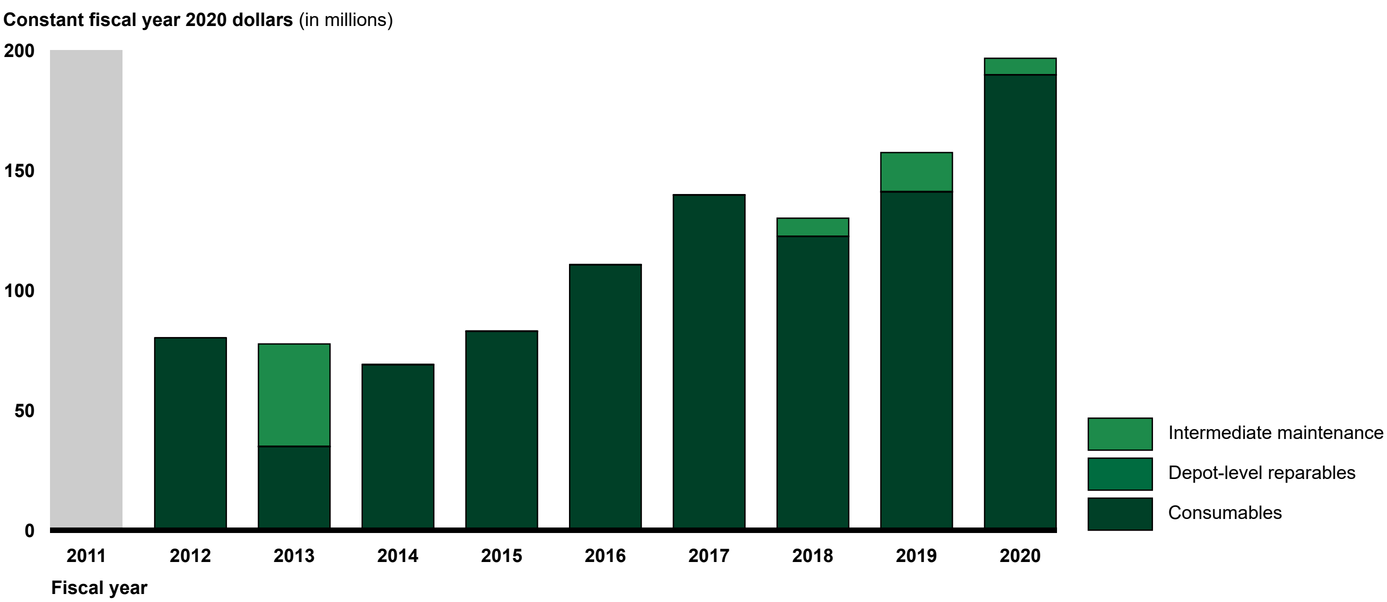
F-35A Maintenance Costs



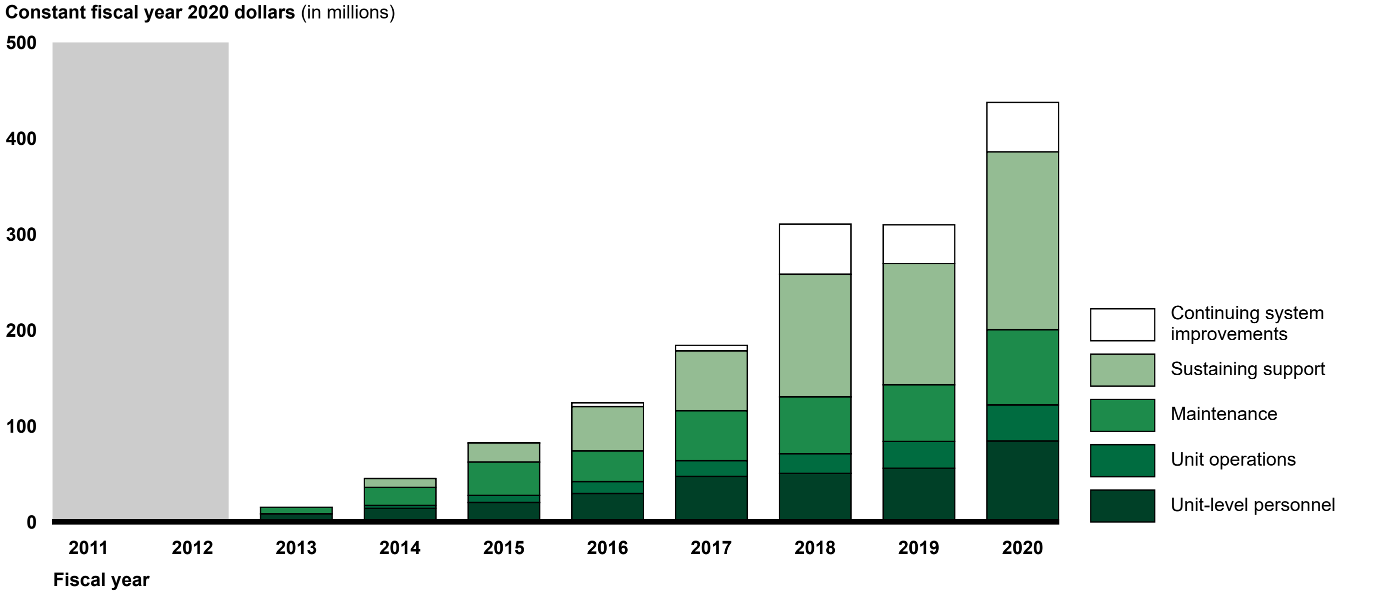
F-35B Total Operating and Support Costs



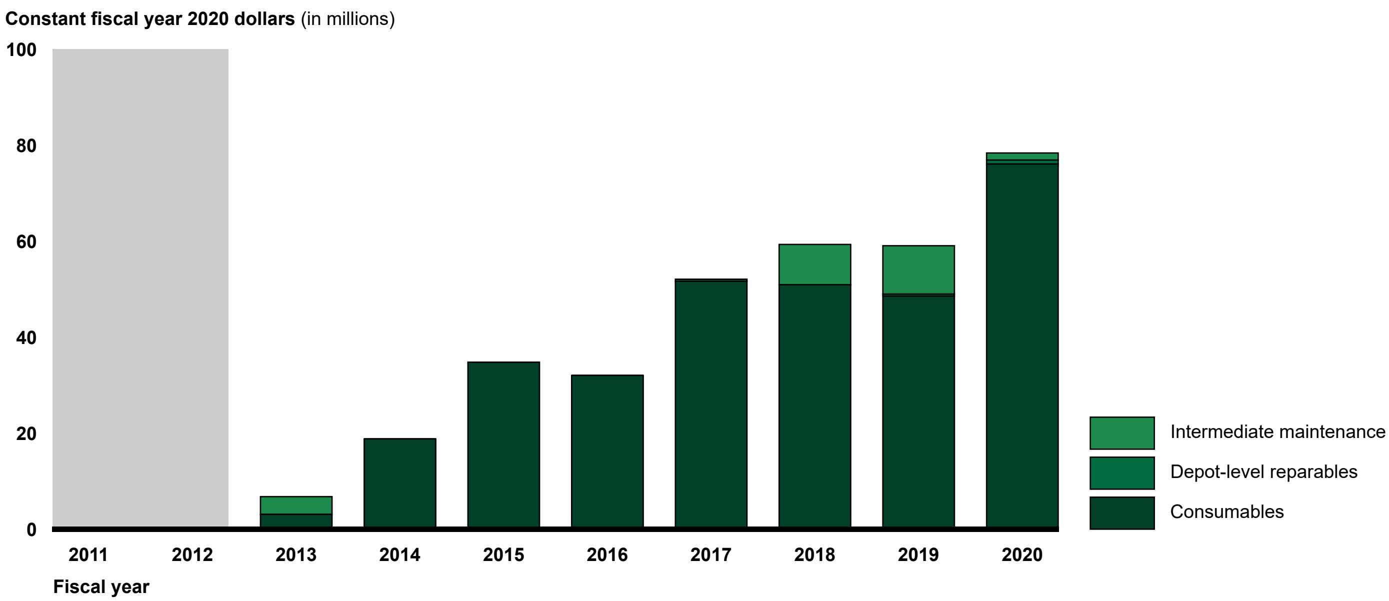
F-35B Maintenance Costs



F-35C Total Operating and Support Costs

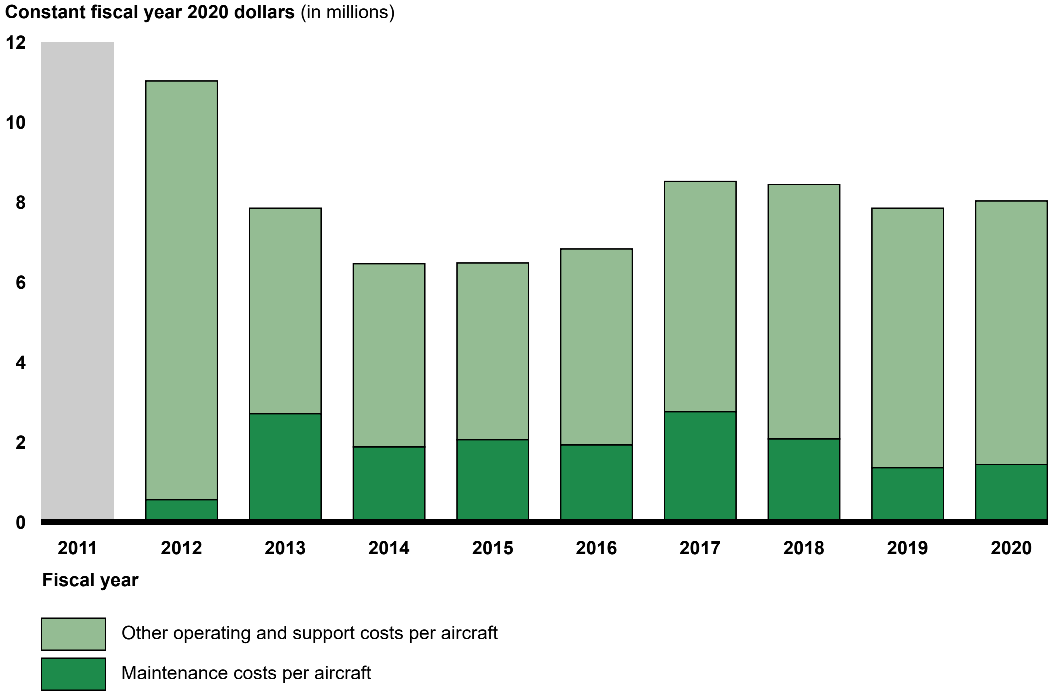


F-35C Maintenance Costs



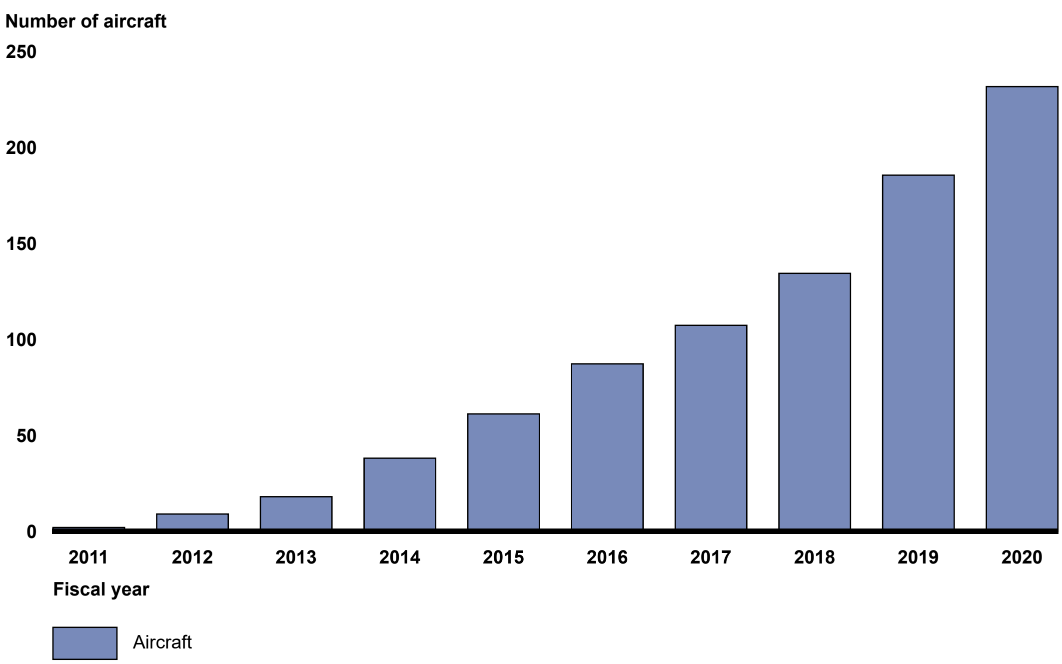
Operating and Support Costs per Aircraft

F-35A Operating and Support Costs per Aircraft

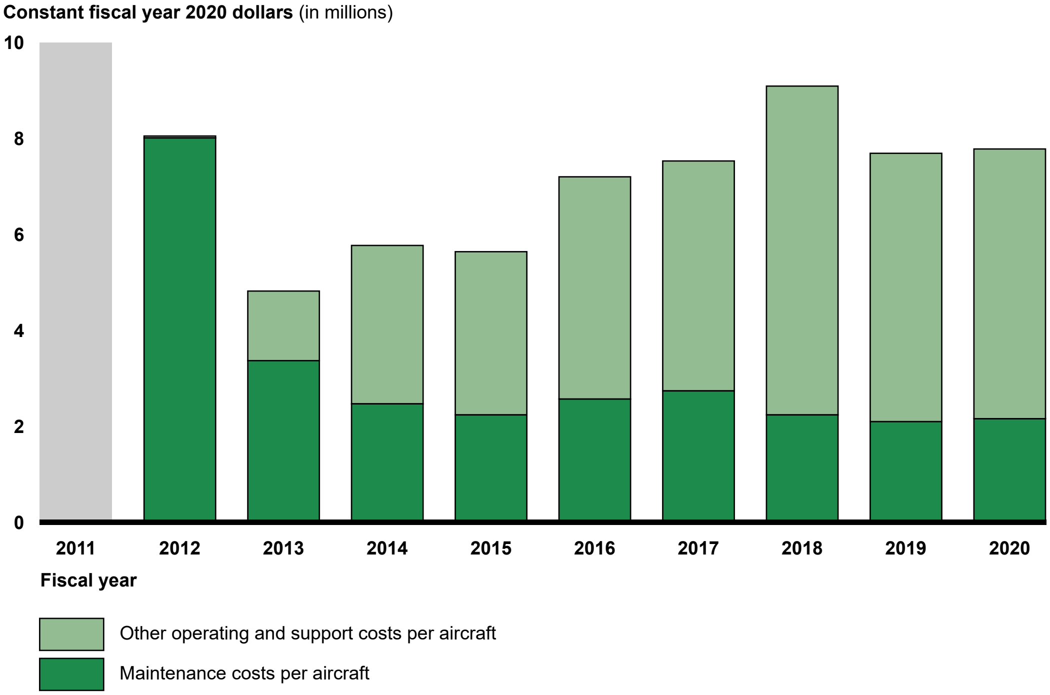


Note: Given the small number of F-35A aircraft in fiscal year 2011 (2 aircraft), we determined that the total O&S costs per aircraft ($26.25 million) was not representative when compared with the costs per aircraft in fiscal years 2012 through 2020. Therefore, we did not include fiscal year 2011 in this figure.

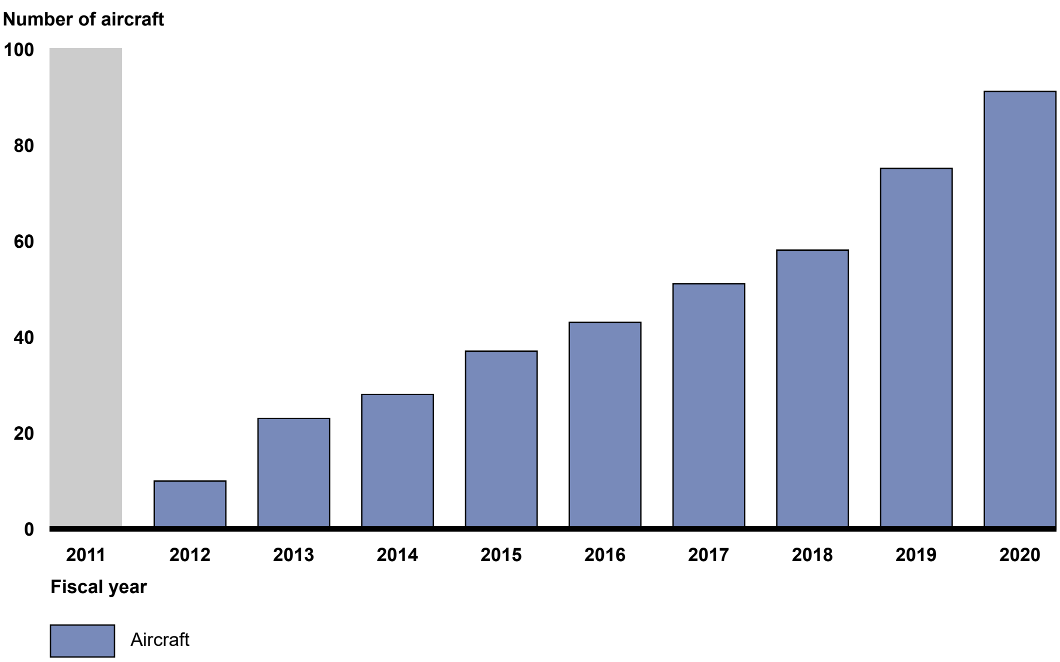
F-35A Fleet Size



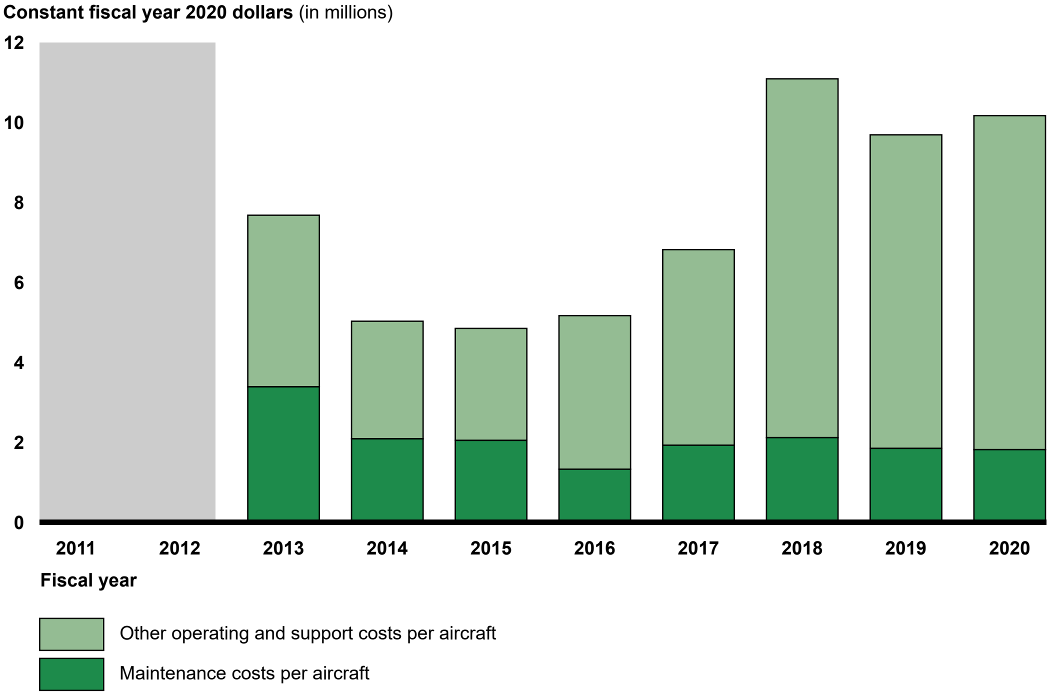
F-35B Operating and Support Costs per Aircraft



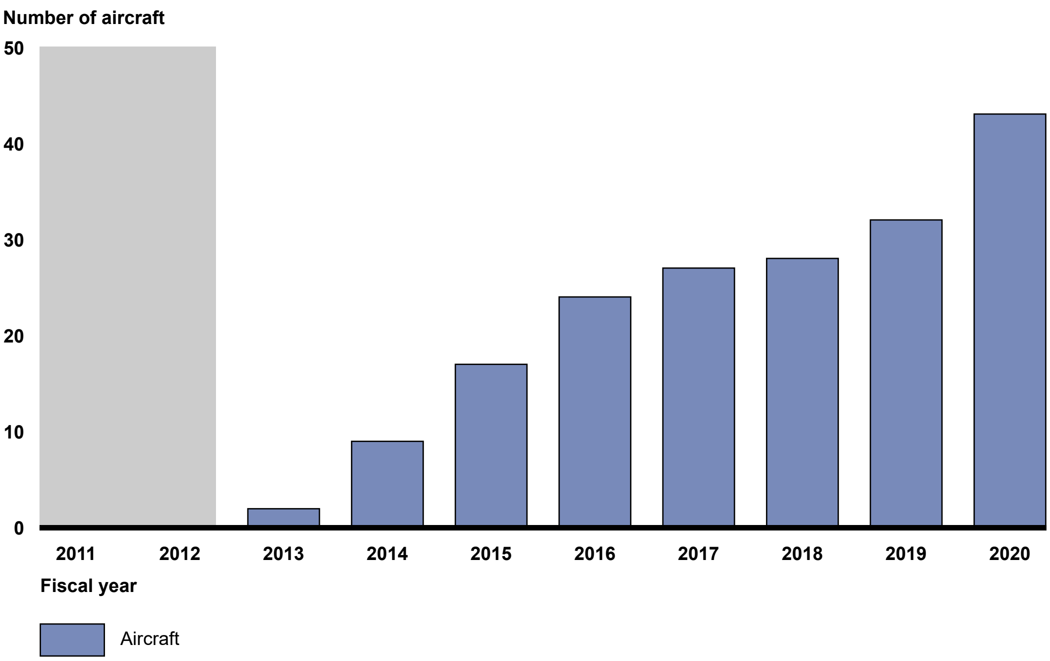
F-35B Fleet Size



F-35C Operating and Support Costs per Aircraft

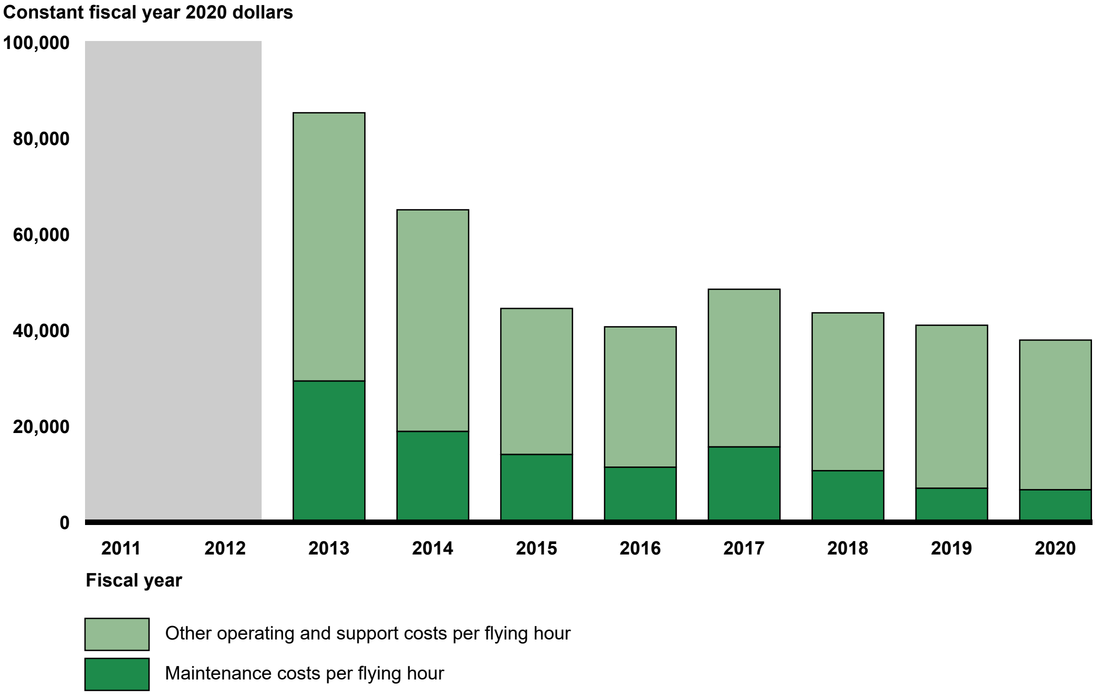


F-35C Fleet Size



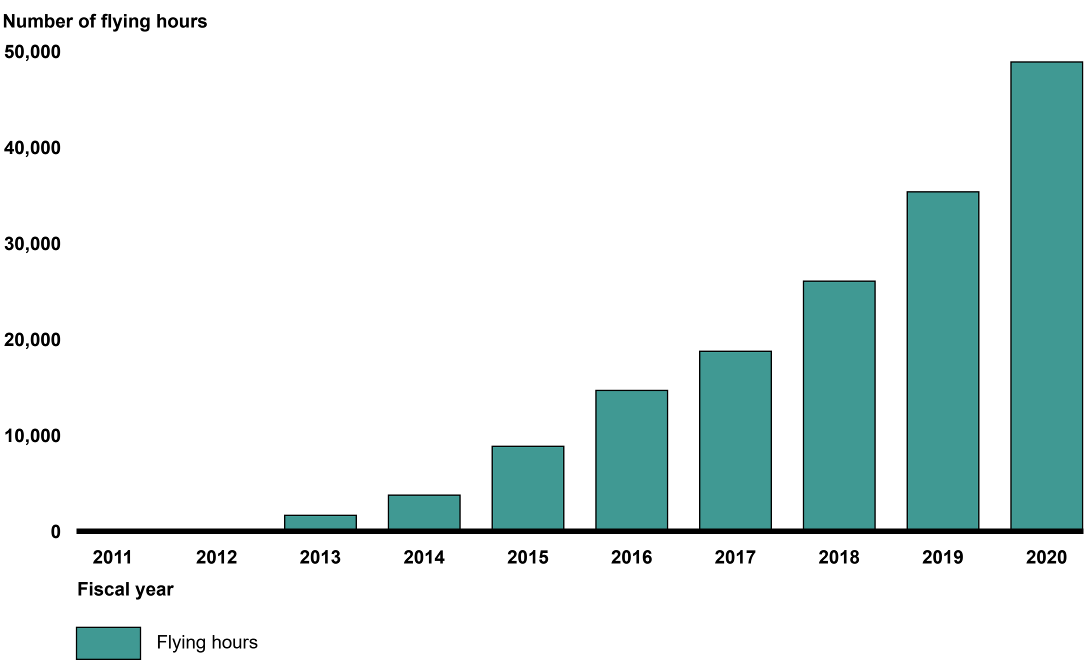
Operating and Support Costs per Flying Hour

F-35A Operating and Support Costs per Flying Hour

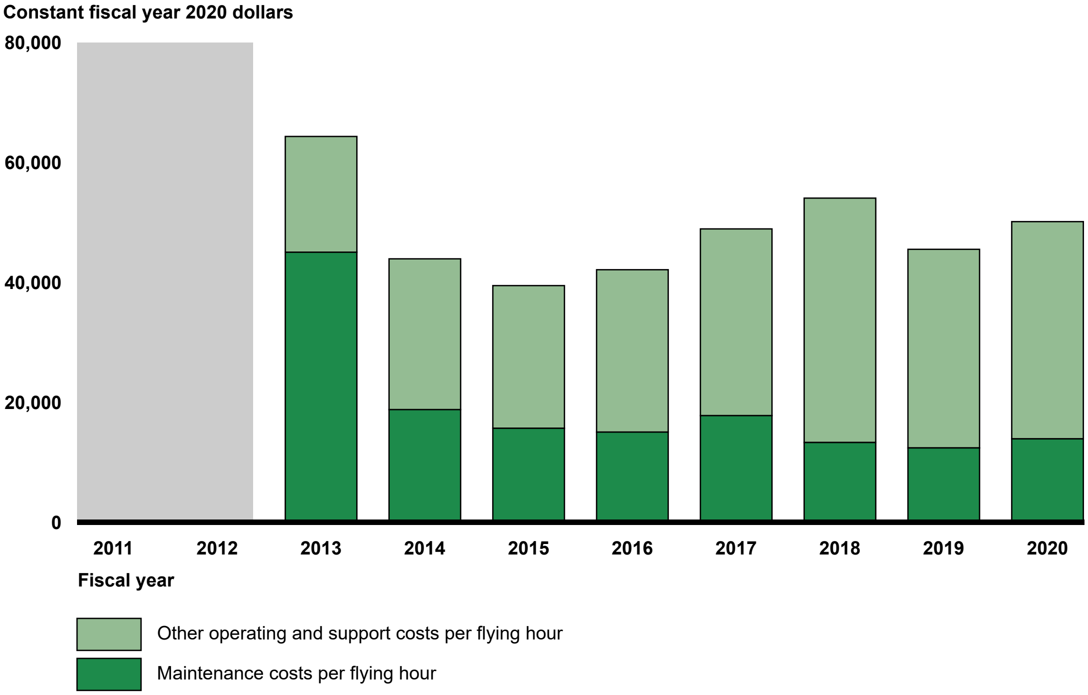


Note: Given the small number of F-35A flying hours in fiscal years 2011 and 2012 (6 and 218 flying hours, respectively), we determined that the total O&S costs per flying hour in those years ($6.85 million and $445,018, respectively) were not representative when compared with the total O&S costs per flying hour in fiscal years 2013 through 2020. Therefore, we did not include fiscal years 2011 and 2012 in this figure.

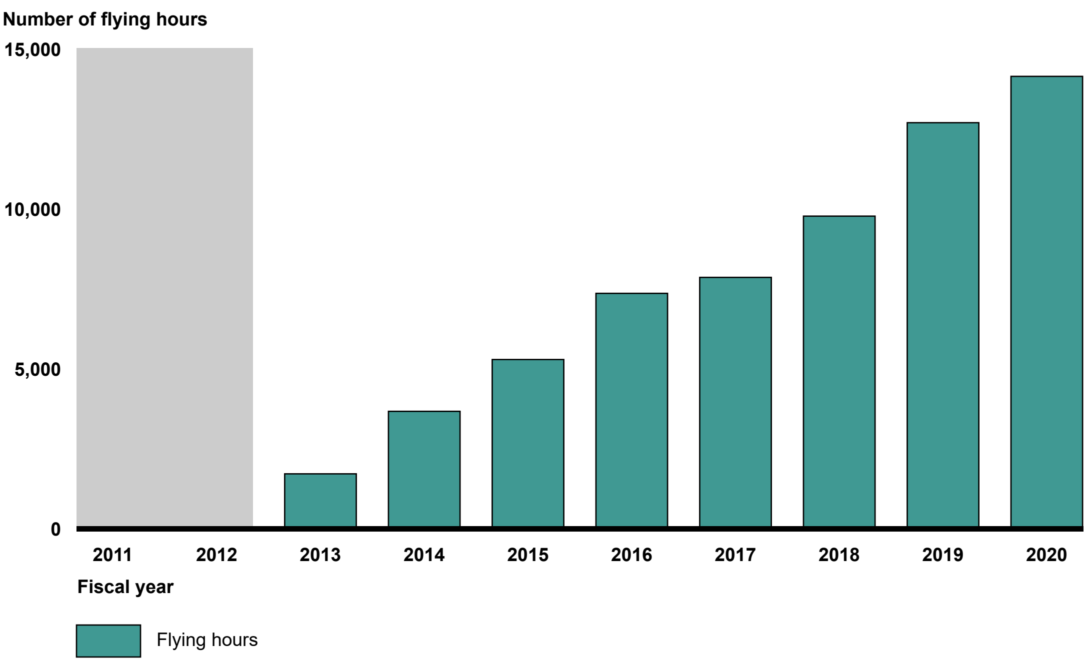
F-35A Flying Hours



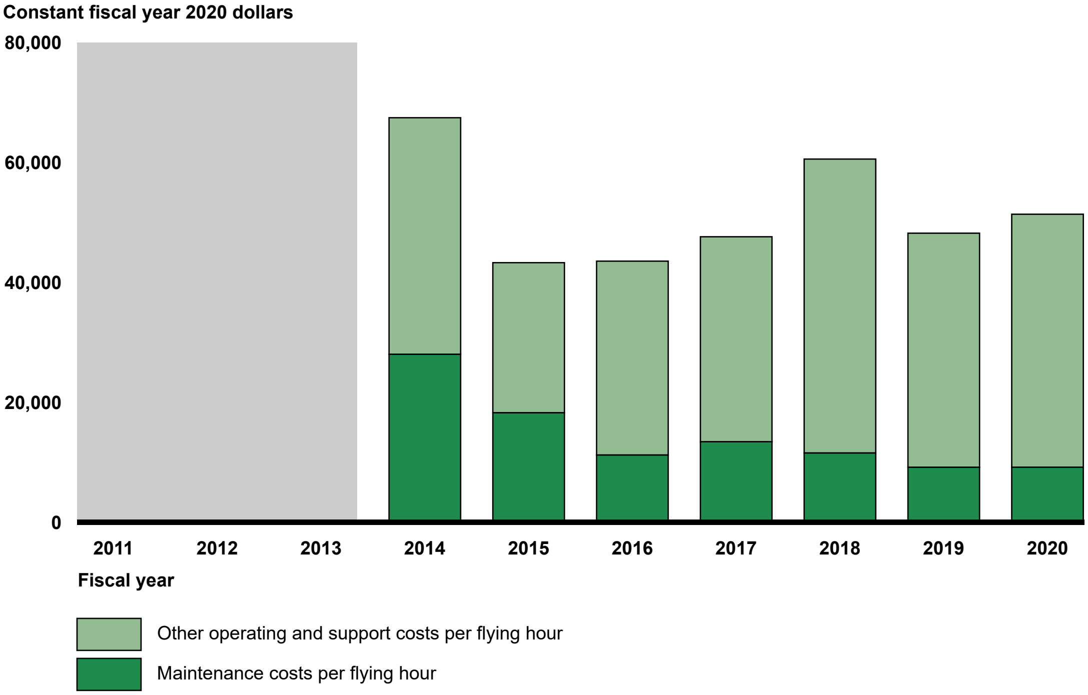
F-35B Operating and Support Costs per Flying Hour



F-35B Flying Hours

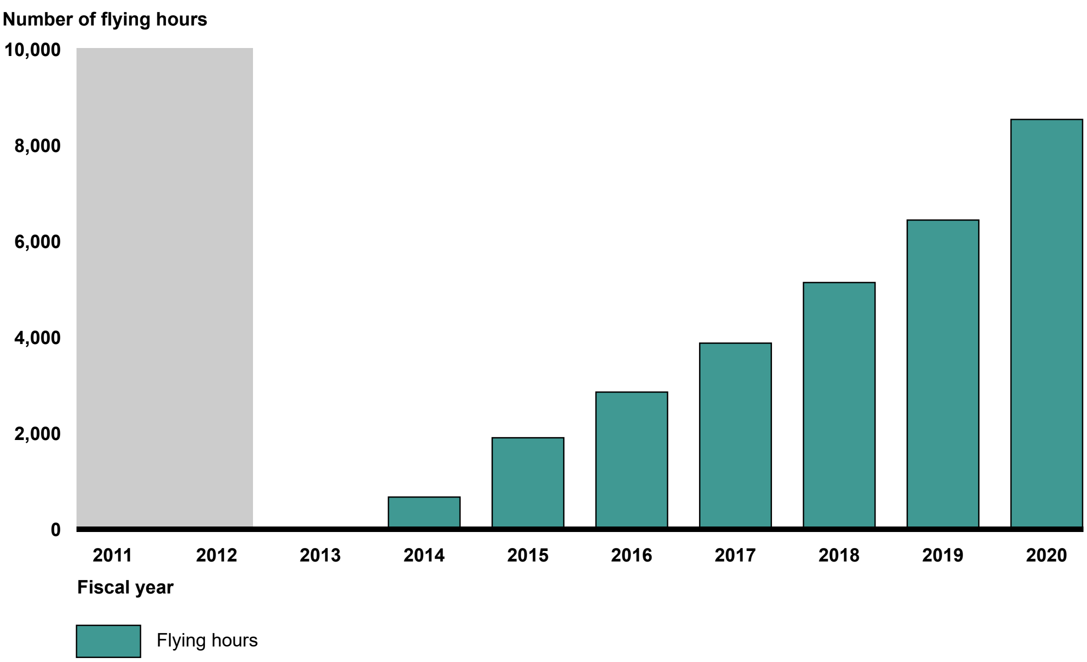


F-35C Operating and Support Costs per Flying Hour



Note: Given the small number of F-35C flying hours in fiscal year 2013 (20 flying hours), we determined that the total O&S costs per flying hour ($767,660) was not representative when compared with the total O&S costs per flying hour in fiscal years 2014 through 2020. Therefore, we did not include fiscal year 2013 in this figure.

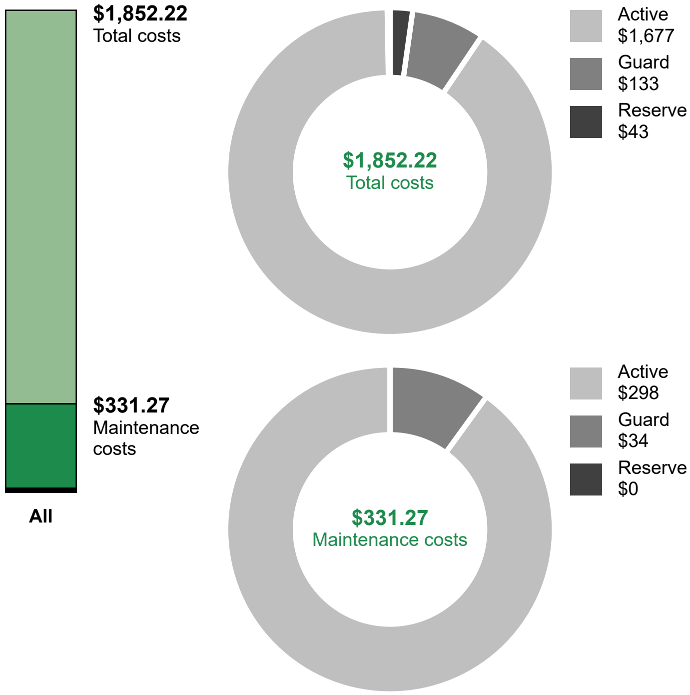
F-35C Flying Hours



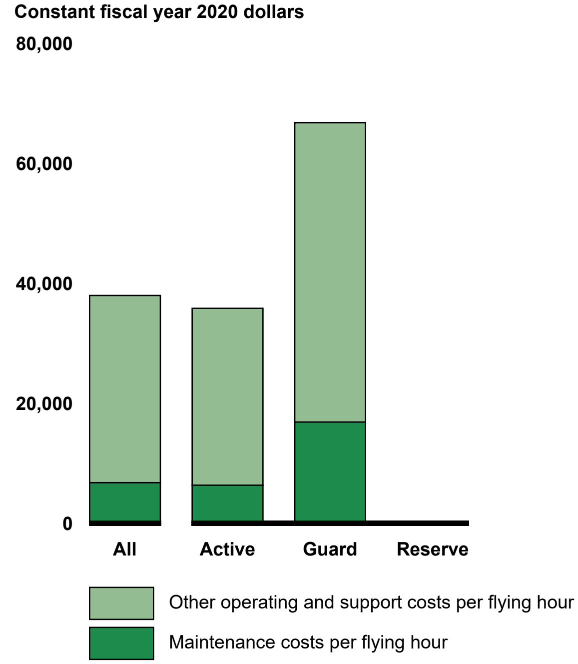
Component-Level Operating and Support Costs

F-35A Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The F-35's 2020 Life Cycle Sustainment Plan prescribes a collaborative government-industry partnership. The F-35 program relies heavily on contractors to provide support, with the Joint Program Office providing management and oversight, according to the plan. Lockheed Martin is the prime contractor for the air system and manages the F-35 supply chain and provides depot maintenance, pilot and maintainer training, and engineering and technical support. Pratt & Whitney, the propulsion system prime contractor, provides support for the engine utilizing a global network of depot repair capability, including a public-private partnership with Air Force's Oklahoma City Air Logistics Complex.

F-35A/B/C Sustainment Challenges

Aging Aircraft
- Delays in acquiring replacement aircraft
- Service life extension
- Unexpected replacement of parts and repairs

Maintenance
- Access to technical data
- Delays in depot maintenance
- Shortage of trained maintenance personnel
- Unscheduled maintenance

Supply Support
- Diminishing manufacturing source
- Parts obsolescence
- Parts shortage and delay

Maintenance: In July 2021, we reported that DOD officials and all of the F-35 locations that responded to our survey identified two specific challenges that negatively affected organizational-level maintenance on the F-35: (1) flight line maintainers' lack of access to technical data (i.e., details about how the aircraft should perform and how to maintain its continued performance) to conduct certain maintenance activities and (2) the availability of support equipment to conduct maintenance efficiently.[1] During our visits to three F-35 installations and two F-35 maintenance depots from December 2021 through March 2022, maintenance officers and maintainers continued to report that these issues negatively affected performance.[2]

In addition, as we reported in July 2022, the department has not met several key performance goals for sustaining the F-35 engine.[3] First, DOD met its 6 percent or less not mission capable due to engine issues goal in one month from January 2021 through February 2022. As a result, the number of F-35 aircraft unable to fly due to the lack of an operating engine has been increasing since January 2020 with a slight decrease from July 2021 through February 2022. Second, DOD has met three of five of its reliability and maintainability goals—metrics aimed at ensuring that the F-35 engine will be available for operations as opposed to out of service for maintenance. The goals that DOD has not met have resulted in higher-levels of maintenance. DOD has developed and is implementing corrective-action plans since fall 2020 to improve the capacity of its engine-repair maintenance depots. DOD's plans have resulted in improvements, such as reducing the time to repair a key module of the engine from 207 days in October 2020 to 119 days in January 2022. However, DOD's plans are highly dependent on assumptions about obtaining funding and its ability to address future risks.

Supply Support: F-35 spare parts availability has shown some improvement over the years, but continues to be a significant challenge. Spare parts availability is measured by rate of not mission capable due to supply—the percentage of time during which aircraft in the possession of F-35 units are unable to fly or conduct any of their tasked missions due to a lack of spare parts. The rate of not mission capable due to supply was about 25 percent in fiscal year 2019 and this rate decreased further, hovering around 17 percent in fiscal years 2020 and 2021. As we reported in July 2021, the F-35 Joint Program Office stated that the program plans to fund enough spare parts to achieve an approximately 15 percent rate of not mission capable due to supply.[4] According to program officials, achieving a lower rate of not mission capable due to supply was not affordable, and would provide only near-term benefits. Therefore, the program has focused on other priorities, such as improving depot repair capacity. As of September 2021, the average depot-level repair time for an F-35 part had improved to 131 days, from 188 days in November 2018. However, this figure remains well above the program's 30-day program objective. In January 2022, the Director, Operational Test and Evaluation, reported that the limited component-level depot repair capacity contributes to the shortfalls in the supply of spares.[5] According to program officials, part repair times continue to lag because the depots do not yet have the capacity to meet program goals for repair time, and they are years away from having sufficient capacity to achieve these goals. F-35 officials stated that mitigation plans are in place to accelerate component repair depot repair capacity. The officials said that this is imperative because an unintended consequence of delayed depot activation is the procurement of more spares to make up for the lack of components in repair coming back into the supply system for the warfighter.

In addition, in April 2019, we reported on the F-35 supply chain and its associated challenges.[6] For example, we recommended that DOD clearly define the strategy by which DOD will manage the F-35 supply chain in the future and update key strategy documents accordingly to include any additional actions and investments necessary to support that strategy. In October 2021, DOD published a business case analysis that assessed its supply chain strategy, but has not updated its strategy. Implementing this recommendation would allow DOD to provide better supply support for the F-35.

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[1]GAO, *F-35 Sustainment: DOD Needs to Cut Billions in Estimated Cost to Achieve Affordability*, GAO-21-439 (Washington D.C.: July 7, 2021).
[2]GAO, *F-35 Sustainment: DOD Faces Several Uncertainties and Has Not Met Key Objectives*, GAO-22-105995 (Washington D.C.: April 28, 2022).
[3]GAO, *F-35 Aircraft: DOD Should Assess and Update Its Engine Sustainment Strategy to Support Desired Outcomes*, GAO-22-104678 (Washington D.C.: July 19, 2022).
[4]GAO-21-439.
[5]Director, Operational Test & Evaluation, *FY 2021 Annual Report* (January 2022).
[6]GAO, *F-35 Aircraft Sustainment: DOD Needs to Address Substantial Supply Chain Challenges*, GAO-19-321 (Washington, D.C.: Apr. 25, 2019).

Implementing actions to mitigate supply and maintenance risks in an era of rising costs and constrained budgets will be imperative to ensure the DOD can afford to sustain its planned F-35 program. In July 2021, we reported that the estimated total sustainment costs in 2020 for the F-35's 66-year life cycle had risen to nearly $1.3 trillion dollars.[7] The estimated life cycle costs for maintenance and sustaining support in 2020 had increased 15.7 percent and 61.3 percent since 2018. As the number of F-35 aircraft in the U.S. fleet grows, so too will the need to sustain them over time.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate. In addition, F-35 program officials stated the following:

- The 28.3 percent increase in the department's F-35 total operating and support costs from 2019 to 2020 for was due to increasing fleet size—25.1 percent increase in the number of aircraft—and operations—a 31.3 percent increase in flying hours for the F-35.
- F-35 engine unscheduled maintenance issues have generally been mitigated, and no longer pose the sustainment risk projected. According to F-35 program officials, engine power module backorders have been cut by over 50 percent by (1) accelerating depot repair capacity at Oklahoma City Air Logistics Complex, (2) adding capacity in F-35 partner countries to repair engines, and (3) reducing unscheduled demands for engine maintenance. Additionally, program officials stated that from June 2021 to June 2022 the rate of not mission capable due to supply associated with the engine decreased 2 percent even as fleet size grew by 20 percent. According to F-35 program officials, the focus now shifts to ensuring that there is sufficient capacity to conduct scheduled engine maintenance overhauls. DOD has added capacity to prepare for overhauls and has identified risks that need to be mitigated to prepare for scheduled depot repair capacity, according to program officials. Program officials also stated that they are focused on reducing the costs associated with these scheduled engine maintenance overhauls.
- The health of the supply chain is predicated on the velocity of the repair network. According to program officials, as of June 2022, 39 of 68 depot repair workloads have been activated at military service depots, with 13 additional workloads planned to be activated by the end of 2022. According to program officials, COVID-19 and funding priorities have delayed remaining activations.

[7]GAO-21-439.

AV-8B
Harrier II

Program Essentials

Lead Service
Marine Corps

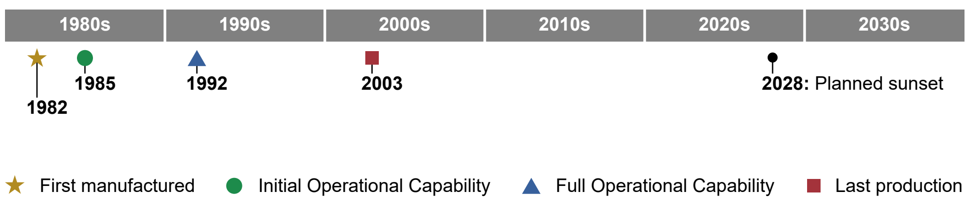
Manufacturer
McDonnell Douglas, British Aerospace, Boeing, BAE Systems

Program Office
Program Manager – Air 257, Naval Air System Command
Patuxent River, Maryland

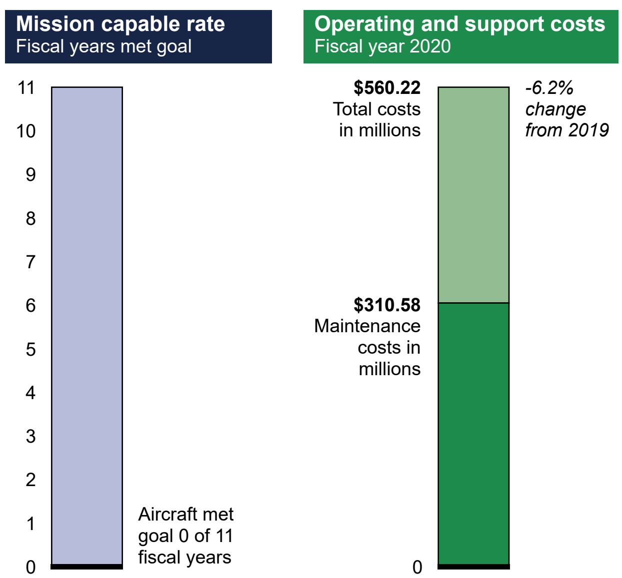
Sustainment
The Navy's Fleet Readiness Centers East and Southwest perform depot maintenance. Marine Corps and contractor personnel perform field maintenance, according to program officials.

The AV-8B is a vertical/short take-off and landing attack aircraft that conducts close-air support, intermediate range intercept, and attack missions. It can deploy from aircraft carriers and other suitable seagoing platforms, as well as forward operating bases and remote landing sites.

AV-8B Life Cycle Timeline



AV-8B Sustainment Status



Aircraft

77 total aircraft
Fiscal year 2020

24.5 years
Average aircraft age in fiscal year 2021

Flying hours

14,354 flying hours
Fiscal year 2020

4,934 hours
Average lifetime flying hours per aircraft in fiscal year 2021

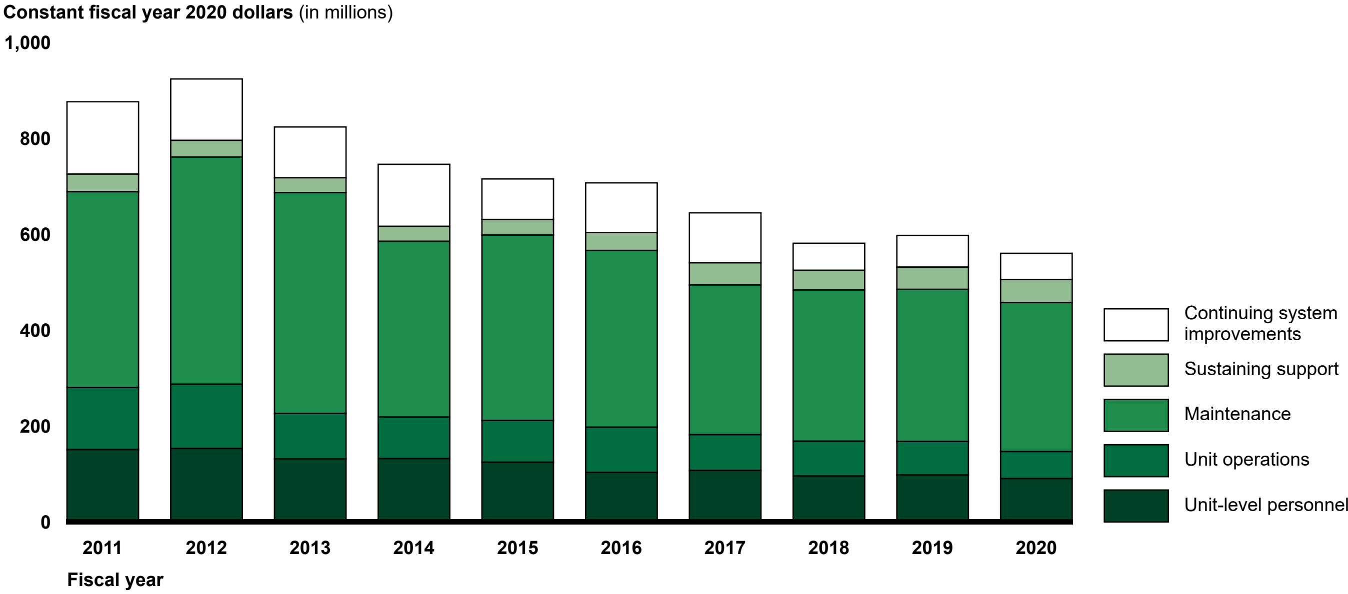
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$7.28 million
Total costs per aircraft

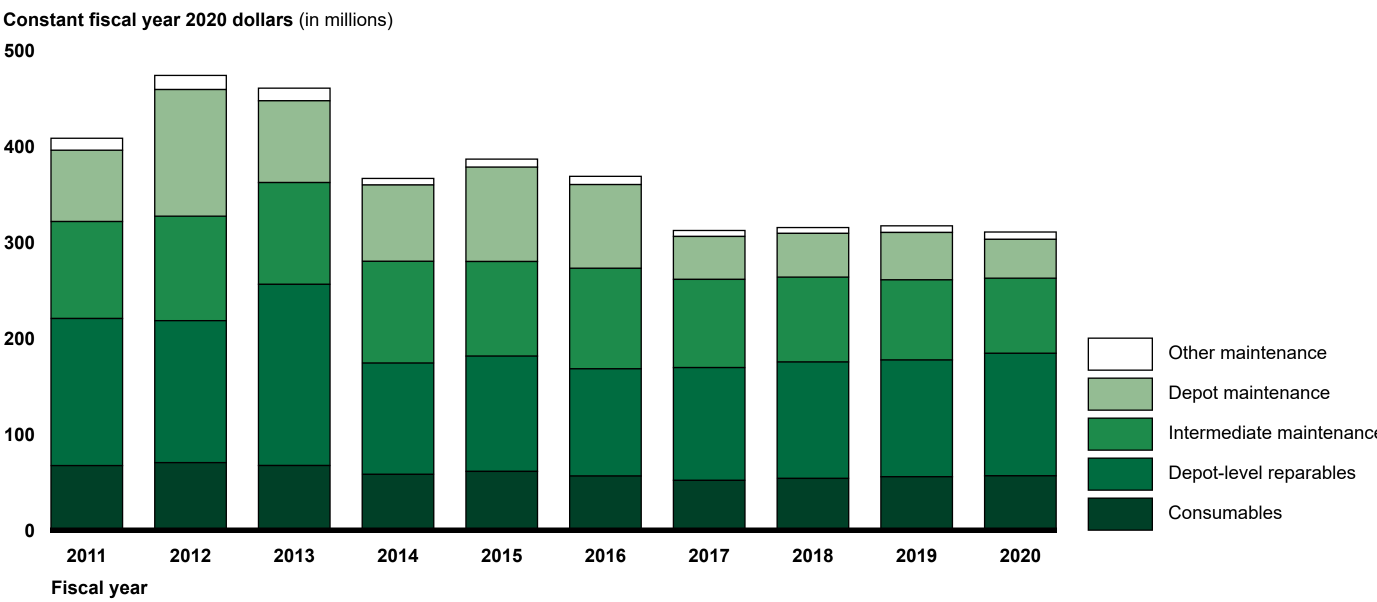
$39,029
Total costs per flying hour
+32.8% change from 2019

Operating and Support Costs

AV-8B Total Operating and Support Costs

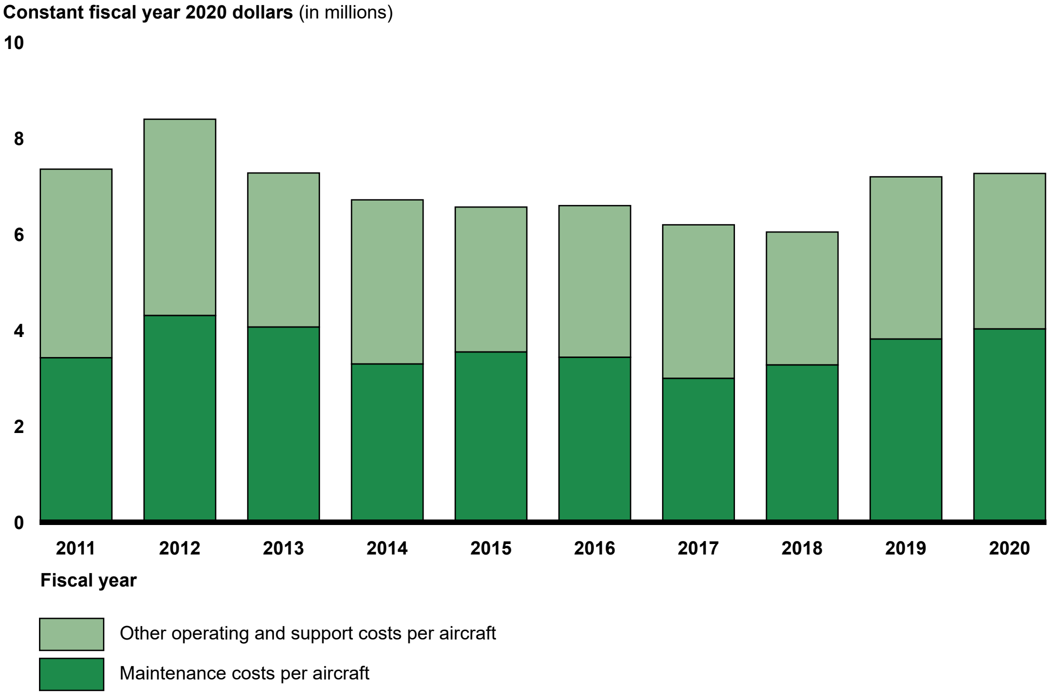


AV-8B Maintenance Costs

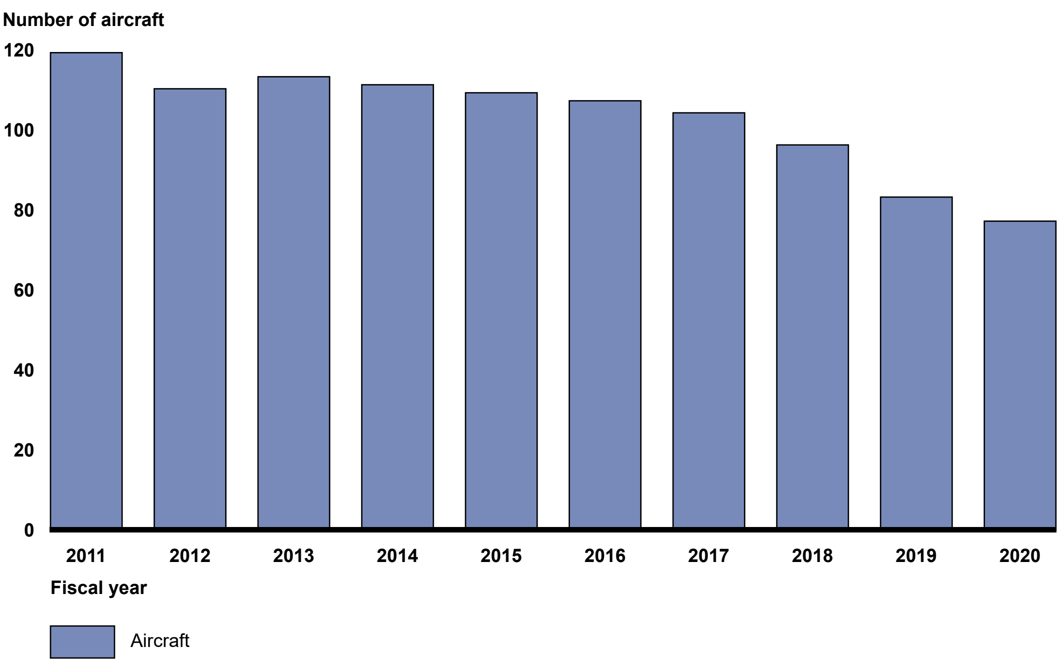


Operating and Support Costs per Aircraft

AV-8B Operating and Support Costs per Aircraft

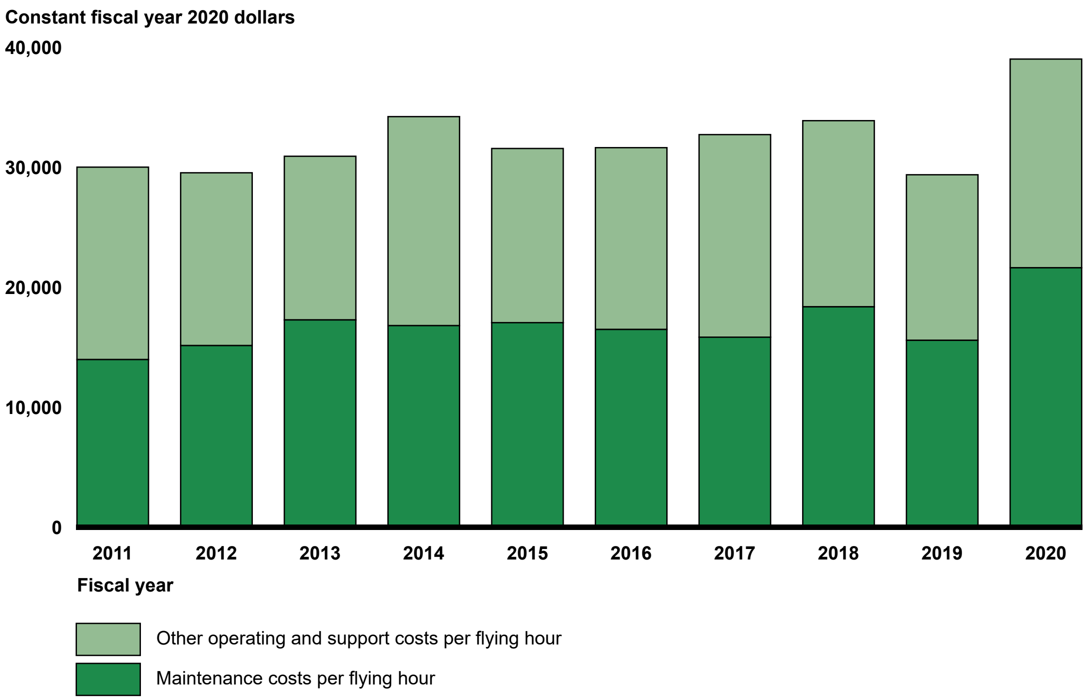


AV-8B Fleet Size

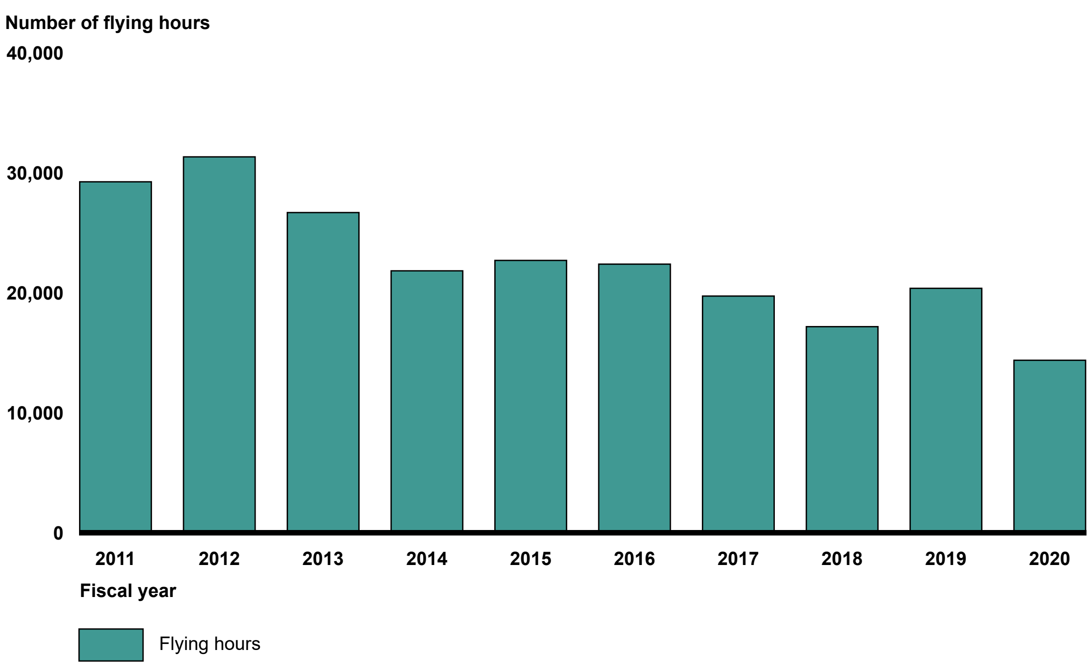


Operating and Support Costs per Flying Hour

AV-8B Operating and Support Costs per Flying Hour



AV-8B Flying Hours



Sustainment Strategy, Challenges, and Mitigation Actions

According to officials, the Navy's Fleet Readiness Center East in North Carolina and Fleet Readiness Center Southwest in California perform AV-8B depot maintenance. Officials stated that Marine Corps and Vertex contractor personnel perform field maintenance. The Naval Supply Systems Command and the Defense Logistics Agency provide supply support for the aircraft. Boeing, Vertex and BAE Systems provide support services for sustaining the aircraft.

AV-8B Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Aging: The AV-8B was originally expected to remain in service through 2015, according to the 2016 AV-8B Logistics Program Plan. However, the Marine Corps plans to keep the AV-8B in service through 2028, according to program officials. Many AV-8B aircraft have been operating beyond the planned service life of 6,000 flight hours, but program officials stated that assessments by the Marine Corps have determined that the aircraft remain operable. The officials said that the Marine Corps has several ongoing actions to keep the AV-8B fleet in service until it is replaced by the F-35B Joint Strike Fighter. These efforts include:

- upgrading engine components,
- retiring aircraft with the most maintenance issues, and
- reassessing the life expenditure model, based on actual flight profiles, to ensure that the aircraft can continue to meet Marine Corps mission needs.

Maintenance: The AV-8B program experienced challenges such as unplanned maintenance and repairs due to the system's aging airframe, longer maintenance times, and vulnerability to foreign-object damage due to the aircraft's design and its operating locations, according to program officials. The officials said that mitigation actions included:

- identifying all parts and components that need to be repaired and replaced during the inspection phase,
- keeping up with maintenance schedules,
- conducting analyses on major components and upgrading them as needed, and
- increasing the awareness of maintainers and other personnel of how to mitigate foreign-object damage.

Program officials also noted that depot, contractor, and field maintainers continued to coordinate efforts at the Fleet Readiness Centers to reduce the time needed for disassembly and reassembly processes to reduce maintenance backlogs.

Further, officials said that the program had experienced a shortage of AV-8B-trained maintainers because of the personnel reductions made to support an earlier F-35 transition and sunset date. To mitigate these shortages, program officials stated that a contract was awarded in July 2020 to provide additional organizational-level maintenance personnel to the fleet.

Supply Support: The AV-8B program has experienced parts shortages and delays. Program officials stated that fewer original equipment manufacturers—and other commercial sources of depot repair—produce, test, and repair the aircraft's components as the AV-8B gets closer to its projected sunset date. Many of them stopped providing this support due to low demand or because the required support equipment was no longer available or serviceable due to obsolescence, according to program officials. To mitigate these parts shortages, program officials said that they are developing additional vendor sources and removing parts from damaged or retired aircraft for use on operating aircraft. Further, the officials stated that the program office works with its supply partners to identify and address potential issues, such as parts and support equipment obsolescence.

The program also developed a tool in 2016 to analyze supply data—such as back orders and single source contracts—from multiple sources and significantly expanded the tool's capability in 2020, according to program officials. They said that this tool has helped the program to identify potential parts shortages and delays that can be addressed in advance and provides monthly forecasts of items that should be ordered, based on demand, to mitigate the problems before they occur.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

A-10
Thunderbolt II

Program Essentials

Lead Service
Air Force

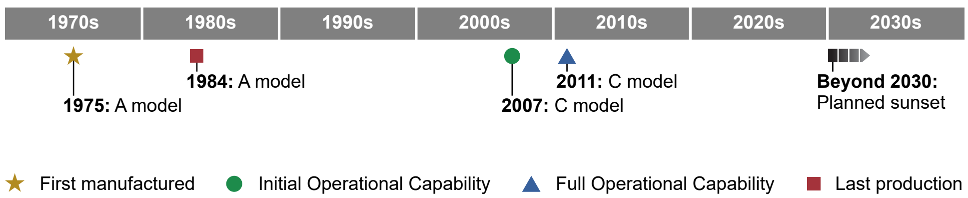
Manufacturer
Fairchild Republic Company

Program Office
Hill Air Force Base, Utah

Sustainment
The Air Force and an overseas contractor provide depot maintenance.

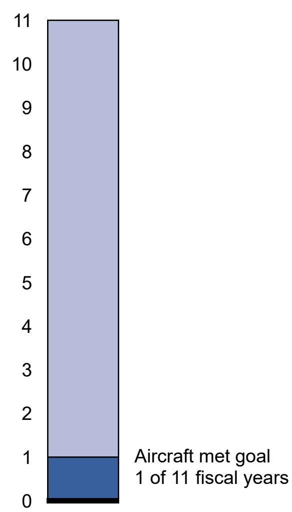
The A-10 Thunderbolt II is a twin-engine jet aircraft specifically designed for close-air support of ground forces. The aircraft can be used against light maritime attack aircraft and all ground targets, including tanks and other armored vehicles.

A-10 Life Cycle Timeline

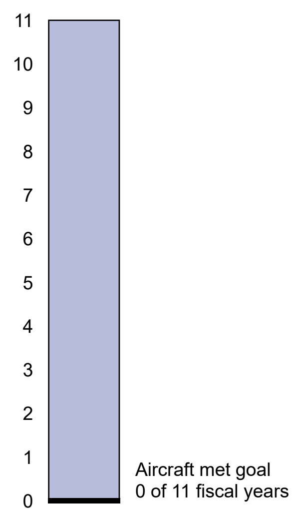


A-10 Sustainment Status

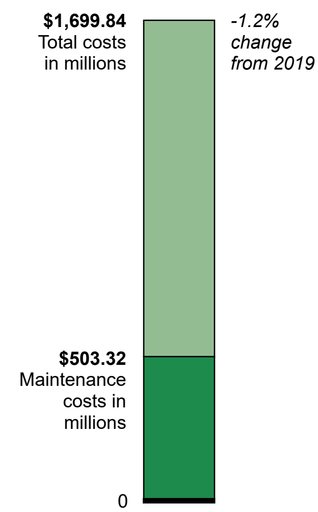
Aircraft availability rate
Fiscal years met goal



Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

281 total aircraft
Fiscal year 2020

40.4 years
Average aircraft age in fiscal year 2021

Flying hours

75,443 flying hours
Fiscal year 2020

12,213 hours
Average lifetime flying hours per aircraft in fiscal year 2021

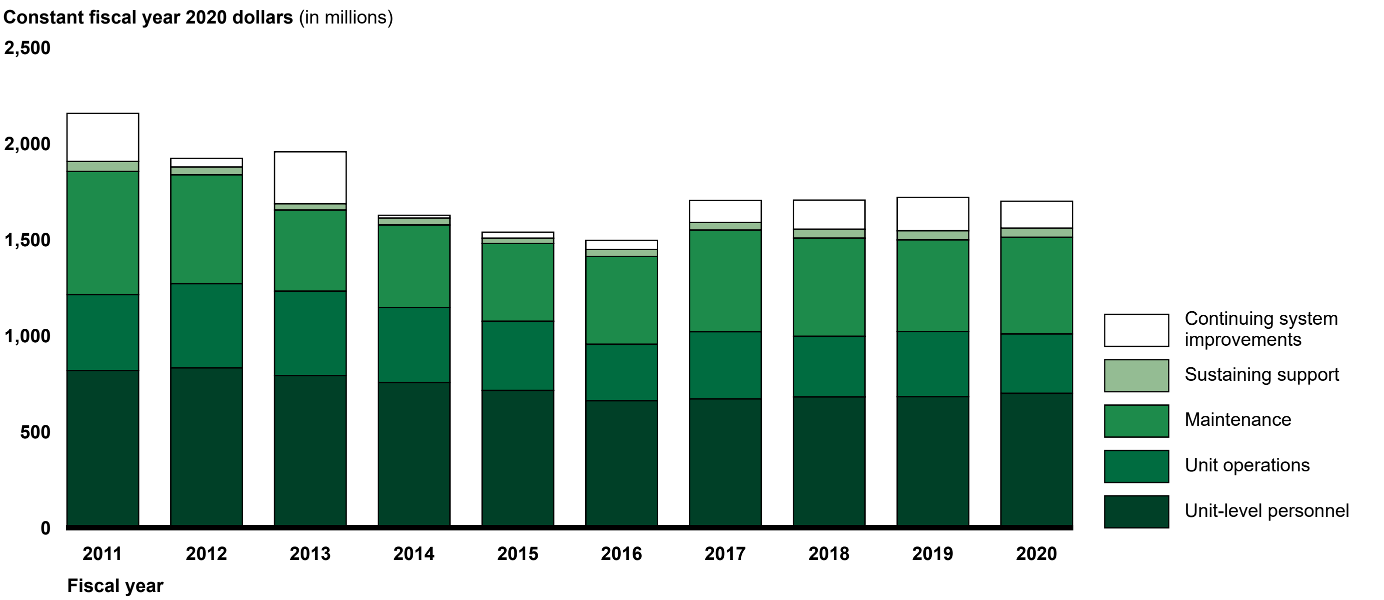
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$6.05 million
Total costs per aircraft

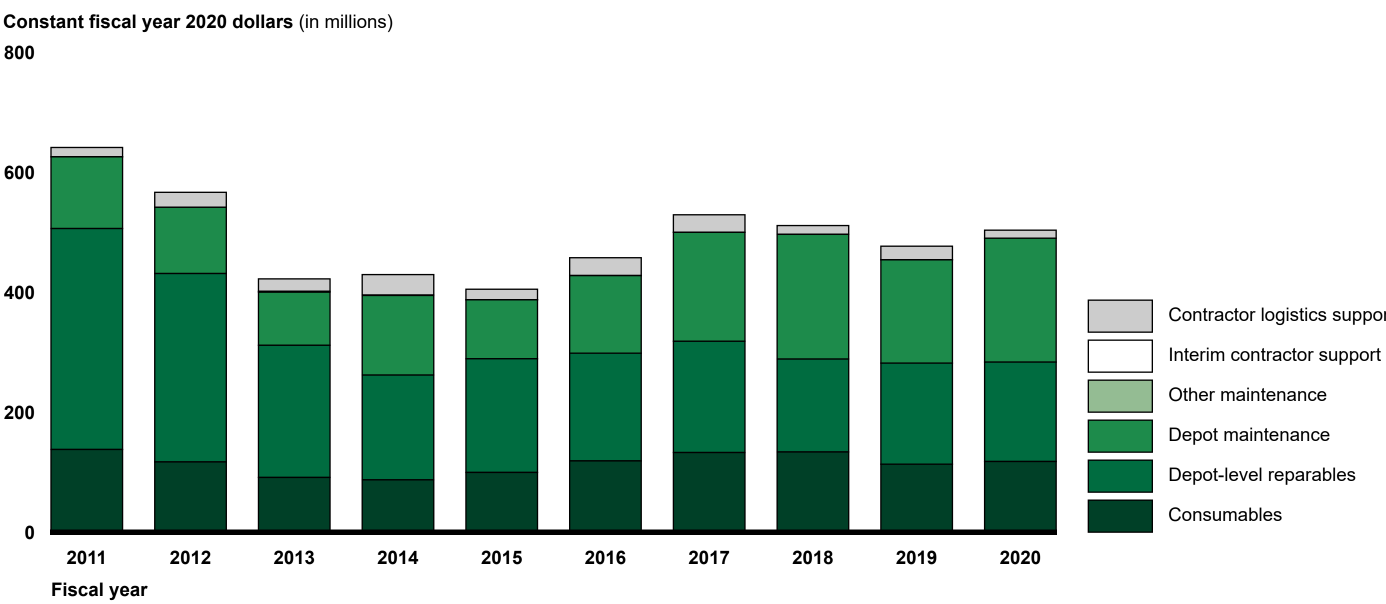
$22,531
Total costs per flying hour
+4.5% change from 2019

Operating and Support Costs

A-10 Total Operating and Support Costs

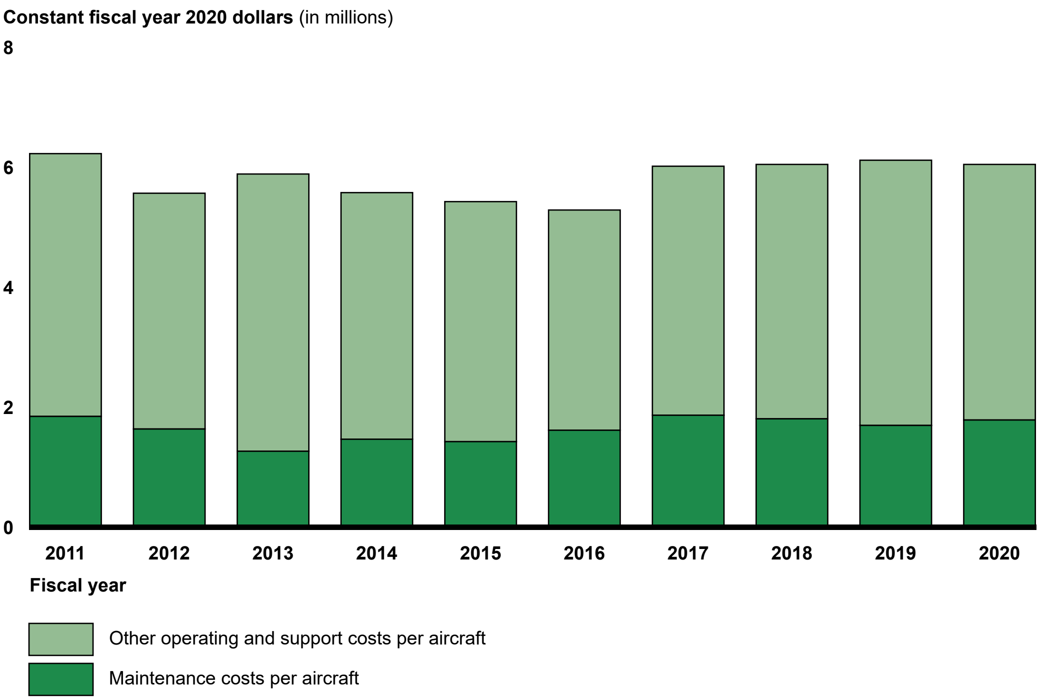


A-10 Maintenance Costs

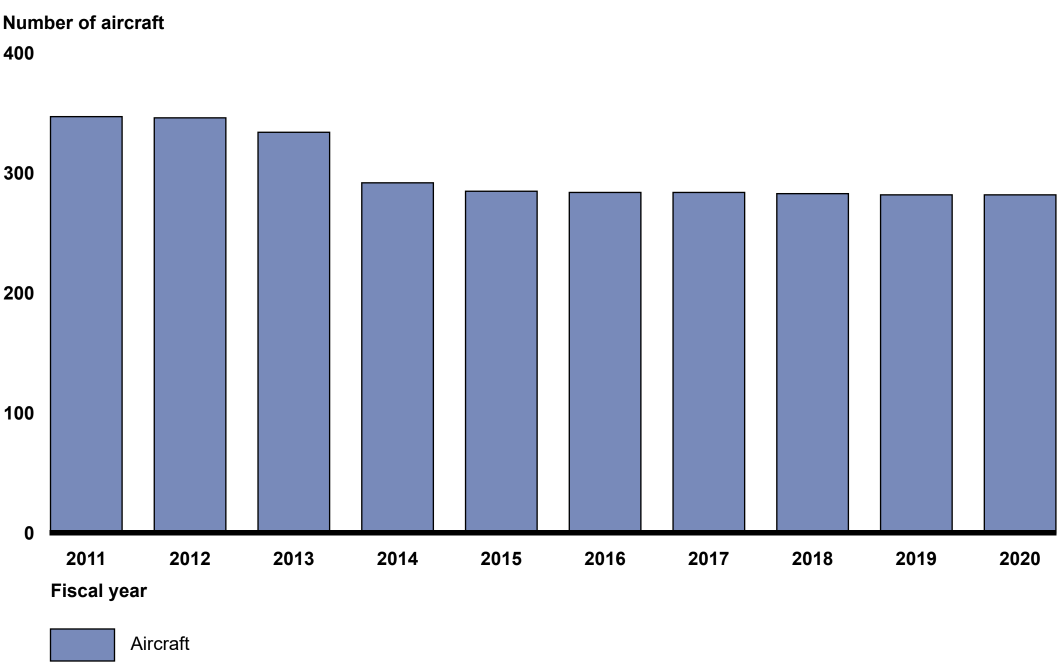


Operating and Support Costs per Aircraft

A-10 Operating and Support Costs per Aircraft

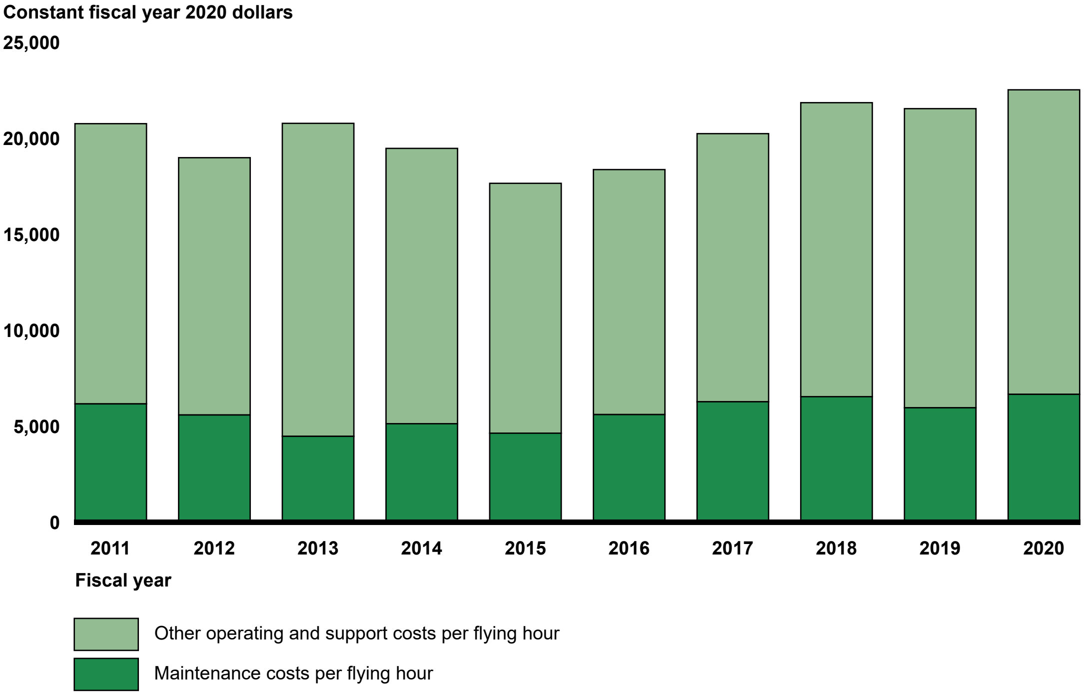


A-10 Fleet Size

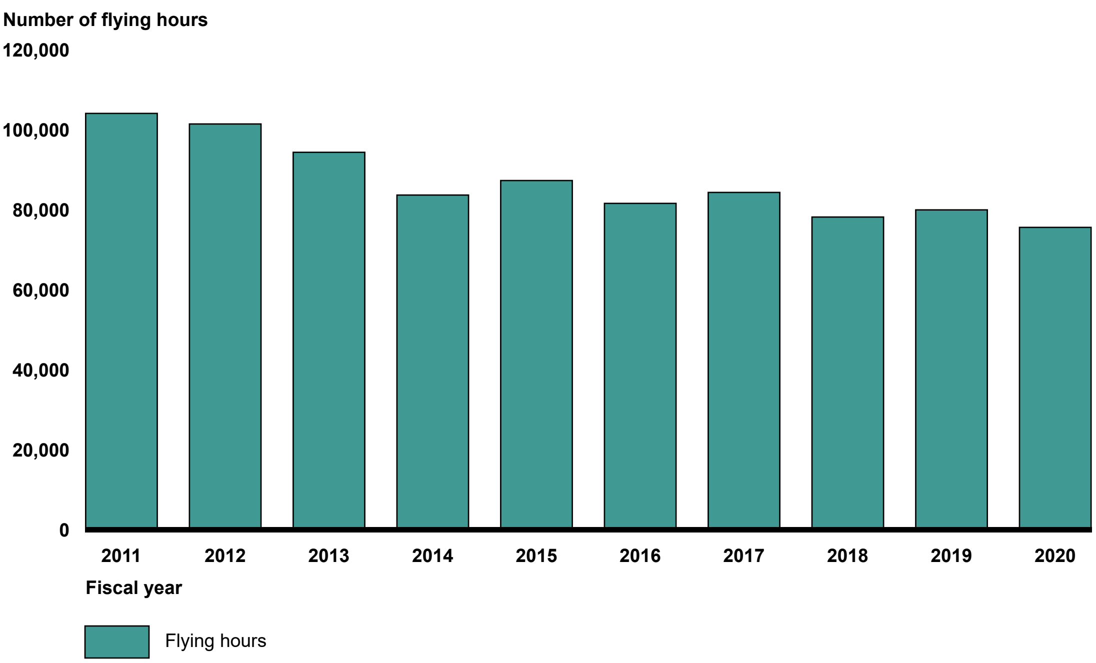


Operating and Support Costs per Flying Hour

A-10 Operating and Support Costs per Flying Hour



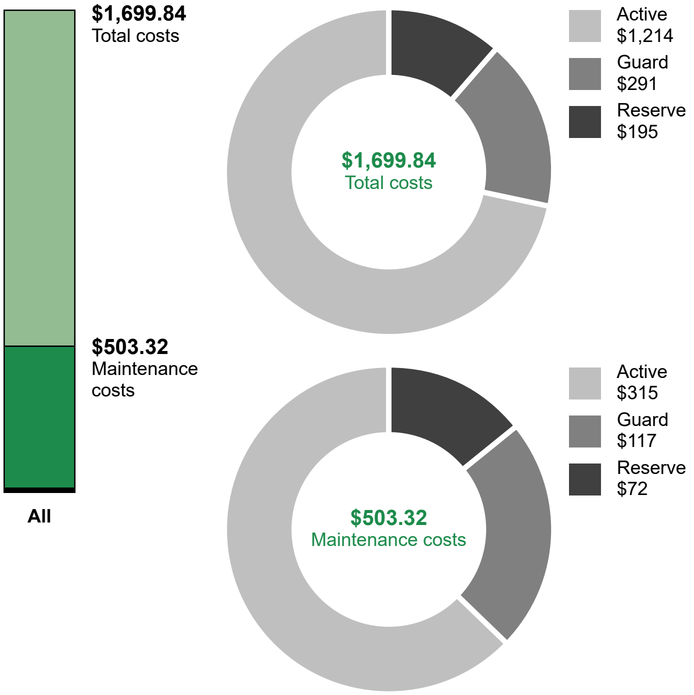
A-10 Flying Hours



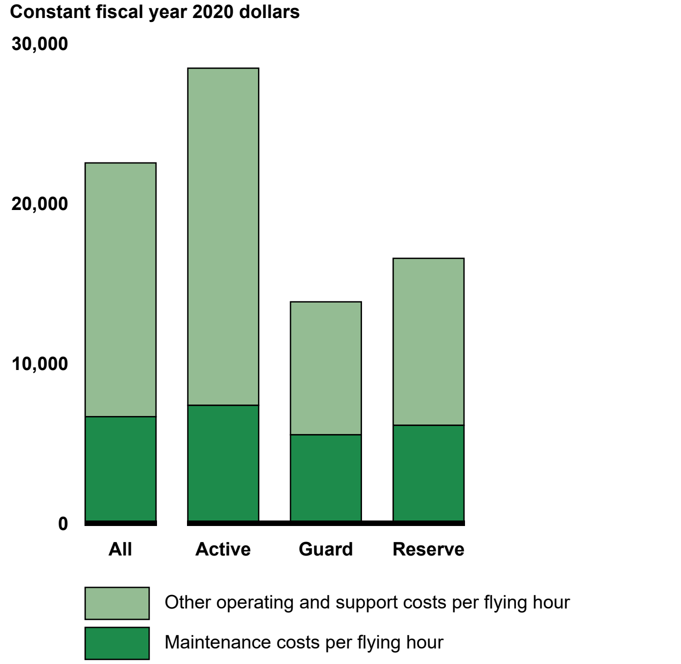
Component-Level Operating and Support Costs

A-10 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

With one exception, the Air Force performs the depot maintenance of the A-10 air vehicle and engine at the Ogden Air Logistics Complex, the Oklahoma City Air Logistics Complex, Warner Robins Air Logistics Complex, and the Aerospace Maintenance and Regeneration Group. Those A-10s operated by Pacific Air Forces receive programmed depot maintenance and modifications from Korean Air Lines.

A-10 Sustainment Challenges

Aging Aircraft
- Delays in acquiring replacement aircraft
- Service life extension
- Unexpected replacement of parts and repairs

Maintenance
- Access to technical data
- Delays in depot maintenance
- Shortage of trained maintenance personnel
- Unscheduled maintenance

Supply Support
- Diminishing manufacturing source
- Parts obsolescence
- Parts shortage and delay

Aging: According to Air Force officials, most aging-related challenges facing the A-10 involve the aircraft's structure, including the wings, fuselage, nacelles (i.e., streamlined housing or tank for something on the outside of an aircraft that houses a part, such as the engine) and flight controls.

Mitigation plans for aging challenges include:

- the purchase of new A-10 wings to address economic repair and service-life requirements (deliveries expected to start in 2022);
- completion of permanent fuselage repairs during programmed depot maintenance to reach warfighter service-life targets;
- a multiyear effort to improve nacelle availability through increased numbers of overhauls and procurement of new assets; and
- the redesign of critical components like the Central Interface Control Unit—which integrates aircraft functions and capabilities—to improve reliability.

Maintenance: According to program officials, A-10 maintenance challenges are often tied to aging, supply support, and related issues that typically manifest themselves in greater investments of time and resources to complete critical tasks, such as phase inspections and gun and engine maintenance.

In addition to delays resulting from increased amounts of unplanned repairs and from parts shortfalls, program officials stated that the A-10's maintenance delays at Ogden Air Logistics Complex were due to shortages of trained maintenance personnel and reduced overtime related to COVID-19. The maintenance delays persisted in fiscal year 2021 due to a shortage of nacelles, and delays were expected to continue into fiscal year 2022.

To mitigate these delays, program officials stated that they have attempted to safely and cost-effectively expand the A-10's programmed depot maintenance intervals. On average, program officials reported that these efforts have increased the time between programmed depot maintenance inductions by 750 hours per aircraft, a 38-percent increase over the 2,000-hour programmed depot-maintenance interval.

Additionally, program officials said a reliability-centered maintenance program begun in fiscal year 2017 has increased the number of hours between inspections from 500 to 600 hours. The A-10 program office has also partnered with the Air Combat Command and begun implementation of Condition Based Maintenance Plus, a DOD initiative to more accurately forecast maintenance needs.

Supply Support: A-10 program officials stated that supply support has been a challenge. In particular, the A-10 has experienced issues associated with diminishing manufacturing sources, raw material availability, reliability degradation of parts, and unforeseen, one-off issues related to a particular part. For example, the Defense Logistics Agency has had difficulty when seeking qualified suppliers to meet A-10 parts needs. Program officials indicated that the uncertainty regarding A-10 divestiture, fleet size and increasingly outdated technology were drivers for the diminishing manufacturing sources.

The A-10 program office and its Air Force and Defense Logistics Agency supply chain partners have taken various actions to mitigate supply chain issues, including end-of-life buys, incentivized contracts, redesigns of existing parts, and the design and procurement of new parts that incorporate more modern components.

Program Office Comments

The program office reviewed a draft of this assessment and did not have any comments.

F-15C/D
Eagle

Program Essentials

Lead Service
Air Force

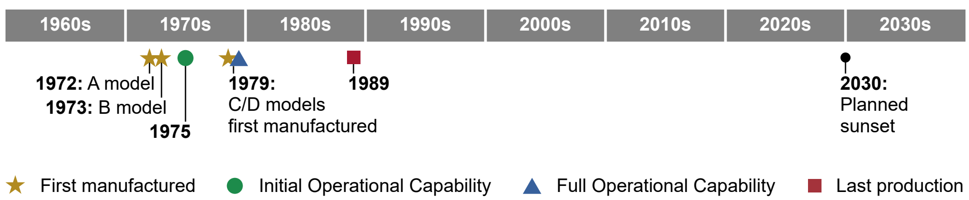
Manufacturer
McDonnell Douglas (acquired by Boeing)

Program Office
Robins Air Force Base, Georgia

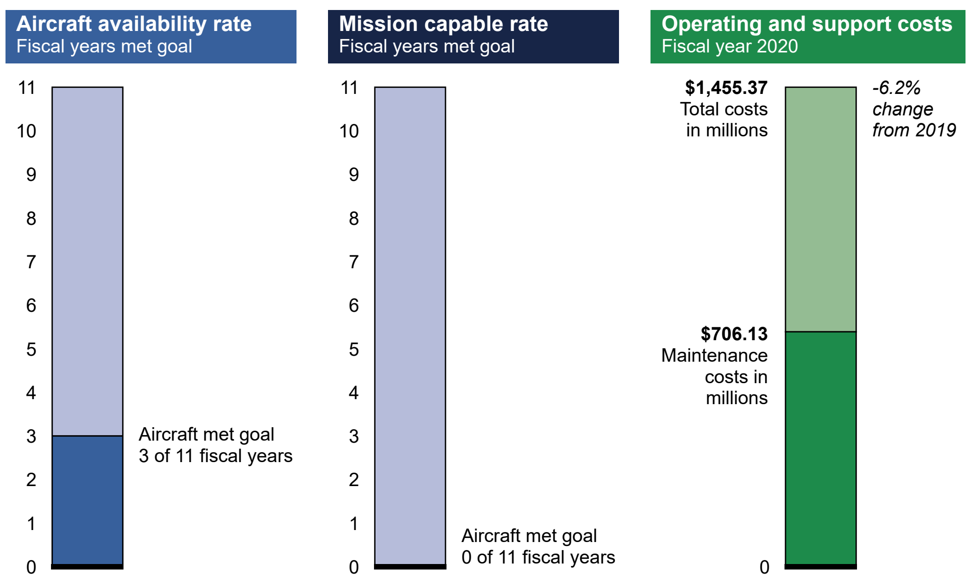
Sustainment
Programmed depot maintenance is performed at Warner Robins Air Logistics Complex and at a contractor's facility. Air Force personnel perform organizational maintenance.

The F-15C/D Eagles are single-seat (F-15C) and two-seat (F-15D) fighters designed to perform air-to-air combat missions. Electronic systems and weaponry gives the F-15C/D the capability to detect, acquire, track and attack enemy aircraft.

F-15C/D Life Cycle Timeline



F-15C/D Sustainment Status



Aircraft

234 total aircraft
Fiscal year 2020

37.2 years
Average aircraft age in fiscal year 2021

Flying hours

37,637 flying hours
Fiscal year 2020

8,699 hours
Average lifetime flying hours per aircraft in fiscal year 2021

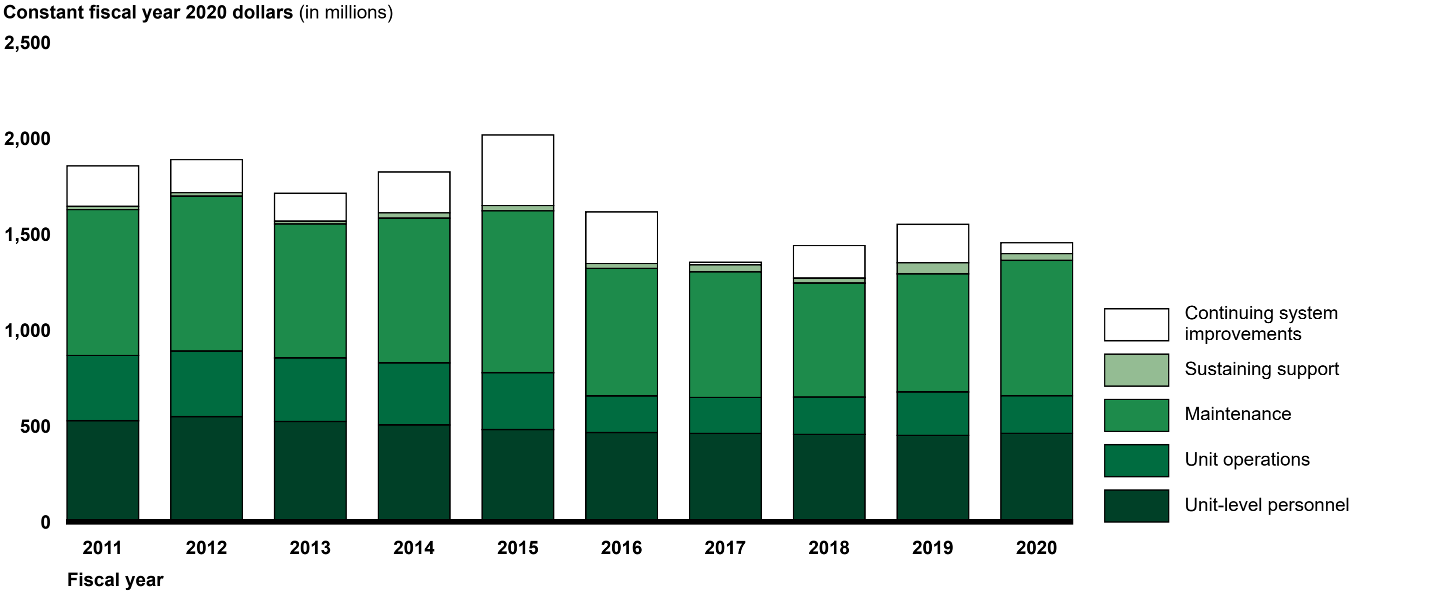
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$6.23 million
Total costs per aircraft

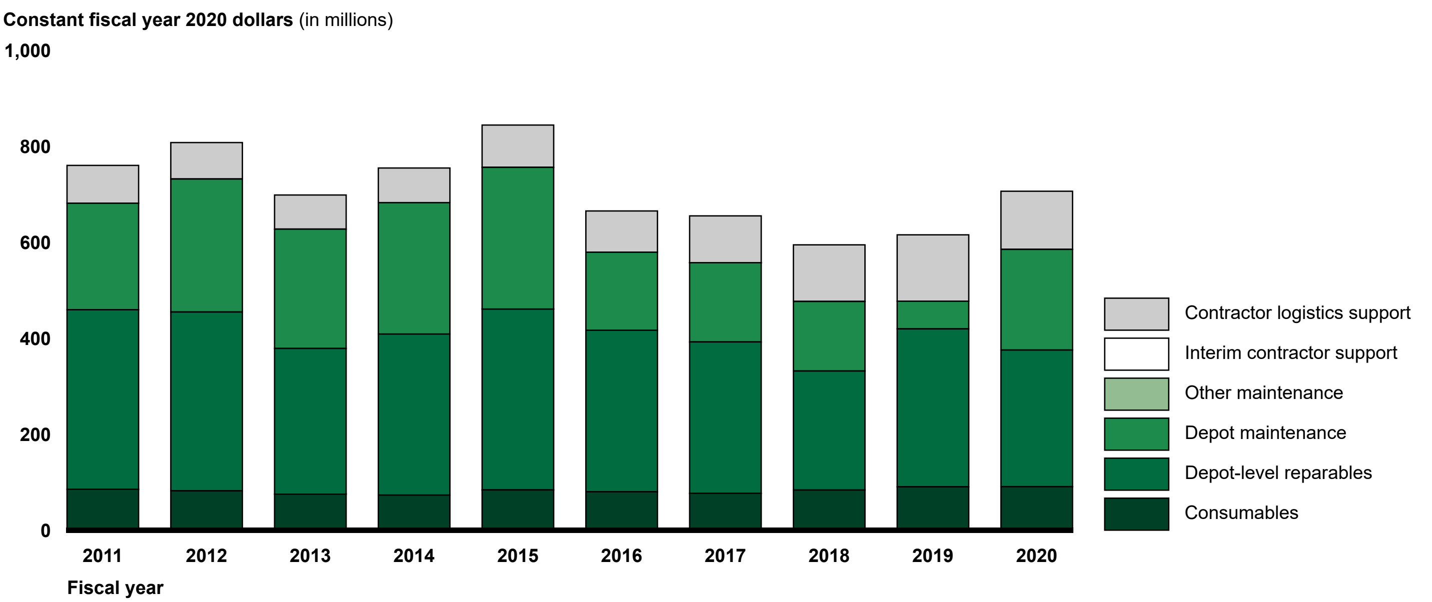
$38,668
Total costs per flying hour
+4.2% change from 2019

Operating and Support Costs

F-15C/D Total Operating and Support Costs

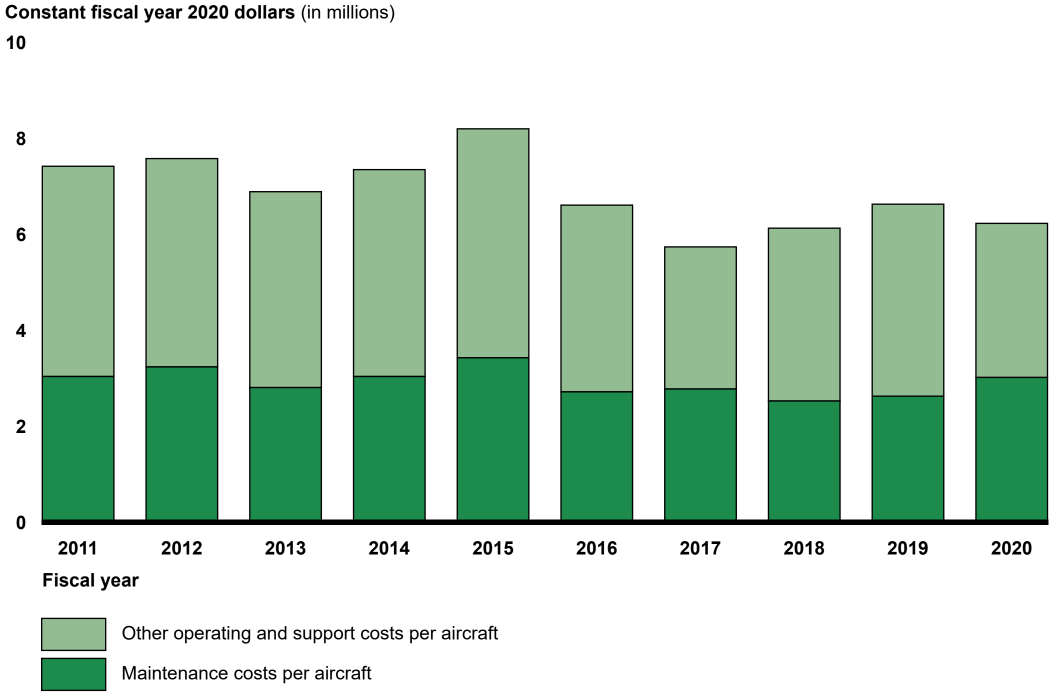


F-15C/D Maintenance Costs

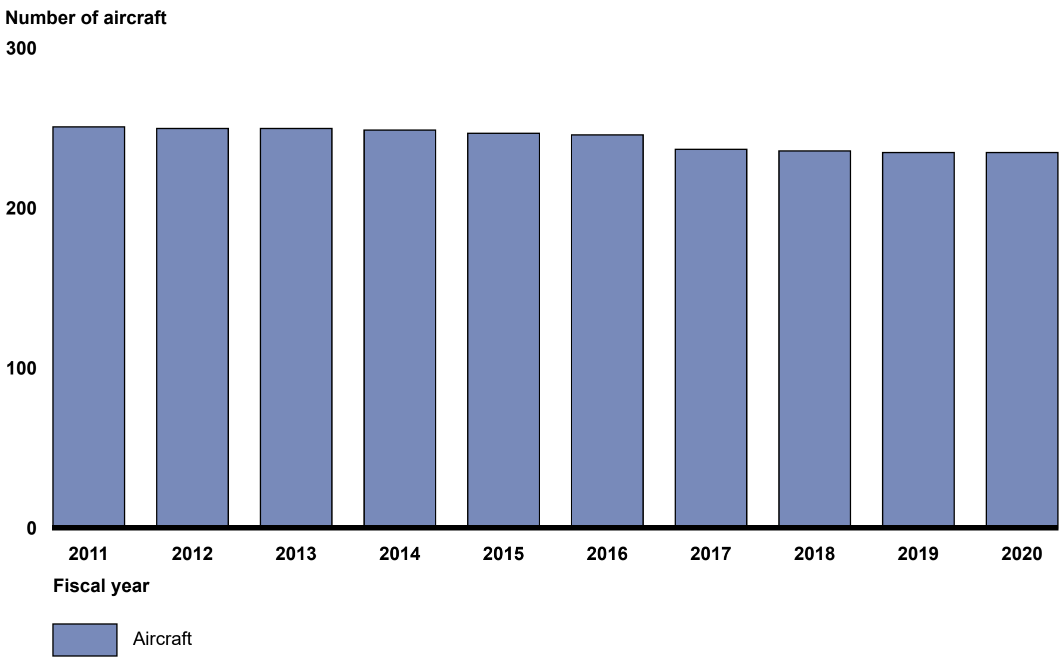


Operating and Support Costs per Aircraft

F-15C/D Operating and Support Costs per Aircraft

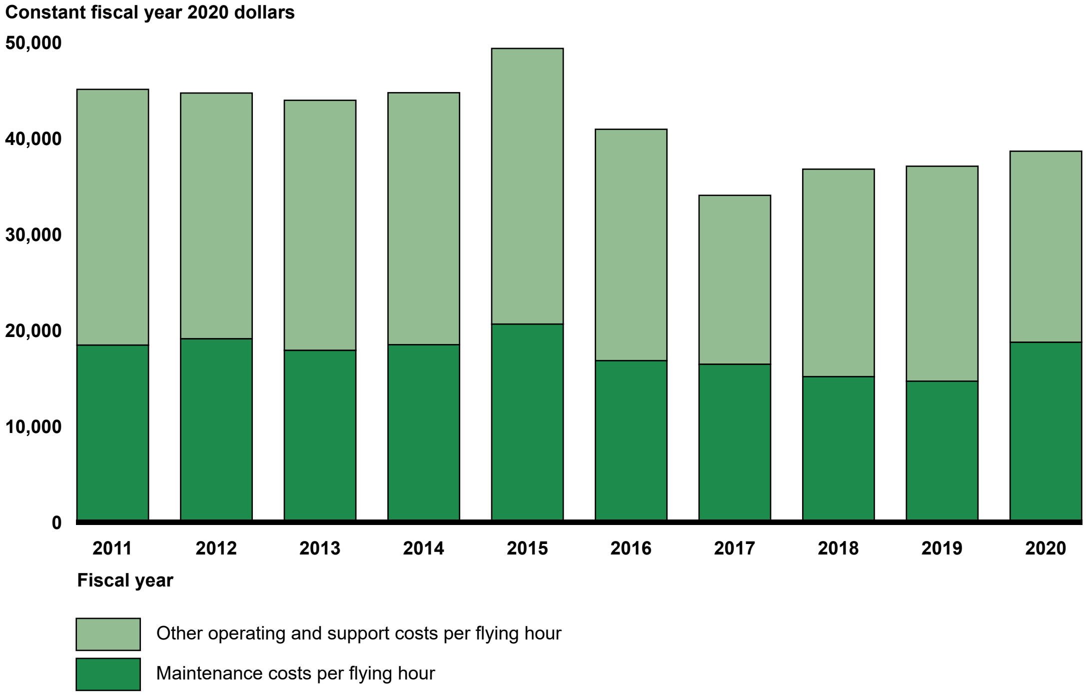


F-15C/D Fleet Size

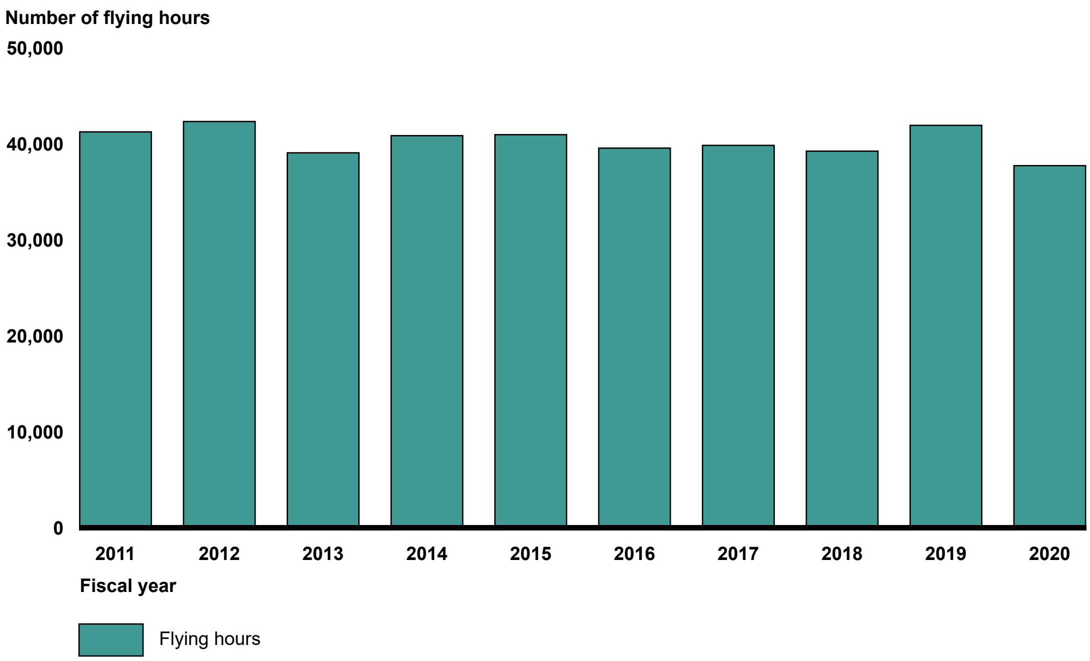


Operating and Support Costs per Flying Hour

F-15C/D Operating and Support Costs per Flying Hour



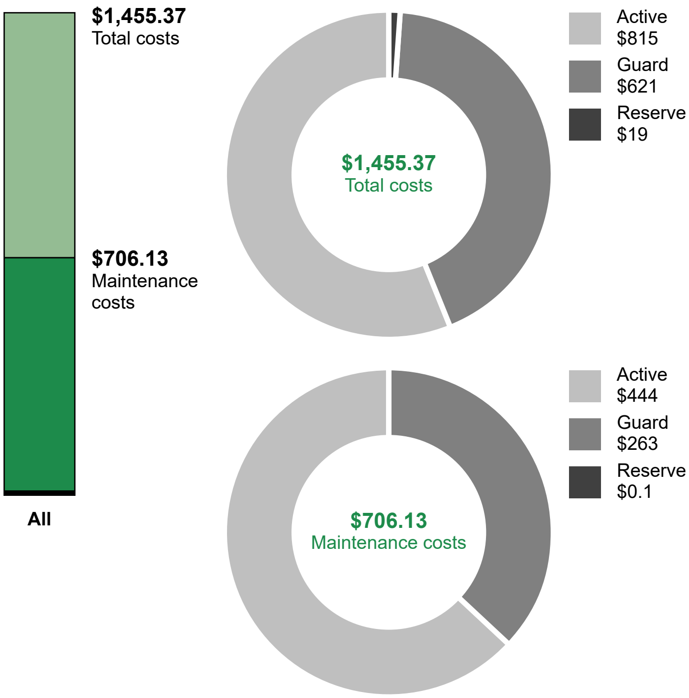
F-15C/D Flying Hours



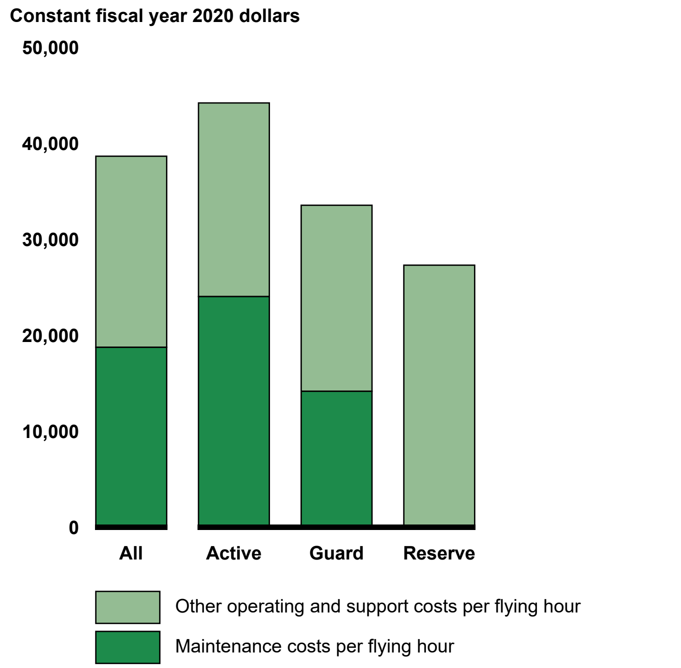
Component-Level Operating and Support Costs

F-15C/D Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Note: The F-15 C/D are operated by both the active and Air National Guard components, but the Reserve force also has minimal operating and support costs associated with program support.

Sustainment Strategy, Challenges, and Mitigation Actions

The Air Force's Warner Robins Air Logistics Complex in Georgia and Korean Air Lines in Kimhae, Korea perform programmed depot maintenance for the F-15C/D airframe. The three Air Force Air Logistics Complexes perform depot-level repair of F-15C/D components. Air Force personnel perform organizational maintenance. The Air Force Sustainment Center and the Defense Logistics Agency provide supply chain management. The F-15C/D/E Product Support Strategy is a two-fold effort to maintain the platform and to simultaneously modernize and expand its counter-air (air superiority) and counter-land (interdiction) capabilities.

F-15C/D Sustainment Challenges

Aging Aircraft

- Delays in acquiring replacement aircraft
- Service life extension
- Unexpected replacement of parts and repairs

Maintenance

- Access to technical data
- Delays in depot maintenance
- Shortage of trained maintenance personnel
- Unscheduled maintenance

Supply Support

- Diminishing manufacturing source
- Parts obsolescence
- Parts shortage and delay

Aging and Maintenance: The F-15C/D fleet is flying beyond its original service life. The program office has conducted full-scale fatigue testing to extend the service life of the fleet, according to program officials, and has started the process for the Air Force's approval of a service-life extension.

The program is facing delays in depot maintenance for a number a reasons, according to program officials. For example, they said:

- Parts shortages have caused delays in repairing stabilizer actuators (according to an Air Force official, the stabilizer actuator is located in the back of the jet and is a hydraulic driven motor that moves the horizontal stabilizer up and down);
- Lengthy structural inspections, which are associated with flying aircraft beyond the original certified service life, have caused depot maintenance to take longer than planned; and
- Additional modification programs, as part of the implementation of the program's overall modification strategy known as "the Convergence of Mods", and delays in receiving the parts kits needed to support the additional modifications, have also contributed to depot maintenance delays.

To mitigate these delays, the F-15's modification strategy purposefully combines the program's modernization schedule with the programmed depot maintenance cycle to minimize the downtime of the aircraft needed for both purposes, according to program officials.

Unscheduled maintenance is another sustainment challenge for the F-15C/D, according to program officials. They cited the aircraft fuselage problems driven by aircraft structure inspections, as well as high demands for flat panel indicators and engine-related anomalies.

The program also faces a shortage of skilled mechanics to repair altitude indicators and oxygen regulators, according to program officials.

Supply Support: Supply support challenges have also been an issue for the F-15C/D fleet due in part to decreasing supply sources for parts that rely on older technology, according to program officials. For example, the officials stated:

- Boeing is attempting to find a suitable supplier for a relay assembly that is obsolete and no longer available from the original supplier;
- The program office is working with private industry to develop a prototype of an alternative rudder actuator (according to an Air Force official, the rudder actuator provides the rotational movement to the rudder surfaces, provides directional control, and augments aircraft stability) to replace the current rudder actuator, which has consistently been a top driver of the F-15C/D and F-15E not mission capable supply rates; and
- The F-15C/D and F-15E Aircraft Availability Improvement Plan includes a funded initiative to improve the reliability of the stabilizer actuator, which has been the number two driver of the F-15C/D not mission capable supply rate due to shortages of certain repair parts.

Finally, program officials stated that another supply challenge for the F-15C/D is the number of unexpected parts replacements. The officials said that the program office is developing parts replacement programs for parts that were not originally expected to be replaced, such as the F-15C/D longerons (i.e., a longitudinal structural component of an aircraft's fuselage). Replacement of the longerons became necessary as a result of the testing that was done for the fleet's service life extension.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

F-15E
Strike Eagle

Program Essentials

Lead Service
Air Force

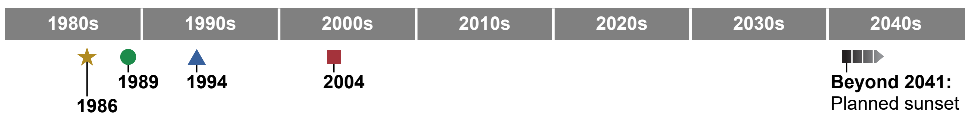
Manufacturer
Boeing

Program Office
Robins Air Force Base, Georgia

Sustainment
Programmed depot maintenance is conducted at the Warner Robins Air Logistics Complex. Air Force personnel perform field maintenance.

The F-15E Strike Eagle is a dual-role fighter designed to perform air-to-air and air-to-ground missions. It has the capability to fight its way to a target over long ranges, destroy enemy ground positions and fight its way out.

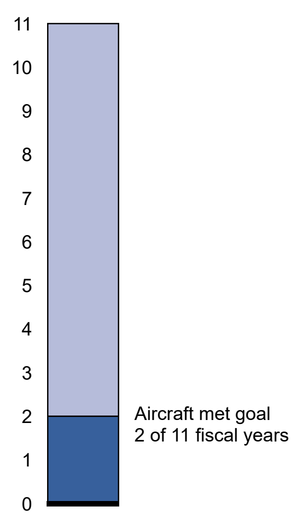
F-15E Life Cycle Timeline



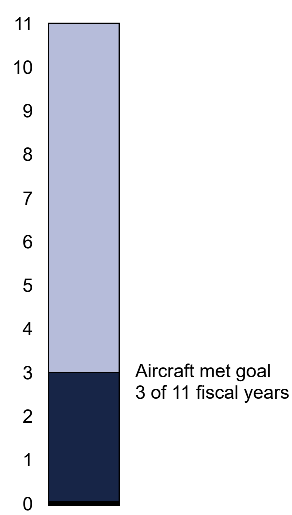
★ First manufactured ● Initial Operational Capability ▲ Full Operational Capability ■ Last production

F-15E Sustainment Status

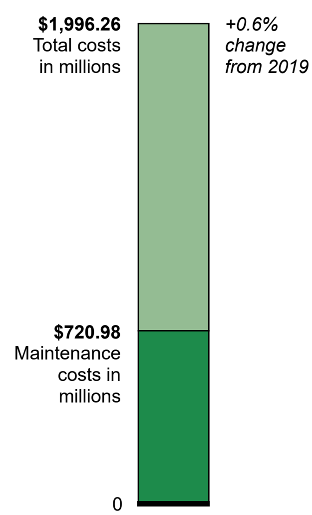
Aircraft availability rate
Fiscal years met goal



Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

218 total aircraft
Fiscal year 2020

29.5 years
Average aircraft age in fiscal year 2021

Flying hours

60,169 flying hours
Fiscal year 2020

8,344 hours
Average lifetime flying hours per aircraft in fiscal year 2021

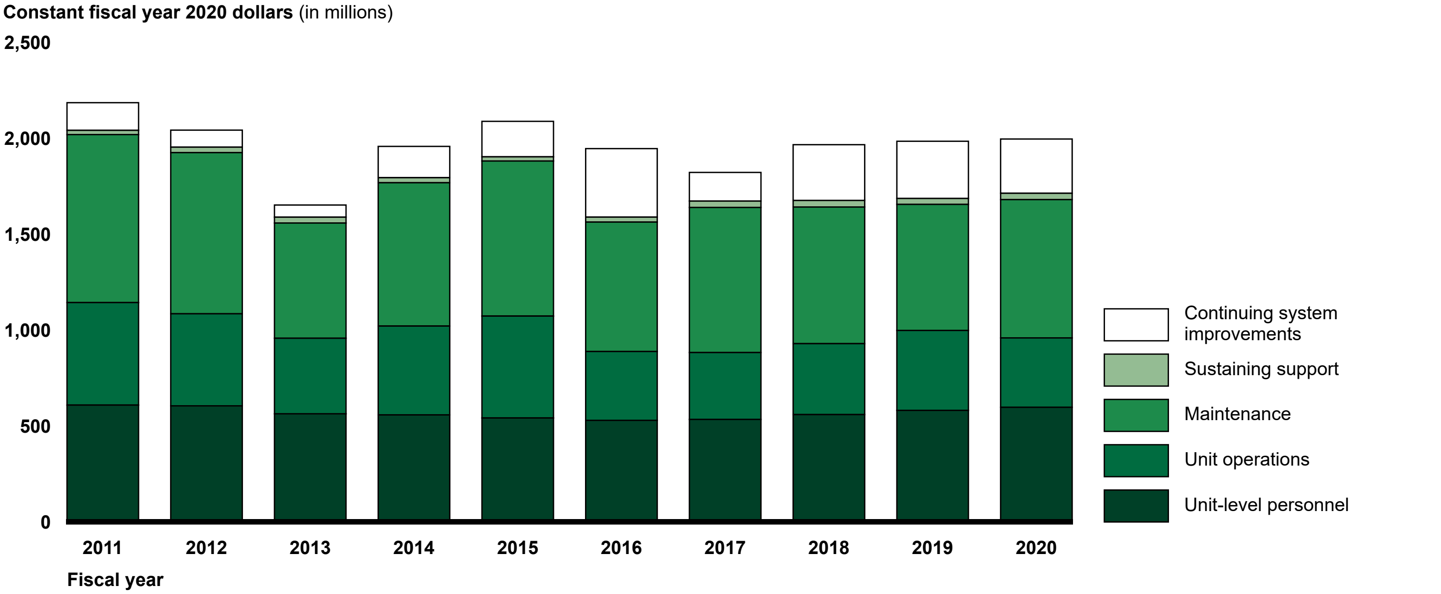
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$9.16 million
Total costs per aircraft

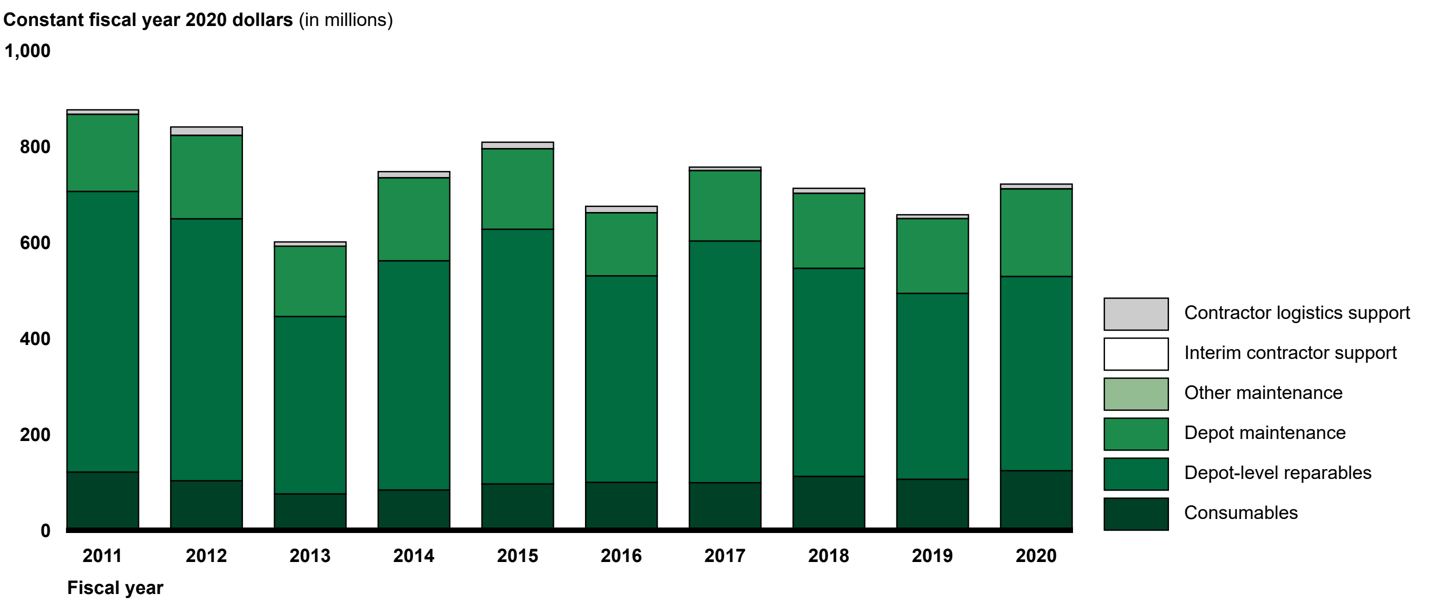
$33,177
Total costs per flying hour
+7.6% change from 2019

Operating and Support Costs

F-15E Total Operating and Support Costs

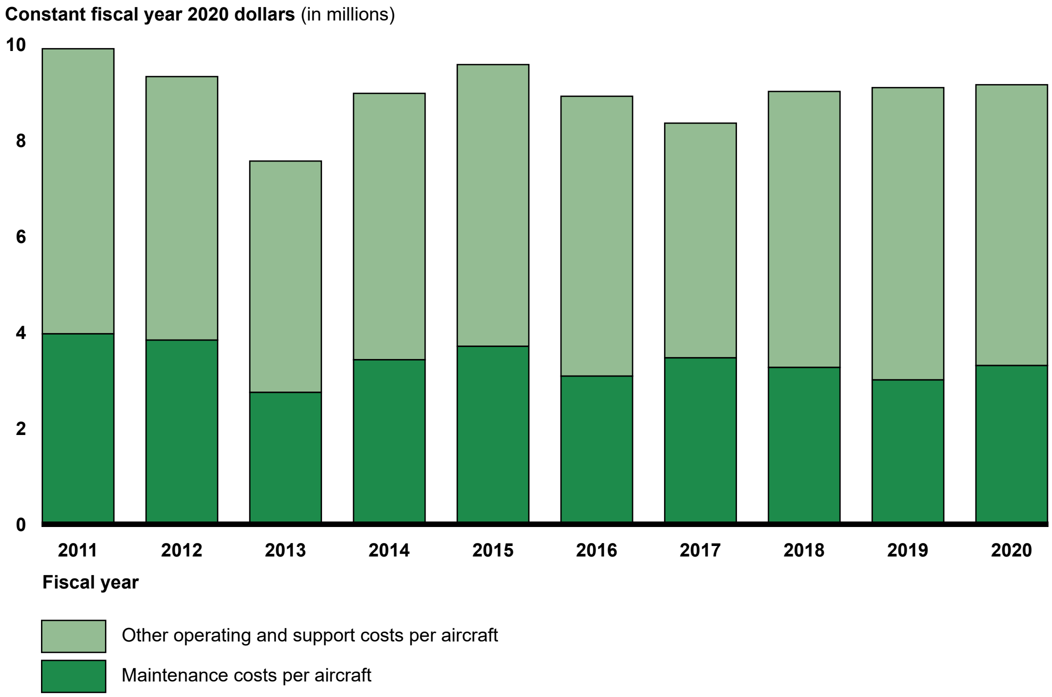


F-15E Maintenance Costs

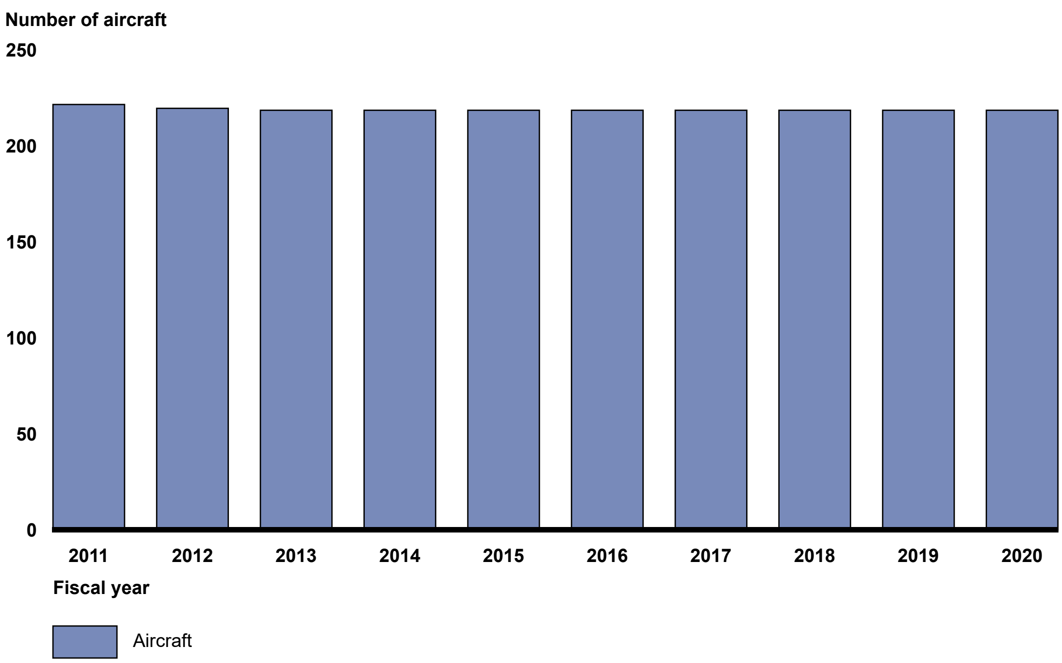


Operating and Support Costs per Aircraft

F-15E Operating and Support Costs per Aircraft

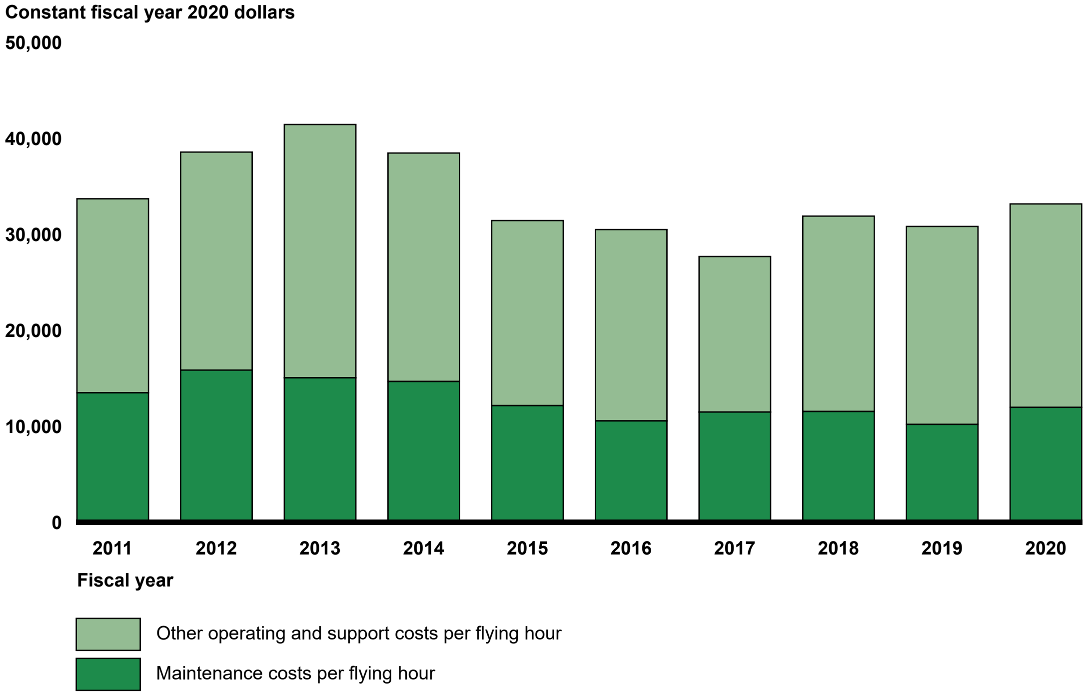


F-15E Fleet Size

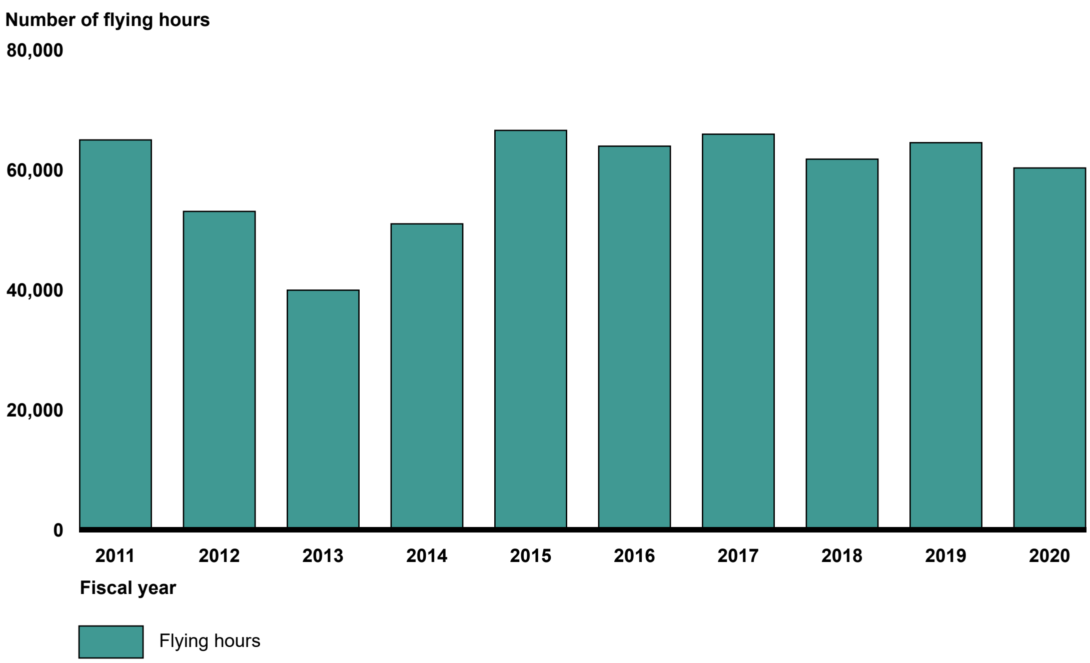


Operating and Support Costs per Flying Hour

F-15E Operating and Support Costs per Flying Hour



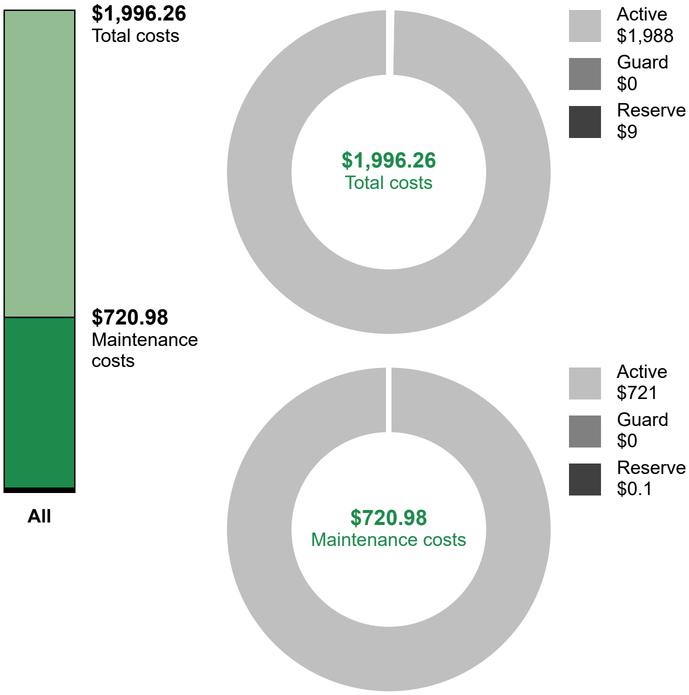
F-15E Flying Hours



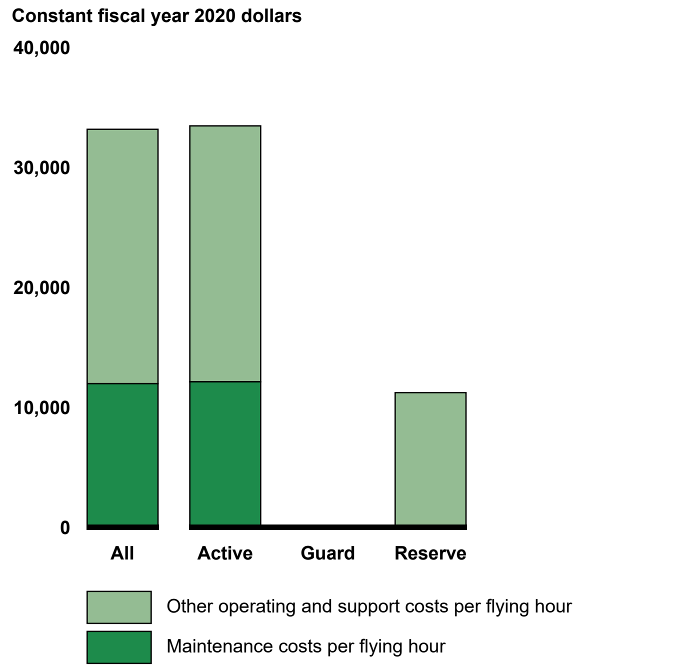
Component-Level Operating and Support Costs

F-15E Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

Programmed depot maintenance for the F-15E airframe is conducted at the Air Force's Warner Robins Air Logistics Complex in Georgia. The three Air Force Air Logistics Complexes provide depot-level repair of F-15E components. Air Force personnel perform organizational maintenance. The Air Force Sustainment Center and the Defense Logistics Agency provide supply chain management. The F-15 C/D/E Product Support Strategy is a two-fold effort to maintain the platform and to simultaneously modernize and expand its counter-air (air superiority) and counter-land (interdiction) capabilities.

F-15E Sustainment Challenges

Aging Aircraft
- Delays in acquiring replacement aircraft
- Service life extension
- Unexpected replacement of parts and repairs

Maintenance
- Access to technical data
- Delays in depot maintenance
- Shortage of trained maintenance personnel
- Unscheduled maintenance

Supply Support
- Diminishing manufacturing source
- Parts obsolescence
- Parts shortage and delay

Aging and Maintenance: The F-15E program faces delays in depot maintenance for a variety of reasons, according to officials. For example, they said:

- Parts shortages have caused delays in repairing stabilizer actuators (according to an Air Force official, the stabilizer actuator is located in the back of the jet and is a hydraulic-driven motor that moves the horizontal stabilizer up and down);
- Lengthy structural inspections, which are associated with flying aircraft beyond the originally certified service life, have caused depot maintenance to take longer than planned; and
- Additional modification programs—as part of the implementation of the program's overall modification strategy known as "the Convergence of Mods"—and delays in receiving the parts kits needed to support the additional modifications, have also contributed to depot maintenance delays.

To mitigate these delays, the F-15E's modification strategy purposefully combines the program's modernization schedule with the programmed depot maintenance cycle to minimize the downtime of the aircraft needed for both purposes, according to program officials.

Additionally, the officials stated that the fleet-wide F-15E programmed depot maintenance interval was increased from 6 years to 7.5 years to mitigate depot maintenance delays by creating additional depot capacity. The officials said that this interval increase was based on a review of structural data collected over the last two programmed depot-maintenance intervals.

Unscheduled maintenance is another sustainment challenge for the F-15E, according to program officials. They cited TF 100-229 engine issues as the primary driver, accounting for 21 percent of the F-15E's total unscheduled maintenance downtime. However, program officials said that the F-15E is also experiencing unscheduled maintenance related to the aircraft's weapons delivery system, environmental control system, and stabilizing actuators.

The program also faces a shortage of skilled mechanics to repair altitude indicators and oxygen regulators, according to program officials.

Supply Support: Supply support challenges have also been an issue for the F-15E fleet due in part to decreasing supply sources for parts that rely on older technology, according to program officials. For example, the officials stated:

- Boeing is attempting to find a suitable supplier for a relay assembly that is obsolete and no longer available from the original supplier; and
- The program office is working with private industry to develop a prototype of an alternative rudder actuator to replace the current rudder actuator, which has consistently been a top driver of the F-15C/D and F-15E not mission capable supply rates. According to an Air Force official, the rudder actuator provides the rotational movement to the rudder surfaces, provides directional control, and augments aircraft stability.

Finally, program officials stated that another supply challenge for the F-15E is the number of unexpected parts replacements that have occurred during program depot maintenance. These unplanned replacements often result in excessive cannibalizations (i.e., taking a part off of one aircraft for use on another aircraft) and contribute to depot maintenance delays.

Program Office Comments

The program office reviewed a draft of this assessment and did not have any comments.

F-16
Fighting Falcon

The F-16 Fighting Falcon is a compact, single-engine, multirole fighter aircraft. It is a highly maneuverable aircraft, with single- and two-seat models, that participates in air-to-air combat and air-to-surface attack missions.

Program Essentials

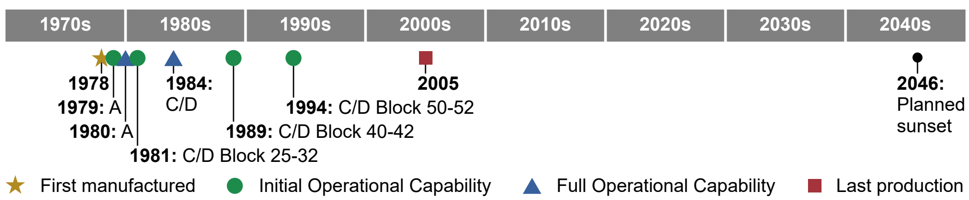
Lead Service
Air Force

Manufacturer
Lockheed Martin

Program Office
Hill Air Force Base, Utah

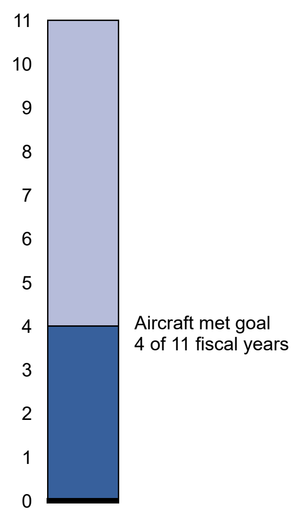
Sustainment
Unscheduled depot maintenance is conducted at the Ogden Air Logistics Complex and at contractor depots. Air Force personnel and contractors perform field maintenance.

F-16 Life Cycle Timeline

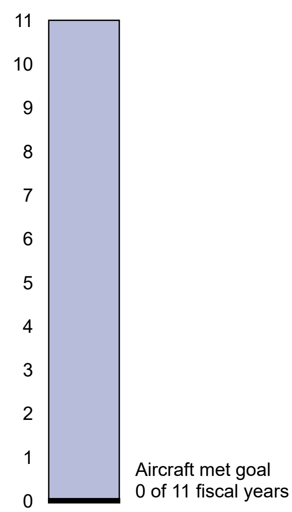


F-16 Sustainment Status

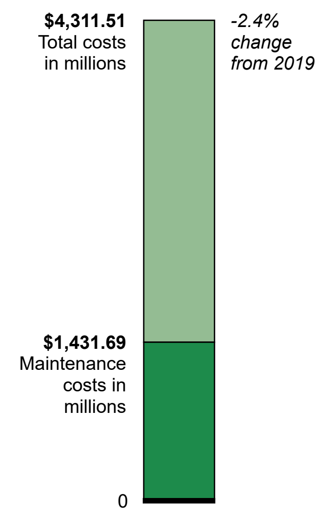
Aircraft availability rate
Fiscal years met goal



Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

936 total aircraft
Fiscal year 2020

31.0 years
Average aircraft age in fiscal year 2021

Flying hours

160,116 flying hours
Fiscal year 2020

C: 7,357 / D: 6,604 hours
Average lifetime flying hours per aircraft in fiscal year 2021

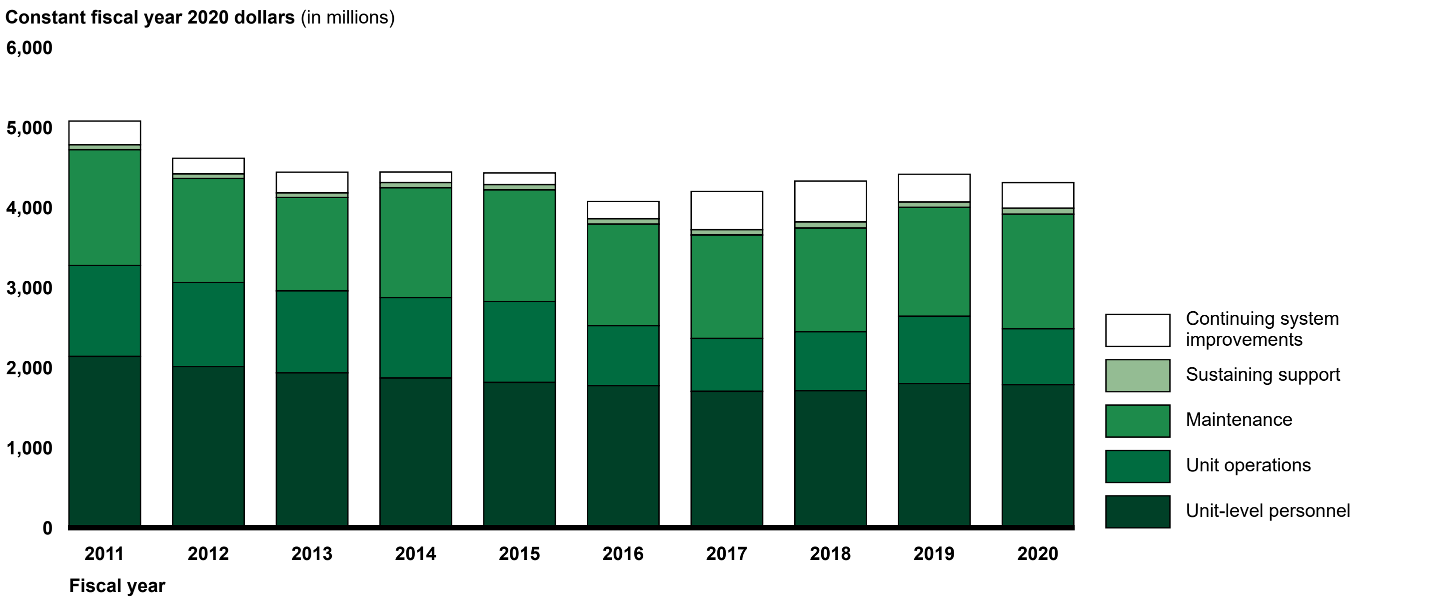
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$4.61 million
Total costs per aircraft

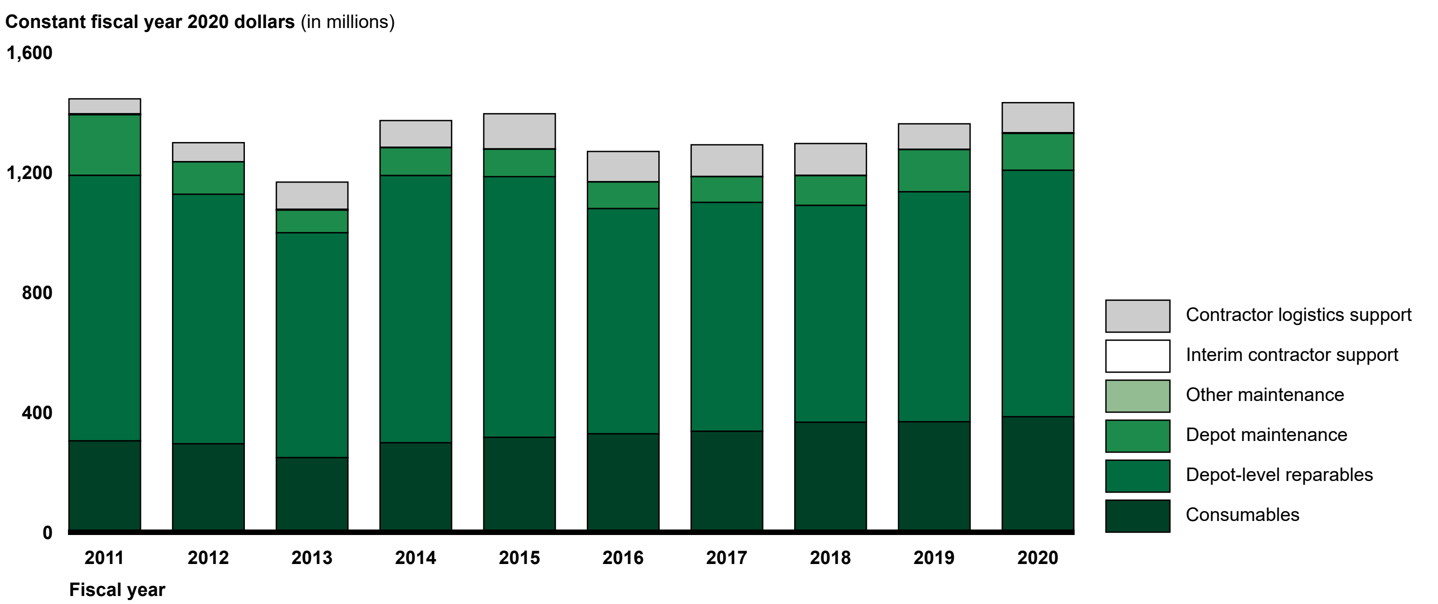
$26,927
Total costs per flying hour
+16.3% change from 2019

Operating and Support Costs

F-16 Total Operating and Support Costs

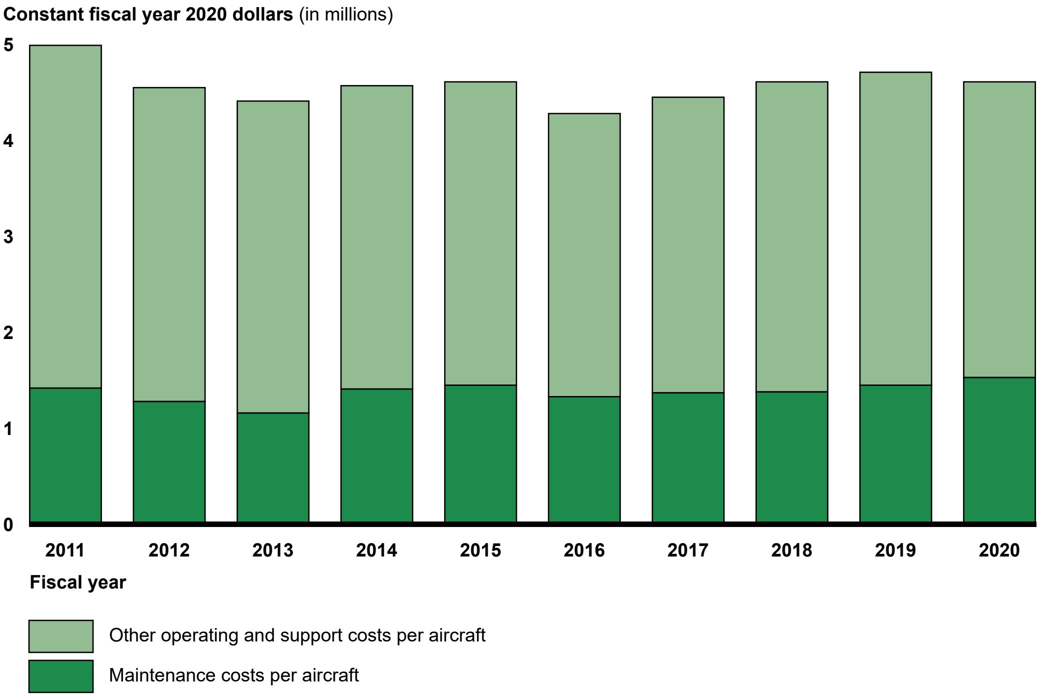


F-16 Maintenance Costs

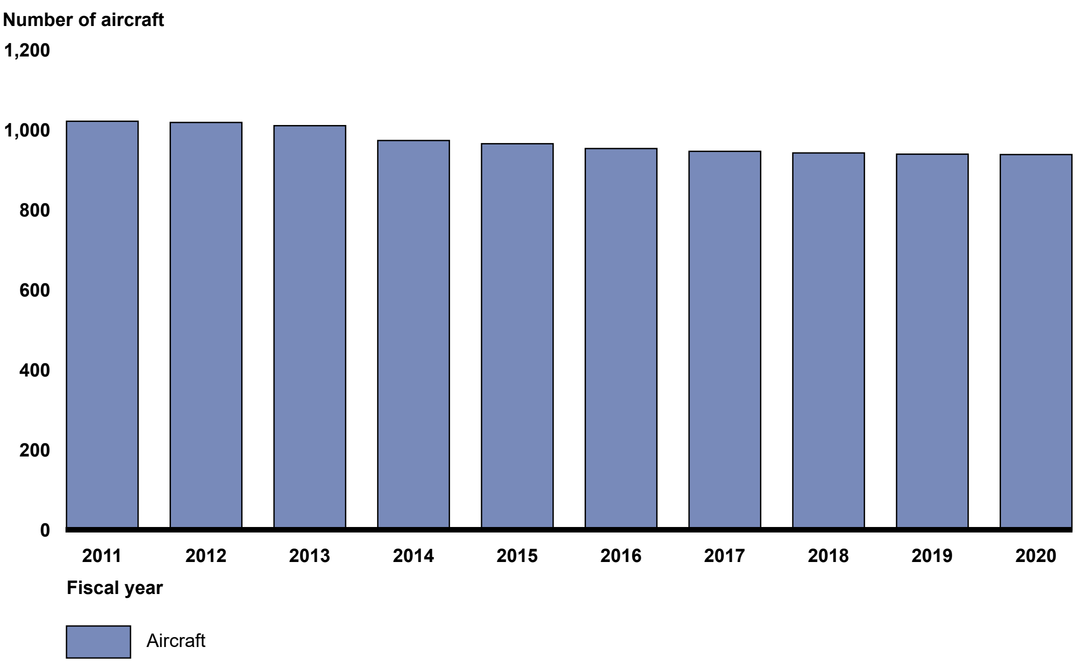


Operating and Support Costs per Aircraft

F-16 Operating and Support Costs per Aircraft

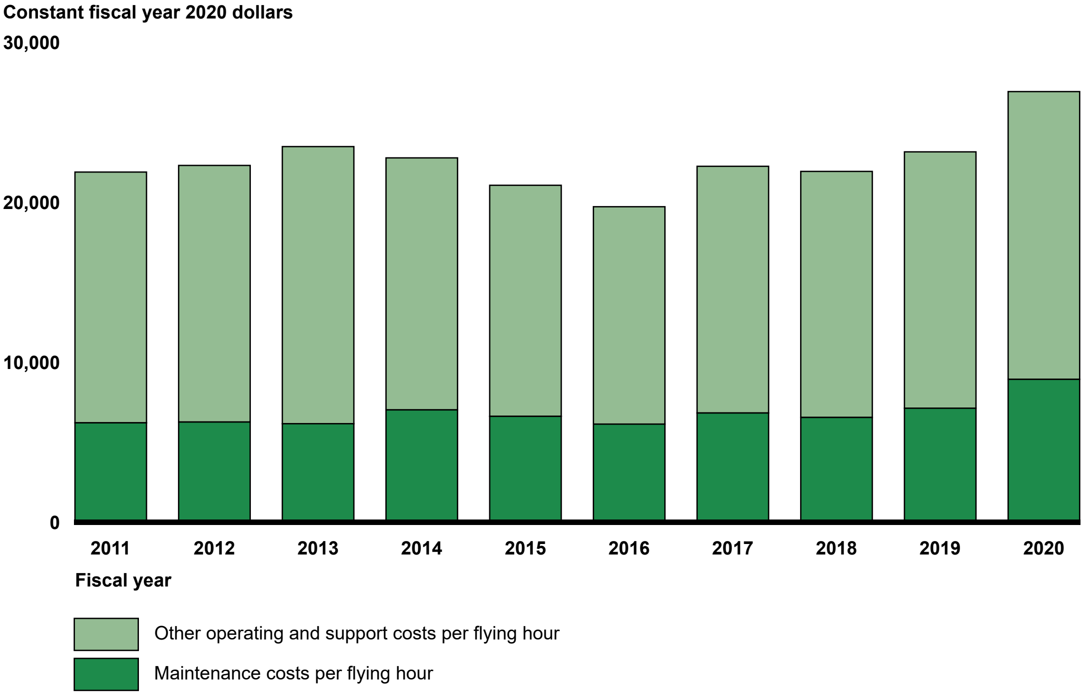


F-16 Fleet Size

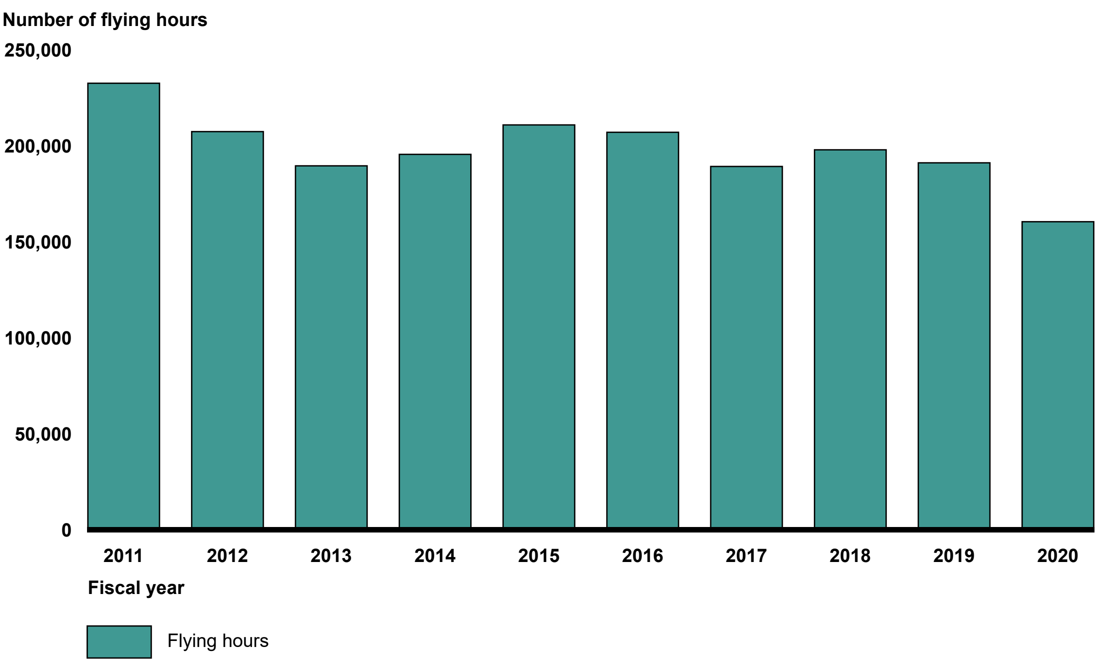


Operating and Support Costs per Flying Hour

F-16 Operating and Support Costs per Flying Hour



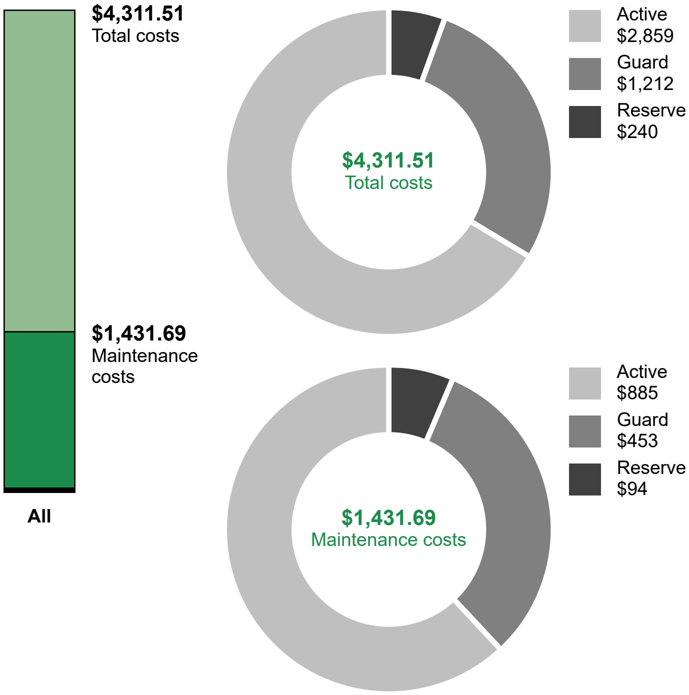
F-16 Flying Hours



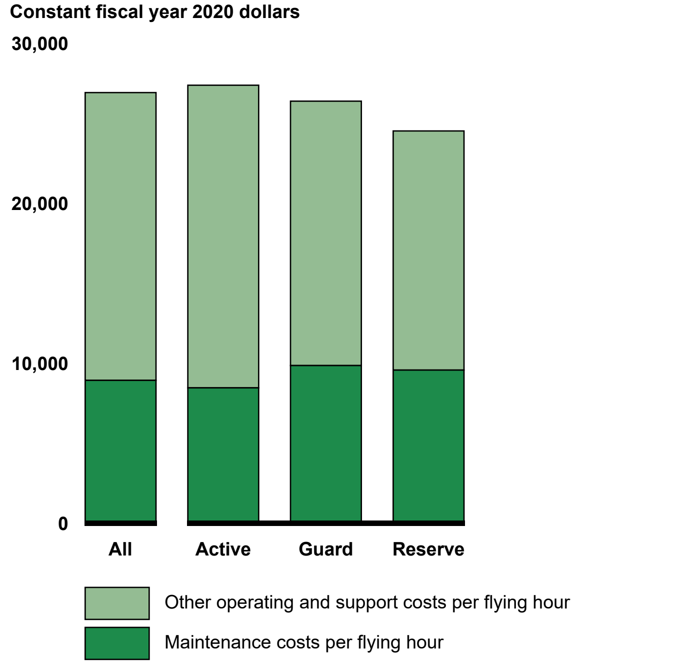
Component-Level Operating and Support Costs

F-16 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

Air Force maintainers and contractor personnel perform the F-16's depot maintenance and field maintenance. According to a program official, the F-16 was designed not to have a programmed depot maintenance requirement, but to receive avionics upgrades and structural repairs as needed. Program officials stated that the Air Force's Ogden Air Logistics Complex in Utah and contractor depot locations in South Carolina, Belgium, and South Korea perform the F-16's unscheduled depot maintenance and scheduled repairs and install the aircraft's upgrades and modifications. The Air Force Supply Chain Management Wing and the Defense Logistics Agency provide the majority of the F-16's supply support.

F-16 Sustainment Challenges

Aging Aircraft
- Delays in acquiring replacement aircraft
- Service life extension
- Unexpected replacement of parts and repairs

Maintenance
- Access to technical data
- Delays in depot maintenance
- Shortage of trained maintenance personnel
- Unscheduled maintenance

Supply Support
- Diminishing manufacturing source
- Parts obsolescence
- Parts shortage and delay

Aging and Maintenance: The Air Force plans to keep some of its F-16 fleet flying until 2046, beyond the original service life of these aircraft. To mitigate this challenge, the Air Force is extending the service life of

450 F-16 aircraft by 5,856 flying hours beyond the planned 8,000 flying-hour service life, using a phased approach. This service-life extension program began in December 2016 and is scheduled to last through 2030 at an estimated cost of $1.6 billion as of October 2020. According to program officials, this service-life extension program does not guarantee that all the aircraft will be able to fly until 2046.

To address aging and unplanned maintenance issues on aircraft that are not included in the service-life extension program, the officials stated that two separate programs were implemented: the Programmed Structural Sustainment and Repair program and the Post-Block Repair program. The two programs focus on repairing or replacing the major structural elements of the aircraft that may exhibit areas of cracking related to the number of flight hours on the aircraft and stress concentrations. These include replacing the bulkheads (i.e., dividing walls or barriers between compartments in an aircraft) and the longerons (i.e., a longitudinal structural component of an aircraft's fuselage) on the cockpit sills, horizontal tail support beams, and skins of the aircraft.

As a result of these programs, maintenance activities have been taking longer and aircraft downtime has increased. Officials stated that the F-16 program office awarded a 10-year depot maintenance contract to Lockheed Martin Greenville Operations in December 2020 to provide for additional capacity to mitigate depot maintenance delays.

Finally, according to program officials, the Air Force owns some of the technical data for the F-16, but does not own all of it and is still dependent on the original equipment manufacturer. Program officials stated they face ongoing challenges procuring sufficient technical data to allow Air Force personnel to repair and modernize portions of the aircraft.

Supply Support: The F-16 has experienced shortages of parts because of:

- supply chain funding shortfalls,
- delayed vendor deliveries,
- increasing requirements for low-demand items,
- diminishing manufacturing sources, and
- parts obsolescence issues.

Program officials said that they work with supply chain partners and industry to address these issues when possible. Examples of the program office's ongoing and planned actions include:

- identification of alternate vendors,
- reverse engineering of parts,
- modification programs,
- redesign of problem parts, and
- cannibalization of parts from other aircraft.

The status of and plans to address the top drivers are also discussed with the program's supply chain partners, including the Defense Logistics Agency, at monthly F-16 Health of the Fleet meetings that are hosted by the program office, according to the officials.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

F-22
Raptor

Program Essentials

Lead Service
Air Force

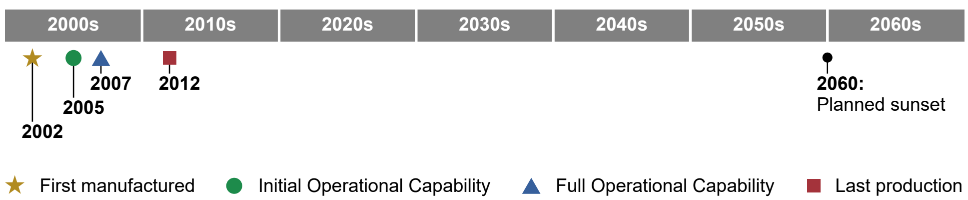
Manufacturer
Lockheed Martin and
Pratt & Whitney (engines)

Program Office
Hill Air Force Base, Utah

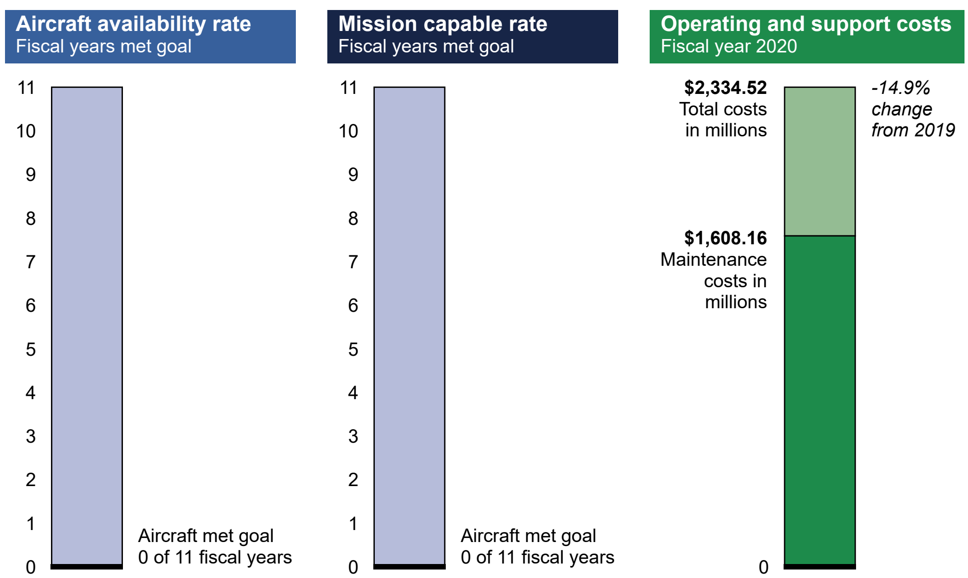
Sustainment
Depot maintenance is conducted at the Ogden Air Logistics Complex and Air Force personnel perform organizational maintenance, according to program officials.

The F-22 is a fifth-generation fighter aircraft with an air dominance primary mission that is designed to engage air targets at great distances and is also air-to-ground capable, according to program officials. It combines stealth, supercruise, maneuverability, and integrated avionics.

F-22 Life Cycle Timeline



F-22 Sustainment Status



Aircraft

186 total aircraft
Fiscal year 2020

14.0 years
Average aircraft age in fiscal year 2021

Flying hours

27,360 flying hours
Fiscal year 2020

2,201 hours
Average lifetime flying hours per aircraft in fiscal year 2021

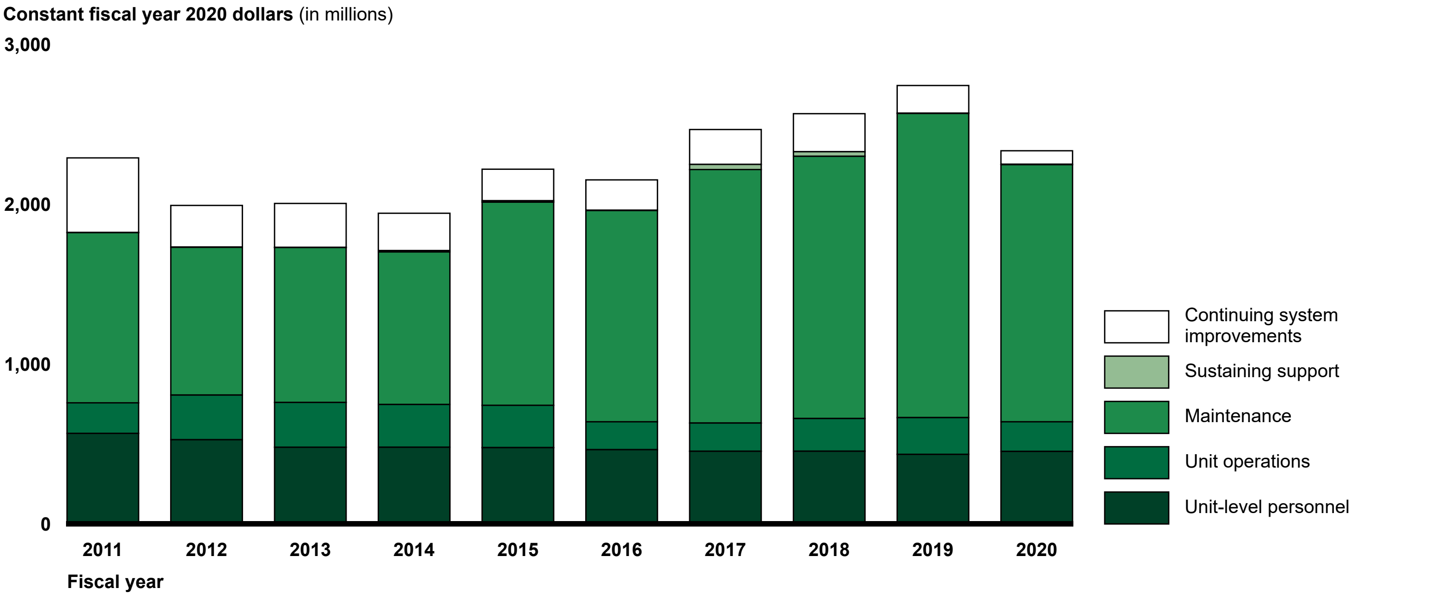
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$12.55 million
Total costs per aircraft

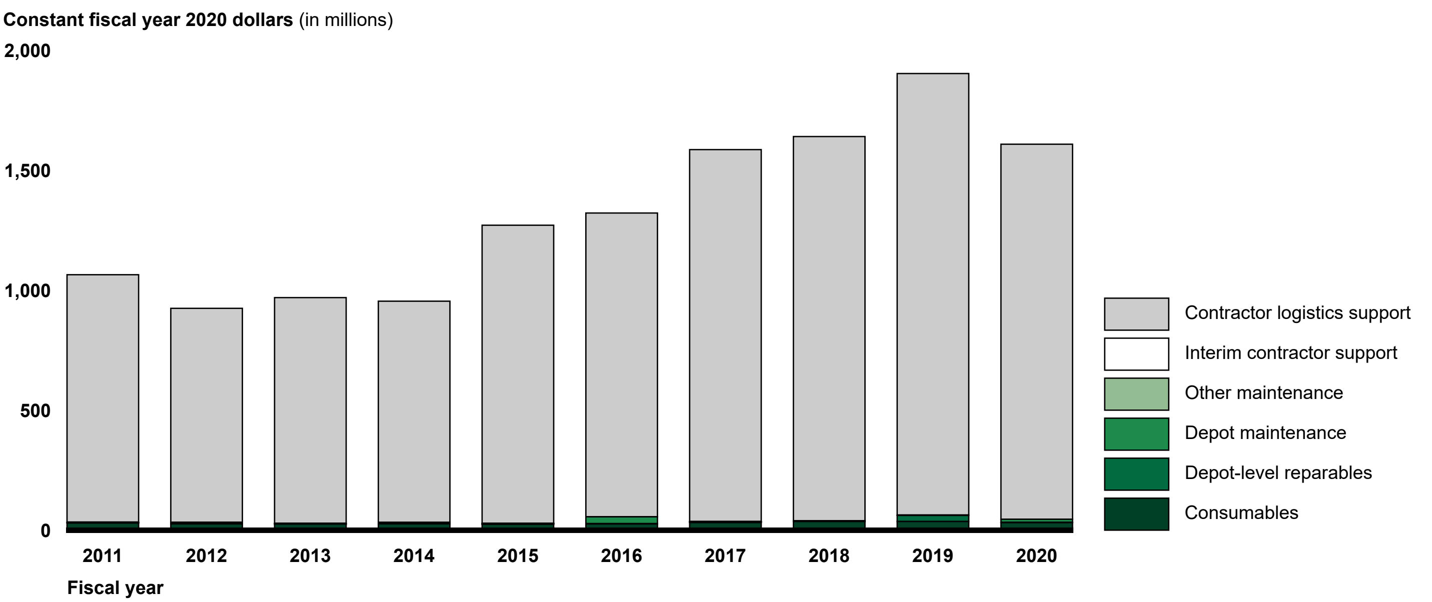
$85,325
Total costs per flying hour
-13.4% change from 2019

Operating and Support Costs

F-22 Total Operating and Support Costs

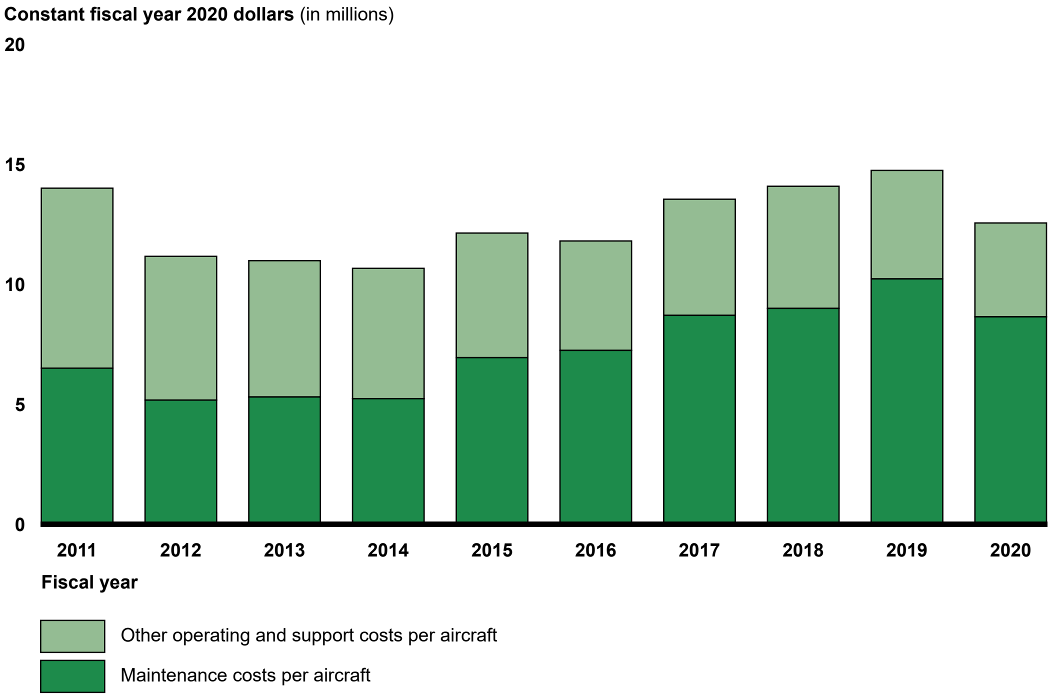


F-22 Maintenance Costs

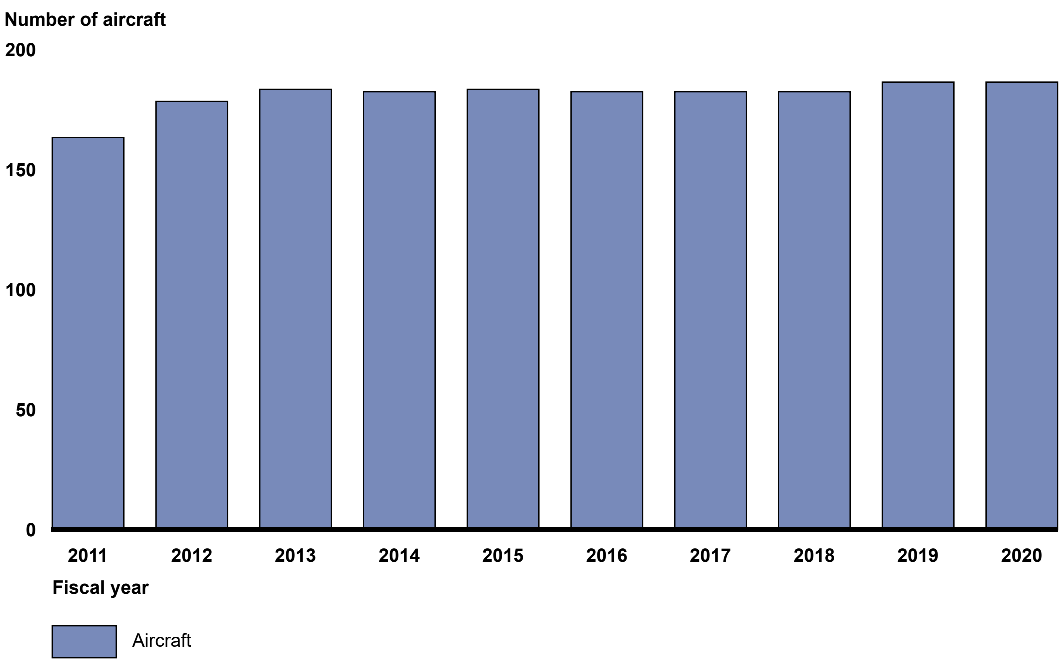


Operating and Support Costs per Aircraft

F-22 Operating and Support Costs per Aircraft

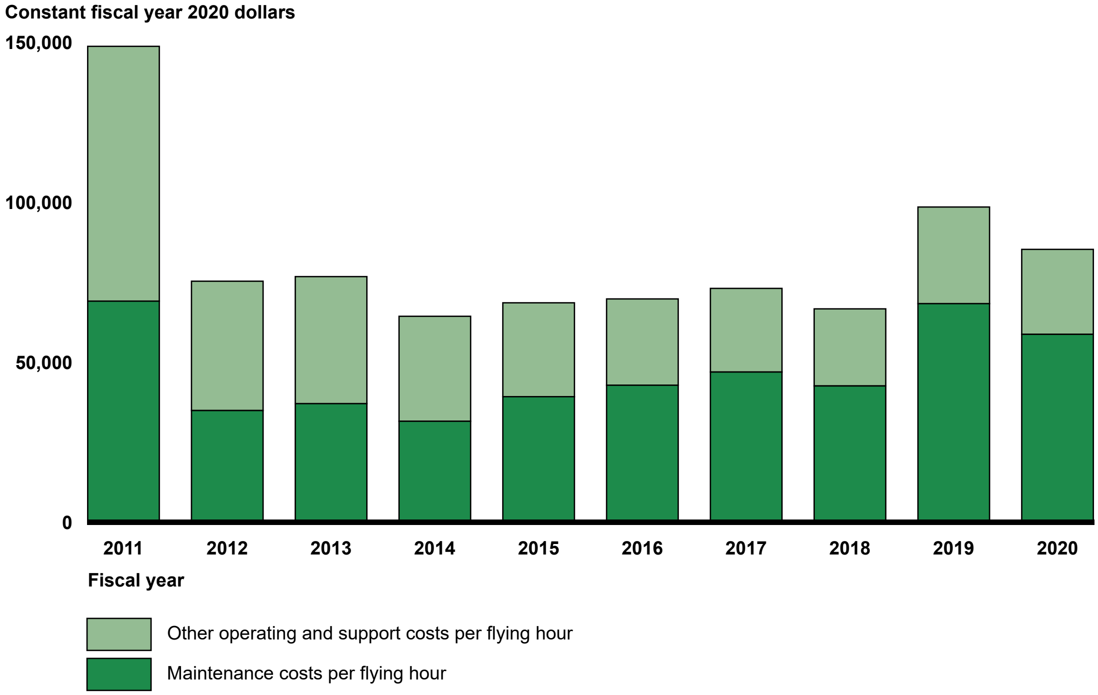


F-22 Fleet Size

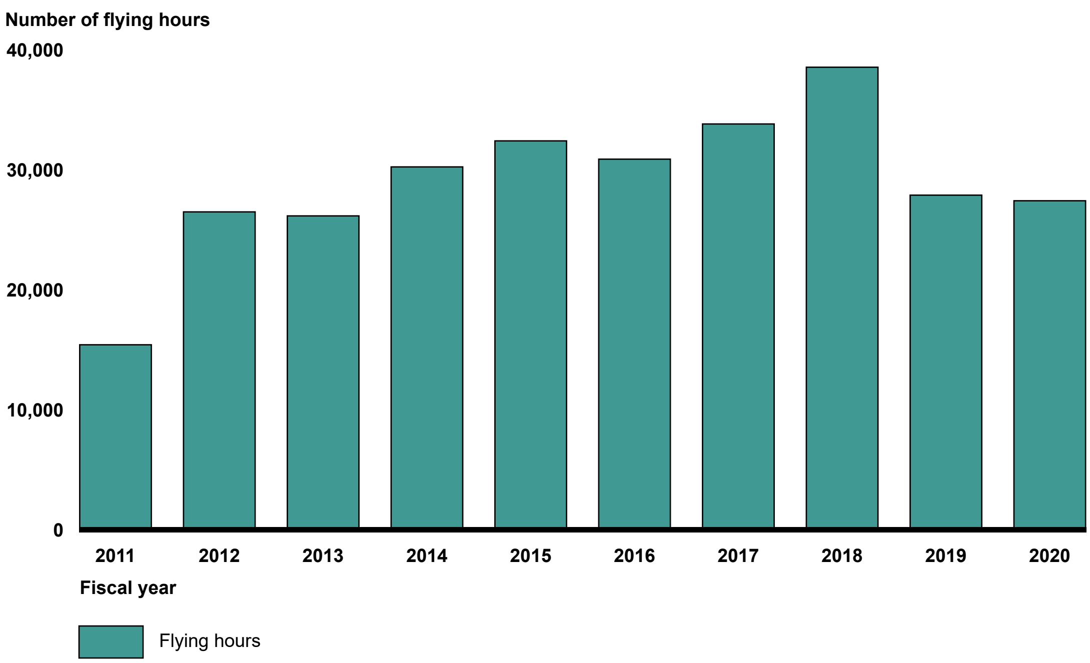


Operating and Support Costs per Flying Hour

F-22 Operating and Support Costs per Flying Hour



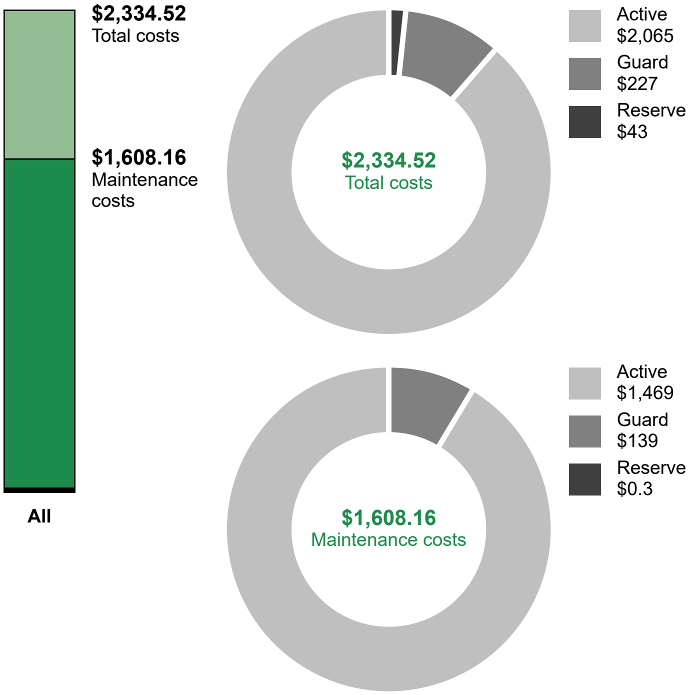
F-22 Flying Hours



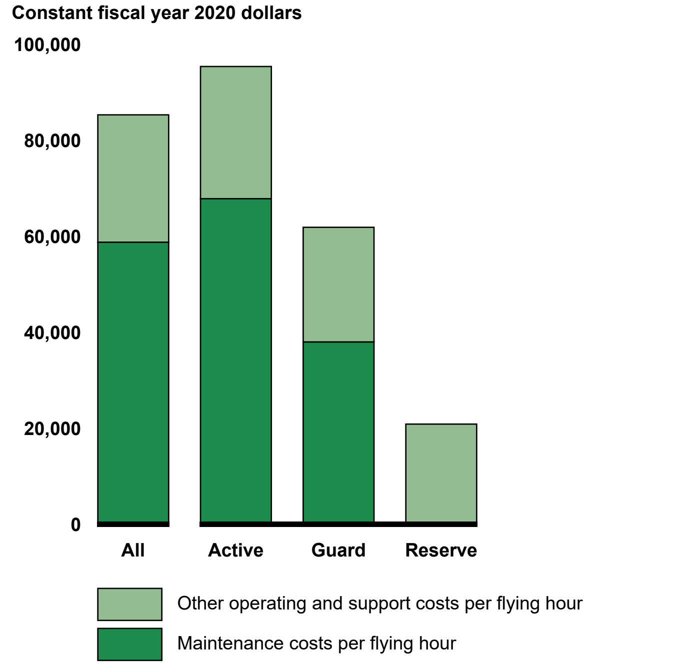
Component-Level Operating and Support Costs

F-22 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

Lockheed Martin provides product support integration, sustaining engineering, and supply chain management, among other support, for the F-22 under a performance-based logistics contract, according to program officials. The officials said that Air Force personnel provide aircraft maintenance for the F-22. Also, the program office directly funds and oversees modification work at the Air Force's Ogden Air Logistics Complex. Program officials stated that aircraft component repairs are controlled by Lockheed Martin and predominantly performed by the original manufacturers of the components, though some of the repair work has transitioned to the Air Force's Ogden, Oklahoma City, and Warner Robins Air Logistics Complexes.

F-22 Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Aging and Maintenance: As the F-22 ages, it requires additional maintenance associated with its low-observable coating. Program officials stated that the low-observable coating is the top maintenance driver of not mission capable aircraft and provided examples of multiple efforts to address the volume of current maintenance and repair requirements and to improve the long-term maintainability of the coating.

According to the officials, the Ogden Air Logistics Complex started performing low-observable coating restoration in fiscal year 2019, repaired 26 aircraft as of the end of fiscal year 2021, and plans to complete the restoration of all aircraft by fiscal year 2030. The program office also added additional capacity for low-observable repairs in February 2019 at a contractor depot in Georgia. The Air Force also extended the shifts of low-observable contractor field teams to further augment Air Force organizational-level maintenance personnel's efforts to maintain the low-observable coating. According to officials, low observable maintenance is an area of focus, the F-22 program office and Lockheed Martin regularly track the progress of low-observable initiatives—such as gap filler longevity and improved repair to reduce fastener cracking—in a quarterly briefing on the health of the fleet. Additionally, the F-22 program faces challenges repairing and replacing parts because the program, in an effort to reduce costs, took delivery of limited technical data.

Supply Support: According to program officials, the F-22 experienced shortages of parts from 2014 through 2018 because flying operations exceeded the number of flying hours that were contracted for in 4 of the 5 years. However, the officials stated that the program office has focused on improving supply support since fiscal year 2017.

Program officials stated that the program received the full supply funding for the flying-hour program from fiscal years 2017 through 2020. The officials said that the program's funding was reduced in fiscal year 2021, but the program fully funded executed flying hours along with critical, low demand spares. According to officials, the Air Force also provided an additional $763 million to the F-22 program to, assist with meeting DOD's goal of an 80-percent mission capable rate for fiscal year 2019, among other things. Officials noted that, because of these efforts, supply support has improved. However, F-22 program officials stated that the F-22 still has not been able to meet Air Combat Command's total not mission capable due to supply target of 9 percent.

Program officials said they have maintained a comprehensive diminishing manufacturing sources program to minimize material shortages. However, they said that the program has numerous challenges in this area stemming from the decision to significantly reduce the number of aircraft produced from more than 700 to less than 200. As a result, according to program officials, fewer manufacturers were willing to invest the capital that is needed to continue or to restart producing parts for the aircraft. Officials cited a missile launch detector sensor as an example of a part with diminishing manufacturing sources.

Additionally, the program is facing unexpected replacement of high-cost, critical replenishment spares that have not been procured (and possibly not produced) since F-22 production stopped in 2010, according to program officials. For example, the program has challenges obtaining parts such as the main weapons bay doors and leading edge flaps (i.e., used to increase the lift of the wing) that are now in demand due to mishaps and other unanticipated events.

Program Office Comments

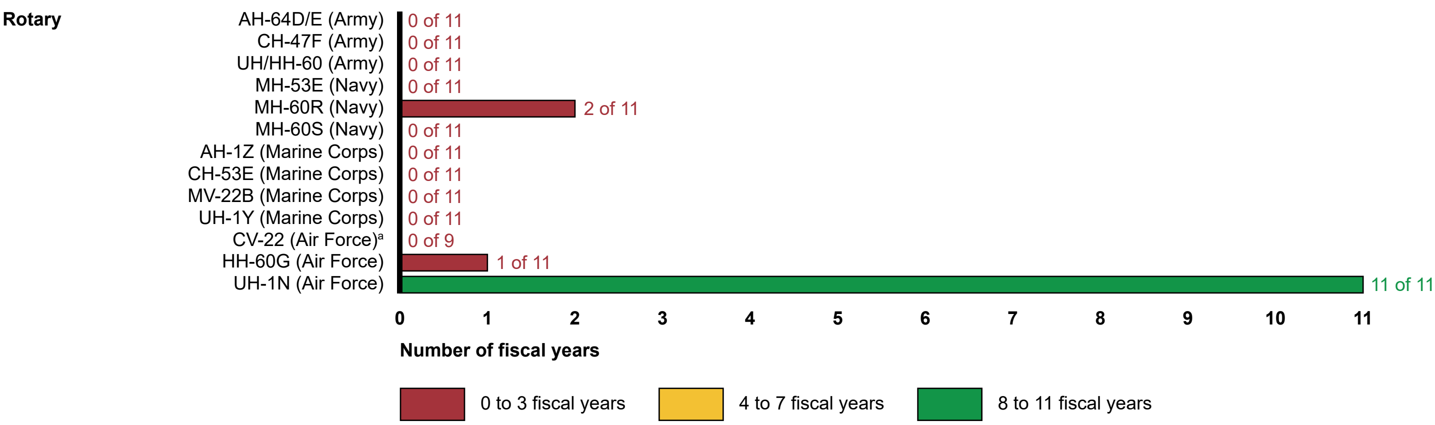
In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

Rotary Aircraft

AH-64D/E Apache

Source: U.S. Army/Captain Brian Harris. | GAO-23-106217

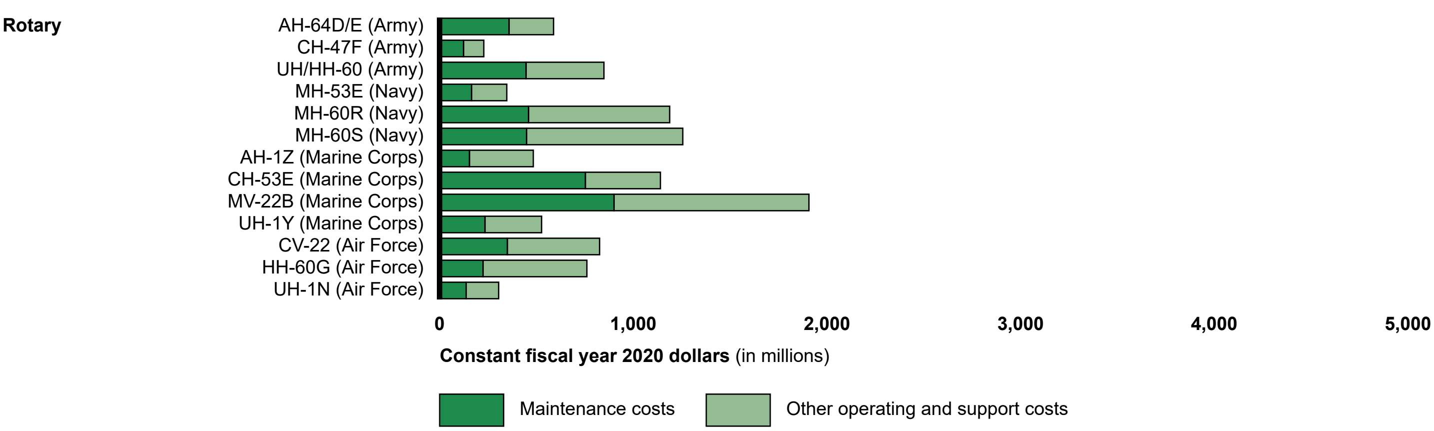
Number of Years Selected Aircraft Met Their Annual Mission Capable Goal, Fiscal Years 2011 through 2021



Source: GAO analysis of Army, Navy, and Air Force data. | GAO-23-106217

[a]For this aircraft, the military department did not provide a mission capable goal for all eleven years.

Annual Operating and Support Costs for Selected Department of Defense Rotary Aircraft, Fiscal Year 2020



Source: GAO analysis of Army, Navy, and Air Force data. | GAO-23-106217

AH-64D/E
Apache

Program Essentials

Lead Service
Army

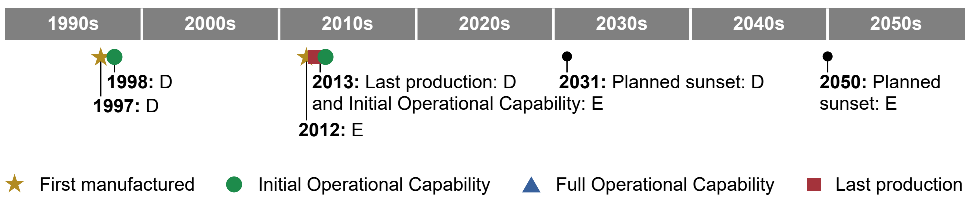
Manufacturer
Boeing Company Integrated Defense Systems

Program Office
Redstone Arsenal, Alabama

Sustainment
Government personnel at Corpus Christi Army Depot perform AH-64E airframe depot maintenance and Army personnel perform field maintenance, according to program officials, with assistance from contractor.

The AH-64D/E Apache is a twin-engine, four-blade tandem-seat, attack helicopter that can perform a variety of missions including ground force security, fixed base operations, aerial escorts, and reconnaissance.

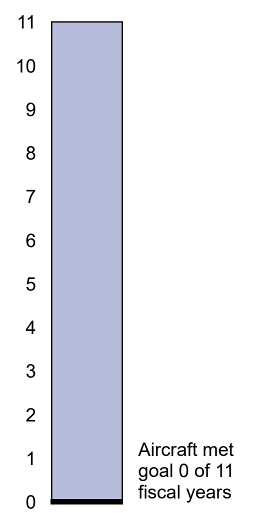
AH-64D/E Life Cycle Timeline



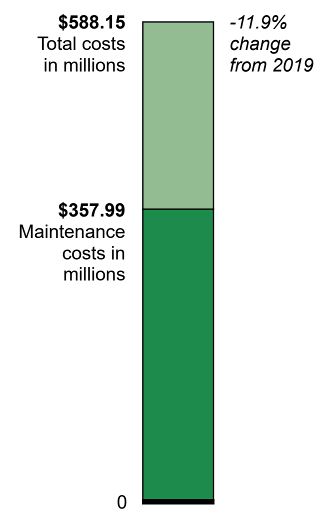
Note: Many of the AH-64Ds were rebuilt from the AH-64As, which were first manufactured in 1985.

AH-64D/E Sustainment Status

Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

648 total aircraft
Fiscal year 2020

D: 12.7 / E: 4.1 years
Average aircraft age in fiscal year 2021

Flying hours

113,734 flying hours
Fiscal year 2020

D: 3,673 / E: 859 hours
Average lifetime flying hours per aircraft in fiscal year 2021

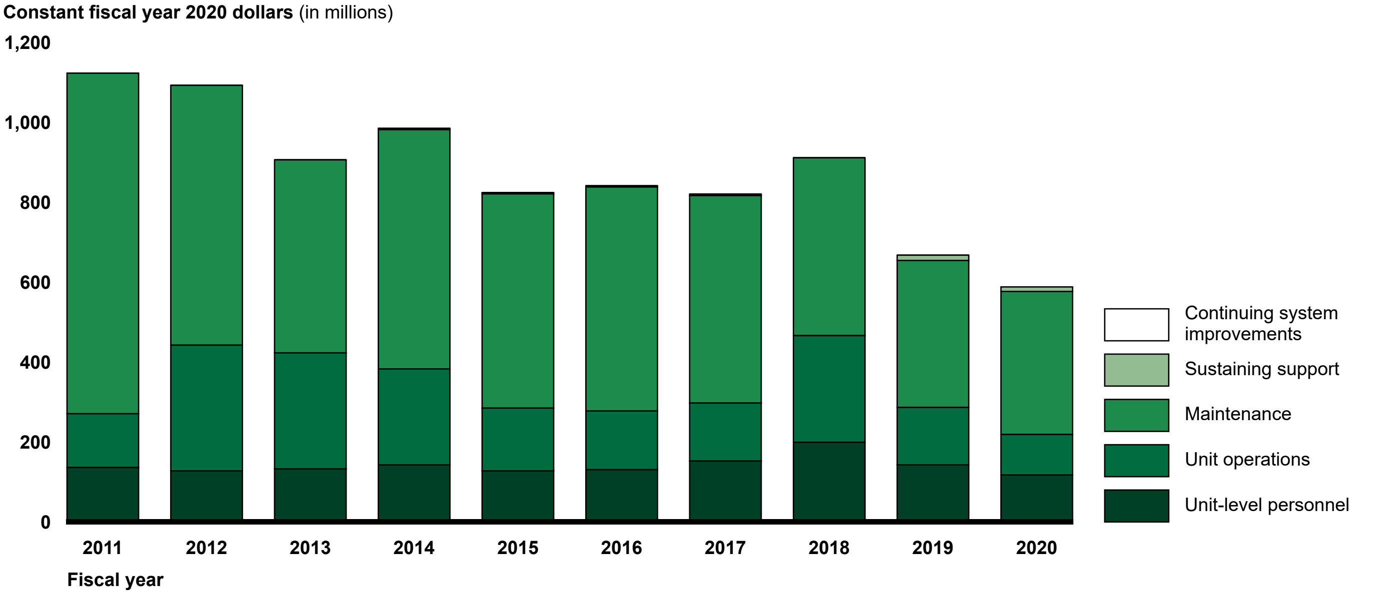
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$0.91 million
Total costs per aircraft

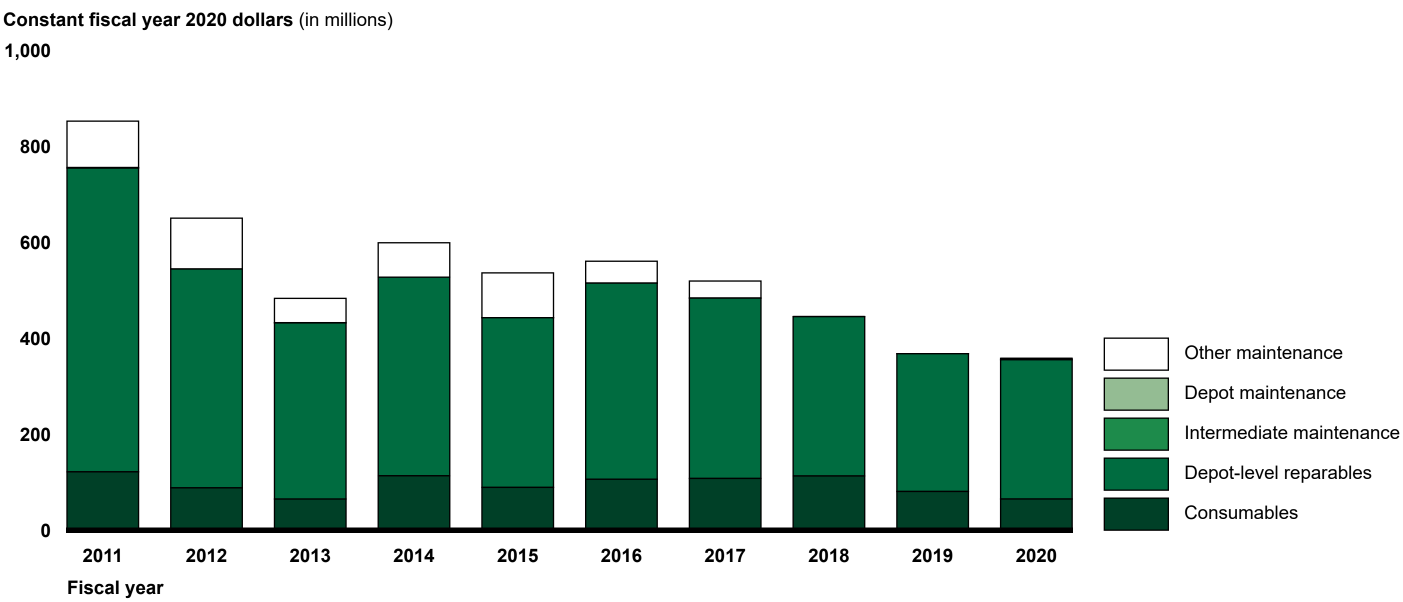
$5,171
Total costs per flying hour
+5.6% change from 2019

Operating and Support Costs

AH-64D/E Total Operating and Support Costs

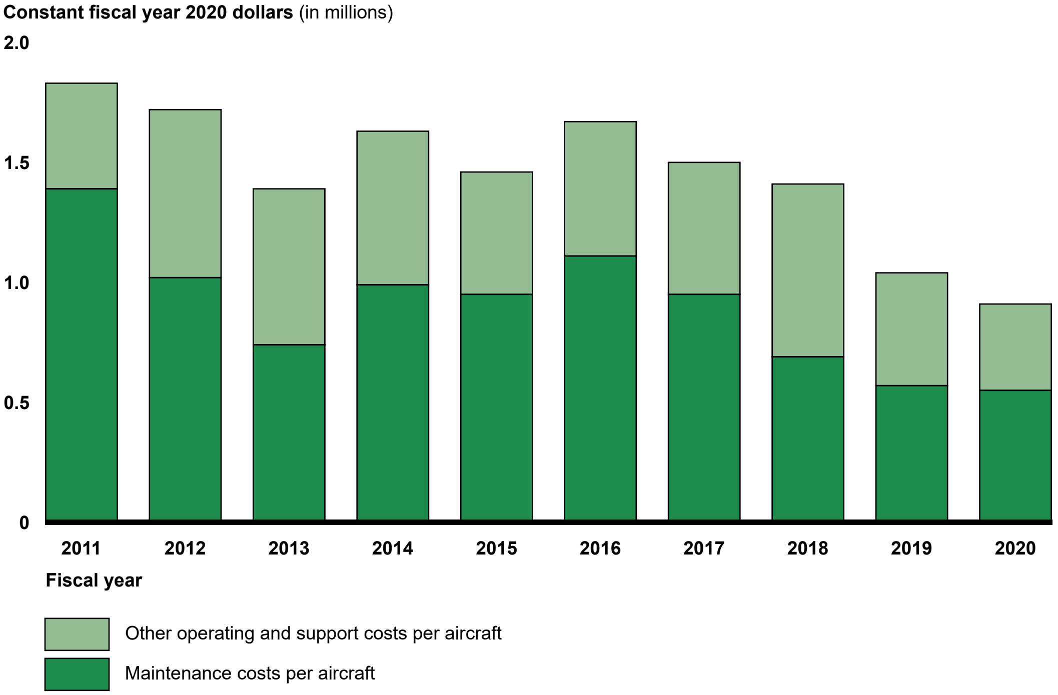


AH-64D/E Maintenance Costs

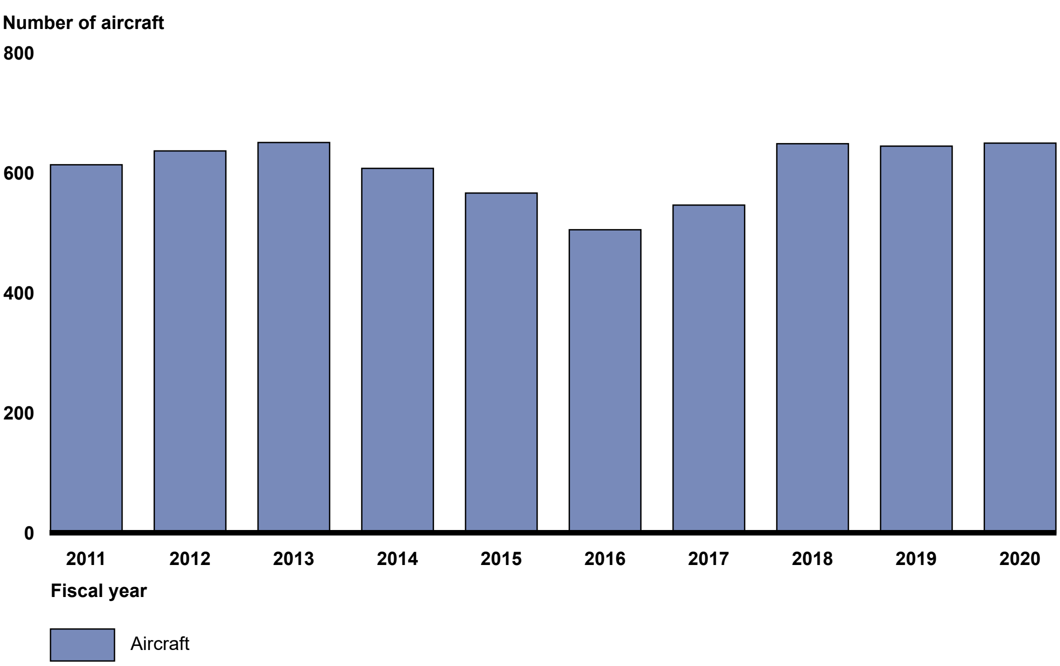


Operating and Support Costs per Aircraft

AH-64D/E Operating and Support Costs per Aircraft

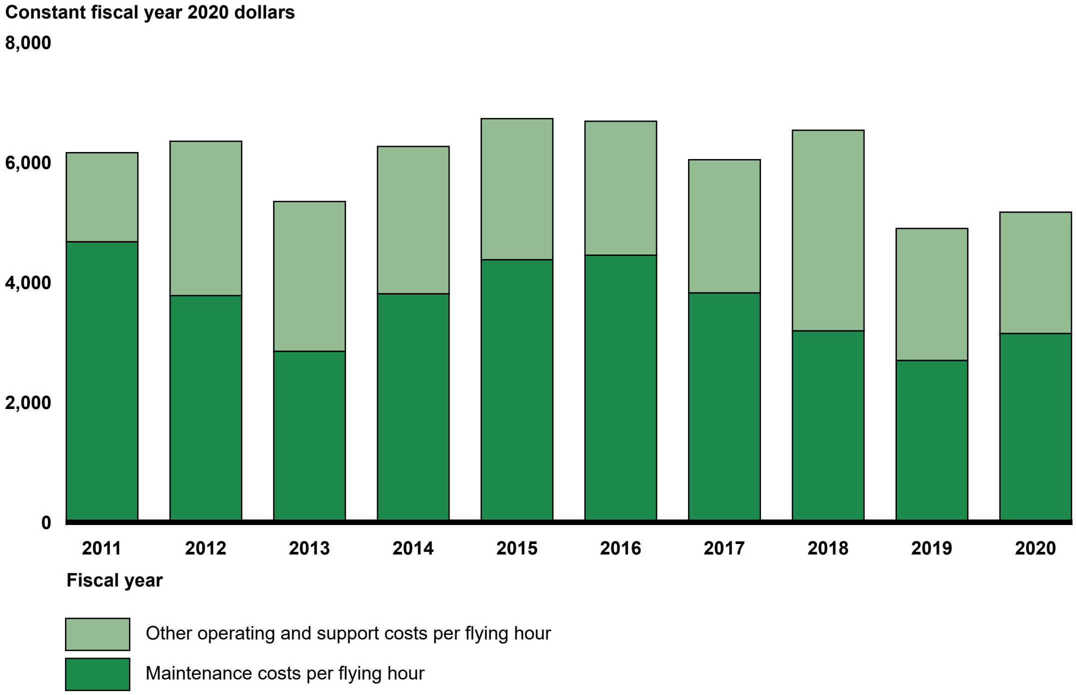


AH-64D/E Fleet Size

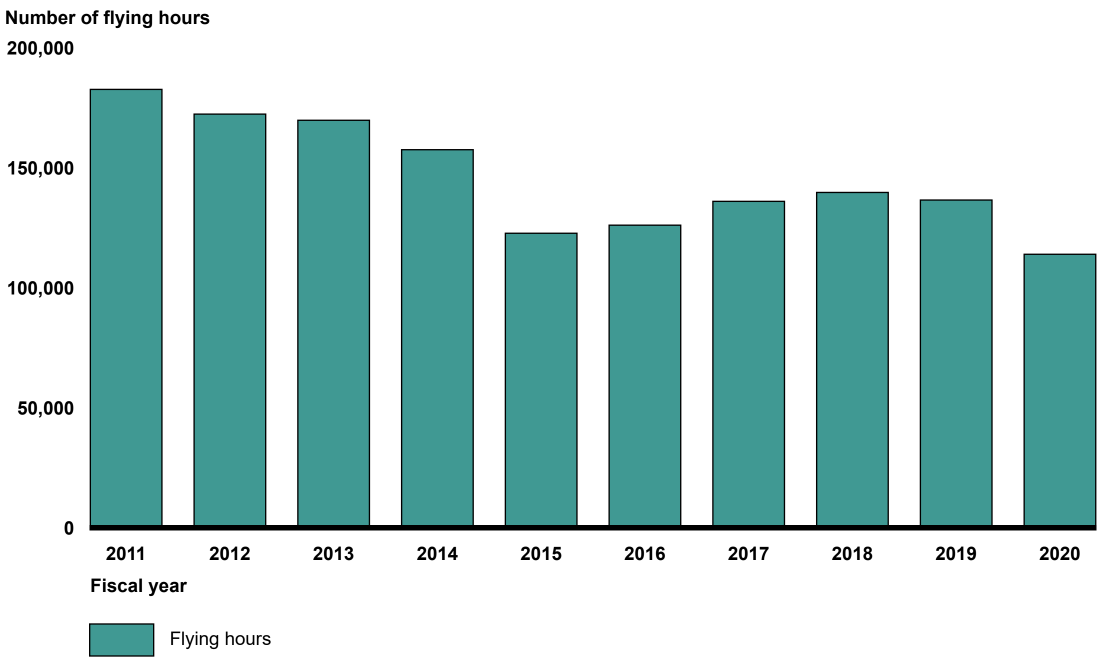


Operating and Support Costs per Flying Hour

AH-64D/E Operating and Support Costs per Flying Hour



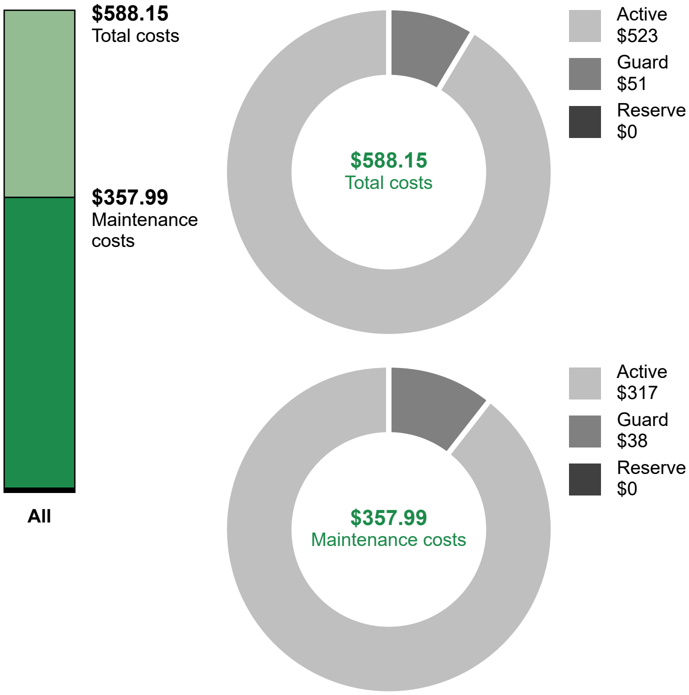
AH-64D/E Flying Hours



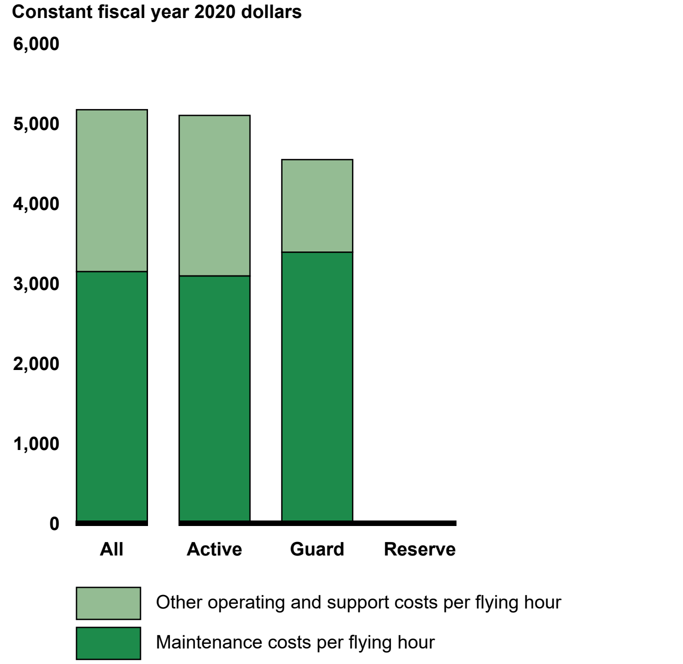
Component-Level Operating and Support Costs

AH-64D/E Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

AH-64D/E sustainment includes both organic and contractor logistics support, performance-based logistics arrangements, public-private partnerships, and commercial service agreements, according to program officials. The officials stated that AH-64E airframe depot maintenance is conducted by government personnel at Corpus Christi Army Depot with assistance from Boeing contractor field service representatives. Further, the program that converts the AH-64D to the AH-64E is conducted by Boeing. Army personnel perform field maintenance with assistance from contractor field service representatives. The Army Materiel Command, the Defense Logistics Agency, Lockheed Martin, and Boeing provide supply support.

AH-64D/E Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Maintenance: According to program officials, depot maintenance delays have been a challenge, as aircraft in depot-level repair average 2 to 4 years for rebuild and repair. The officials said that the long lead times to return the aircraft to service after depot-level repair was attributed to reductions in aircraft available for operations. In addition, program officials stated that fleet-wide shortages of personnel, coupled with long duration training for critical skill positions, affected both scheduled and unscheduled maintenance time frames.

The program has also experienced unscheduled maintenance challenges in recent years, according to officials. For example, in fiscal year 2021, there were 21 unscheduled maintenance events, including those related to platform generators with low reliability and high early failure rates that caused significant supportability concerns for the program.

Supply Support: Program officials stated that the AH-64 component reliability issues were responsible for the decrease in the fleet's mission capable rate in recent years. According to officials, the program office has been working with original equipment manufacturers and the Defense Contract Management Agency to ensure a quality control process is in place at all levels of the manufacturing process. Further, they said that the program office has conducted multiple site inspections of original equipment manufacturer and sub-contracted facilities in an effort to identify possible process improvements.

According to program officials, parts shortages and delays have also been an increasing challenge for the program as sub-tier manufacturing issues are being affected by the reduction of raw materials due to the effects of the COVID-19 global pandemic. Officials noted that obsolescence and diminishing manufacturing sources are also a supply challenge faced by the program as the transition of aircraft components from AH-64D-unique to AH-64E-unique parts will continue to increase the obsolescence issues on legacy aircraft. However, program officials said they expect that continued modernization of the AH-64 fleet will generate an overall reduction in the program's current obsolescence issues.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

CH-47F
Chinook

Program Essentials

Lead Service
Army

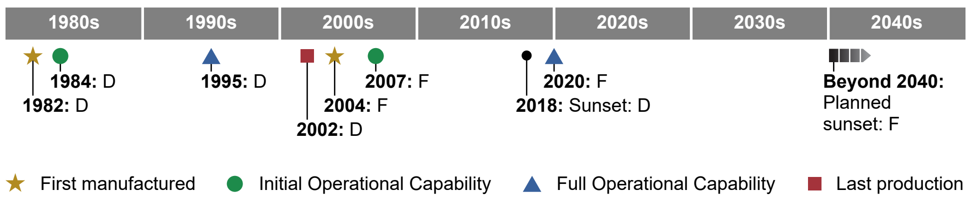
Manufacturer
Boeing

Program Office
Project Manager Cargo Helicopters, Redstone Arsenal, Alabama

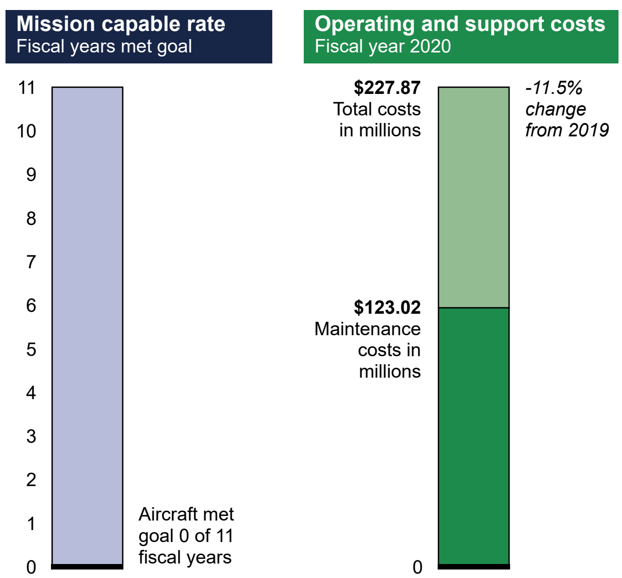
Sustainment
Corpus Christi Army Depot and several Army Theater Aviation Sustainment Maintenance Groups perform depot maintenance. Army personnel perform field maintenance.

The CH-47F Chinook is the Army's only heavy-lift cargo rotary wing aircraft that supports combat and other critical operations. It transports forces and heavy equipment and provides routine aerial sustainment of maneuver forces.

CH-47F Life Cycle Timeline



CH-47F Sustainment Status



Aircraft

417 total aircraft
Fiscal year 2020

F: 8.7 years
Average aircraft age in fiscal year 2021

Flying hours

58,125 flying hours
Fiscal year 2020

F: 1,390 hours
Average lifetime flying hours per aircraft in fiscal year 2021

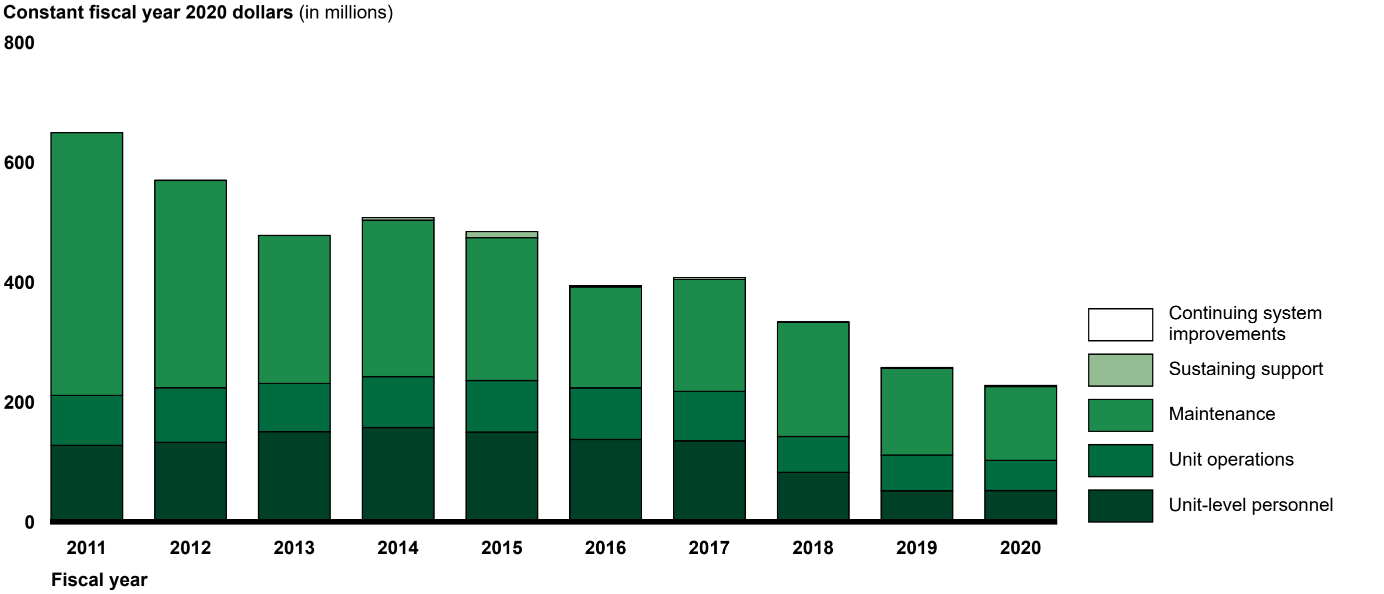
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$0.55 million
Total costs per aircraft

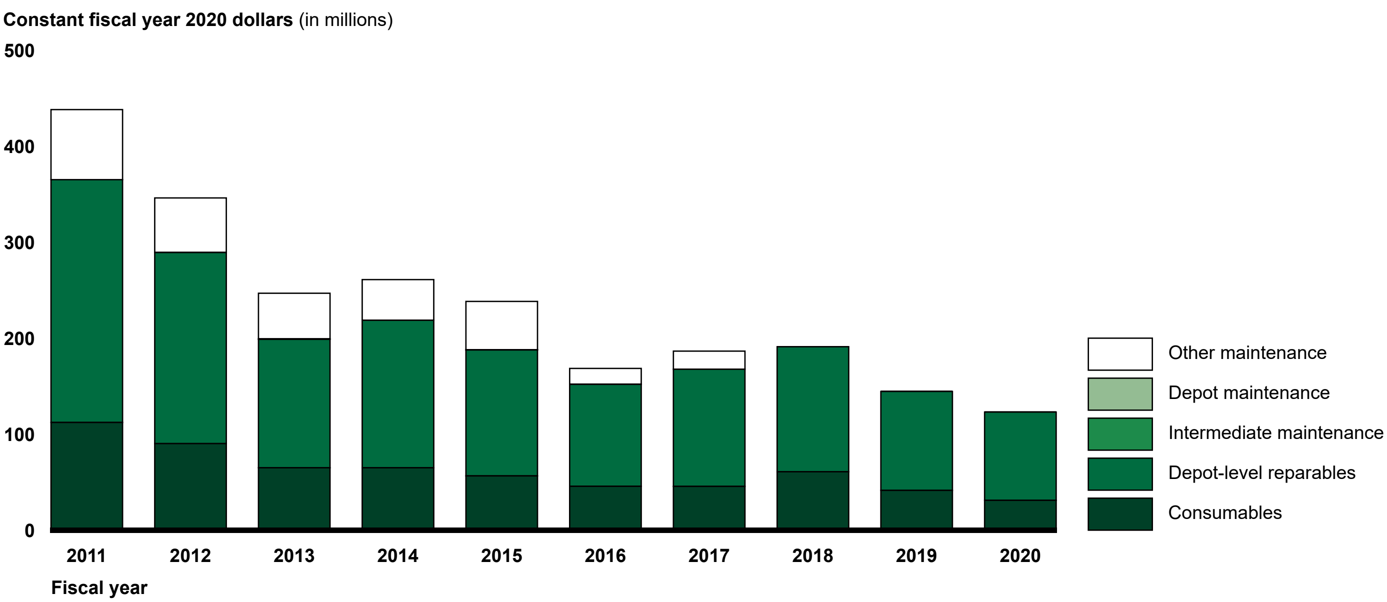
$3,920
Total costs per flying hour
+1.0% change from 2019

Operating and Support Costs

CH-47F Total Operating and Support Costs

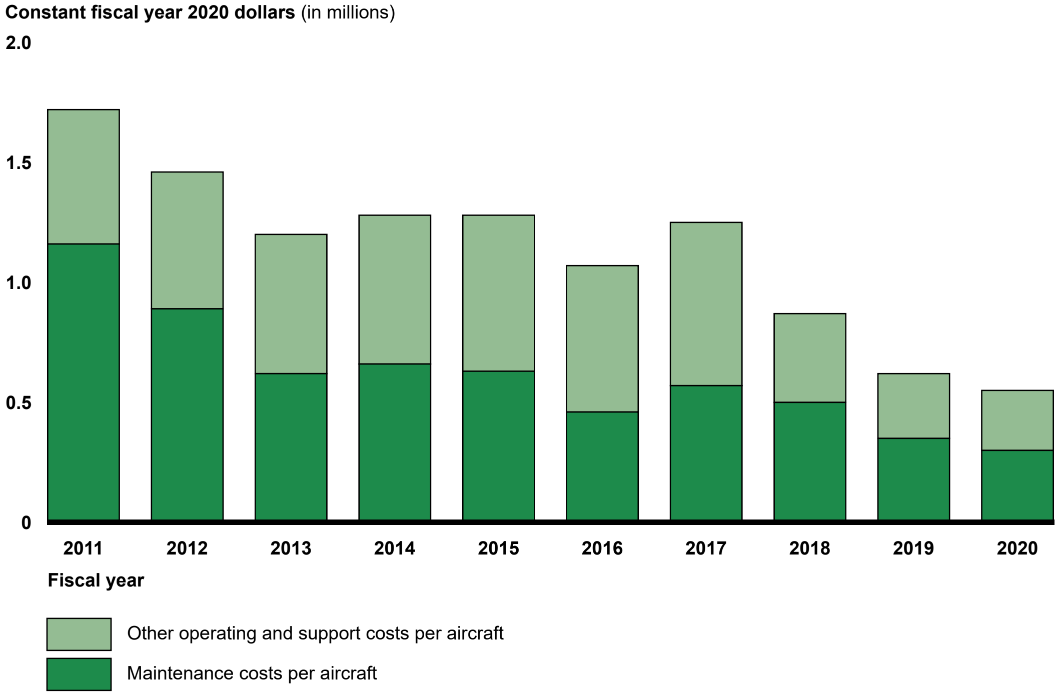


CH-47F Maintenance Costs

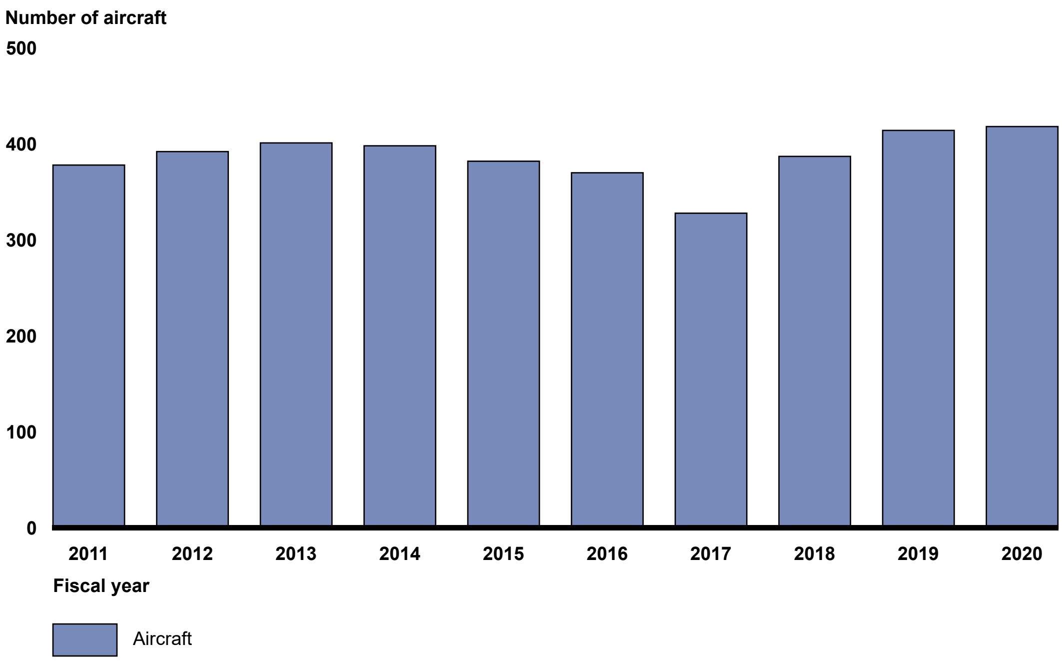


Operating and Support Costs per Aircraft

CH-47F Operating and Support Costs per Aircraft

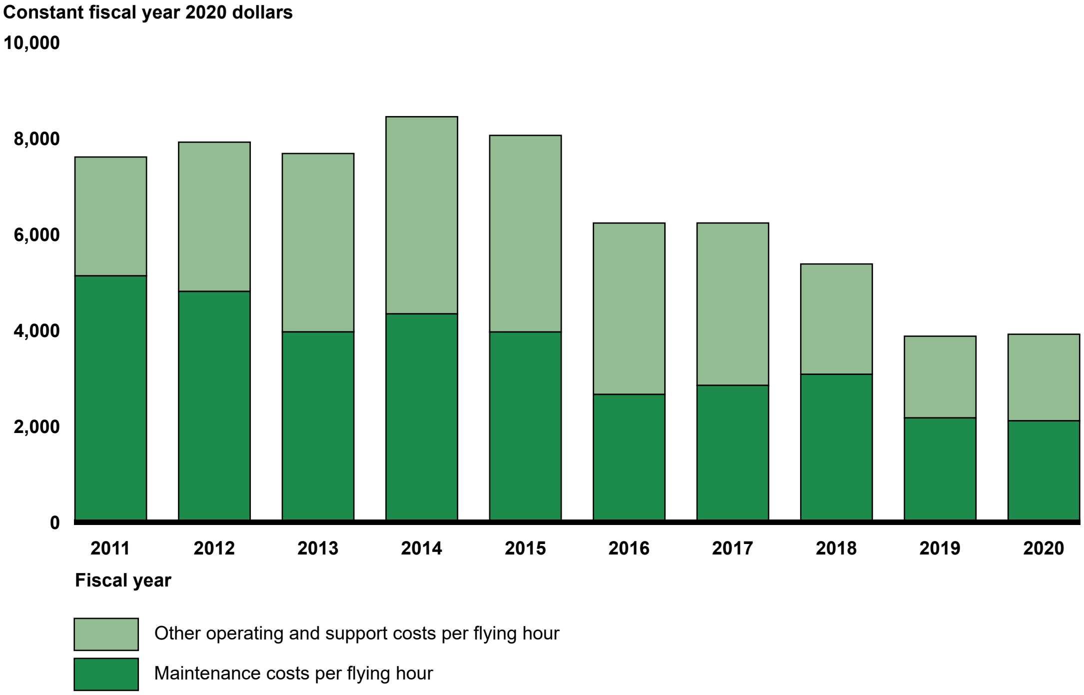


CH-47F Fleet Size

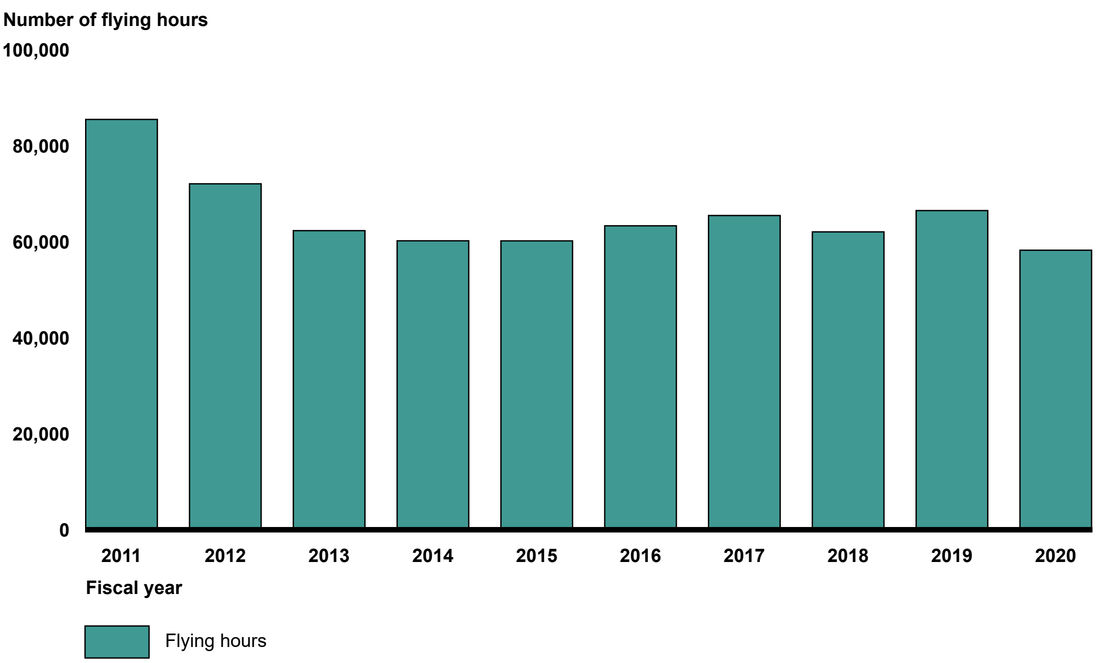


Operating and Support Costs per Flying Hour

CH-47F Operating and Support Costs per Flying Hour



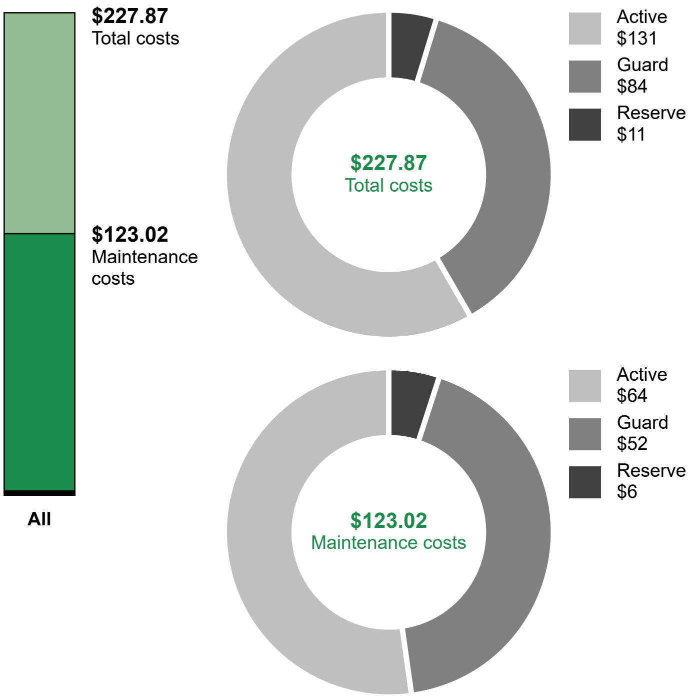
CH-47F Flying Hours



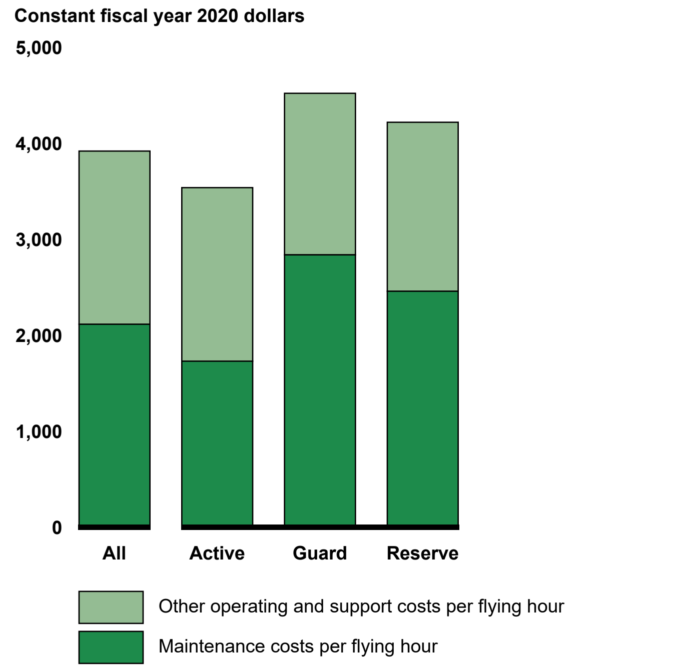
Component-Level Operating and Support Costs

CH-47F Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

According to program office officials, the CH-47 was being modernized between fiscal years 2011 and 2019, and there was no depot maintenance during that time frame. The Army initially sustained the CH-47 with interim contractor support and then transitioned to either government or limited performance-based logistics support. Boeing provided the limited performance-based logistics support for legacy blades. Corpus Christi Army Depot and several Theater Aviation Sustainment Maintenance Groups perform CH-47F depot maintenance. Field maintenance is performed by Army personnel. According to officials, the Defense Logistics Agency and Army Aviation and Missile Command provide supply support for the CH-47F.

CH-47F Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Maintenance: According to program officials, the duration of scheduled maintenance time frames has been a challenge for the CH-47F fleet, but the program office began implementation of a revised scheduled maintenance plan in June 2019, which significantly extends task inspection intervals. For example, heavy maintenance inspections that were previously scheduled at 200 and 400 flying hours have been performed at 320 and 640 flying hours, which officials expect will lead to a 2.5 percent reduction in the amount of scheduled maintenance downtime across the fleet, and a similar increase in the mission capable rate. According to program office officials, the goal is to have the entire CH-47F fleet under this new maintenance plan by July 2022. In addition, program officials stated that aircraft repairs from crash battle damage were taking longer than expected due to the amount of time it takes to induct (i.e., begin maintenance) aircraft at the depot repair facilities and the delays getting structural parts.

After evaluating a recent increase in the not mission capable maintenance rate, program officials stated that several factors contributed to the increase:

- Number of aircraft: There was a large increase in the number of aircraft being inducted into the new scheduled maintenance plan in fiscal year 2021, especially in the active-duty Army.
- Time for process: The induction process is very time consuming, with each unit experiencing a learning curve.
- Staff shortage: Many Army National Guard units do not have the necessary number of full-time maintainers, which increases not mission capable maintenance down time.
- Inspection work: Aircraft that were previously inducted in fiscal years 2019 and 2020 began to require inspections (e.g., at 160 hours and 320 hours) that also required more time. Also, the inspectors had to overcome a learning curve.
- Maintenance transition: There was an increase in unscheduled maintenance due to a transition from contractor maintenance to military maintenance by active-duty Army personnel.

Supply Support: One of the biggest sustainment challenges for the CH-47, according to program officials, has been having access to low-demand, but critical parts, such as airframe components and outer surface skins. To mitigate this issue, the officials said that the CH-47F production line has been used to obtain long lead-time parts, and specific parts have been fabricated at Army Logistics Readiness Centers.

Additionally, officials noted that supply chain management issues have continued to be a problem, due to a low volume of parts in the system, long production lead times, and delinquent deliveries. Officials said that the program office is continuing to work with Boeing and other contractors to identify high-risk parts and suppliers and to implement corrective actions for the root causes, improve processes, and develop risk mitigation strategies for each part and its supplier.

Program officials stated that the CH-47 program was affected by two events in 2021 that reduced the supply posture for several parts across the weapon system and increased the potential for higher not mission capable supply rates in the future. First, the Army Materiel Command issued an operational order that required that supply backorders be released. Second, the Aviation and Missile Command’s funding significantly decreased.

Managing avionics and software systems for obsolescence issues also continues to be a significant challenge for the program and obsolescence is expected to grow at an increasing rate, according to program officials. However, the program office conducts proactive obsolescence monitoring for components and seeks out industry support to mitigate this issue, but the officials said that the re-design efforts, even if funded by original equipment manufacturers, are costly.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

UH/HH-60
Black Hawk

Program Essentials

Lead Service
Army

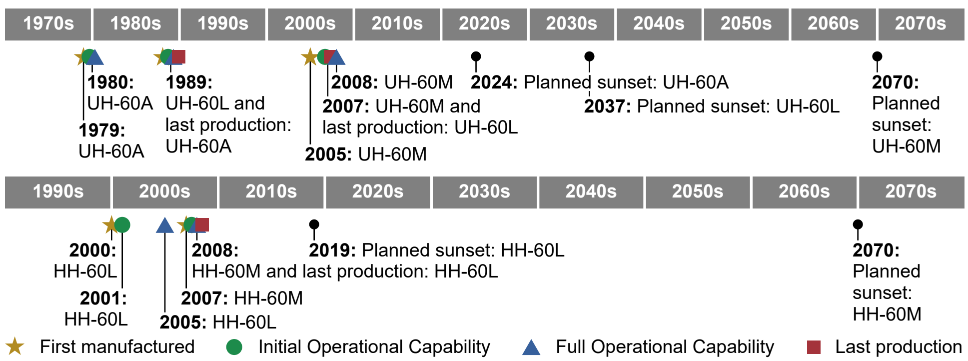
Manufacturer
Sikorsky Aircraft Corporation

Program Office
Program Manager Utility Helicopters, Redstone Arsenal, Alabama

Sustainment
Corpus Christi Army Depot performs airframe depot maintenance. Army personnel provide field maintenance with assistance from contractor representatives.

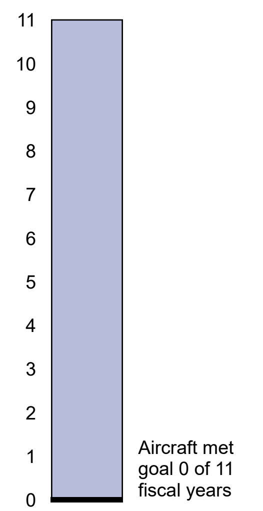
The UH/HH-60 Black Hawk is a utility transport helicopter that provides air assault, general support, command and control, and special operations support to combat, stability, and support operations. The HH-60 also provides aeromedical evacuation services.

UH/HH-60 Life Cycle Timeline

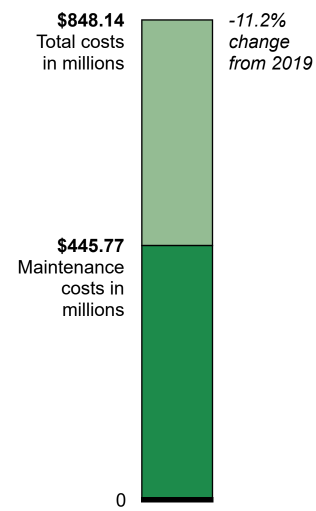


UH/HH-60 Sustainment Status

Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

1,968 total aircraft
Fiscal year 2020

16.1 years
Average aircraft age in fiscal year 2021

Flying hours

272,179 flying hours
Fiscal year 2020

149 hours
Average lifetime flying hours per aircraft in fiscal year 2021

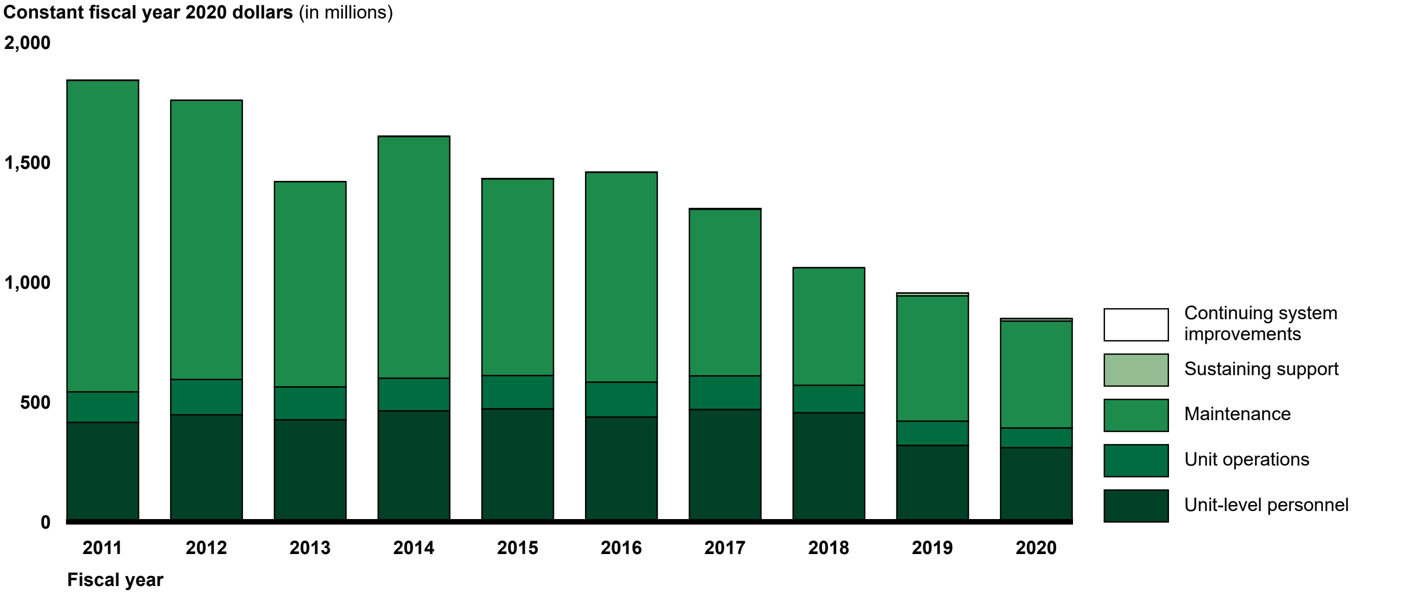
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$0.43 million
Total costs per aircraft

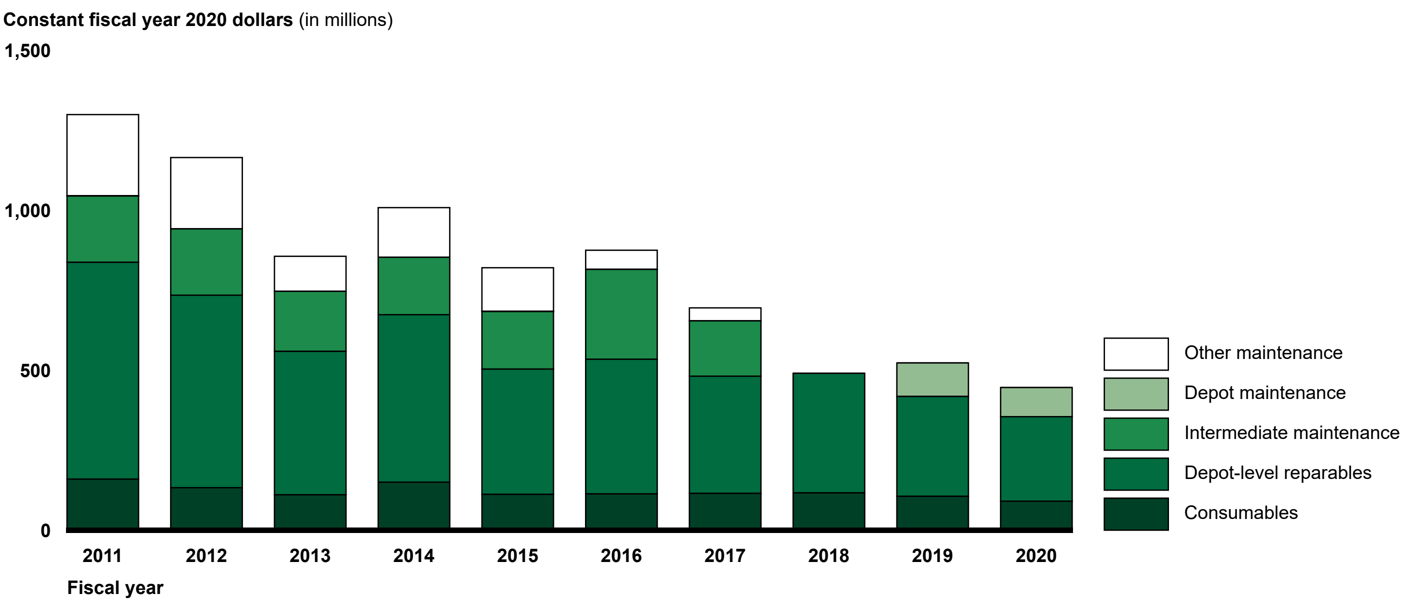
$3,116
Total costs per flying hour
+7.6% change from 2019

Operating and Support Costs

UH/HH-60 Total Operating and Support Costs

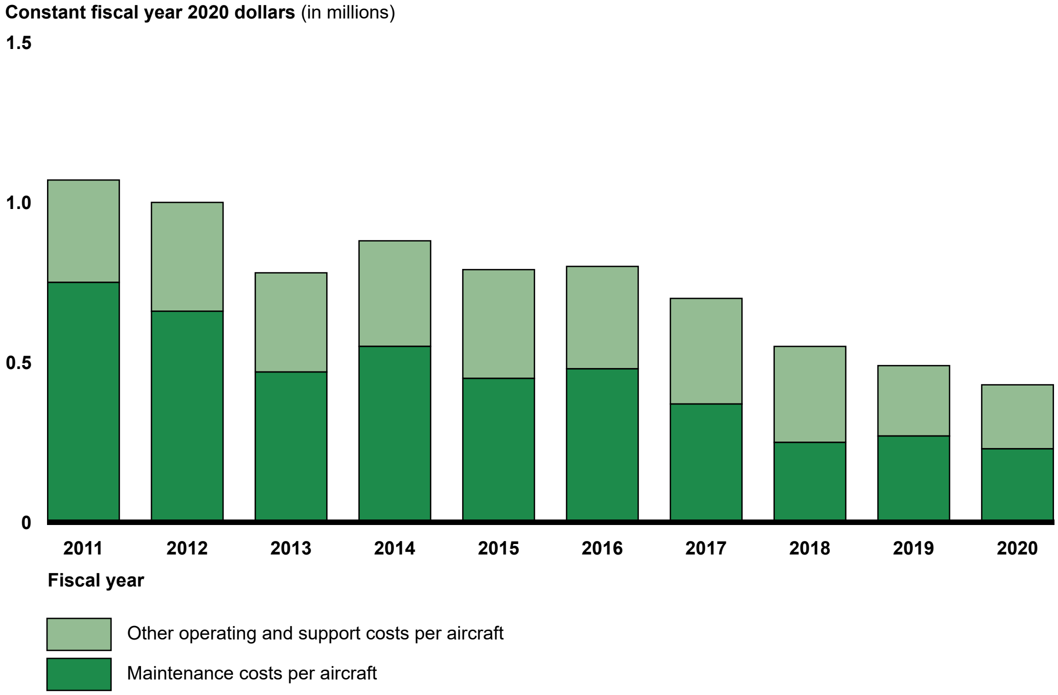


UH/HH-60 Maintenance Costs

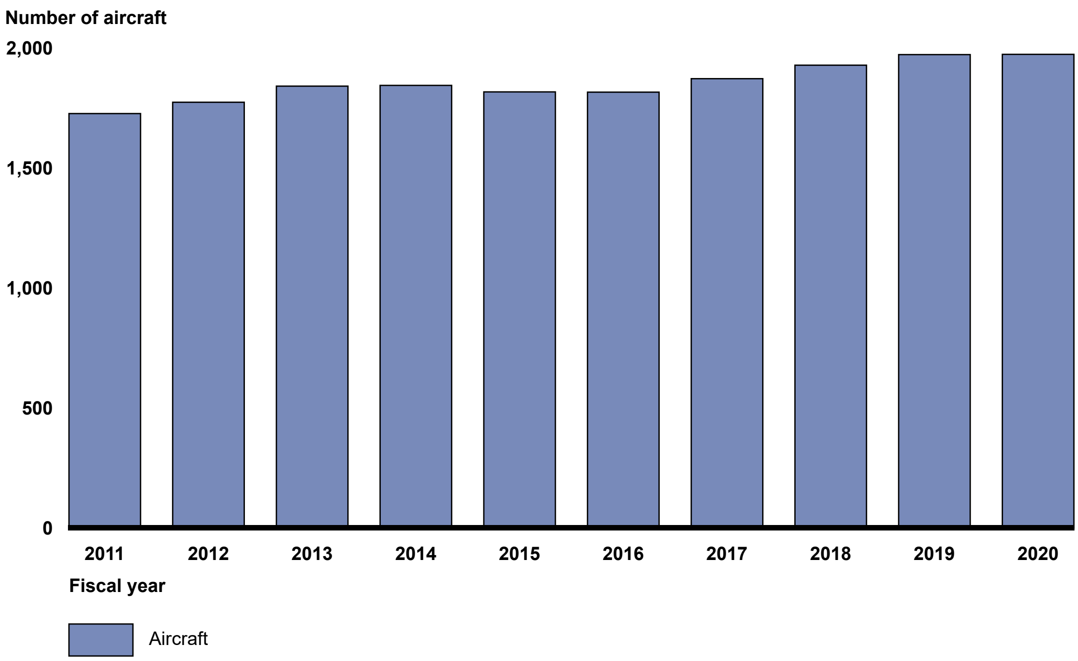


Operating and Support Costs per Aircraft

UH/HH-60 Operating and Support Costs per Aircraft

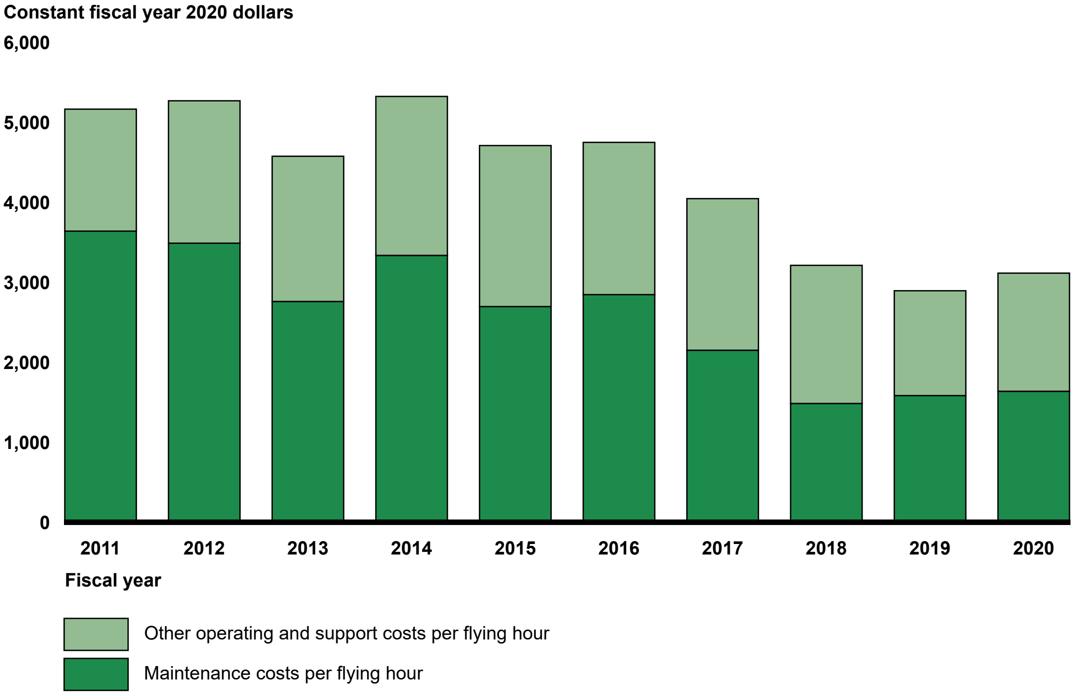


UH/HH-60 Fleet Size

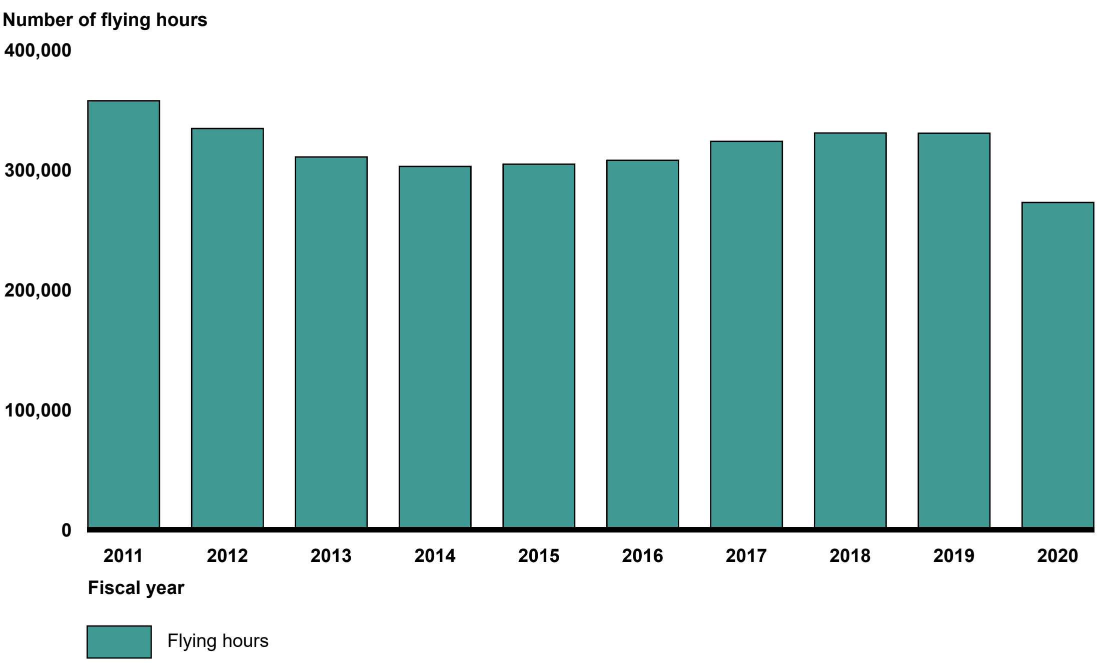


Operating and Support Costs per Flying Hour

UH/HH-60 Operating and Support Costs per Flying Hour



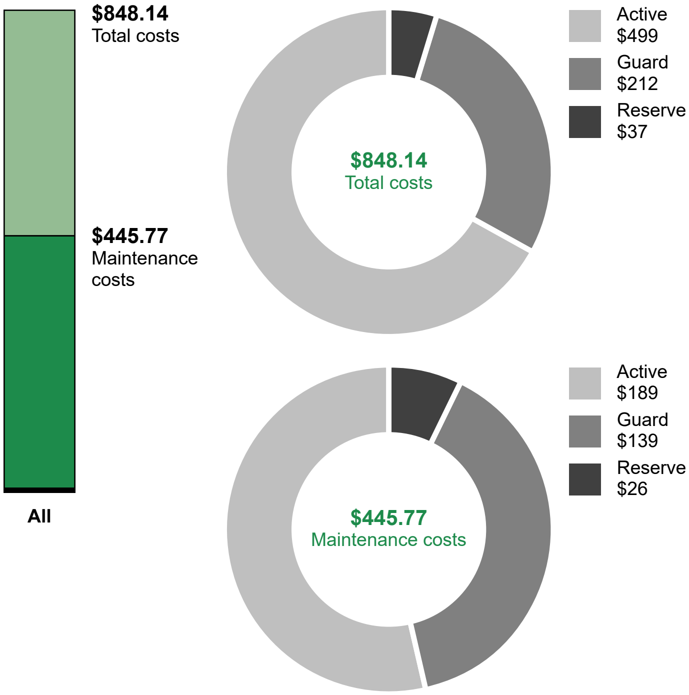
UH/HH-60 Flying Hours



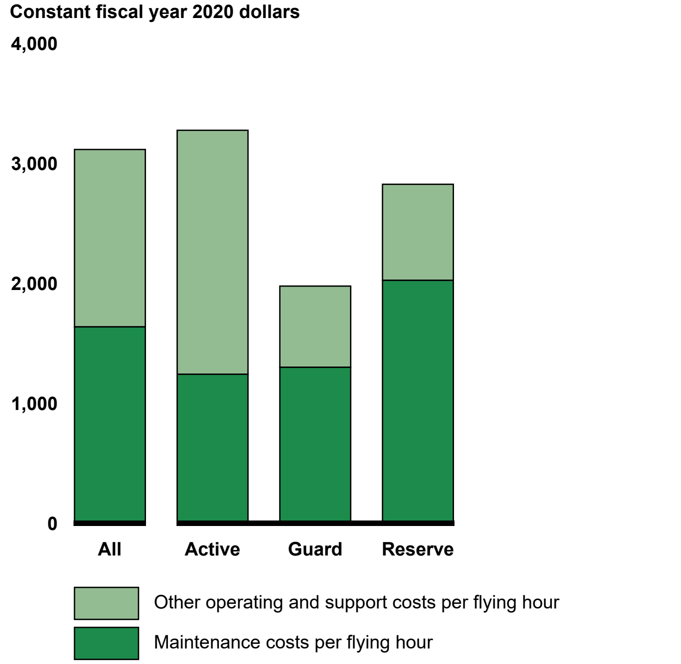
Component-Level Operating and Support Costs

UH/HH-60 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The Army manages the UH-60A, UH/HH-60L, and UH/HH-60M in an integrated manner, according to program officials. The Corpus Christi Army Depot in Texas performs depot maintenance on the UH/HH-60's airframe and components and Tobyhanna Army Depot in Pennsylvania performs depot maintenance on the aircraft's reparable components. Army personnel perform field maintenance with assistance from contractor field representatives. The Army Supply System, Sikorsky Aircraft Corporation, and the Defense Logistics Agency provide supply support for the UH/HH-60 fleet.

UH/HH-60 Sustainment Challenges

Aging Aircraft
- Delays in acquiring replacement aircraft
- Service life extension
- Unexpected replacement of parts and repairs

Maintenance
- Access to technical data
- Delays in depot maintenance
- Shortage of trained maintenance personnel
- Unscheduled maintenance

Supply Support
- Diminishing manufacturing source
- Parts obsolescence
- Parts shortage and delay

Maintenance: Manning and maintainer availability continue to be the main challenges affecting the program's not mission capable maintenance rate, according to officials. They told us that if the unit does not have the proper level of personnel to support maintenance actions, the time needed to complete maintenance actions will increase.

For the personnel at a unit, the program officials stated that maintainer availability is at the discretion of the commander. They also stated that they expect that retention numbers and maintainer availability will be continued drivers of the program’s not mission capable maintenance rate in fiscal year 2022.

Supply Support: The Army has experienced parts quality challenges that have caused delays in repair and parts production lead times for the UH/HH-60, according to program officials. To address these challenges, they said that the program office is adjusting lead time requirements and using more long-term contracts with manufacturers.

Additionally, program officials stated that they have worked to mitigate parts issues by leading monthly engagements with parts suppliers to reduce production lead times. Further, the officials said that they continually work with Sikorsky Aircraft Corporation and the Defense Logistics Agency to expedite deliveries for parts shortages affecting the Army depots and contractor component repair. However, according to officials, these mitigation actions are recovering from COVID issues, but open communication continues.

Program Office Comments

The program office reviewed a draft of this assessment and did not have any comments.

MH-53E
Sea Dragon

Program Essentials

Lead Service
Navy

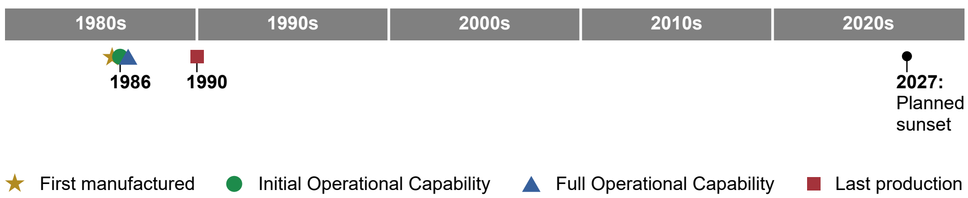
Manufacturer
Lockheed Martin/Sikorsky

Program Office
Program Manager – Air 261, Naval Air Systems Command, Patuxent River, Maryland

Sustainment
The Navy's Fleet Readiness Center East performs depot maintenance. Navy personnel perform organizational maintenance.

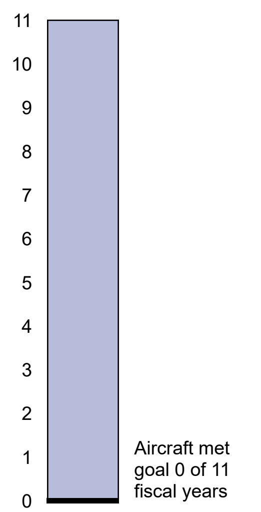
The MH-53E is a heavy-lift helicopter with two primary missions, airborne mine countermeasures and heavy-lift/vertical onboard delivery. The MH-53E is capable of mine hunting, sweeping, and neutralization, and rapidly transporting troops and equipment from ship to shore.

MH-53E Life Cycle Timeline

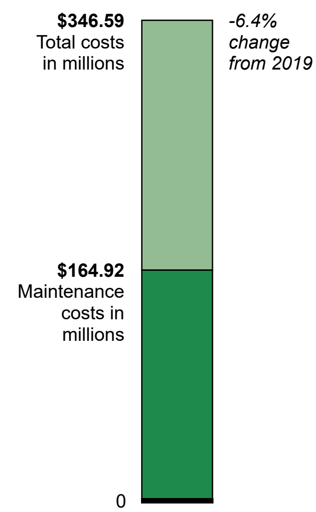


MH-53E Sustainment Status

Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

28 total aircraft
Fiscal year 2020

29.6 years
Average aircraft age in fiscal year 2021

Flying hours

7,141 flying hours
Fiscal year 2020

6,255 hours
Average lifetime flying hours per aircraft in fiscal year 2021

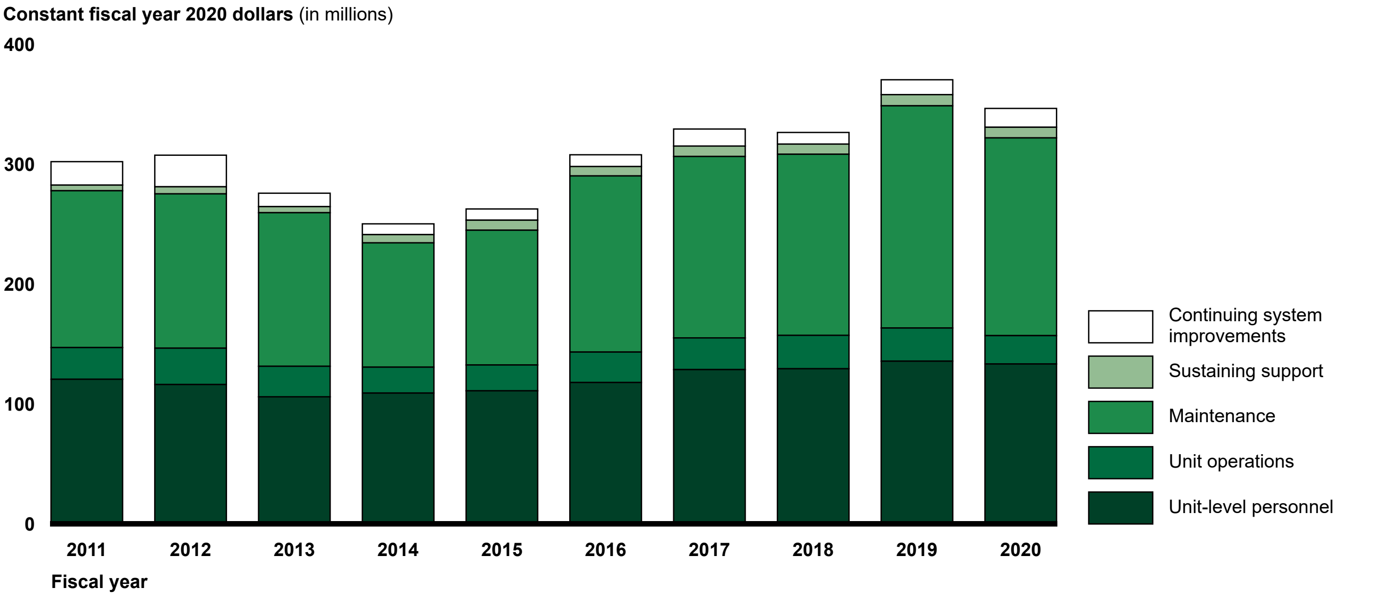
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$12.38 million
Total costs per aircraft

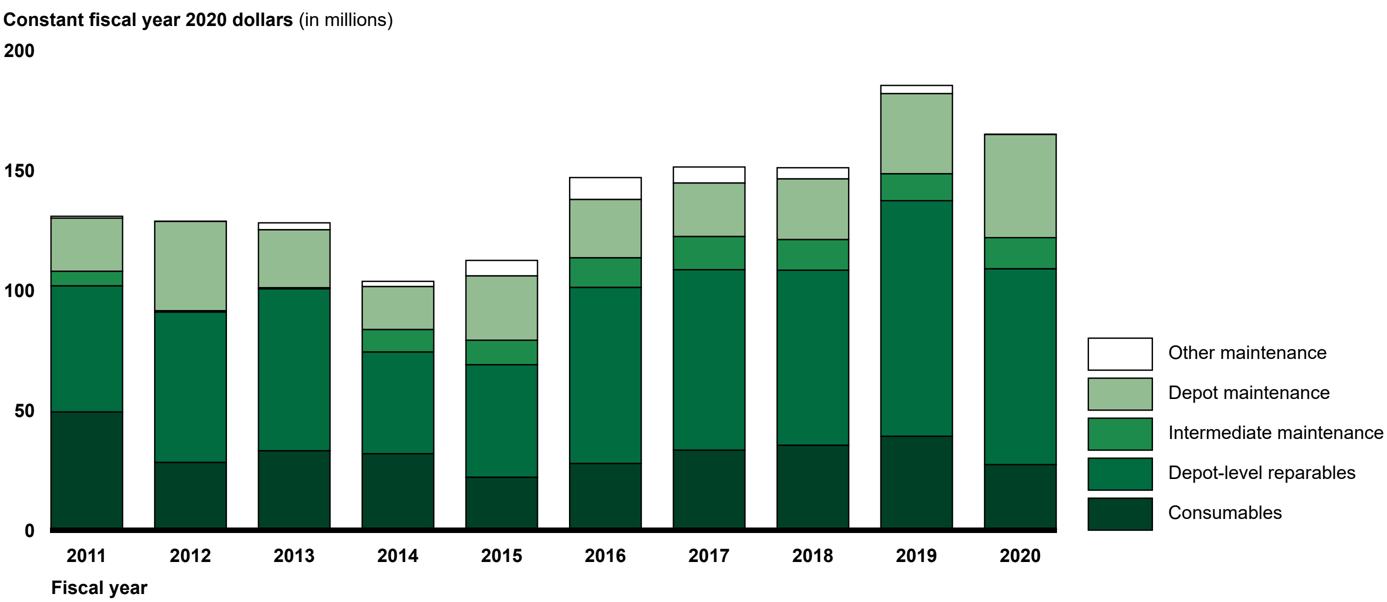
$48,535
Total costs per flying hour
+4.2% change from 2019

Operating and Support Costs

MH-53E Total Operating and Support Costs

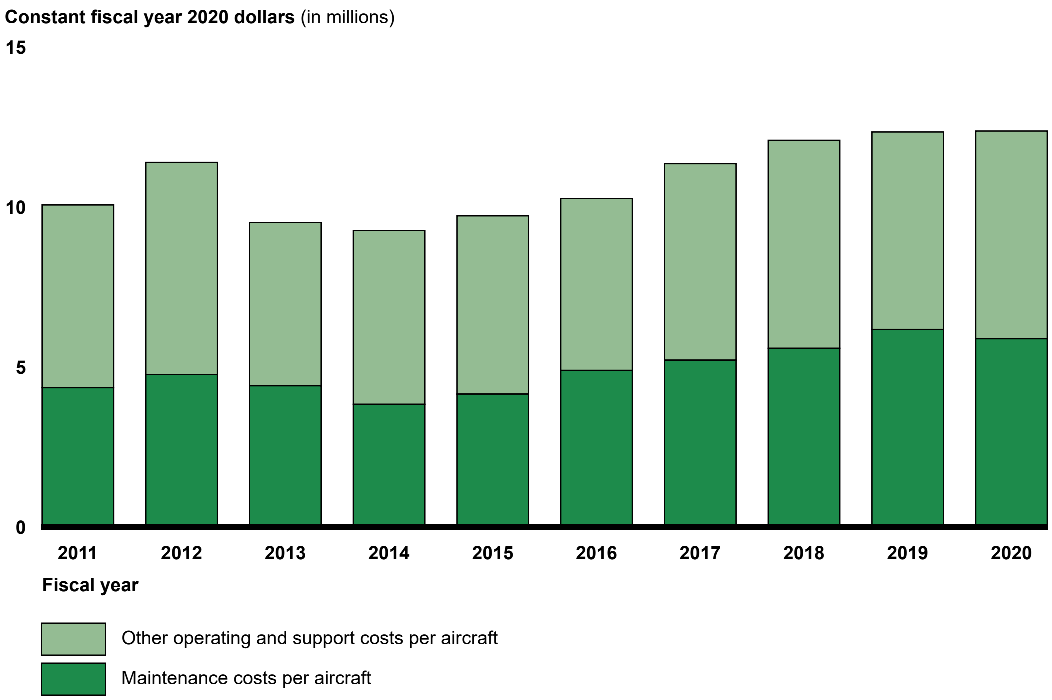


MH-53E Maintenance Costs

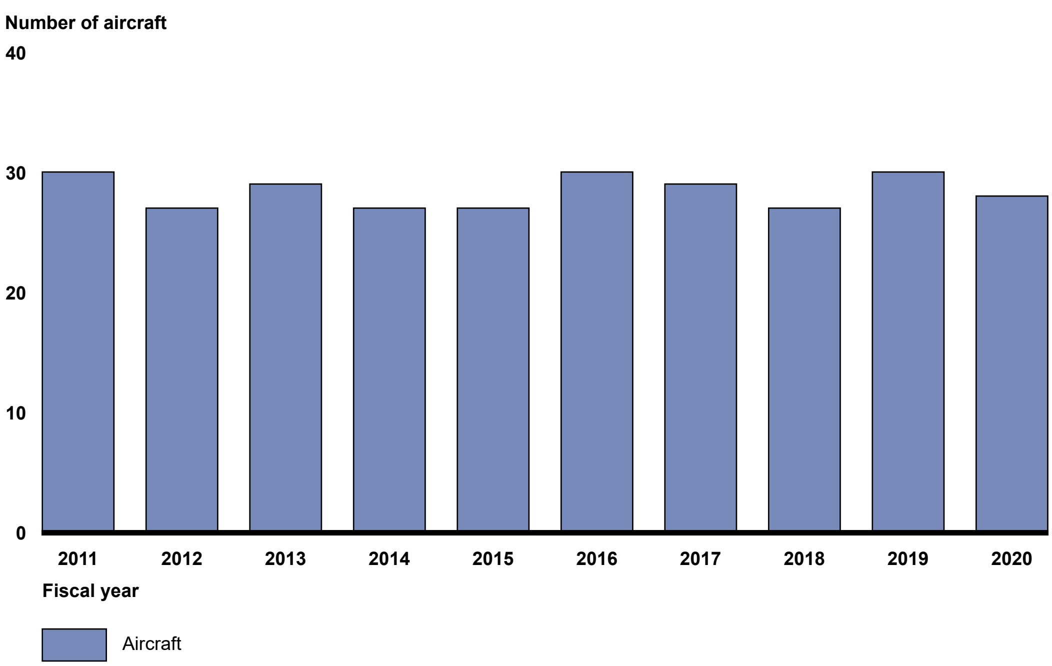


Operating and Support Costs per Aircraft

MH-53E Operating and Support Costs per Aircraft

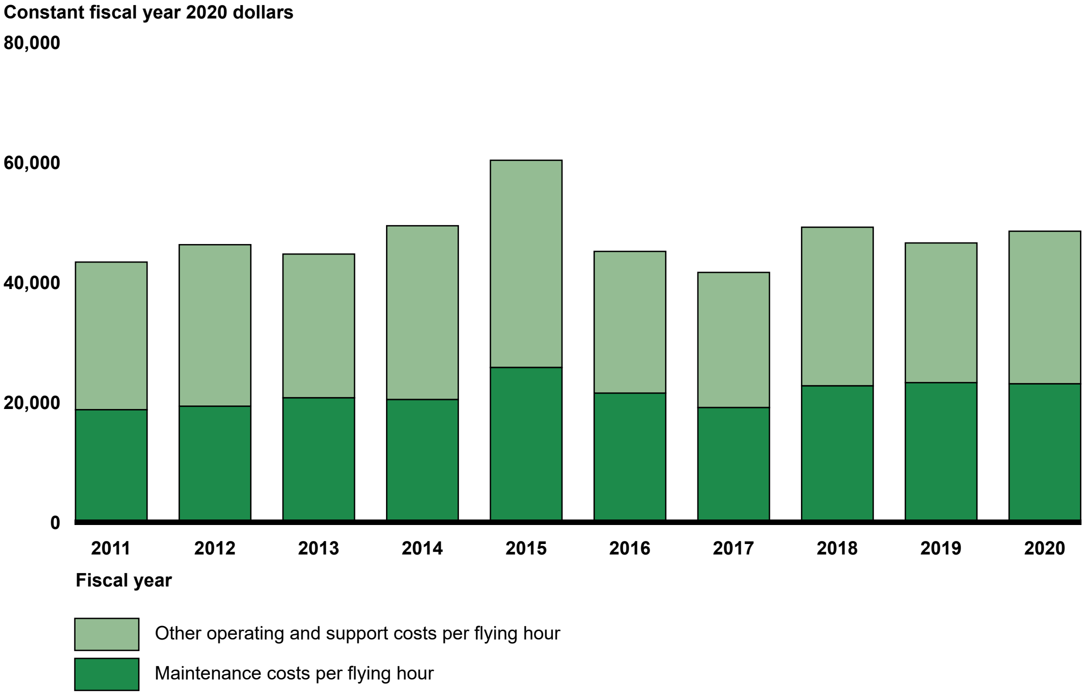


MH-53E Fleet Size

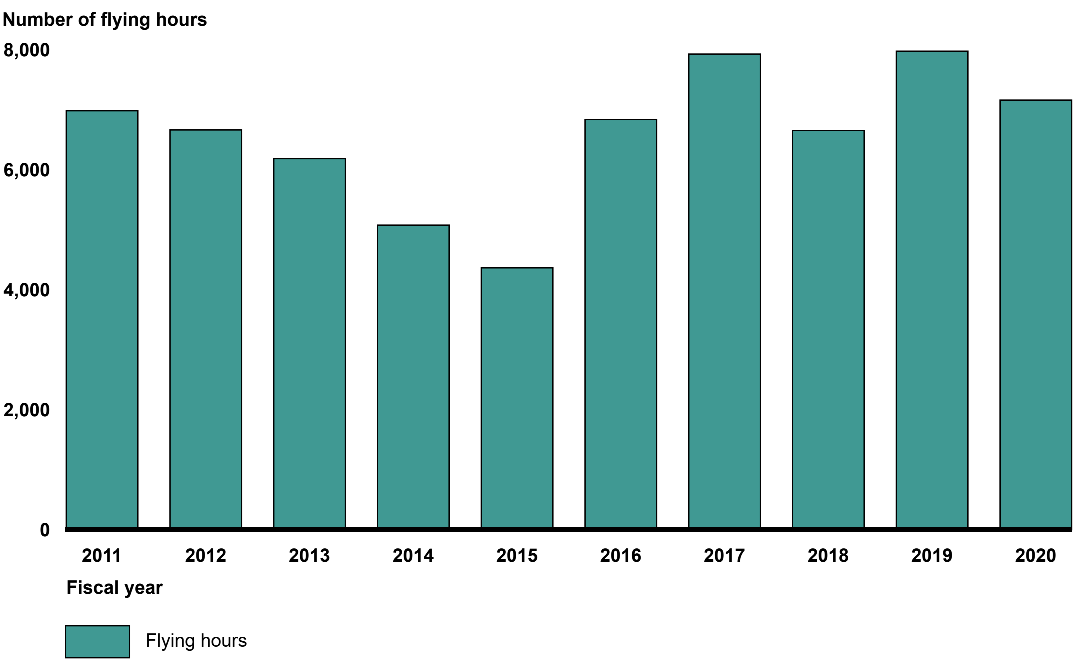


Operating and Support Costs per Flying Hour

MH-53E Operating and Support Costs per Flying Hour



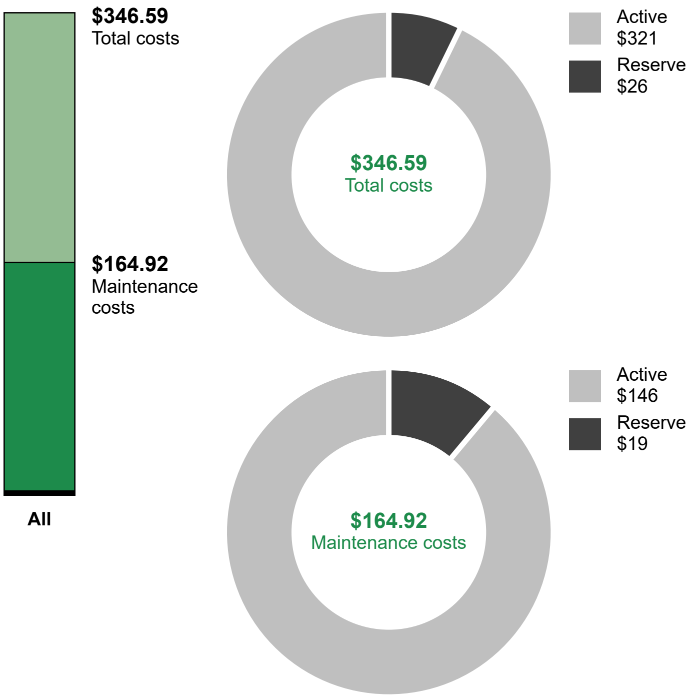
MH-53E Flying Hours



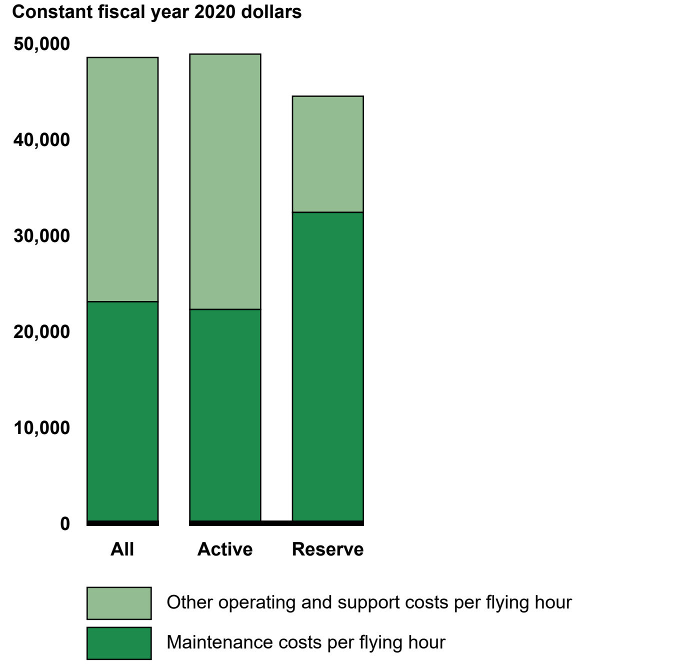
Component-Level Operating and Support Costs

MH-53E Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The Navy's Fleet Readiness Center East in North Carolina performs depot maintenance on the MH-53E. Navy personnel perform organizational maintenance. The Naval Supply Systems Command and the Defense Logistics Agency provide supply support.

MH-53E Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Aging: Officials stated that because the MH-53E has been in operation for more than 35 years, it faces challenges associated with an aging aircraft, including additional repair procedures to return assets to the fleet, and diminishing manufacturing sources and material shortages persist.

Maintenance: Officials said that many of the MH-53E's readiness issues are due to very heavy usage during wartime, along with a lack of needed depot maintenance to restore the aircraft. Officials told us that heavy operational deployments sometimes necessitate postponing non-essential discrepancies and repairs; these discrepancies and repairs tend to build up, requiring downtime later to catch up on maintenance issues.

Officials told us that a Depot Readiness Initiative was implemented in 2018 to quickly return aircraft to a mission capable status. According to program officials, the Depot Readiness Initiative allows the depot maintenance personnel to address issues that were out of the scope of the planned depot work, thus lessening the amount of work returned to the organization. For example, officials said, a broken latch on the aircraft door is normally not an issue the depot would repair, but addressing the issue allows the aircraft to be operational when returned to organizational level.

Officials cited several ongoing actions to enhance maintenance capability for the MH-53E, including a continued focus on training to increase technical expertise of aircraft maintainers. For example, officials told us they had previously reached out to the Air Force to obtain personnel who could train MH-53E maintainers on wiring skills.

Supply Support: The MH-53E has experienced challenges with parts shortages due to diminishing manufacturing sources and obsolescence. Program officials stated that the shortages are also a result of an over-reliance on demand history to inform supply support decisions instead of using forward-looking, predictive criteria. Officials explained that this refers to the supply system practice of using the last eight quarters of demand history to forecast future procurement of a part. According to officials, the program has experienced longer supply response times to fill requirements while the supply system fills the backlog of requisitions. To mitigate problems associated with using historical demand, the officials said that the program works with its supply stakeholders to reduce asset allocations at retail sites when periods of increased demand are not expected to continue. Further, officials said that most retail sites work to inform the supply system of upcoming events that may drive a higher-than-historical consumption rate to ensure ready-for-issue parts are on the shelf when needed.

According to program officials, first-time failures for parts can be challenging as the program office must obtain parts that have never been ordered before, and may no longer be in production. To address these failures, officials told us that they monitor airframes that are roughly at the same number of flight hours to determine if there is a trend while also working to identify a source for the part, or to manufacture the part.

Officials told us that through the program's Reliability Control Board efforts and critical parts reviews, the program office has actions ongoing to improve parts availability such as expanding the use of product support arrangements and performance-based logistics contracts with industry partners—to ensure parts availability until 2027—and the program is implementing demand planning and predictive forecasting tools to determine parts inventory requirements.

For example, according to officials, the program office works with its Navy Supply Weapon Systems Support team that initially established—and currently manages—a performance-based logistics contract with Sikorsky Aircraft Corporation, a Lockheed Martin Company, for more than 60 components. Program officials stated that this effort has been ongoing for roughly 15 years and the most recent contract was awarded in 2018 and ends in 2023.

Additionally, according to program officials, Fleet Readiness Center East, the organic depot maintenance provider, has established a public-private partnership with Sikorsky Aircraft Corporation that has improved parts availability by providing parts to the organic depots to enable repairs and mitigate wait times for the parts.

These arrangements are important to keep the industrial base viable and to ensure organic depot capability is sustained, according to program officials. They said that industry partners are incentivized through these arrangements to manage diminishing manufacturing sources, material shortages, and parts reliability issues to ensure availability metrics are met or exceeded, which increases flight line readiness.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

MH-60R
Seahawk

Program Essentials

Lead Service
Navy

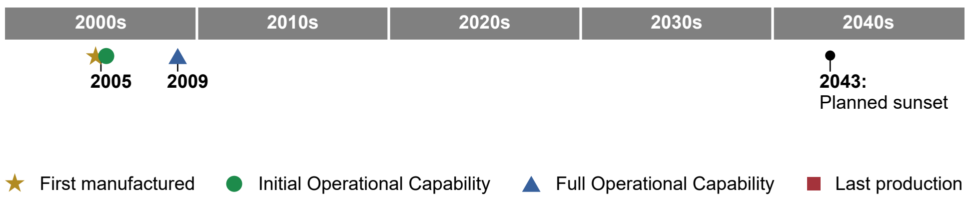
Manufacturer
Lockheed Martin/Sikorsky

Program Office
Program Manager – Air 299, Naval Air Systems Command, Patuxent River, Maryland

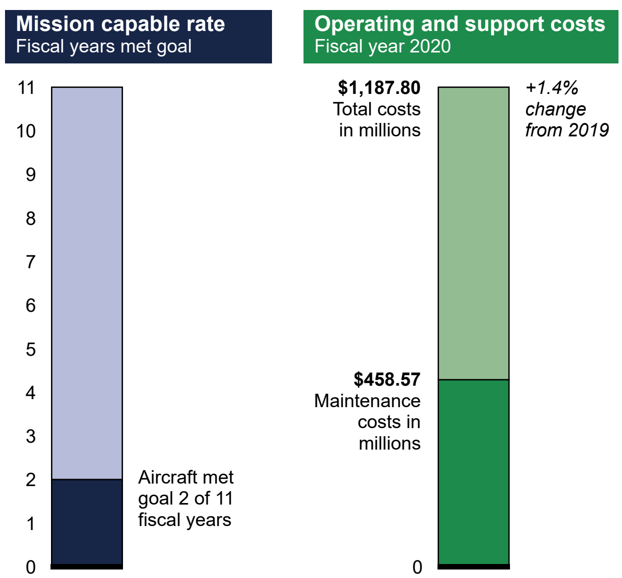
Sustainment
The Navy's Fleet Readiness Centers Southeast, Southwest, Mid-Atlantic and Western Pacific perform planned depot maintenance. Navy personnel perform field maintenance.

The MH-60R Seahawk is a twin-engine helicopter. Its primary missions are anti-submarine and anti-surface warfare. Secondary missions include electromagnetic warfare, search and rescue, naval surface fire support, logistics support, personnel transport, and medical evacuation.

MH-60R Life Cycle Timeline



MH-60R Sustainment Status



Aircraft

220 total aircraft
Fiscal year 2020

8.2 years
Average aircraft age in fiscal year 2021

Flying hours

81,608 flying hours
Fiscal year 2020

2,836 hours
Average lifetime flying hours per aircraft in fiscal year 2021

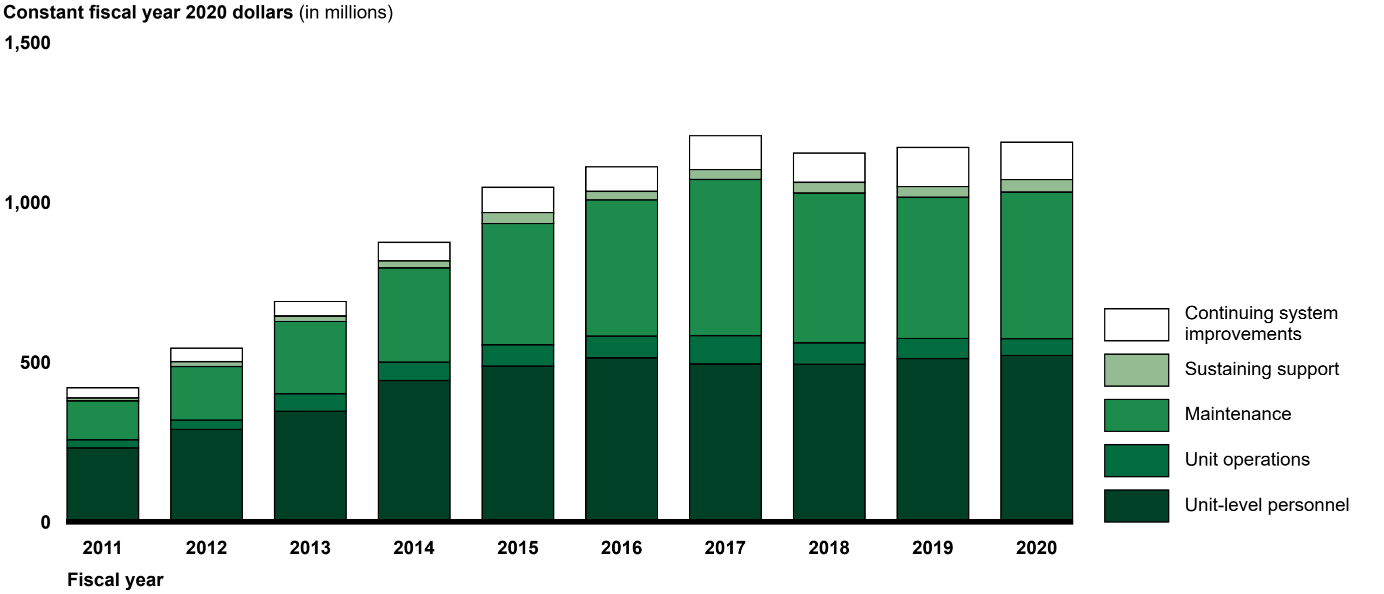
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$5.40 million
Total costs per aircraft

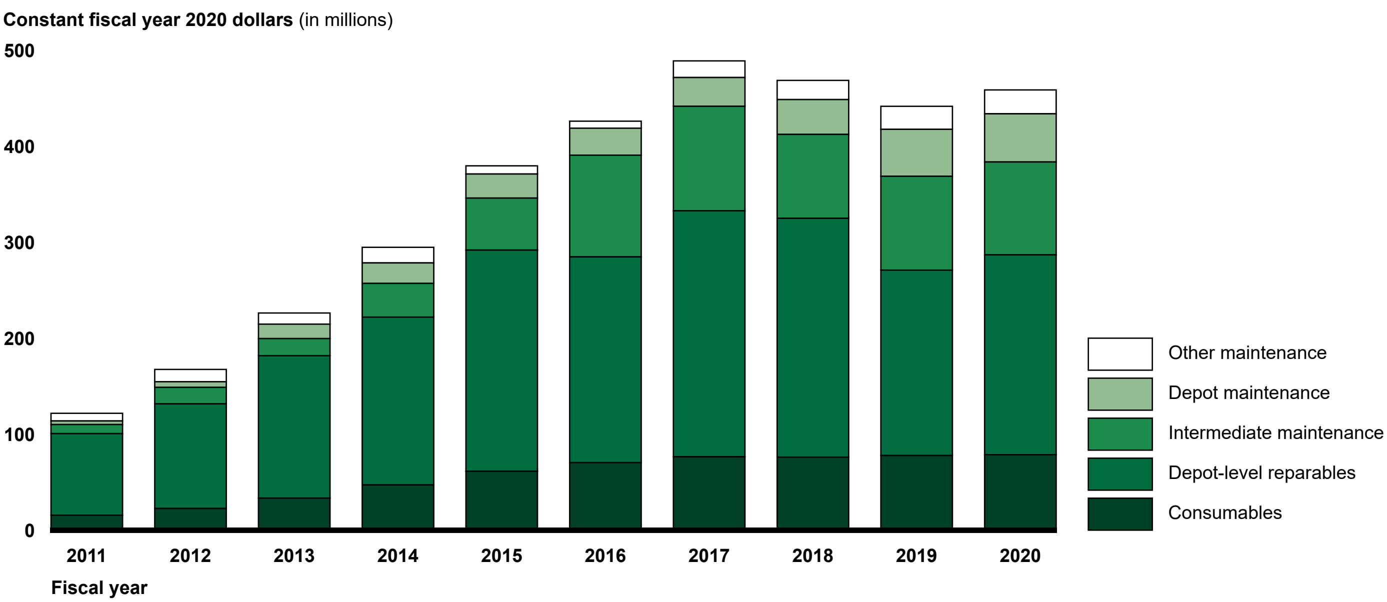
$14,555
Total costs per flying hour
+4.3% change from 2019

Operating and Support Costs

MH-60R Total Operating and Support Costs

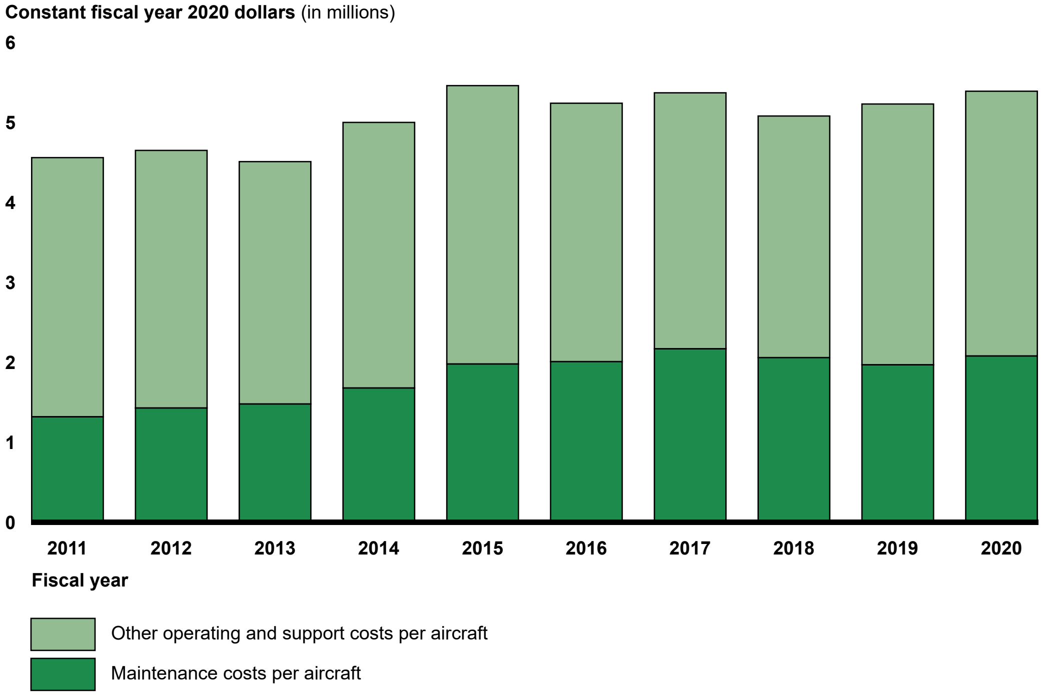


MH-60R Maintenance Costs

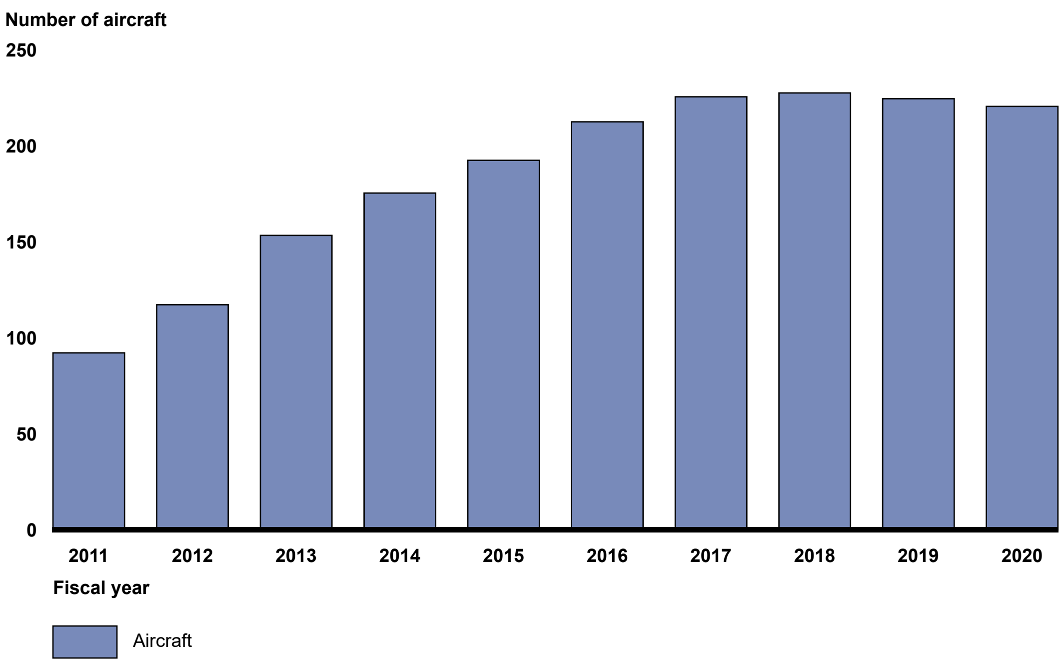


Operating and Support Costs per Aircraft

MH-60R Operating and Support Costs per Aircraft

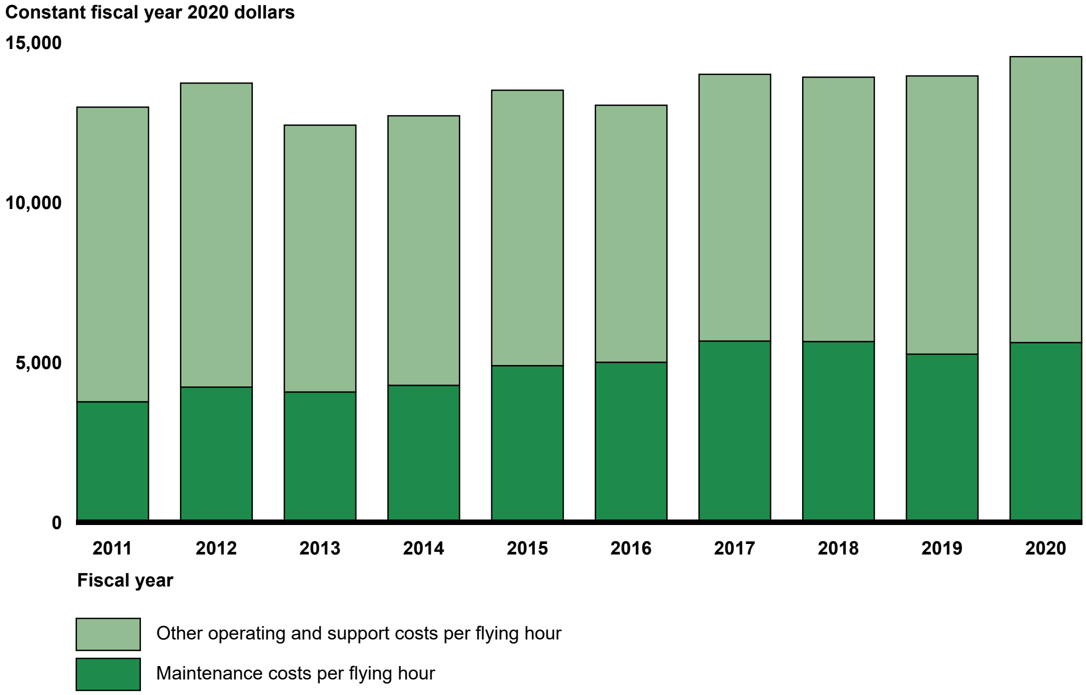


MH-60R Fleet Size

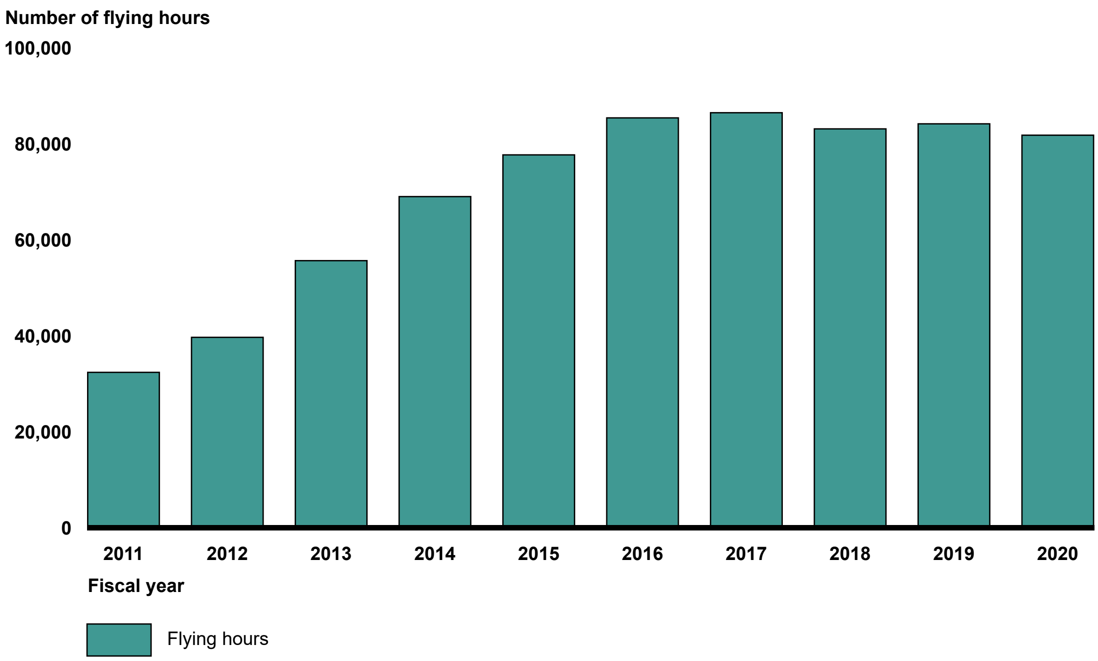


Operating and Support Costs per Flying Hour

MH-60R Operating and Support Costs per Flying Hour



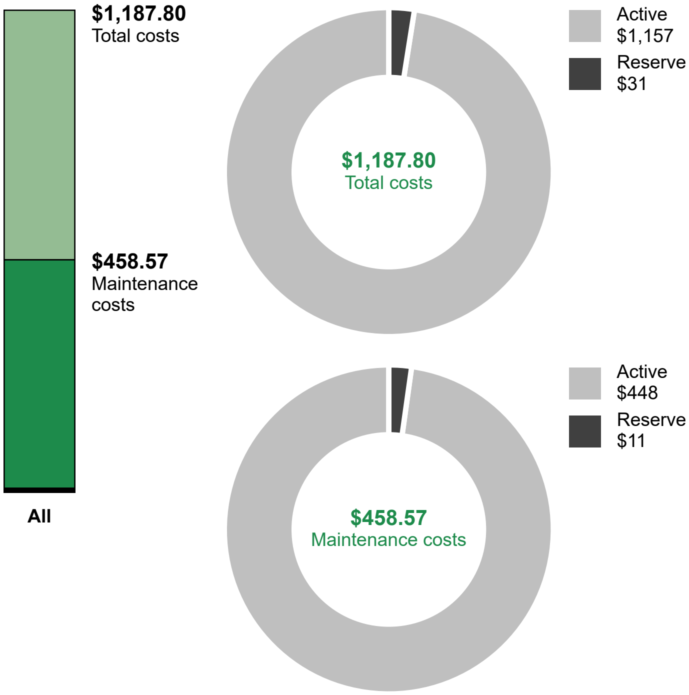
MH-60R Flying Hours



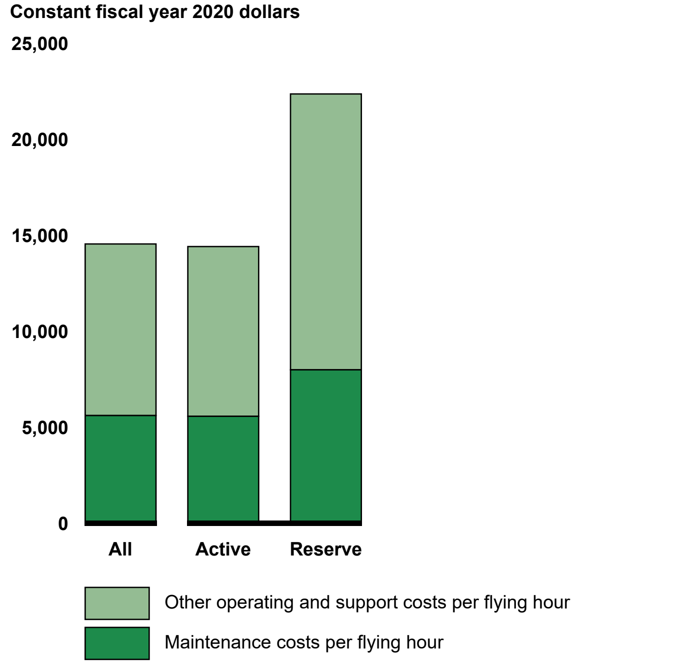
Component-Level Operating and Support Costs

MH-60R Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The Navy's Fleet Readiness Centers Southeast, Southwest, Mid-Atlantic and Western Pacific perform planned depot maintenance on the MH-60R. Navy personnel perform field maintenance. According to program officials, in 2020 the Naval Supply Systems Command renewed a performance-based logistics contract with the Lockheed Martin Corporation to repair MH-60 depot-level reparable items and manage the inventory of those parts.

MH-60R Sustainment Challenges

Aging Aircraft
- Delays in acquiring replacement aircraft
- Service life extension
- Unexpected replacement of parts and repairs

Maintenance
- Access to technical data
- Delays in depot maintenance
- Shortage of trained maintenance personnel
- Unscheduled maintenance

Supply Support
- Diminishing manufacturing source
- Parts obsolescence
- Parts shortage and delay

Maintenance: A shortage of trained maintenance personnel continues to be a challenge, according to program officials. In fiscal year 2021, the MH-60 program implemented an organizational-level initiative to reform maintenance management processes that they said is expected to improve maintainer experience. In addition, a program official stated that the program is partnering with intermediate maintenance repair sites to leverage the depot-level experience and opportunities to effect repairs closer to the flight line.

Program officials also stated that prior to the end of fiscal year 2021, delays in depot maintenance were a challenge because the MH-60 planned maintenance intervals were exceeding the established delivery dates. However, officials said that the Naval Sustainment System reforms at the depots improved the turnaround times on the aircraft's two planned maintenance intervals.

More specifically, the Commander, Naval Air Systems Command tasked the depots in April 2021 to meet reduced turnaround times for the H-60's two planned maintenance intervals and emphasized the need to return H-60 aircraft to the fleet faster, according to the Naval Air Systems Command. Program officials said that the reduced turnaround times for the two planned maintenance intervals were 21 and 26 days shorter, or about 15 and 16 percent less, than the original turnaround times. The officials stated that aircraft deliveries started to meet the reduced turnaround times in August 2021 and a total of nine aircraft were delivered that met the reduced times in the last 2 months of fiscal year 2021.

Program officials stated that, in January 2021, the program office implemented the Maintenance Operations Center Aircraft on Ground initiative for the MH-60S and the MH-60R aircraft to improve the mission capable rate of both fleets. According to the office of the Commander, Naval Air Force Atlantic Public Affairs office, the Maintenance Operations Center Aircraft on Ground initiative enables long-term collaboration among Naval Aviation stakeholders by bringing together maintenance, supply, engineering, and depot experts, and contractors that partner with the Navy, to improve aircraft operational readiness through planned maintenance intervals by identifying and resolving barriers.

Supply Support: The MH-60R has continued to experience sustainment challenges from parts shortages and delays, diminishing manufacturing sources, and obsolescence, according to program officials. For example, they stated the following specifics.

- There have been periodic delivery delays for both consumable items and reparable parts. The proposed manufacturing contracts for the supply of several mission systems did not receive any bids, so the program is searching for alternate sources of supply for these systems.
- Several mission systems, such as the airborne systems for locating and destroying naval mines, have started to have obsolescence issues.

To mitigate parts shortages and delays, officials stated that the program office engaged the U.S. Army Redstone Arsenal Combat Capabilities Development Command to research and analyze obsolescence issues and determine resolution and options for paths forward.

Program Office Comments

The program office reviewed a draft of this assessment and did not have any comments.

MH-60S
Seahawk

Program Essentials

Lead Service
Navy

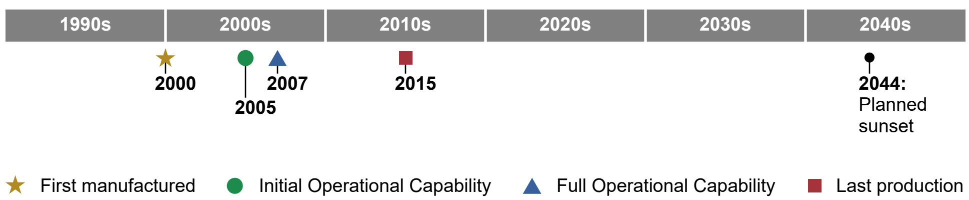
Manufacturer
Lockheed Martin/Sikorsky

Program Office
Program Manager – Air 299, Naval Air Systems Command, Patuxent River, Maryland

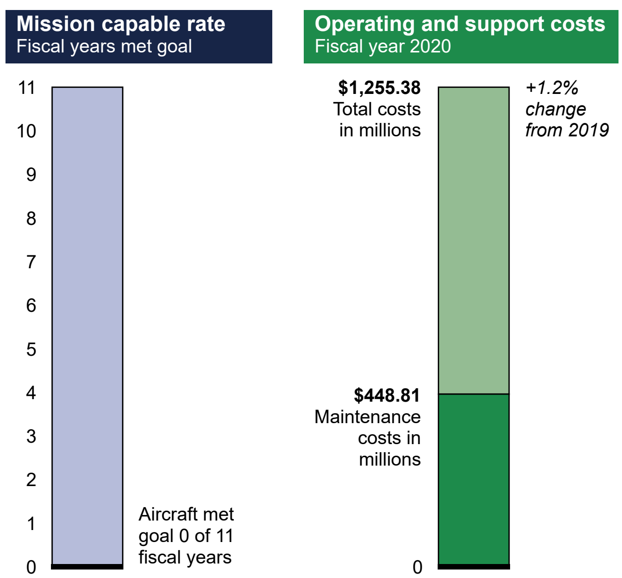
Sustainment
The Navy’s Fleet Readiness Centers Southeast, Southwest, Mid-Atlantic and Western Pacific perform planned depot maintenance.

The MH-60S Seahawk is a multimission twin-engine helicopter. Its primary missions are anti-surface warfare, combat search and rescue, organic airborne mine countermeasure, combat support, aeromedical evacuation, and humanitarian disaster relief.

MH-60S Life Cycle Timeline



MH-60S Sustainment Status



Aircraft

237 total aircraft
Fiscal year 2020

12.5 years
Average aircraft age in fiscal year 2021

Flying hours

76,906 flying hours
Fiscal year 2020

4,264 hours
Average lifetime flying hours per aircraft in fiscal year 2021

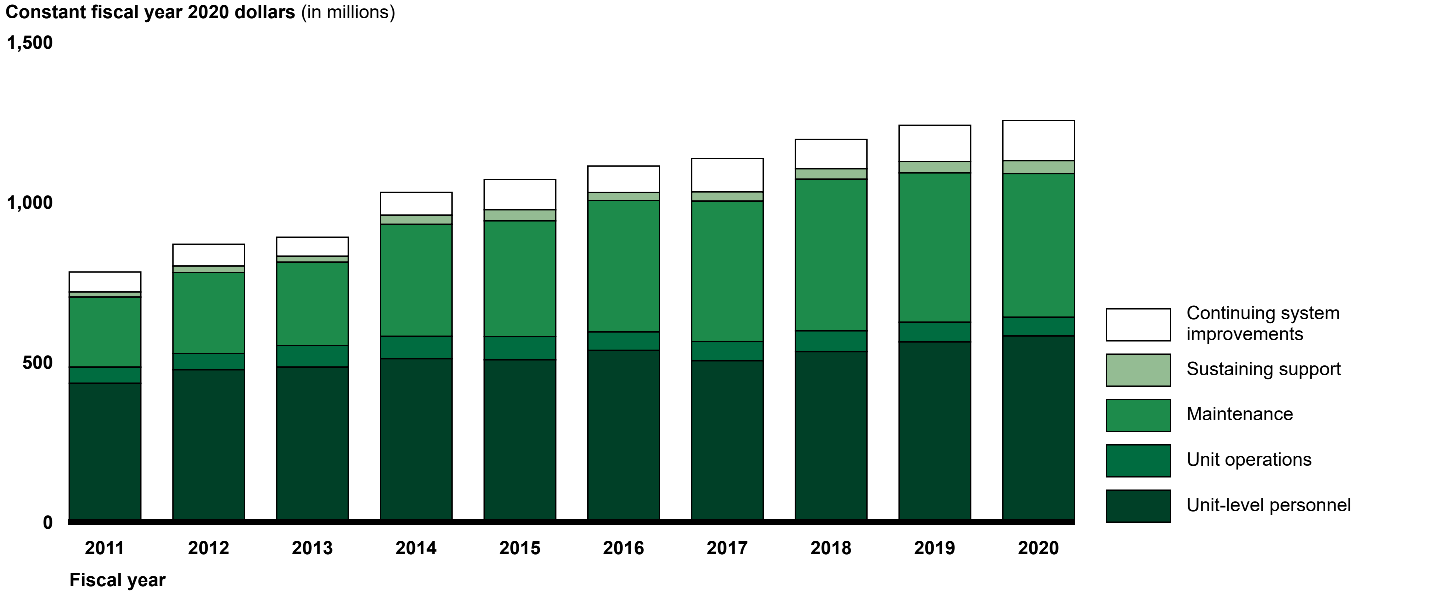
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$5.30 million
Total costs per aircraft

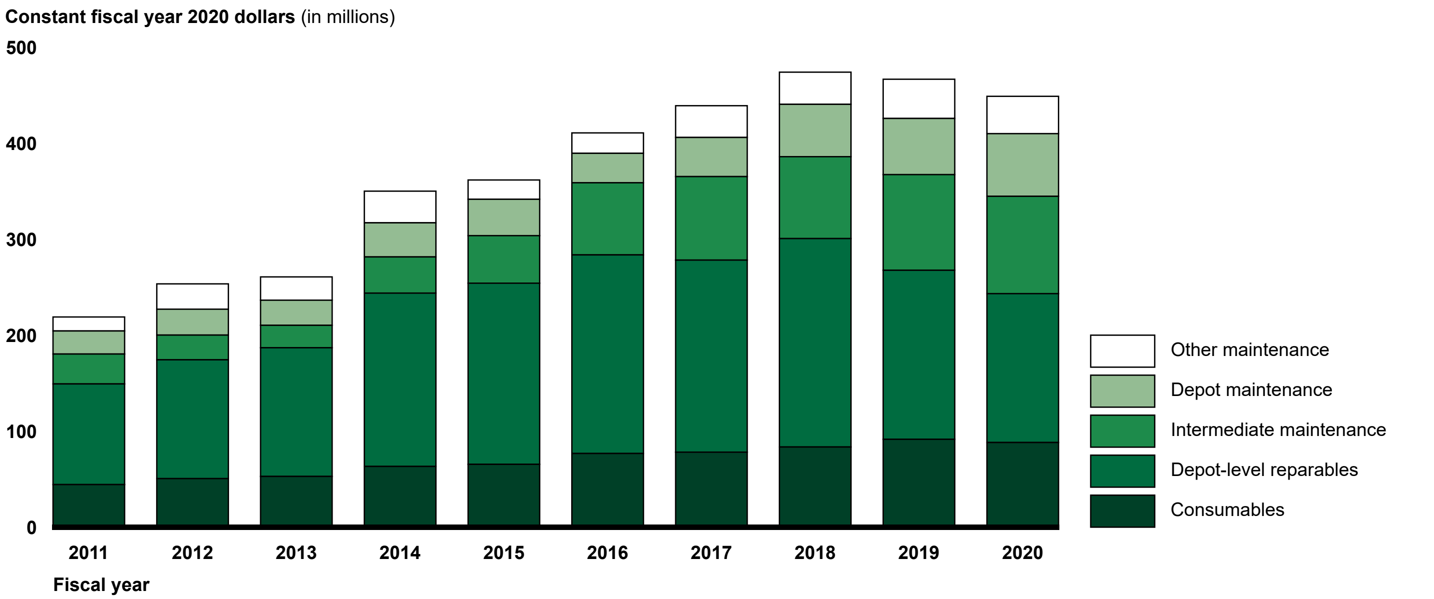
$16,324
Total costs per flying hour
+2.9% change from 2019

Operating and Support Costs

MH-60S Total Operating and Support Costs

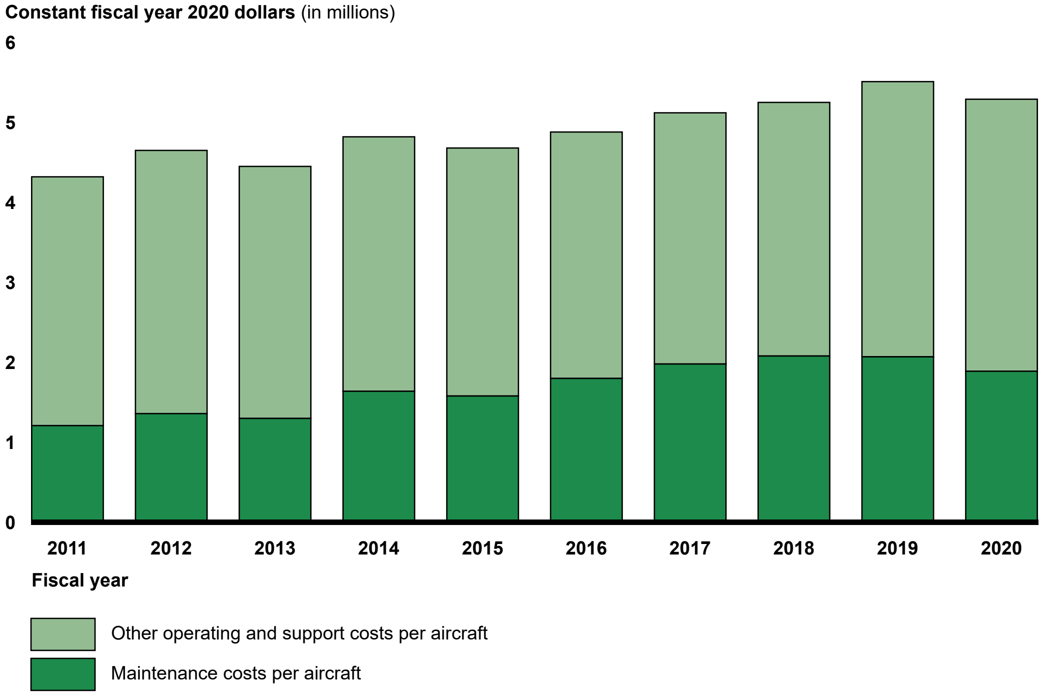


MH-60S Maintenance Costs

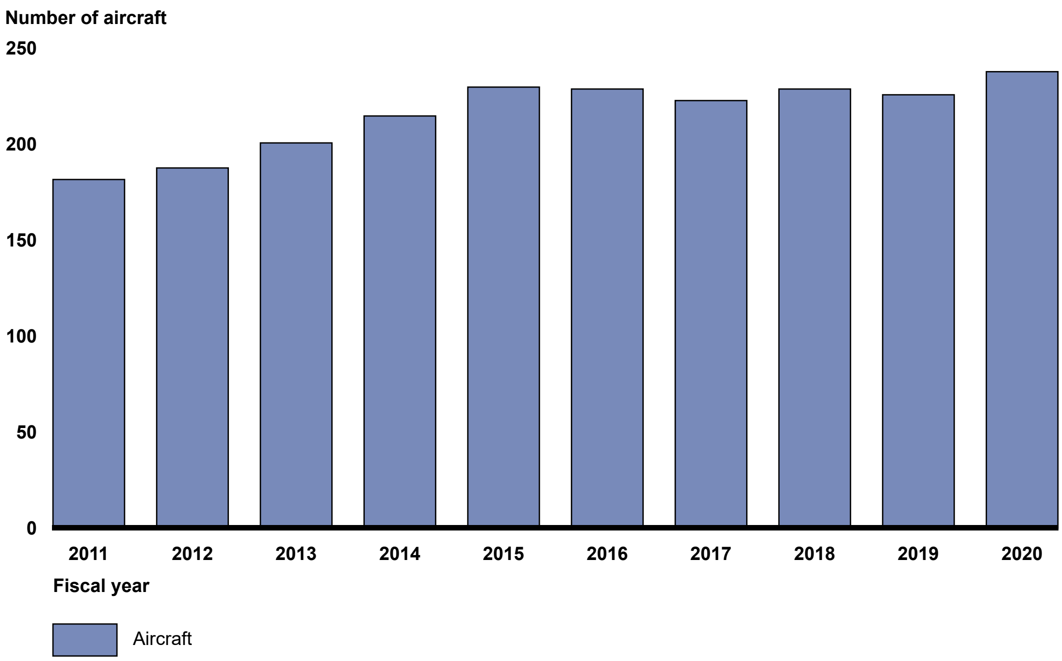


Operating and Support Costs per Aircraft

MH-60S Operating and Support Costs per Aircraft

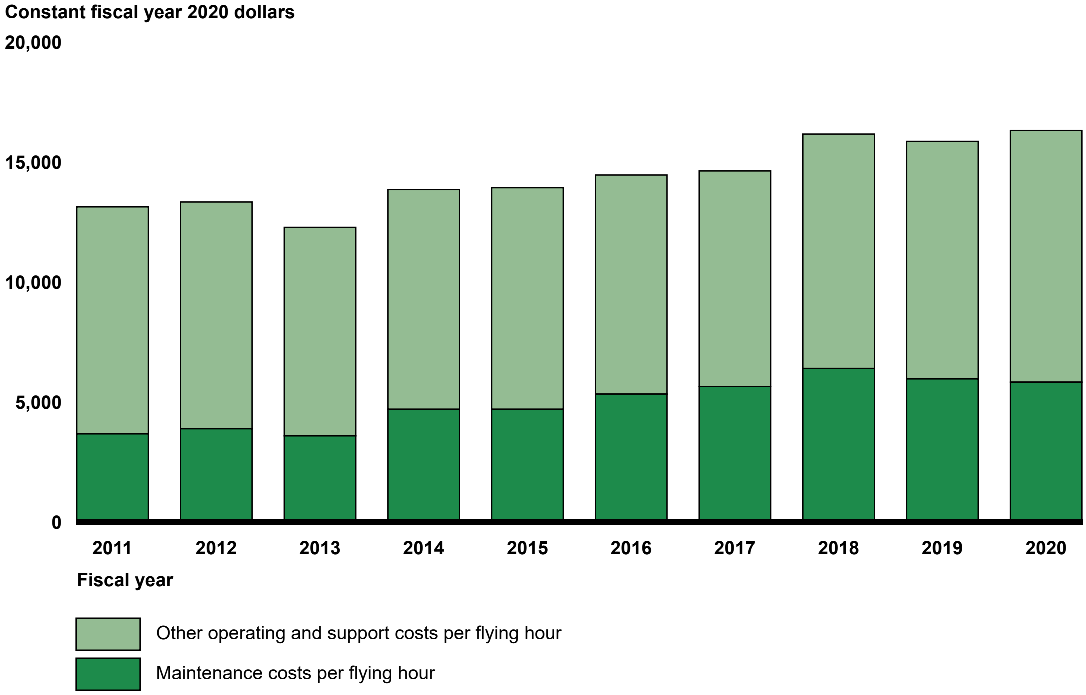


MH-60S Fleet Size

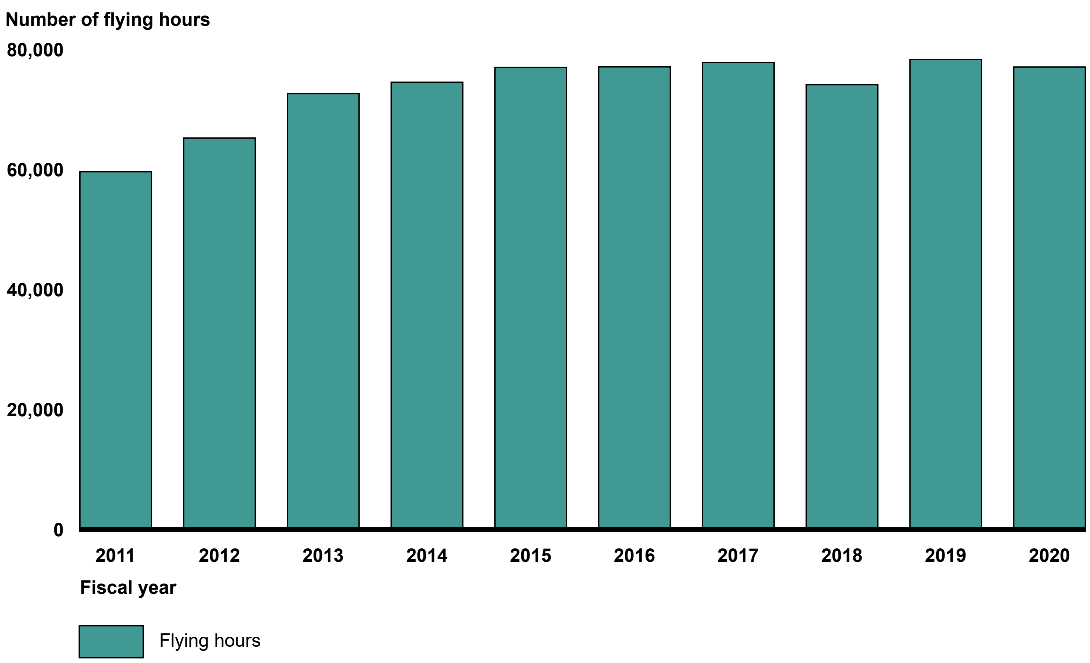


Operating and Support Costs per Flying Hour

MH-60S Operating and Support Costs per Flying Hour



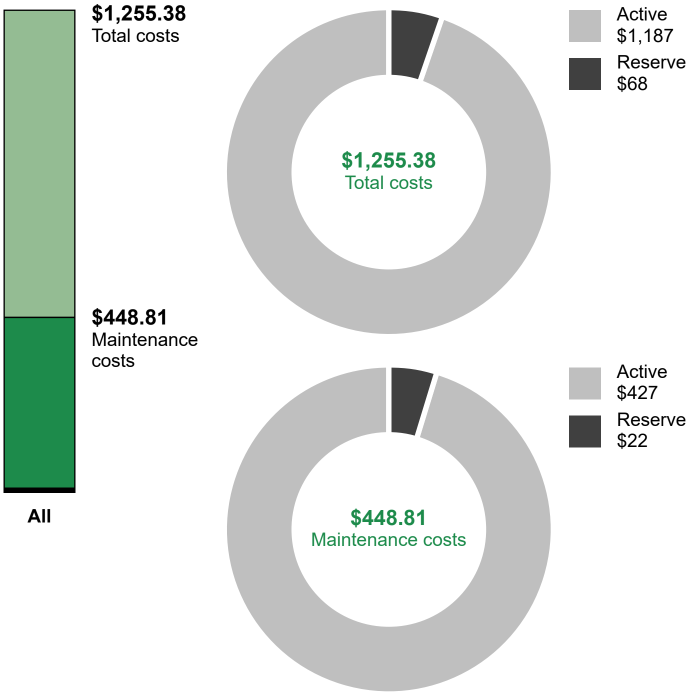
MH-60S Flying Hours



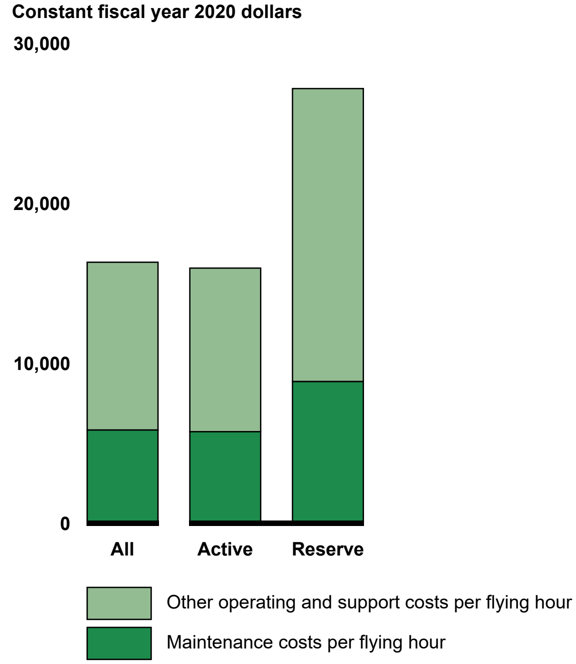
Component-Level Operating and Support Costs

MH-60S Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The Navy's Fleet Readiness Centers Southeast, Southwest, Mid-Atlantic and Western Pacific perform planned depot maintenance on the MH-60S. According to program officials, in 2020 the Naval Supply Systems Command renewed a performance-based logistics contract with the Lockheed Martin Corporation to repair MH-60 depot-level reparable items and manage the inventory of those parts.

MH-60S Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Maintenance: According to program officials, a shortage of trained maintenance personnel continues to be a challenge. In fiscal year 2021, the MH-60 program implemented an organizational-level initiative to reform maintenance management processes that they said is expected to improve maintainer experience. In addition, a program official stated that they are partnering with intermediate maintenance repair sites to leverage depot-level experience and opportunities to effect repairs closer to the flight line.

Program officials also stated that prior to the end of fiscal year 2021, delays in depot maintenance were a challenge because the MH-60 planned maintenance intervals exceeded the established delivery dates. However, they said that the Naval Sustainment System reforms at the depots improved the turnaround times on the aircraft's two planned maintenance intervals.

More specifically, the Commander, Naval Air Systems Command asked the depots in April 2021 to meet reduced turnaround times for the H-60's two planned maintenance intervals and emphasized the need to return H-60 aircraft to the fleet faster, according to the Naval Air Systems Command. Program officials said that the reduced turnaround times for the two planned maintenance intervals were 22 and 26 days shorter, or about 15 and 16 percent less, than the original turnaround times. The officials stated that aircraft deliveries started to meet the reduced turnaround times in August 2021 and nine aircraft were delivered that met the reduced times in the last 2 months of fiscal year 2021.

Program officials stated that, in January 2021, the program office implemented the Maintenance Operations Center Aircraft on Ground initiative for the MH-60S and the MH-60R aircraft to improve the mission capable rate of both fleets. According to the Commander, Naval Air Force Atlantic Public Affairs office, the Maintenance Operations Center Aircraft on Ground initiative enables long-term collaboration among Naval Aviation stakeholders by bringing together maintenance, supply, engineering, and depot experts, and contractors that partner with the Navy. The initiative is aimed at improving aircraft operational readiness through planned maintenance intervals by identifying and resolving barriers.

Supply Support: The MH-60S has continued to experience sustainment challenges from parts shortages and delays, diminishing manufacturing sources, and obsolescence, according to program officials. For example, they stated the following details.

- There have been periodic delivery delays for both consumable items and reparable parts. The proposed manufacturing contracts for the supply of several mission systems did not receive any bids, so the program is searching for alternate sources of supply for these systems.
- Several mission systems, such as the airborne systems for locating and destroying naval mines, have started to have obsolescence issues.

To mitigate parts shortages and delays, officials stated that the program office engaged the U.S. Army Redstone Arsenal Combat Capabilities Development Command to research and analyze obsolescence issues and determine resolution and options for paths forward.

Program Office Comments

The program office reviewed a draft of this assessment and did not have any comments.

AH-1Z
Viper

Program Essentials

Lead Service
Marine Corps

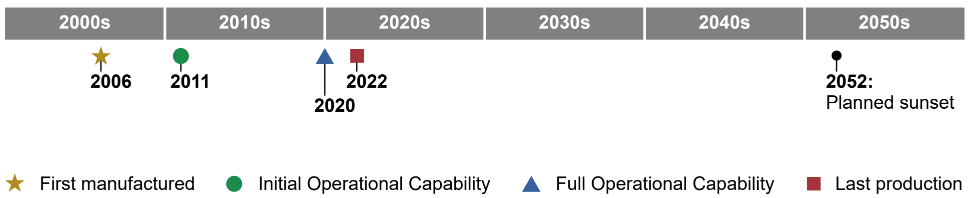
Manufacturer
Bell Helicopter Textron, Inc.

Program Office
Program Managers – Air 276, Naval Air Systems Command, Patuxent River, Maryland

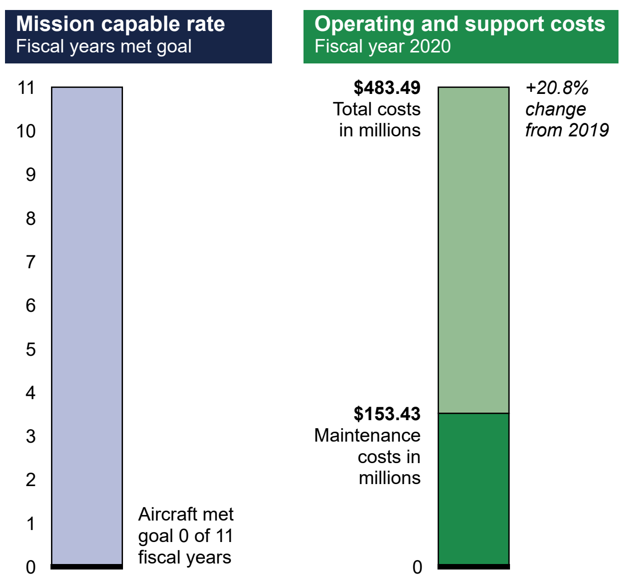
Sustainment
The Navy's Fleet Readiness Centers East, Southwest, and Western Pacific perform depot maintenance. Marine Corps personnel perform field maintenance.

The AH-1Z Viper attack helicopter provides close-air support, armed escort, armed/visual reconnaissance, anti-armor operations, anti-air warfare, and fire support coordination capabilities under day, night, and adverse weather conditions.

AH-1Z Life Cycle Timeline



AH-1Z Sustainment Status



Aircraft

143 total aircraft
Fiscal year 2020

4.2 years
Average aircraft age in fiscal year 2021

Flying hours

23,423 flying hours
Fiscal year 2020

912 hours
Average lifetime flying hours per aircraft in fiscal year 2021

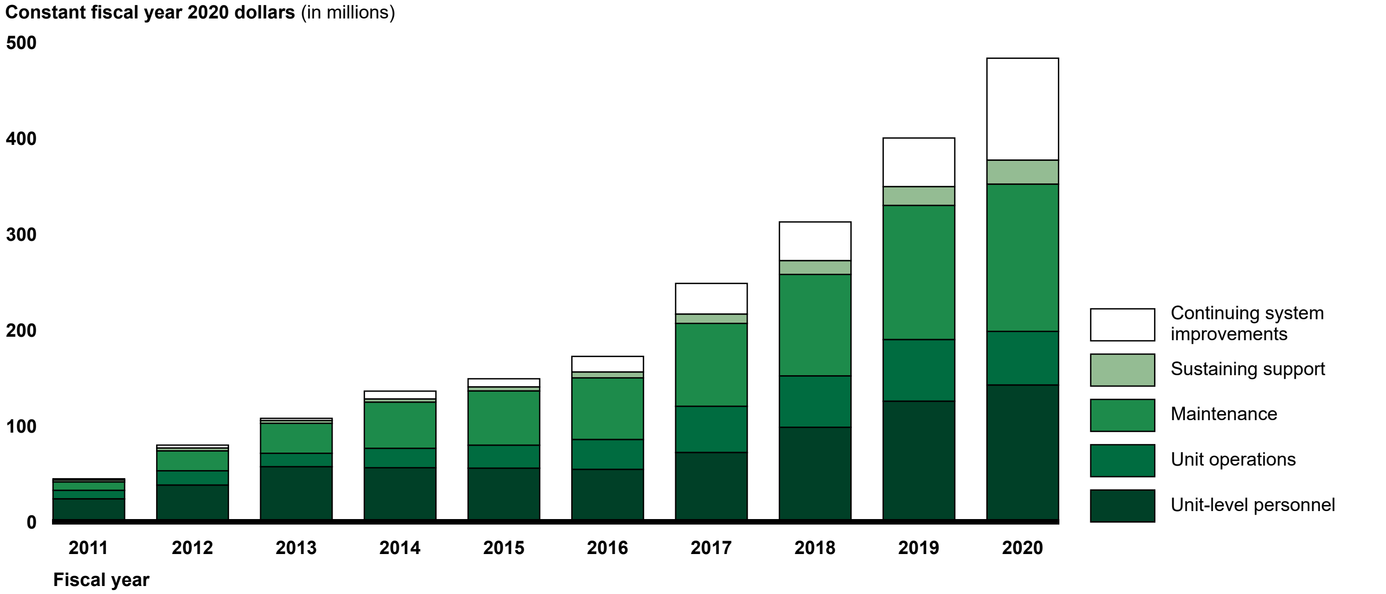
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$3.38 million
Total costs per aircraft

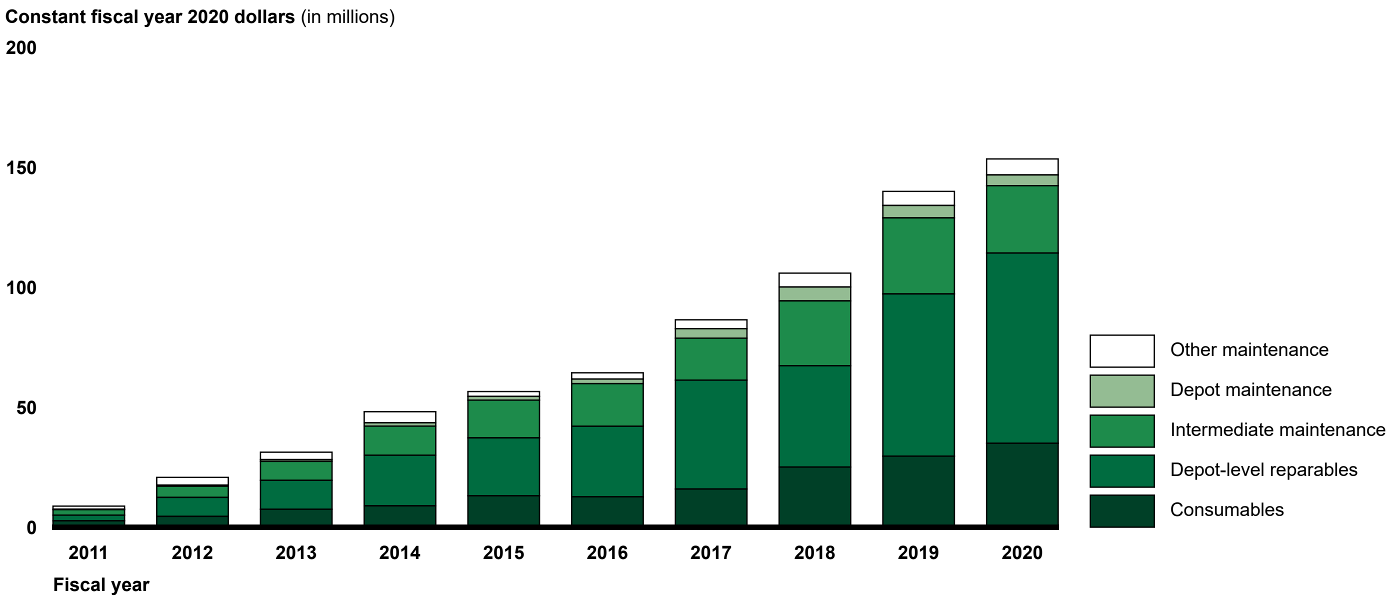
$20,642
Total costs per flying hour
+16.7% change from 2019

Operating and Support Costs

AH-1Z Total Operating and Support Costs

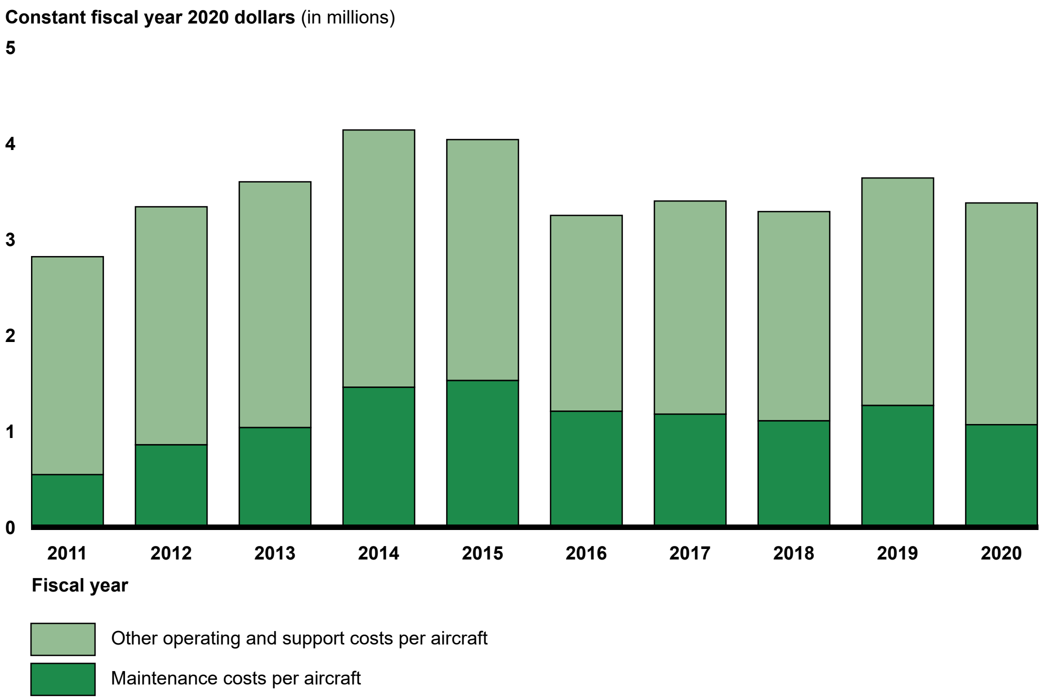


AH-1Z Maintenance Costs

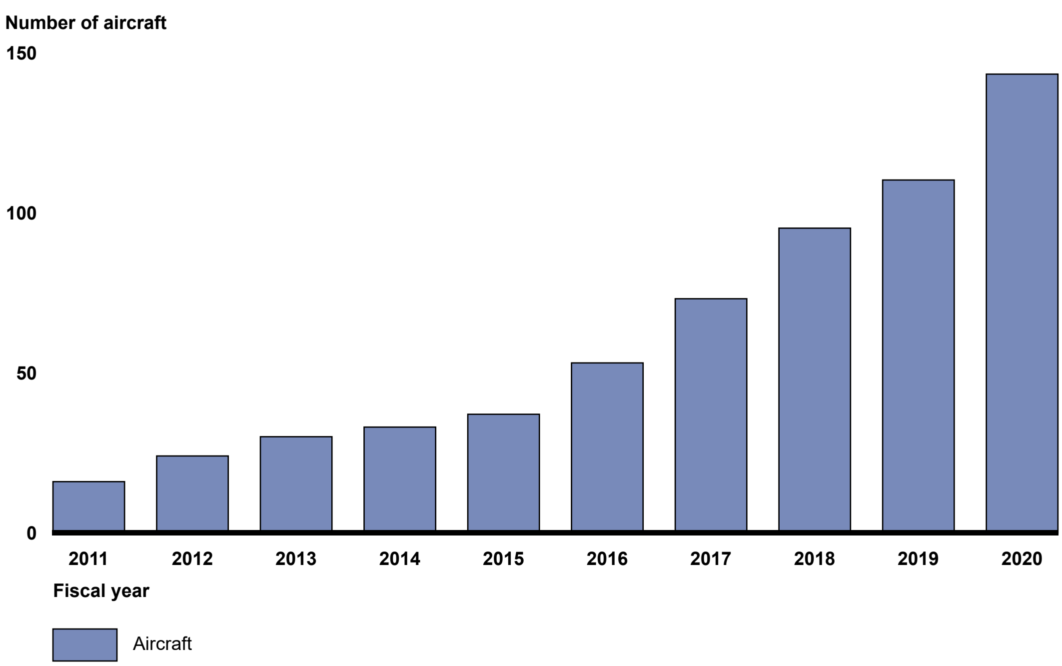


Operating and Support Costs per Aircraft

AH-1Z Operating and Support Costs per Aircraft

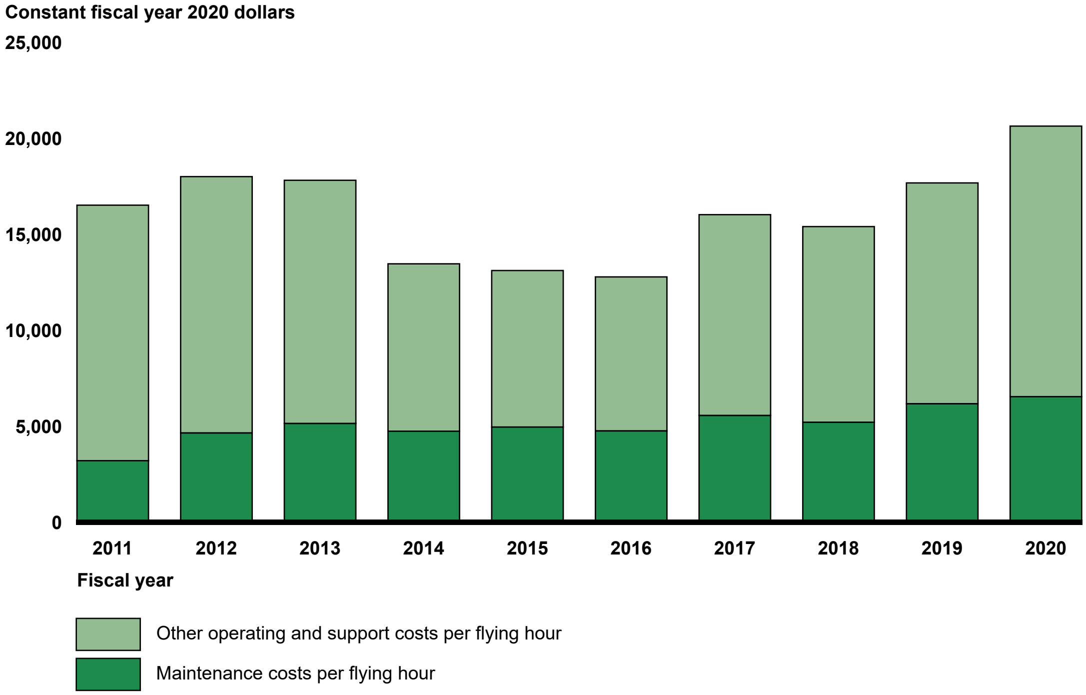


AH-1Z Fleet Size

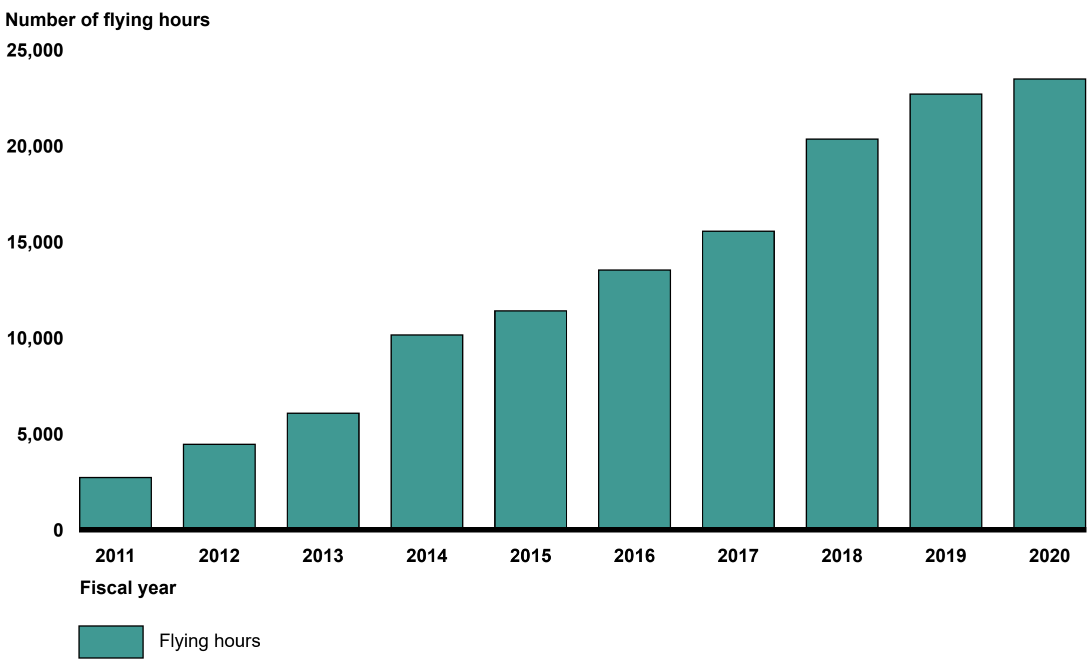


Operating and Support Costs per Flying Hour

AH-1Z Operating and Support Costs per Flying Hour



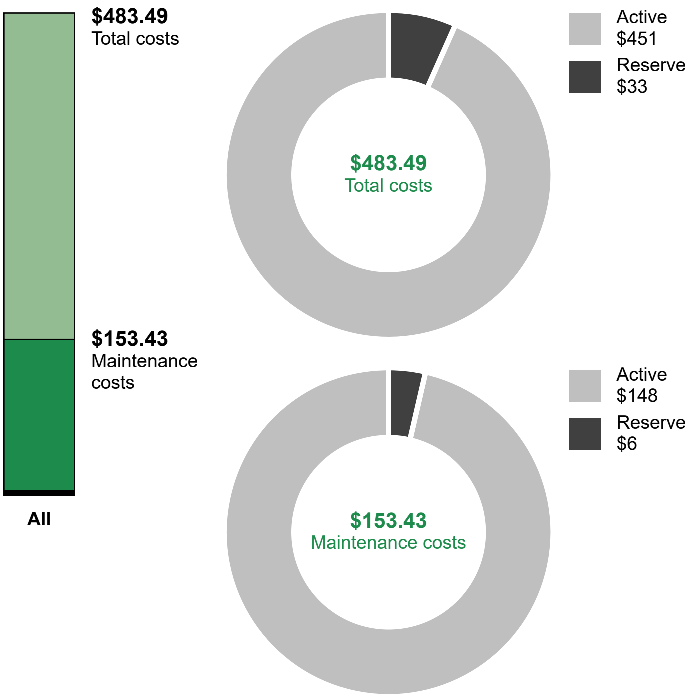
AH-1Z Flying Hours



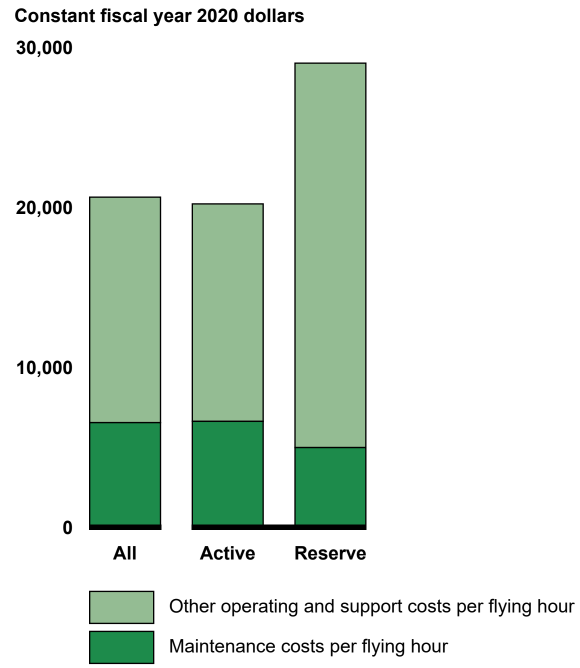
Component-Level Operating and Support Costs

AH-1Z Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

According to officials, the Navy's Fleet Readiness Centers East, Southwest, and Western Pacific (located in North Carolina, California, and Japan, respectively) perform depot maintenance on the AH-1Z. In addition, Marine Corps personnel perform field maintenance at the squadron level. The Naval Supply Systems Command and the Defense Logistics Agency provide supply support for the AH-1Z fleet.

AH-1Z Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Maintenance: Unplanned maintenance continues to be a challenge, according to program officials. As of November 2021, the officials stated that the ratio of unscheduled to scheduled maintenance was 4 to 1. Due to the high rate of unplanned maintenance events, they said that there are not enough maintainers and work hours available to achieve the program's mission capable goals.

Additionally, according to the officials, the program faced other challenges, such as:

- Delays in the delivery of AH-1Z aircraft from depot maintenance due to excessive work in progress at the depot and work that was a part of the depot readiness initiative. Other factors that contributed to the delays included paint removal and aircraft cleaning, which are completed prior to performing structural inspections and repairs, and transportation.
- Shortages of maintainers at the squadron level.
- Shortages of qualified journeyman and other higher-level maintenance personnel who were both trained and certified in corrosion prevention and treatment. Corrosion has historically been a major degrader of the AH-1Z fleet.

According to program officials, the following actions were taken or are planned to mitigate these challenges. In fiscal years 2022 and 2023, 12 older, excess AH-1Z aircraft will be sent to the 309th Aerospace Maintenance and Regeneration Group at Davis-Monthan Air Force Base in order to increase maintenance capacity. Further, program officials noted that the Commandant's Force Design 2030 plan has directed the divestment of two light helicopter attack squadrons, which they stated will be accomplished by the end of fiscal year 2023. Officials said that as the fleet is rightsized, maintainers will not be as strained in the future and the AH-1Z fleet's availability should increase.

The officials also stated that the program office established a monthly Reliability Control Board to pursue actions to improve component reliability, maintainability and availability. The board's efforts have resulted in various component improvements and redesigns to increase both the availability of the items and their respective reliability rates, reducing the need to repair those components in the future.

Further, officials noted that the Fleet Support Team offices, which were previously established by the program office at each major AH-1Z location, also continued to provide technical assistance and training to the various sites, improving maintainer proficiency and their skillsets. Officials stated that the program office increased the numbers of Fleet Support Team engineers and logistics support personnel to provide advanced training troubleshooting. Additionally, teams composed of Fleet Support Team personnel and technicians from the aircraft's manufacturer have been deployed, as needed, to provide targeted support to improve readiness.

Finally, program officials stated that the repair depots have initiated action plans to reduce aircraft turnaround times, among other initiatives.

Supply Support: Multiple components have diminishing manufacturing sources or have become obsolete, and the COVID-19 pandemic has contributed to parts shortages and delays, according to officials. However, the poor reliability and availability of critical components remained the primary supply support challenges for the AH-1Z. They said that the 85 percent commonality of major components between the AH-1Z and UH-1Y further affects the supply chain when it is stretched because components are not as available or reliable as projected, as the two programs compete for the same components.

Examples of high-demand components that have affected the program's mission capable rate are drive system components, such as the main rotor gear box, and self-locking hardware. According to officials, the divestment of two squadrons should also help alleviate some of the pressure on the supply chain in the future.

Program officials stated that the Naval Supply Systems Command entered into a performance-based logistics contract with Bell Textron Incorporated in January 2020 for supply support for 36 rotors and drives components. Further, the officials said that the Defense Logistics Agency entered into a performance-based logistics contract with Bell Textron Incorporated in September of 2020 for 2,711 consumable items. These contracts significantly reduced back orders and have started to make material available that had previously contributed to higher not mission capable supply rates, according to program officials.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

CH-53E Super Stallion

Program Essentials

Lead Service
Marine Corps

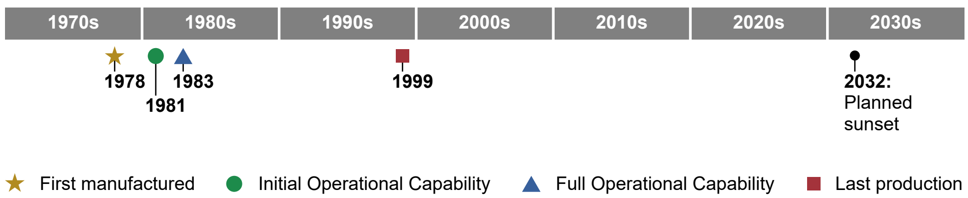
Manufacturer
Sikorsky

Program Office
Program Manager – Air 261, Naval Air System Command, Patuxent River, Maryland

Sustainment
The Navy's Fleet Readiness Centers East and Southwest, and a contractor, perform depot maintenance. Marine Corps personnel perform organizational and intermediate maintenance.

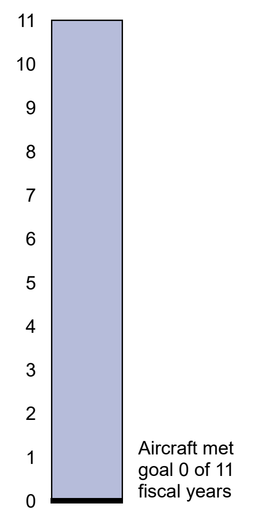
The CH-53E helicopter's mission is the transportation of heavy equipment and supplies for amphibious assault. The aircraft incorporates secure communications capability, a global positioning system, and aviator night-vision imaging systems heads-up display sensors.

CH-53E Life Cycle Timeline

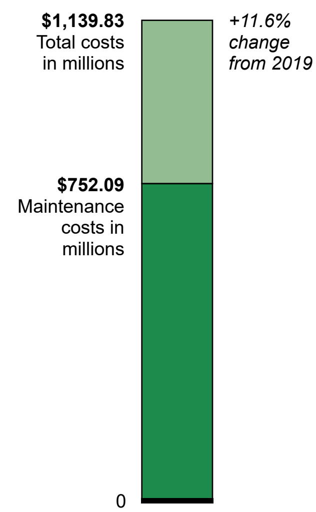


CH-53E Sustainment Status

Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

139 total aircraft
Fiscal year 2020

32.7 years
Average aircraft age in fiscal year 2021

Flying hours

24,990 flying hours
Fiscal year 2020

6,224 hours
Average lifetime flying hours per aircraft in fiscal year 2021

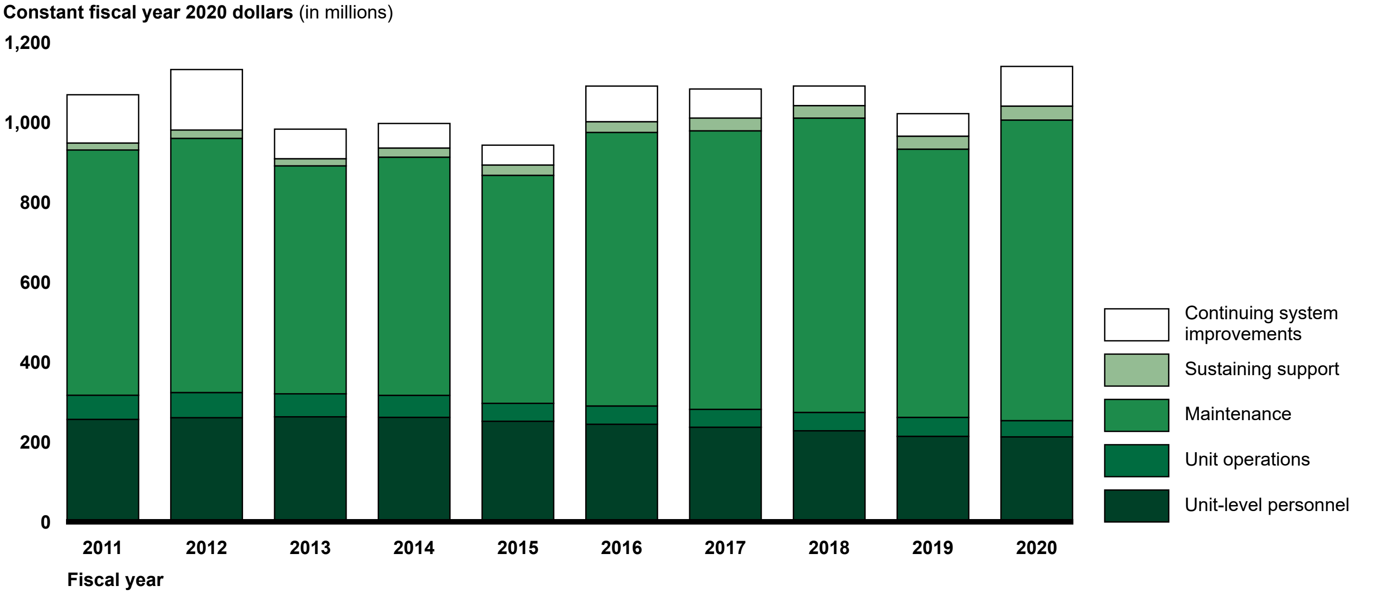
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$8.20 million
Total costs per aircraft

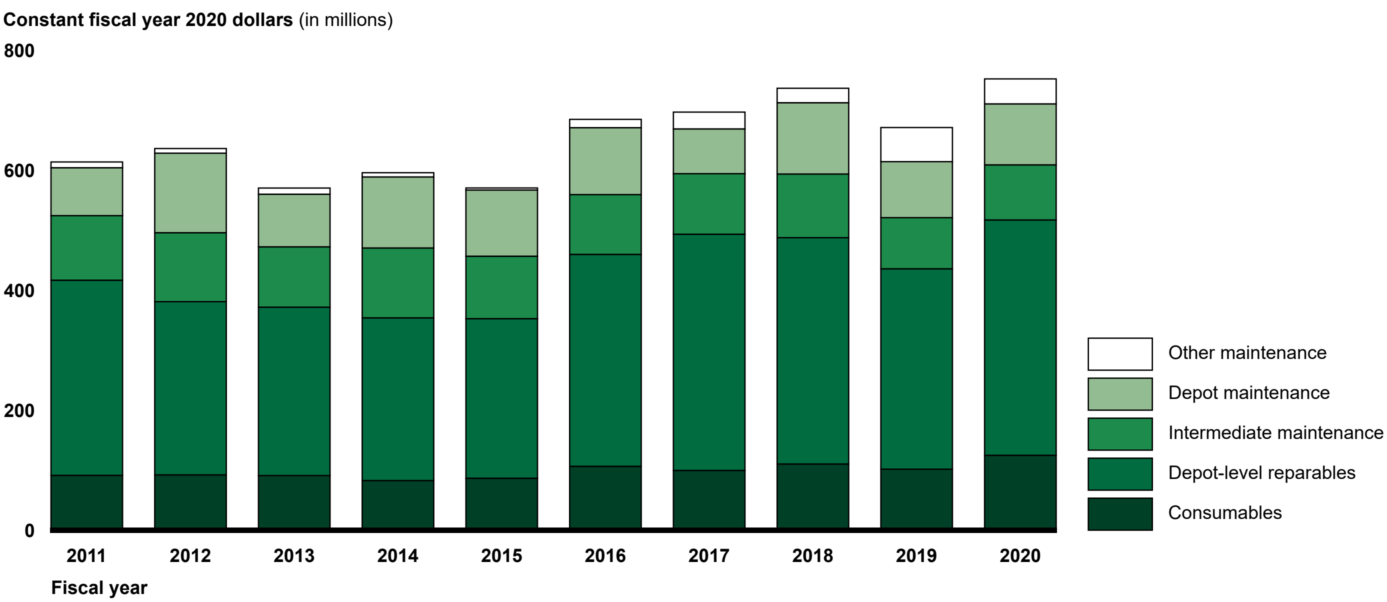
$45,612
Total costs per flying hour
+20.6% change from 2019

Operating and Support Costs

CH-53E Total Operating and Support Costs

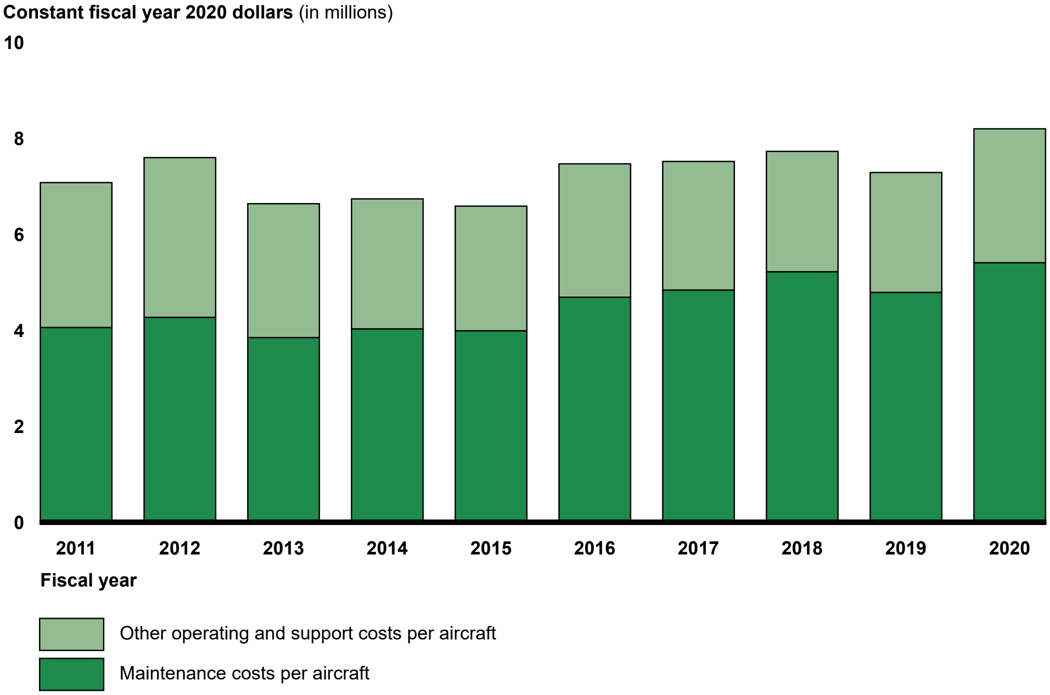


CH-53E Maintenance Costs

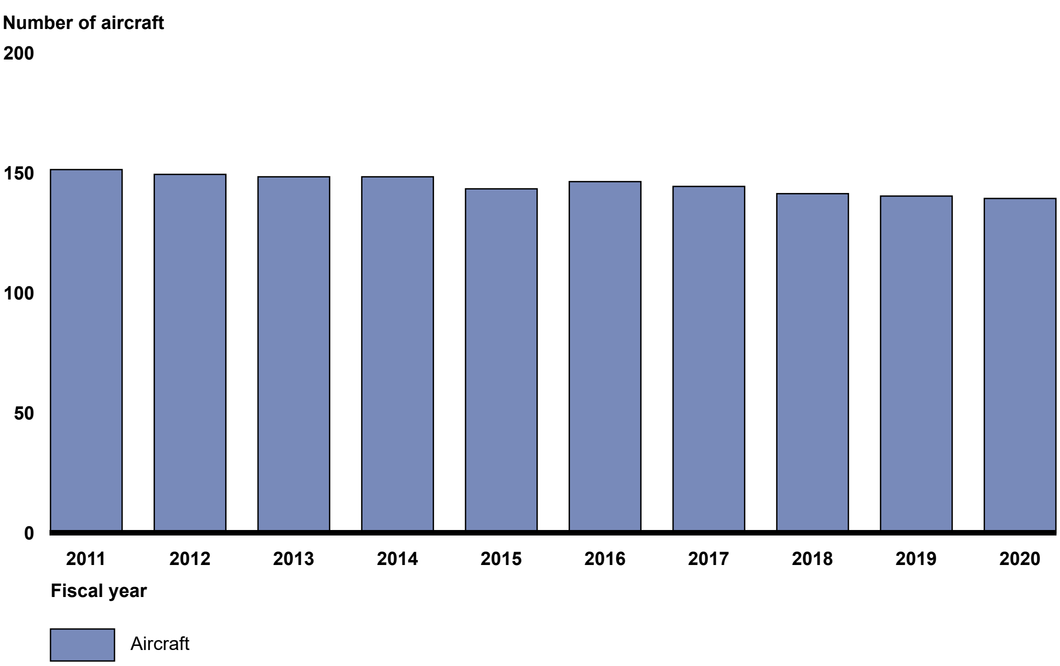


Operating and Support Costs per Aircraft

CH-53E Operating and Support Costs per Aircraft

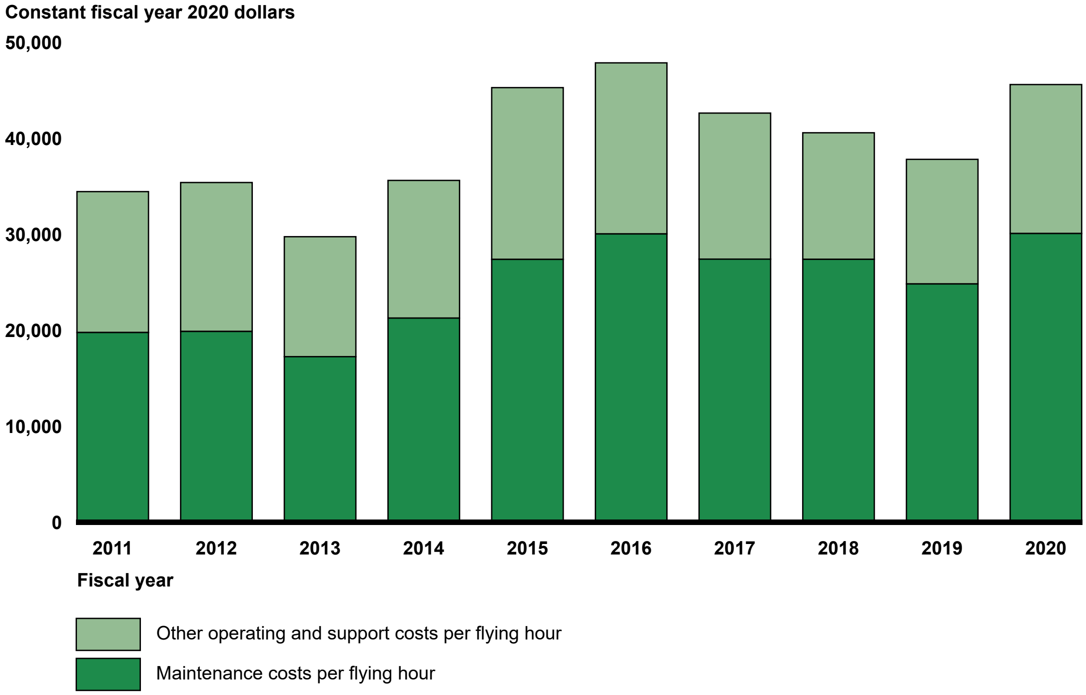


CH-53E Fleet Size

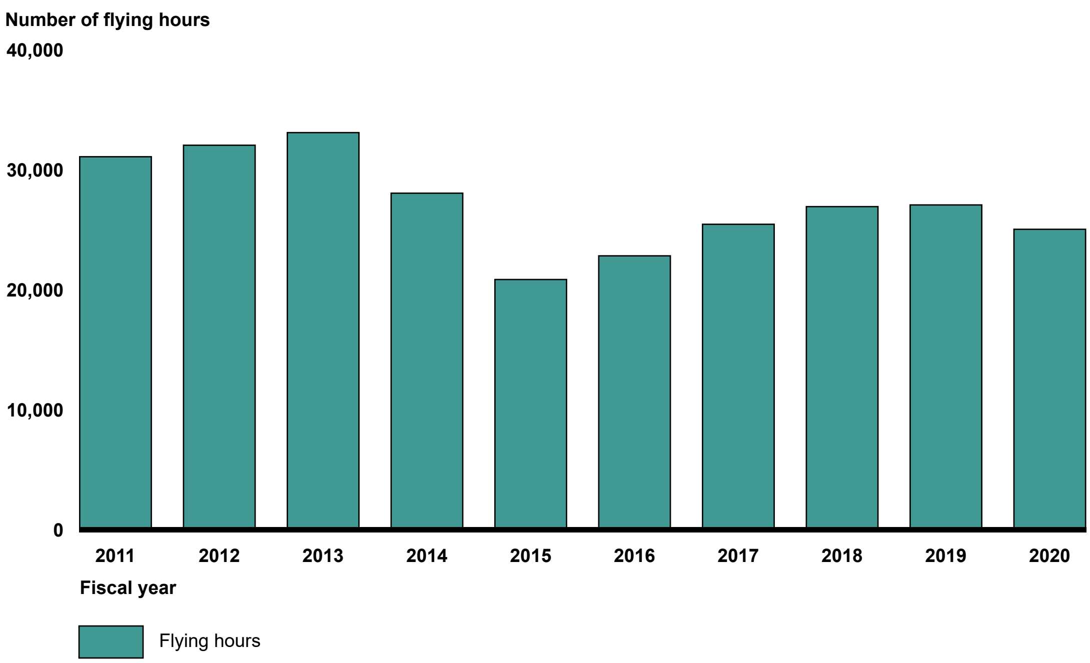


Operating and Support Costs per Flying Hour

CH-53E Operating and Support Costs per Flying Hour



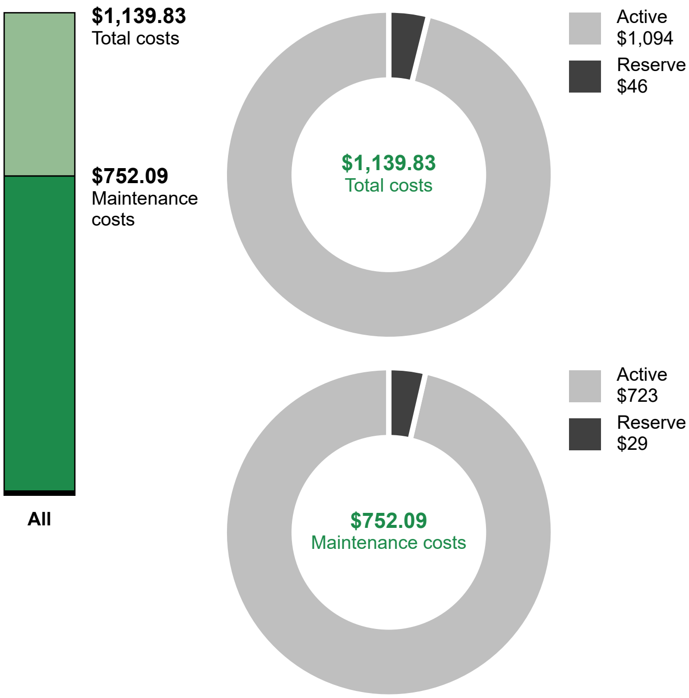
CH-53E Flying Hours



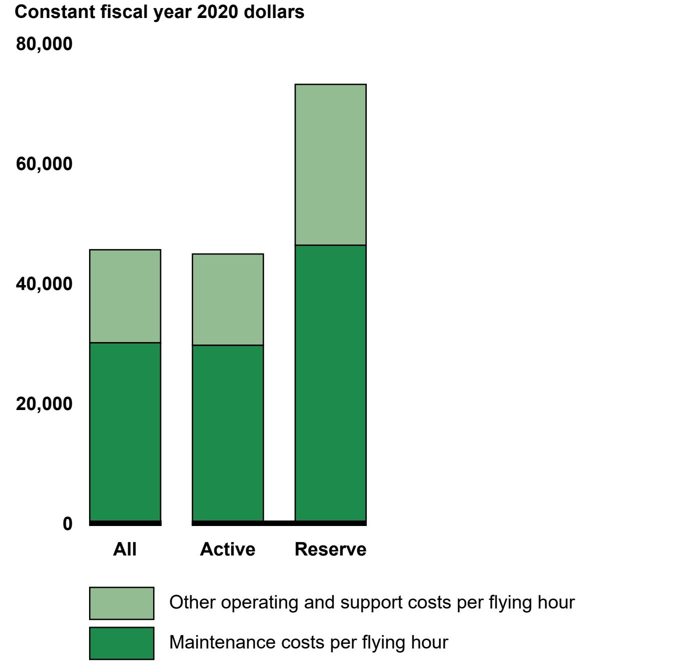
Component-Level Operating and Support Costs

CH-53E Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

Depot maintenance for the CH-53E is performed by the Navy's Fleet Readiness Center Southwest in California, the Navy's Fleet Readiness Center East in North Carolina, and at Korean Air Lines Co. Ltd.'s facilities in Korea. Marine Corps personnel perform organizational and intermediate maintenance. The Naval Supply Systems Command and the Defense Logistics Agency provide supply support.

CH-53E Sustainment Challenges

Aging Aircraft
- Delays in acquiring replacement aircraft
- Service life extension
- Unexpected replacement of parts and repairs

Maintenance
- Access to technical data
- Delays in depot maintenance
- Shortage of trained maintenance personnel
- Unscheduled maintenance

Supply Support
- Diminishing manufacturing source
- Parts obsolescence
- Parts shortage and delay

Maintenance: The CH-53E program has been facing challenges with depot maintenance delays. More specifically, program officials said that the average planned maintenance interval turnaround time for the 12 aircraft that were completed in fiscal year 2021 was 344 days, while the planned time was 271 days. According to program officials, excess corrosion was a key reason for the actual turnaround times, in addition to unanticipated depot-level repairs that were needed but were not in the standard work on which the turnaround time goal was established.

Program officials said that a Commander Fleet Readiness Center initiative was underway to reduce planned maintenance interval turnaround times. Under the initiative, 30, 60, and 90-day briefs occur before an aircraft is inducted at the depot to identify areas that will need work and give the Fleet Readiness Centers additional time to prepare to shorten the repair turnaround time.

To mitigate corrosion, the key factor in the depot maintenance delays, program officials said that the fleet is working to improve the documentation of completed maintenance actions to address corrosion, and then use that information to perform more thorough preventative maintenance for corrosion during scheduled inspections.

The program has also faced unexpected part replacements and repairs, according to program officials. For example, officials told us that main rotor head dampers, which are supposed to last for 800 hours before needing repair/to be replaced, are only lasting 150 hours or less. In response, the program revised the process for installing new dampers and ensured that the replacement parts are available to the fleet so that aircraft are not out of commission for extended periods, according to program officials. Further, officials said that the original equipment manufacturer's ongoing initiative to improve the reliability of the damper and expect that new dampers will be available in 2023.

Officials also said that the program's ongoing reset efforts will mitigate the CH-53's maintenance and supply challenges, but they did not identify the specific challenges. According to officials, the current reset program was started in 2016 after a 2015 Marine Corps readiness review report concluded that many of the CH-53E's readiness issues at the time were due to very heavy and hard usage in 11 years of wartime, along with a lack of needed depot maintenance to restore the aircraft upon their return.

The current CH-53E reset program is a period of dedicated maintenance that re-baselines all squadron-level inspections, replaces high-time components, and delivers a leak-free, full mission capable aircraft back to the warfighter with no "awaiting-maintenance" discrepancies, according to the Naval Air Systems Command. Program officials stated that the current reset contract, with option periods, extends through fiscal year 2025 and includes the reset of 78 aircraft. As of the end of fiscal year 2021, program officials said that 45 aircraft have been reset and 10 aircraft were in process.

Supply Support: According to officials, the CH-53E program has been experiencing parts shortages and delays due to the Navy supply system's reliance on prior demand history for supply support decisions instead of forward-looking, predictive criteria. To mitigate the problems associated with using historical demand, the officials said that most retail sites work to inform the supply system of upcoming events that may drive a higher-than-historical consumption rate to ensure that parts are available when needed.

The program has also been experiencing parts shortages related to diminishing manufacturing sources and obsolescence challenges. Program officials said that they are expanding the use of product support arrangements and performance-based logistics contracts with suppliers. Additionally, according to program officials, Fleet Readiness Center East, the organic depot maintenance provider, has established a public-private partnership with Sikorsky Aircraft Corporation that has improved parts availability by providing parts to the organic depots to enable repairs and mitigate wait times for the parts.

The CH-53E has been in operation for more than 40 years and the program's mission capable metrics reflect a mature aircraft with maintenance and supply challenges, according to program officials. The CH-53E is scheduled to be retired beginning in fiscal year 2024. The officials stated that the CH-53E aircraft will eventually be replaced by CH-53K aircraft, with deliveries of CH-53K aircraft beginning in fiscal year 2022.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

MV-22B
Osprey

Program Essentials

Lead Service
Marine Corps

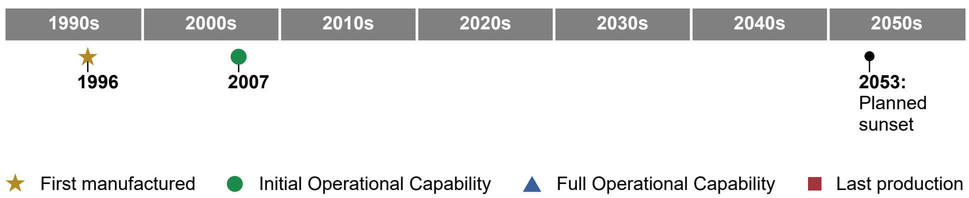
Manufacturer
Bell-Boeing Joint Program Office

Program Office
V-22 Joint Program Office – Air 275, Naval Air Systems Command, Patuxent River, Maryland

Sustainment
Depot maintenance is performed at the Navy's Fleet Readiness Centers East and Southwest and at field locations in Japan and Hawaii. Rolls Royce performs depot maintenance on the engines. Marine Corps personnel perform organizational maintenance.

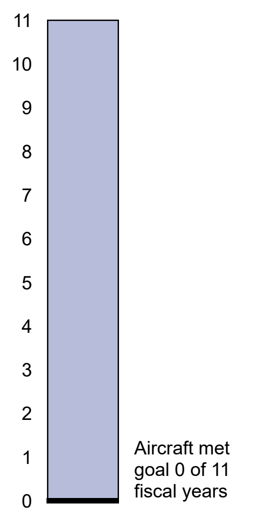
The MV-22B Osprey operates as a helicopter when taking off and landing vertically, and once airborne, it converts to operate as a high-speed, fuel-efficient turboprop airplane. The Marine Corps uses the MV-22B as an assault transport for troops, equipment and supplies.

MV-22B Life Cycle Timeline

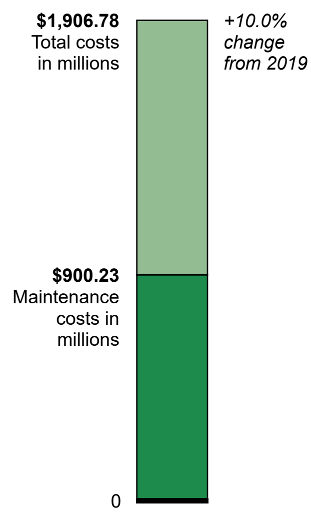


MV-22B Sustainment Status

Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

301 total aircraft
Fiscal year 2020

9.2 years
Average aircraft age in fiscal year 2021

Flying hours

44,585 flying hours
Fiscal year 2020

1,607 hours
Average lifetime flying hours per aircraft in fiscal year 2021

Operating and support costs per aircraft and flying hour
Fiscal year 2020

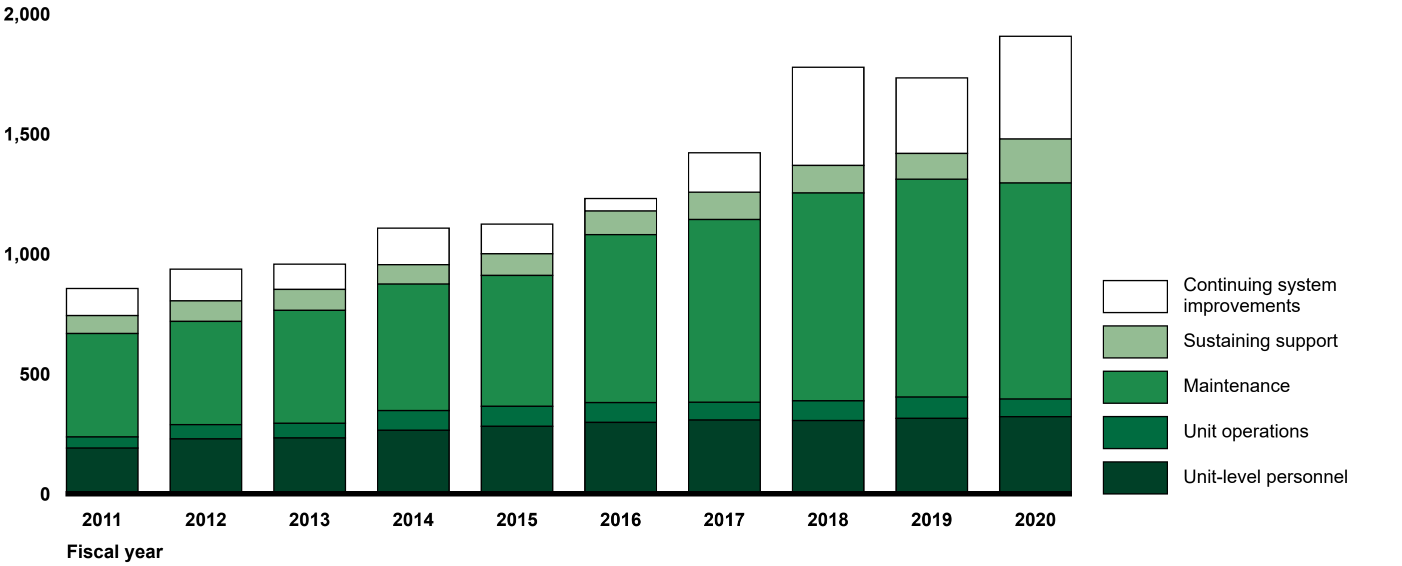
$6.33 million
Total costs per aircraft

$42,767
Total costs per flying hour
+21.8% change from 2019

Operating and Support Costs

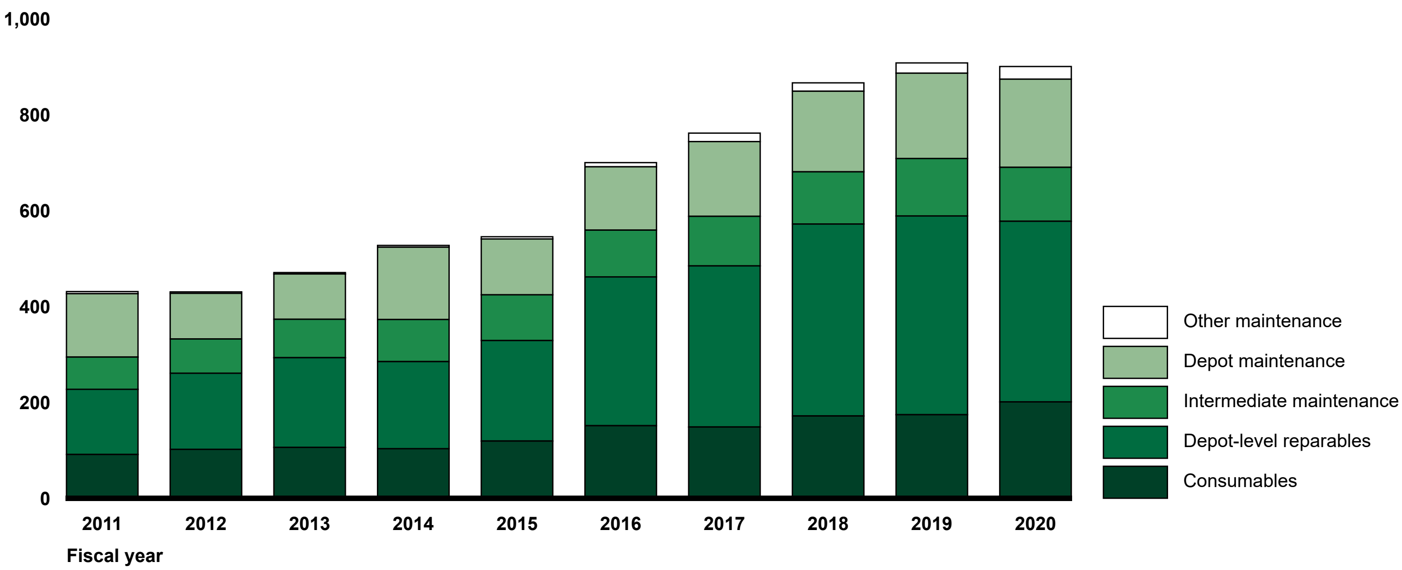
MV-22B Total Operating and Support Costs

Constant fiscal year 2020 dollars (in millions)



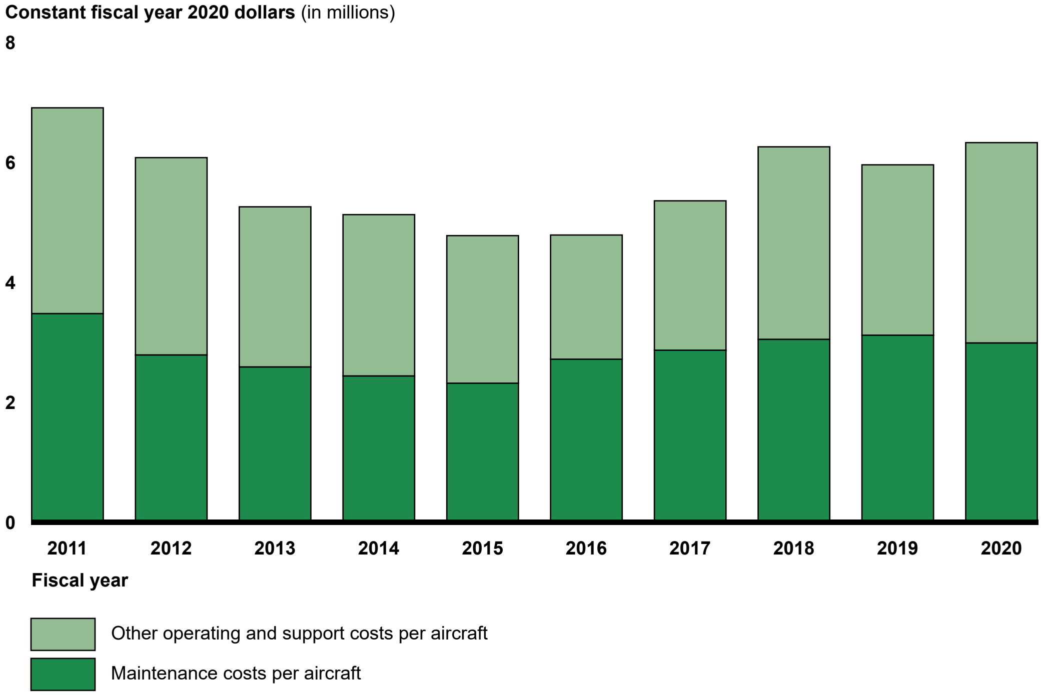
MV-22B Maintenance Costs

Constant fiscal year 2020 dollars (in millions)

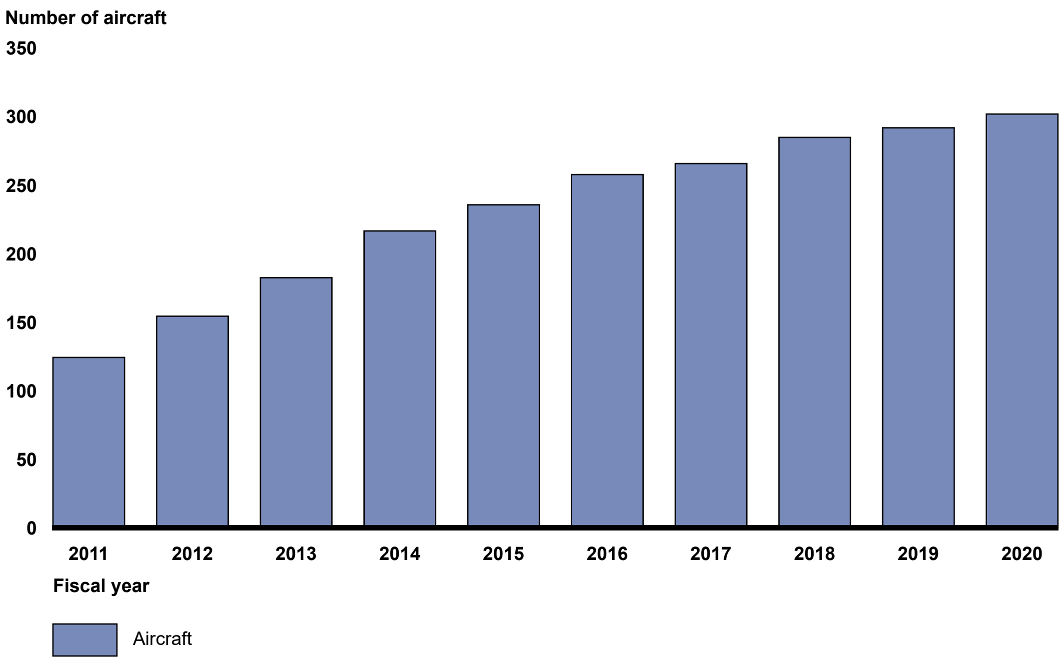


Operating and Support Costs per Aircraft

MV-22B Operating and Support Costs per Aircraft

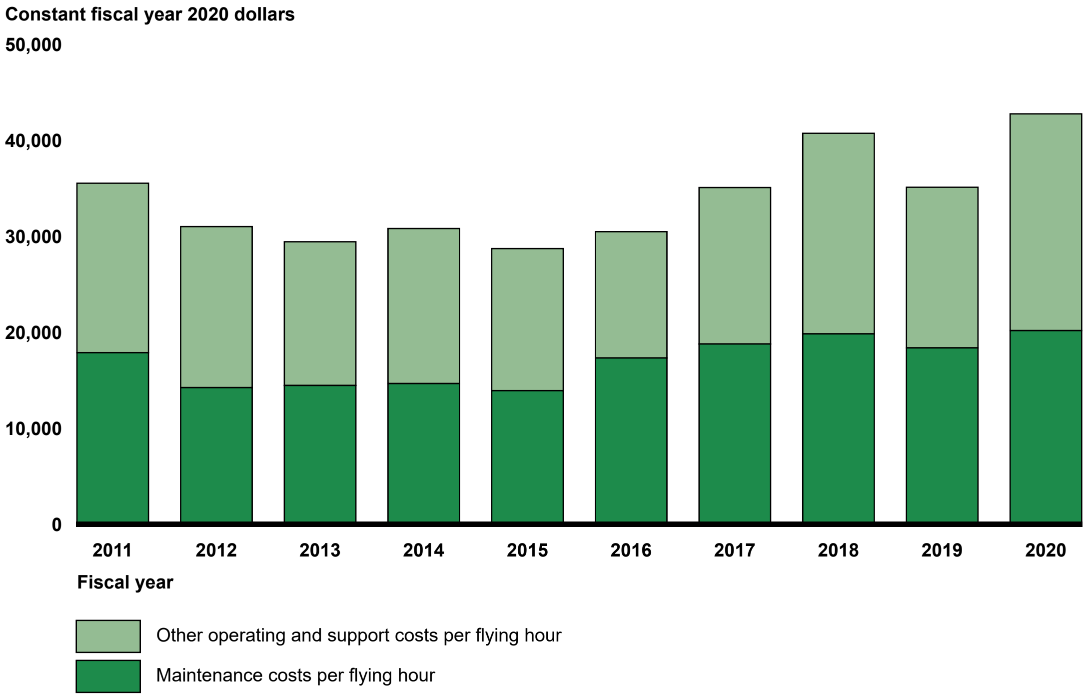


MV-22B Fleet Size

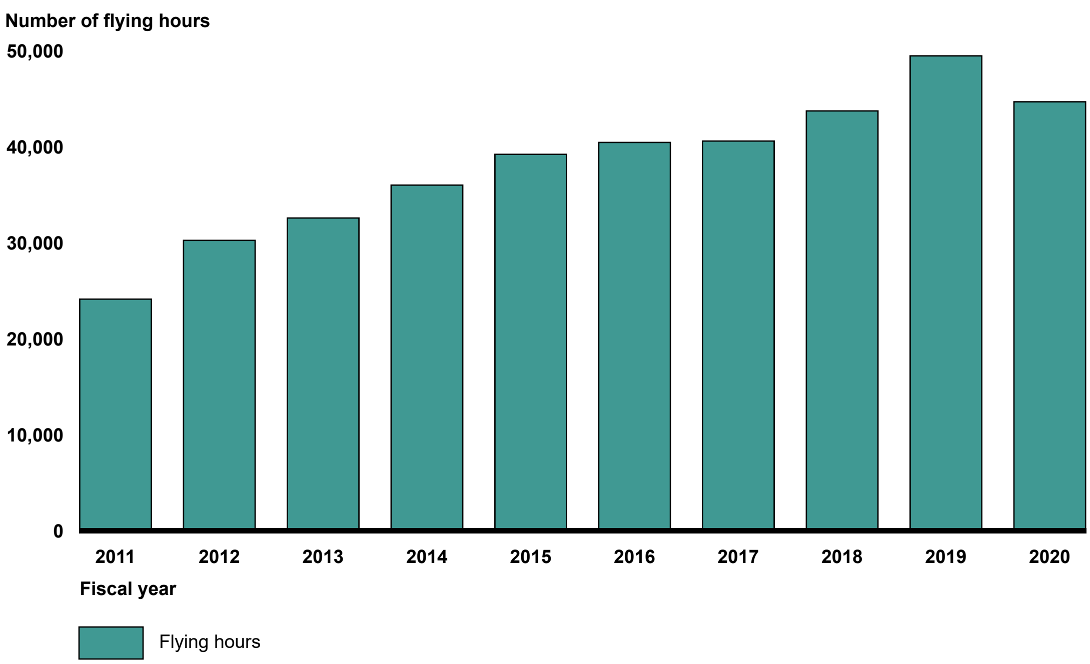


Operating and Support Costs per Flying Hour

MV-22B Operating and Support Costs per Flying Hour



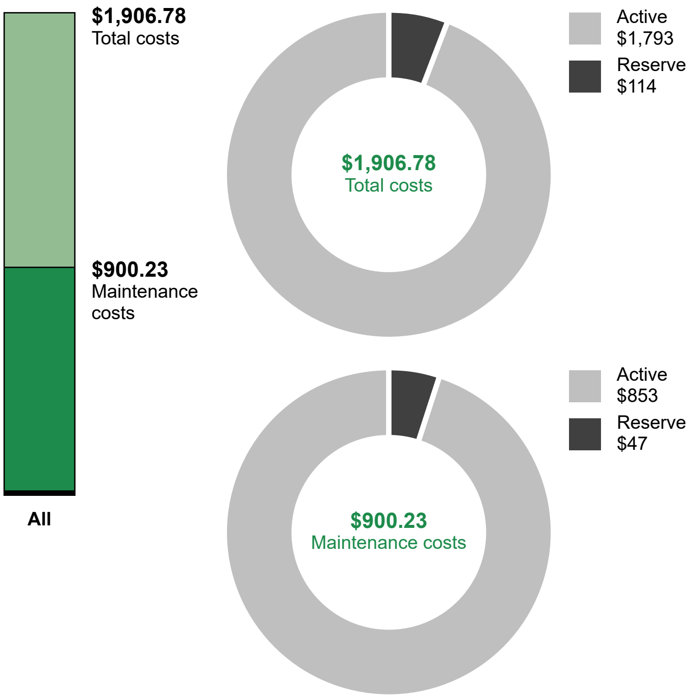
MV-22B Flying Hours



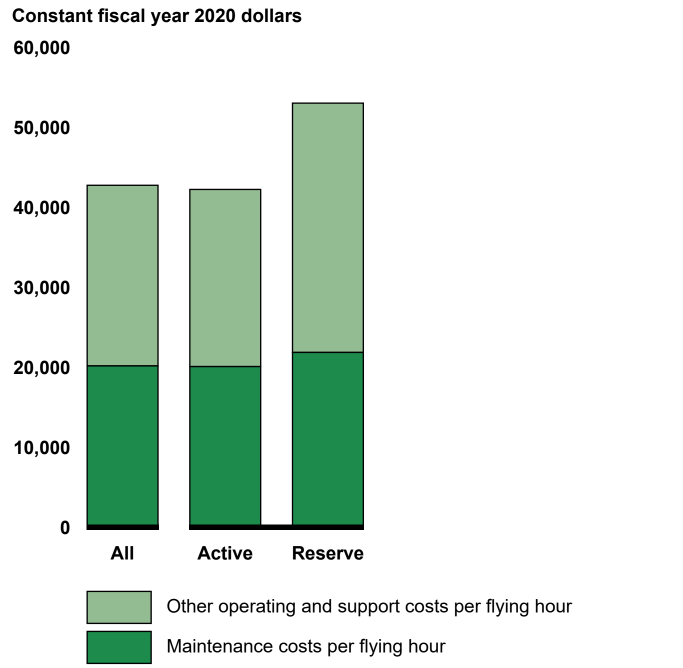
Component-Level Operating and Support Costs

MV-22B Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The V-22 Joint Program Office manages the sustainment of the Marine Corps' MV-22B, the Air Force's and U.S. Special Operations Command's CV-22, and the Navy's CMV-22. MV-22B depot maintenance is performed at the Navy's Fleet Readiness Centers East and Southwest, in North Carolina and California, respectively, and at Fleet Readiness Center field locations in Japan and Hawaii. Rolls Royce performs depot maintenance on the engines. Marine Corps personnel perform organizational maintenance. The Naval Supply Systems Command and the Defense Logistics Agency provide supply support for the aircraft.

MV-22B Sustainment Challenges

Aging Aircraft

- Delays in acquiring replacement aircraft
- Service life extension
- Unexpected replacement of parts and repairs

Maintenance

- Access to technical data
- Delays in depot maintenance
- Shortage of trained maintenance personnel
- Unscheduled maintenance

Supply Support

- Diminishing manufacturing source
- Parts obsolescence
- Parts shortage and delay

Aging: As the MV-22B ages and more aircraft undergo depot-level maintenance, program officials said that more corrosion continues to be found. Officials told us that they developed a corrosion roadmap to assist with the discovery of corrosion that is present on the aircraft and they have been developing additional repairs so that the entire fleet is not affected by corrosion issues.

Program officials said that the access to technical data is also a maintenance challenge for the V-22 platform that can hinder the corrosion efforts for the MV-22B, which is routinely operated in a marine, salt water environment. For example, officials stated that corrosion was recently discovered on a part of the aircraft and the government engineers needed specific data to develop inspection and repair procedures to address the corrosion on the part. The program office was not initially able to obtain the data from the original equipment manufacturer, according to program officials. However, after months of negotiation, they said that the program office was finally able to obtain the necessary data and develop the repair procedures, and the repairs were being made.

Maintenance: According to program officials, an independent review of the Osprey program found that both the MV-22B and the CV-22 had too many configurations, which the review said increases the not mission capable maintenance rate because of the time it takes maintainers to first determine the configuration on which they are working, and then determine whether the maintenance manual procedures are current, before conducting maintenance. Program officials said that reducing the number of configurations would also make the V-22 easier and more affordable to support based on the need for fewer parts, fewer configurations to test, and fewer software configurations to maintain.

The program office started the Common Configuration-Readiness and Modernization initiative in 2017 to reduce the number of MV-22B configurations from approximately 70 to 15, according to program officials. However, the officials said that the program is curtailing this effort in fiscal year 2024 due to budget constraints and schedule delays. In fiscal year 2022, the program office started the Common Configuration-Capability Relevant initiative to reduce the configurations of the remaining 104 aircraft, according to program officials. They stated that this effort is scheduled to be completed in fiscal year 2030, but did not specify the number of configurations that the aircraft would have. Instead, program officials said that the program is focused on key engineering changes to increase the supportability and capability of the aircraft.

The officials said that the program office initiated additional efforts in fiscal year 2020 that were focused on reducing the MV-22B's not mission capable maintenance rate, including:

- weekly planned maintenance interval calls to help track the status of aircraft undergoing depot rework, and
- weekly reviews of long-term down aircraft with all stakeholders to help to get those aircraft back into a flyable status as quickly as possible.

The officials stated that the weekly reviews of long-term down aircraft with stakeholders were the program office's adaptation of the Commander, Naval Air Forces Maintenance Operations Center initiative. According to the Commander, Naval Air Force Atlantic Public Affairs office, the Maintenance Operations Center initiative enables long-term collaboration among Naval Aviation stakeholders by bringing together maintenance, supply, engineering, and depot experts, and contractors that partner with the Navy, to improve aircraft operational readiness through planned maintenance intervals by identifying and resolving barriers. In fiscal year 2022, the MV-22B program transitioned from its program office-led weekly reviews to the actual Maintenance Operations Center initiative and is the first Marine Corps platform under the Naval Sustainment System, according to program officials.

Additionally, to reduce maintenance requirements and the not mission capable maintenance rate, the program office also has processes in place to identify potential reliability improvements for the V-22 platform, including the MV-22B, according to program officials. More specifically, the officials said that the program office evaluates break rates and reliability through a Reliability and Maintainability Program. Further, they stated that the program office reviews systems with high not mission capable maintenance contributions during a monthly program Reliability Control Board that was established in fiscal year 2020 to identify and evaluate the root causes of readiness degraders and to develop corrective actions.

Supply Support: The MV-22B has experienced challenges with spare parts shortages and delays due to diminishing manufacturing sources, obsolescence, and reliability issues, according to program officials. For example, an official stated that the program office has had a significant challenge obtaining avionics parts, especially with circuit cards and displays, due to diminishing manufacturing sources and obsolescence. The officials said that the program office has implemented a Diminishing Manufacturing Sources and Obsolescence Team to evaluate and find solutions to V-22 parts availability issues. The program office also works with vendors and industrial partners to find solutions, such as parts redesign efforts, to diminishing manufacturing sources and obsolescence issues, according to officials.

Program officials also reported that they are also pursuing initiatives to improve the reliability of parts and components to improve readiness. For example, the program office implemented Program Reliability Control Board for the V-22 to focus on top supply readiness degraders and make supply chain recommendations to the leadership of the Naval Aviation Enterprise, among other things, according to program officials. Further, an official said that the program office is working with the Naval Supply Systems Command to award a fixed-price performance-based logistics contract to Bell-Boeing—to replace the current cost-plus contract—to incentivize Bell-Boeing to initiate changes to components to increase their lifespans and to reduce cost.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

UH-1Y
Venom

Program Essentials

Lead Service
Marine Corps

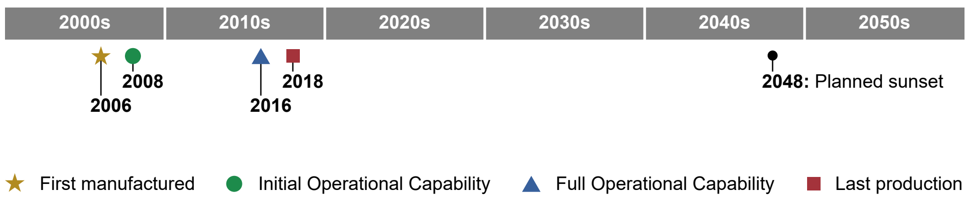
Manufacturer
Bell Helicopter Textron, Inc.

Program Office
Program Manager – Air 276, Naval Air Systems Command, Patuxent River, Maryland

Sustainment
The Navy's Fleet Readiness Centers East, Southwest, and Western Pacific perform depot maintenance. Marine Corps personnel perform organizational maintenance.

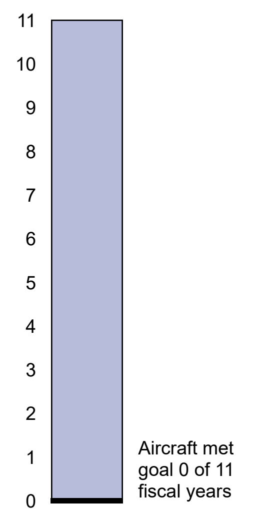
The UH-1Y Venom is a multi-role utility helicopter equipped to perform multiple missions, including close-air support, combat assault support, command and control, aerial escort, search and rescue, and special operations support.

UH-1Y Life Cycle Timeline

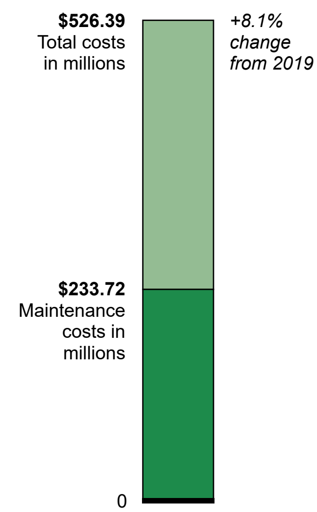


UH-1Y Sustainment Status

Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

126 total aircraft
Fiscal year 2020

8.1 years
Average aircraft age in fiscal year 2021

Flying hours

21,151 flying hours
Fiscal year 2020

1,676 hours
Average lifetime flying hours per aircraft in fiscal year 2021

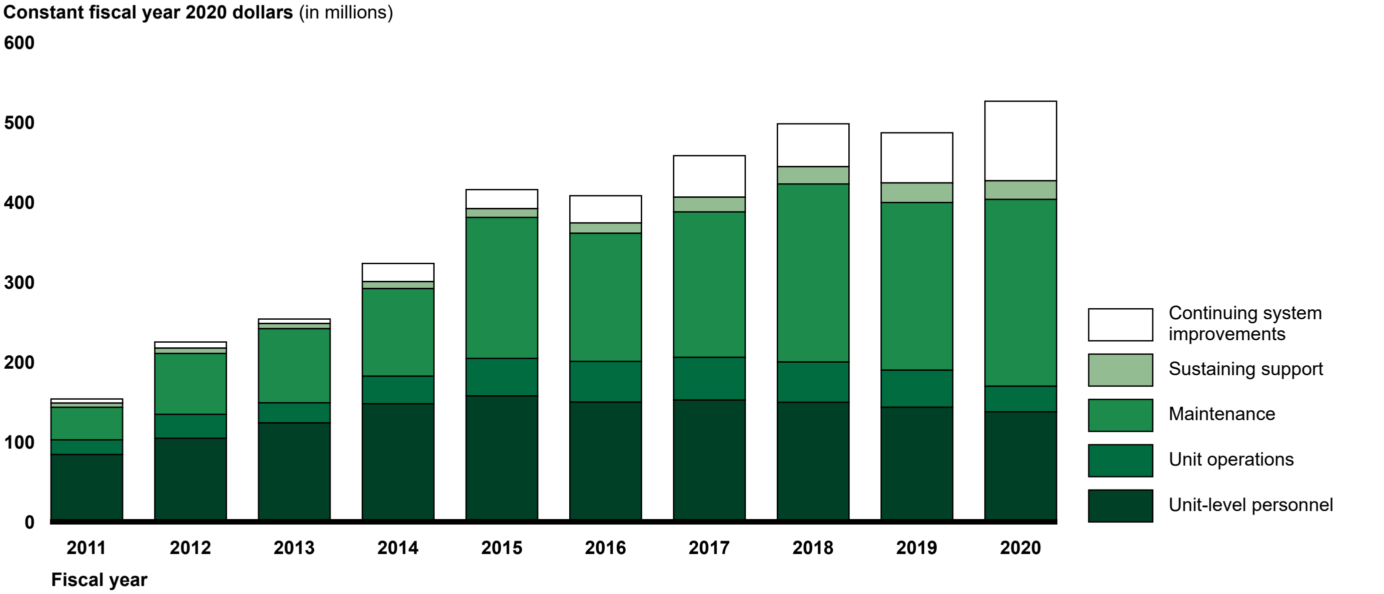
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$4.18 million
Total costs per aircraft

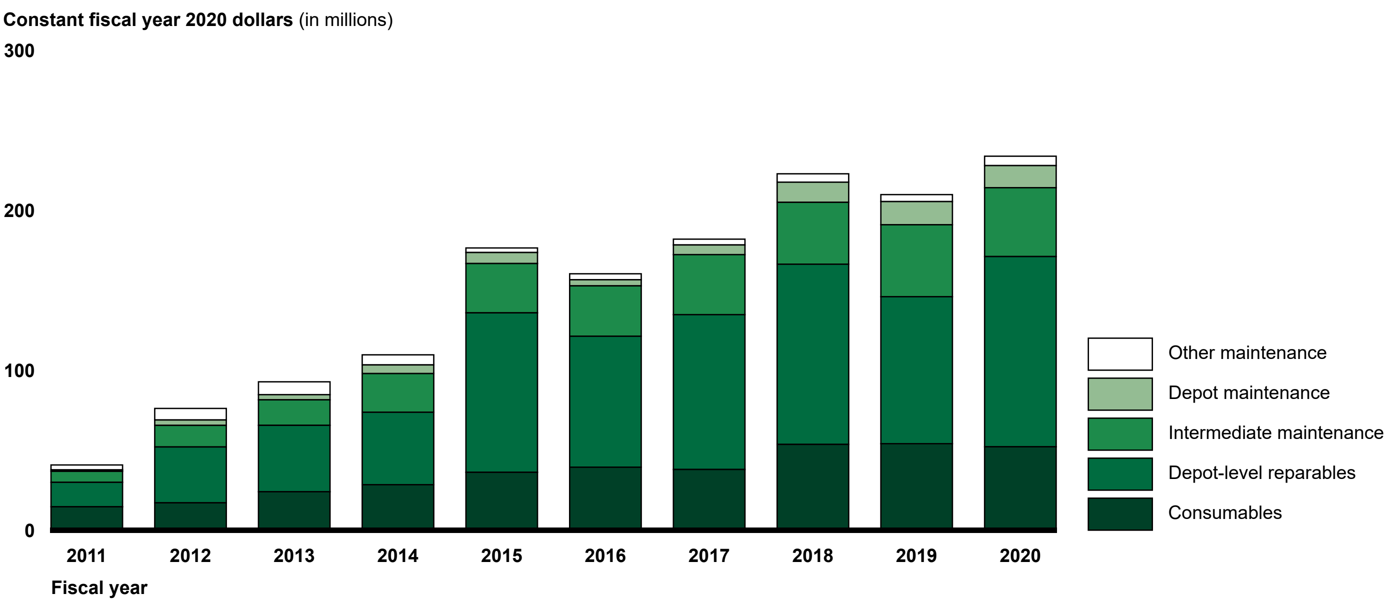
$24,887
Total costs per flying hour
+18.2% change from 2019

Operating and Support Costs

UH-1Y Total Operating and Support Costs

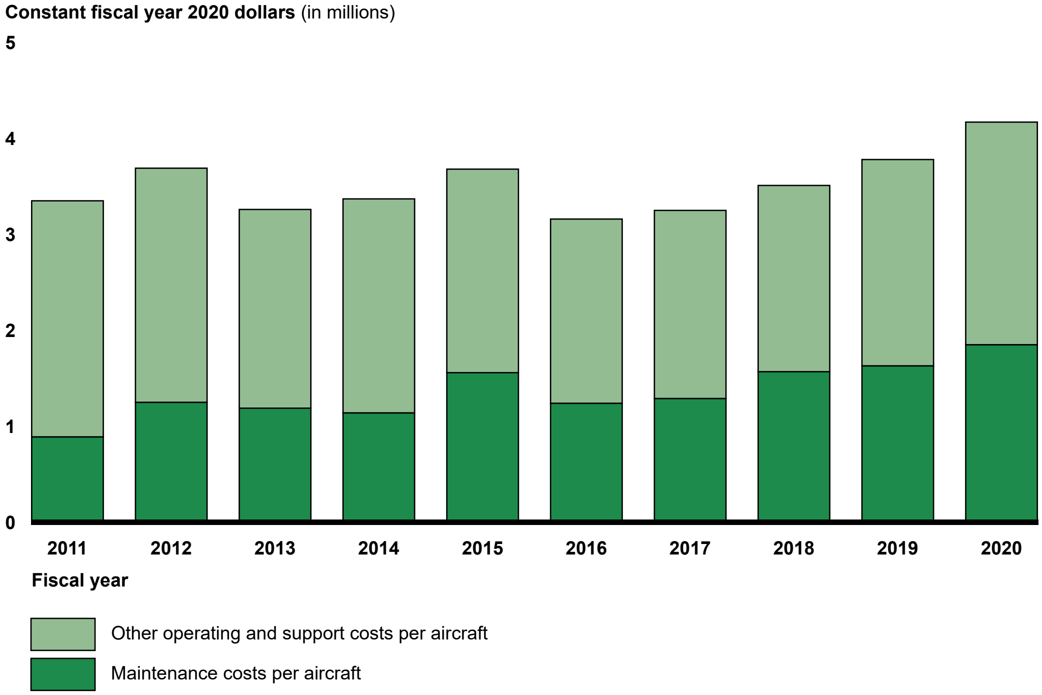


UH-1Y Maintenance Costs

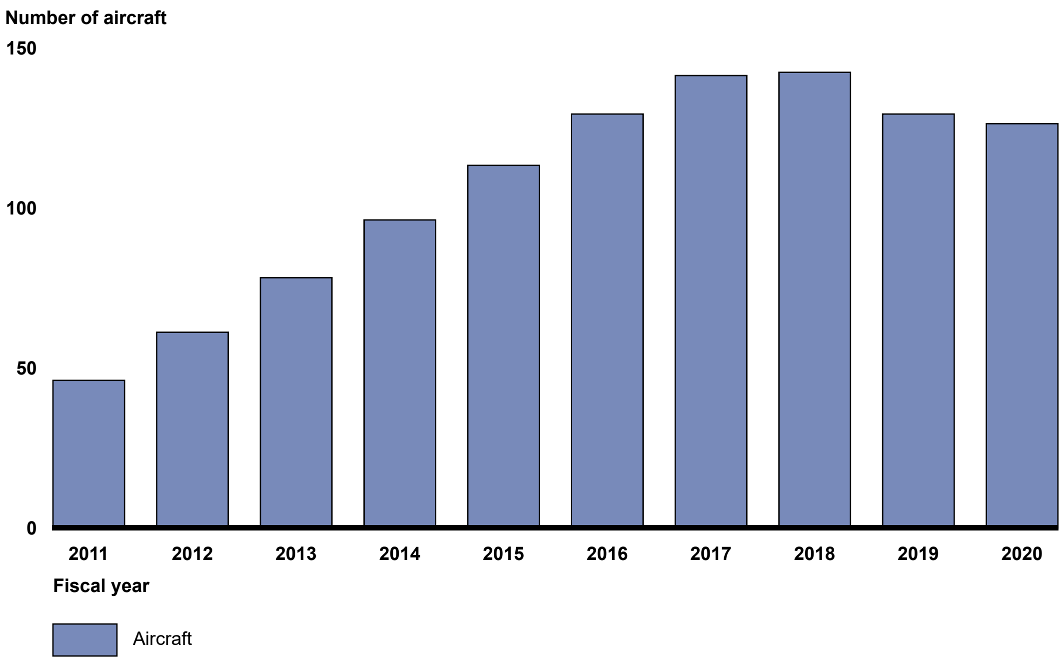


Operating and Support Costs per Aircraft

UH-1Y Operating and Support Costs per Aircraft

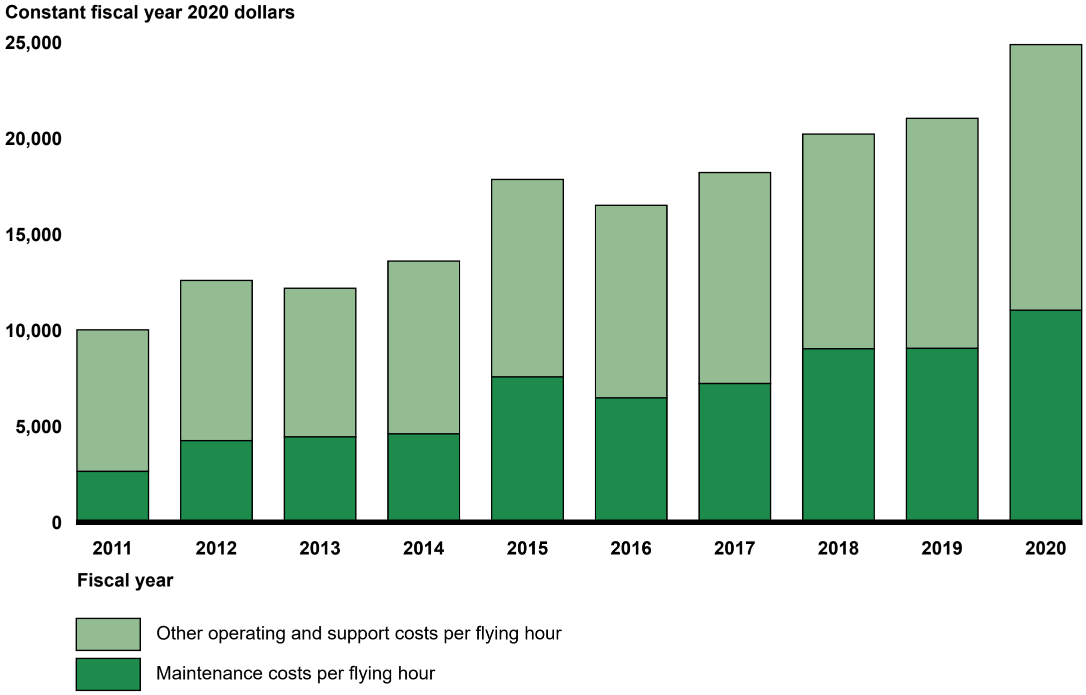


UH-1Y Fleet Size

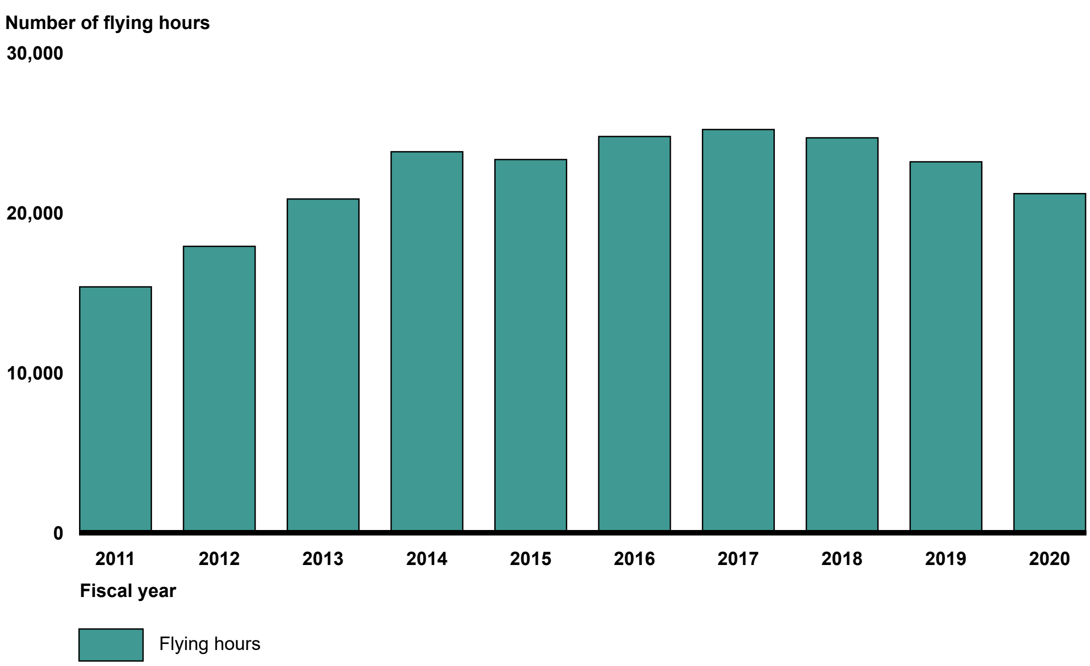


Operating and Support Costs per Flying Hour

UH-1Y Operating and Support Costs per Flying Hour



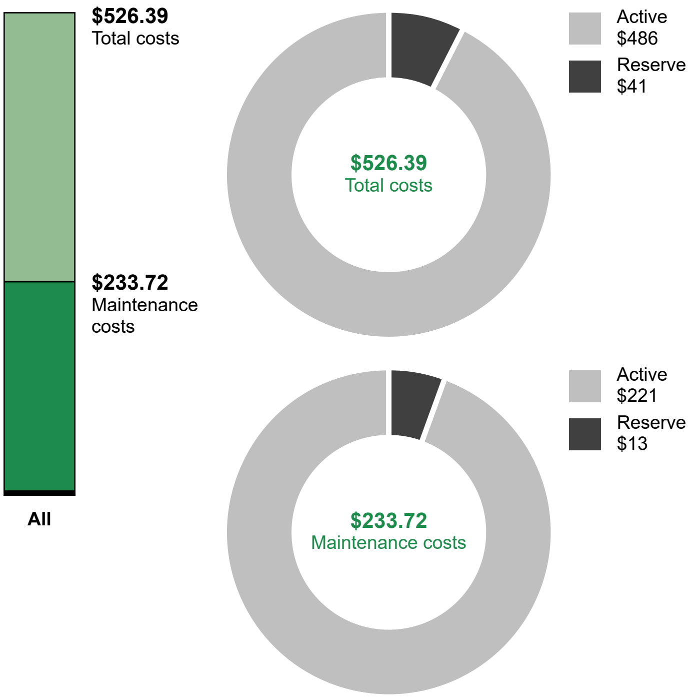
UH-1Y Flying Hours



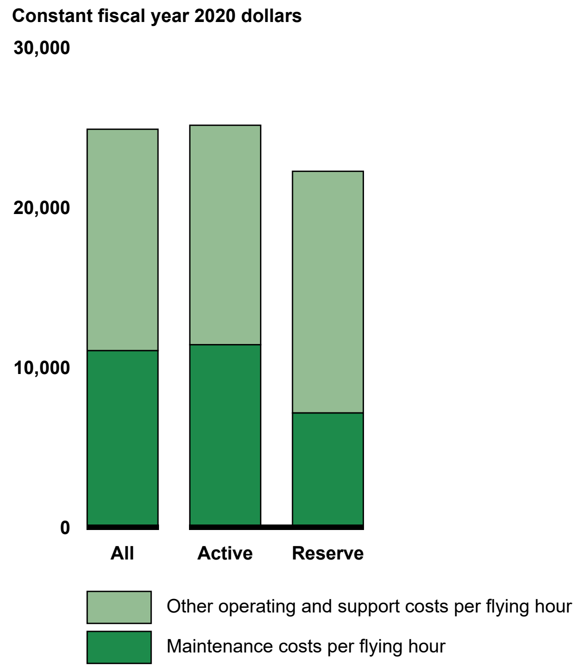
Component-Level Operating and Support Costs

UH-1Y Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The Navy's Fleet Readiness Centers East, Southwest, and Western Pacific (located in North Carolina, California, and Japan, respectively) perform depot maintenance on the UH-1Y. Marine Corps personnel perform field maintenance. The Naval Supply Systems Command and the Defense Logistics Agency provide supply support for the UH-1Y fleet.

UH-1Y Sustainment Challenges

Aging Aircraft
- Delays in acquiring replacement aircraft
- Service life extension
- Unexpected replacement of parts and repairs

Maintenance
- Access to technical data
- Delays in depot maintenance
- Shortage of trained maintenance personnel
- Unscheduled maintenance

Supply Support
- Diminishing manufacturing source
- Parts obsolescence
- Parts shortage and delay

Maintenance: According to program officials, unplanned maintenance continues to be a challenge. For example, officials said that the ratio of unscheduled to scheduled maintenance was 6 to 1 and maintainers were not available to perform unplanned maintenance in a timely manner.

Additionally, according to the officials, the program also faced other challenges:

- Delays occurred in the delivery of UH-1Y aircraft from depot maintenance due to excessive work in progress at the depot, work on the depot readiness initiative, and other factors such as longer preparation needed before components could be replaced.
- Additional aircraft were added to the inventory but additional maintainers were not assigned to meet 100 percent of needs.
- Shortage of qualified journey-level and other higher-level maintenance personnel who were both trained and certified in corrosion prevention and treatment. Corrosion has historically been a major degrader of the UH-1Y fleet.

A monthly Reliability Control Board was established to pursue actions to improve component reliability, maintainability and availability, and the board's efforts have resulted in various component improvements and redesigns to increase both the availability of the items and their respective reliability rates. These actions reduced the need for future unscheduled maintenance on those components.

Program officials stated that the repair depots have initiated action plans to reduce aircraft turnaround times, among other initiatives.

In fiscal year 2021, 15 UH-1Y aircraft were sent to the Aerospace Maintenance and Regeneration Group at Davis-Monthan Air Force Base to increase maintenance capacity, according to program officials. Further, the Commandant's Force Design 2030 plan has directed the divestment of two light helicopter attack squadrons.

The officials stated that the Fleet Support Team offices, which were previously established by the program office, at each major UH-1Y location, also continued to provide technical assistance and training to the various sites. The number of personnel was increased by the program office for Fleet Support Team engineers and logistics support to provide advanced training and troubleshooting. Teams composed of Fleet Support Team personnel and technicians from the aircraft's manufacturer have been deployed, as needed, to provide targeted support to improve readiness. These actions improved maintainer proficiency and their skillsets.

Supply Support: The UH-1Y program faces supply challenges, including poor reliability and availability of critical components, according to program officials. Further, officials told us there is 85 percent commonality between the AH-1Z and UH-1Y, so the two programs compete for components and that competition increased the not mission capable supply rate.

Examples of high-demand components that have affected the program's mission capable rate are drive system components, such as the main rotor gear box, and self-locking hardware. According to officials, the reduction of excess aircraft inventory and the divestment of two squadrons should help alleviate some of the pressure on suppliers in the future.

In January 2020, the Naval Supply Systems Command entered into a performance-based logistics contract with Bell Helicopter Textron for repairs and supply support for 36 rotors and drives components. Further, the Defense Logistics Agency entered into a performance-based logistics contract with Bell in September of 2020 for 2,711 consumable items. These contracts significantly reduced back orders and have started to make material available that had previously contributed to higher not mission capable supply rates. In addition, multiple components on the UH-1Y have diminishing manufacturing sources or have become obsolete, and the COVID-19 pandemic has contributed to parts shortages and delays, according to officials.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

CV-22
Osprey

Program Essentials

Lead Service
Air Force

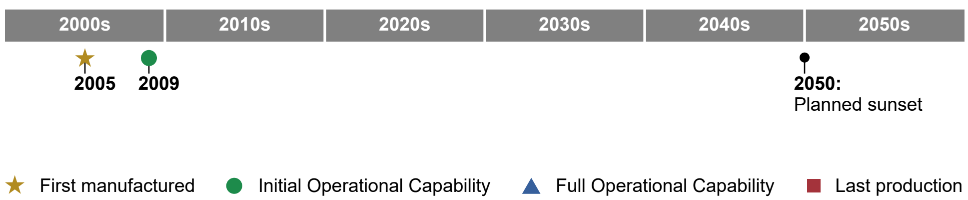
Manufacturer
Bell-Boeing Joint Program Office

Program Office
V-22 Joint Program Office – Air 275, Naval Air Systems Command, Patuxent River, Maryland

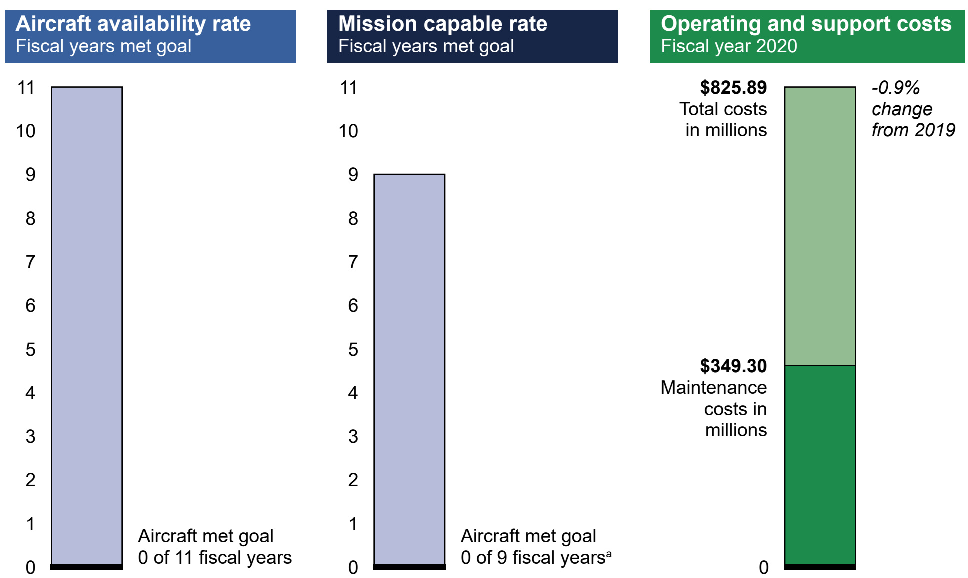
Sustainment
Personnel from the Navy's Fleet Readiness Centers East and Southwest, and from Bell Boeing, perform depot maintenance at two Air Force installations under a Joint Performance Based Logistics and Engineering contract, according to program officials.

The CV-22 Osprey is a tiltrotor aircraft that combines the vertical performance of a helicopter with the long-range and speed characteristics of a turboprop aircraft. Special operations forces use the CV-22 to conduct long-range infiltration, exfiltration, and resupply missions.

CV-22 Life Cycle Timeline



CV-22 Sustainment Status



Aircraft

50 total aircraft
Fiscal year 2020

9.3 years
Average aircraft age in fiscal year 2021

Flying hours

10,329 flying hours
Fiscal year 2020

2,206 hours
Average lifetime flying hours per aircraft in fiscal year 2021

Operating and support costs per aircraft and flying hour
Fiscal year 2020

$16.41 million
Total costs per aircraft

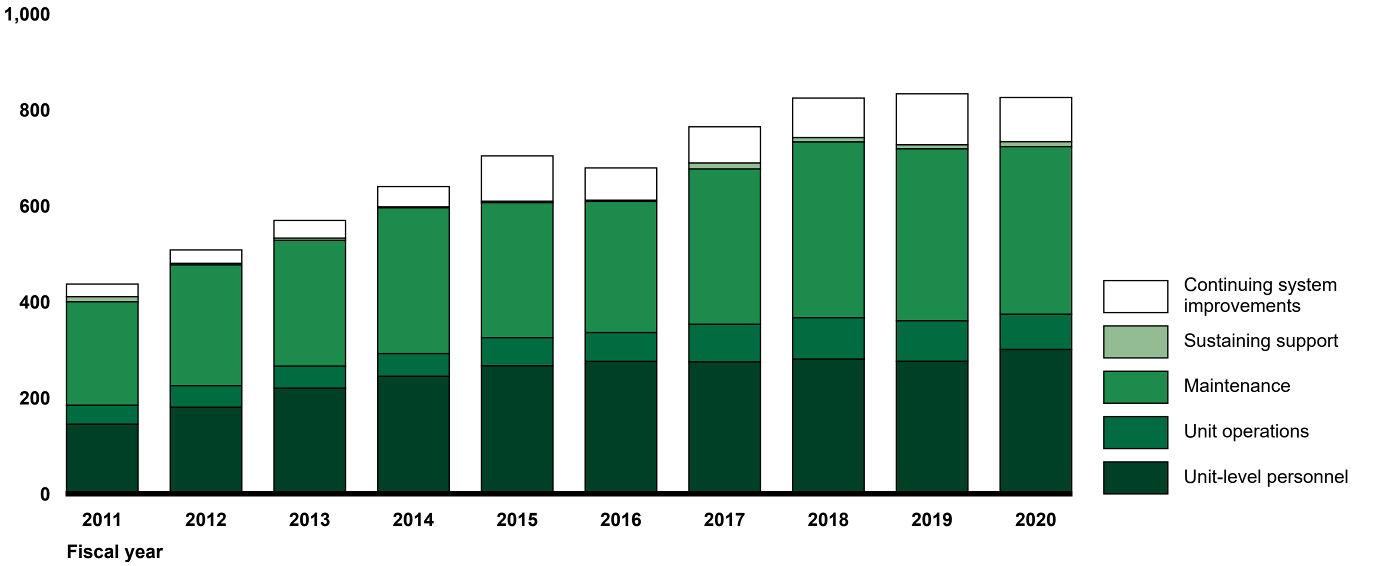
$79,958
Total costs per flying hour
+5.5% change from 2019

[a]For this aircraft, the military department did not provide a mission capable goal for all eleven years.

Operating and Support Costs

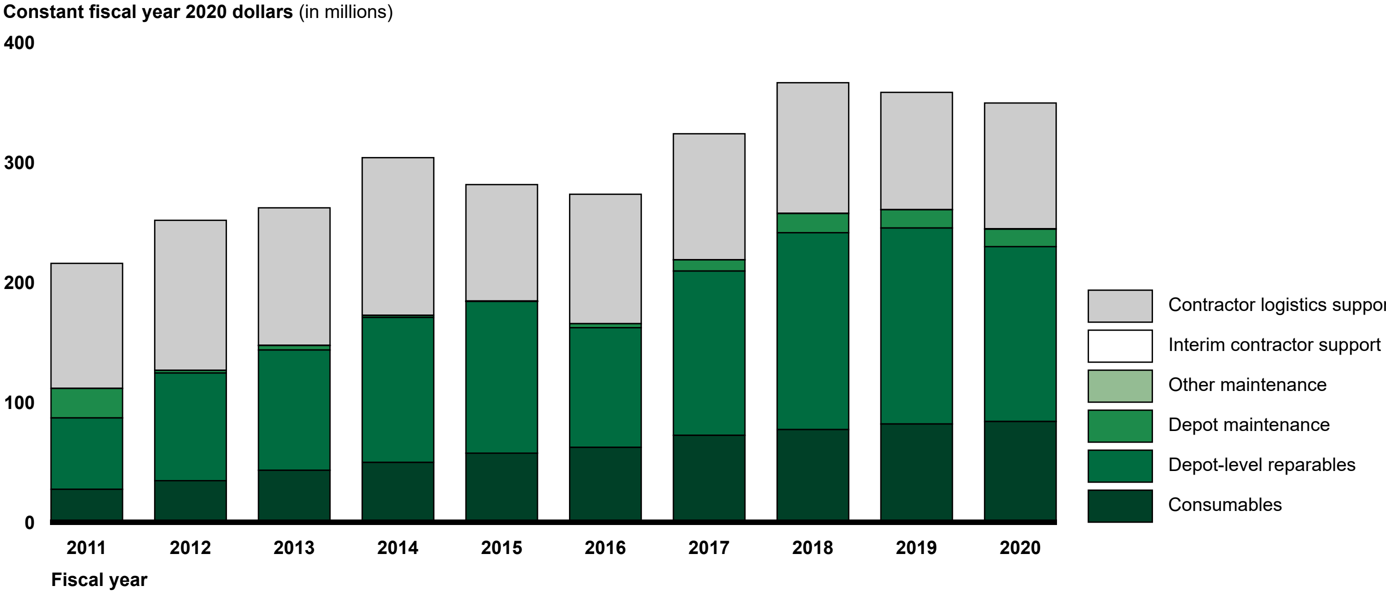
CV-22 Total Operating and Support Costs

Constant fiscal year 2020 dollars (in millions)



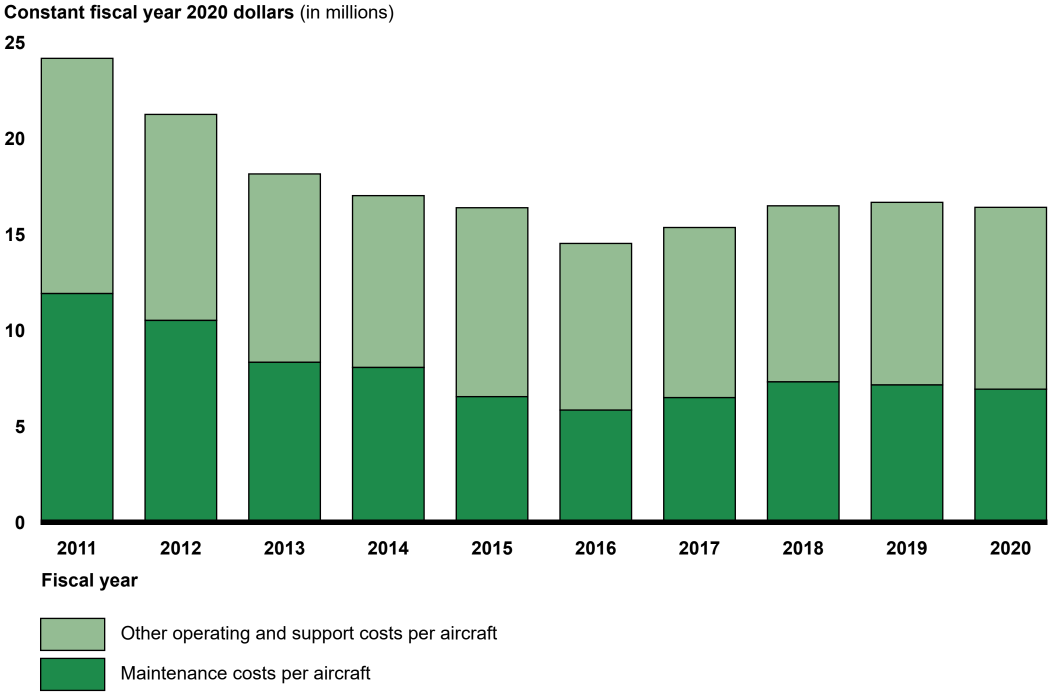
CV-22 Maintenance Costs

Constant fiscal year 2020 dollars (in millions)

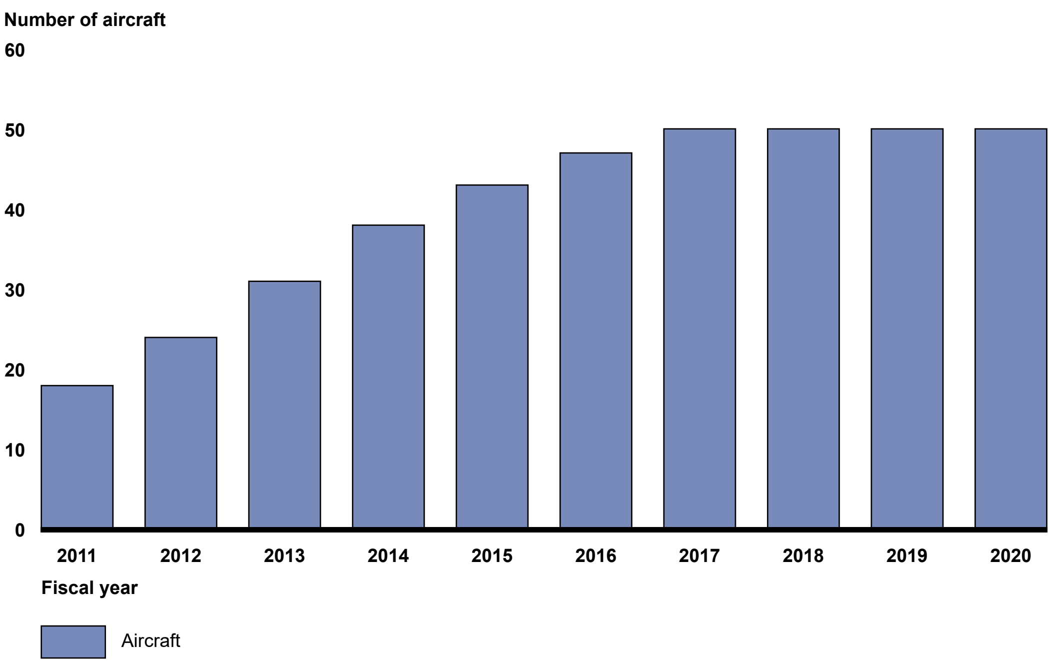


Operating and Support Costs per Aircraft

CV-22 Operating and Support Costs per Aircraft

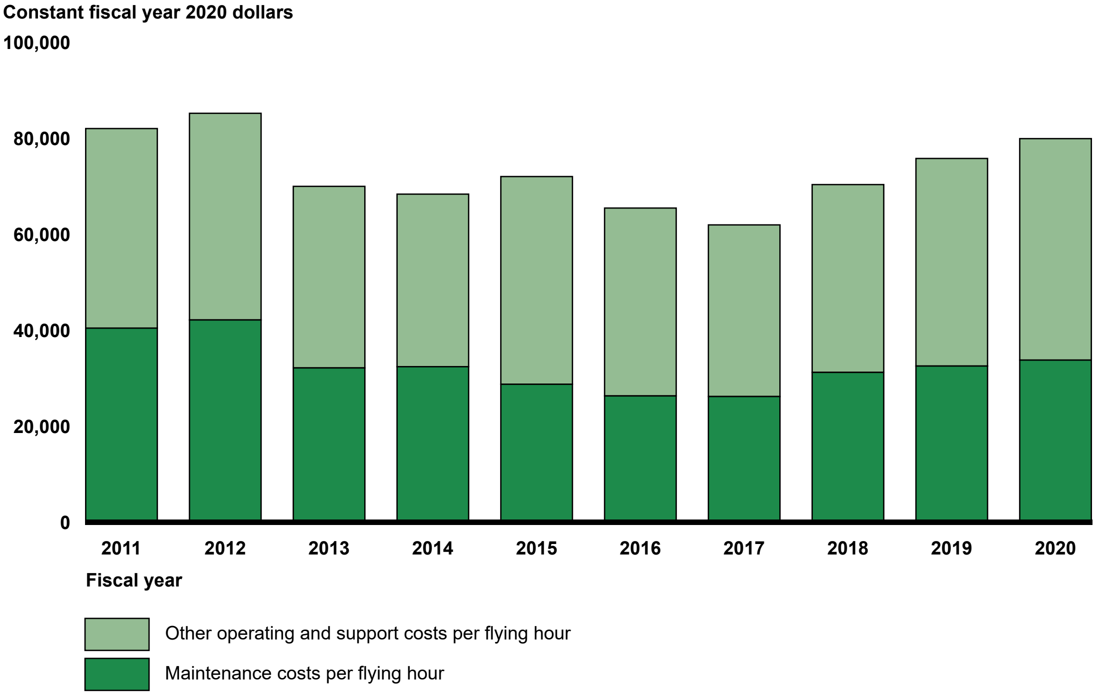


CV-22 Fleet Size

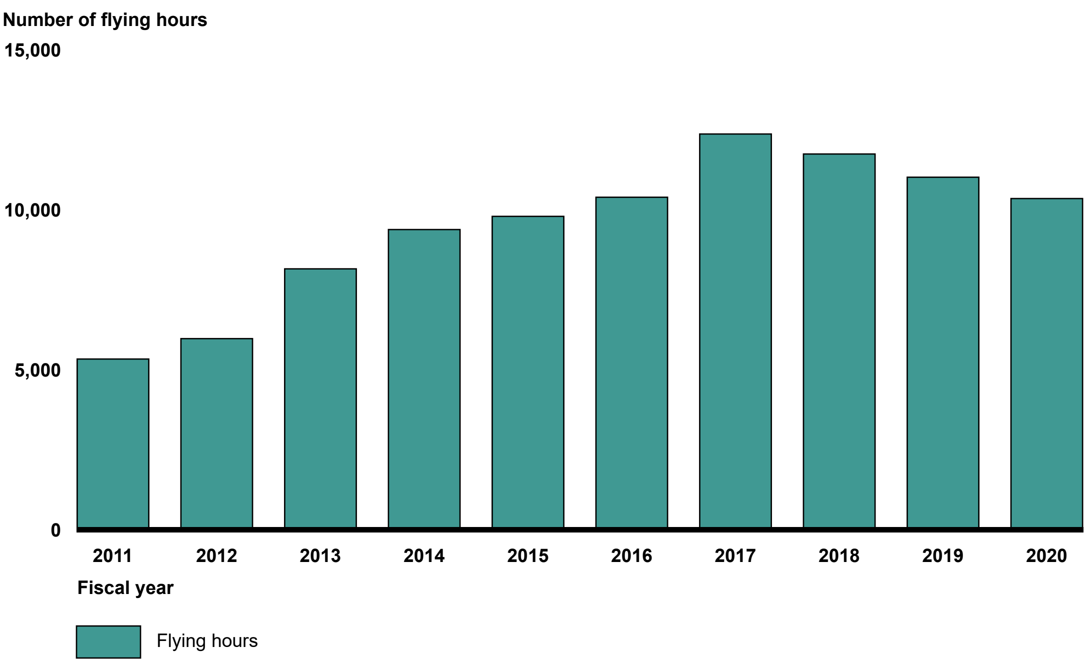


Operating and Support Costs per Flying Hour

CV-22 Operating and Support Costs per Flying Hour



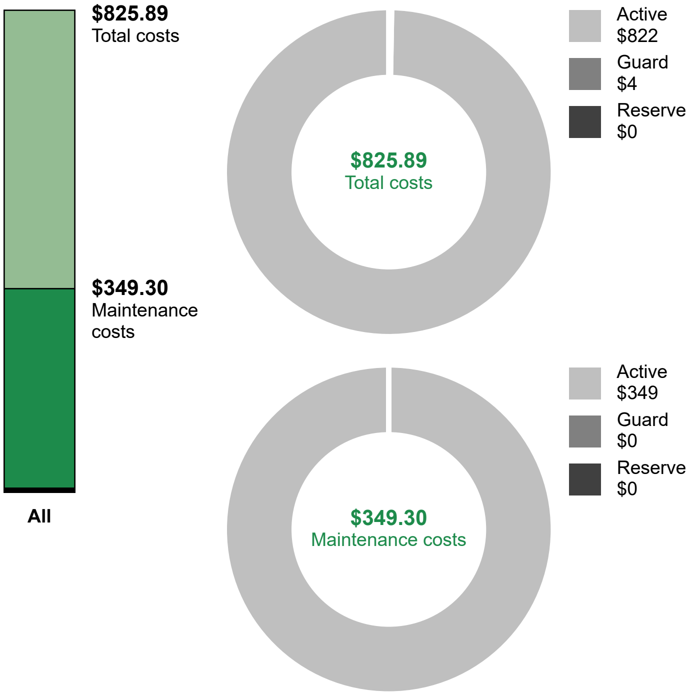
CV-22 Flying Hours



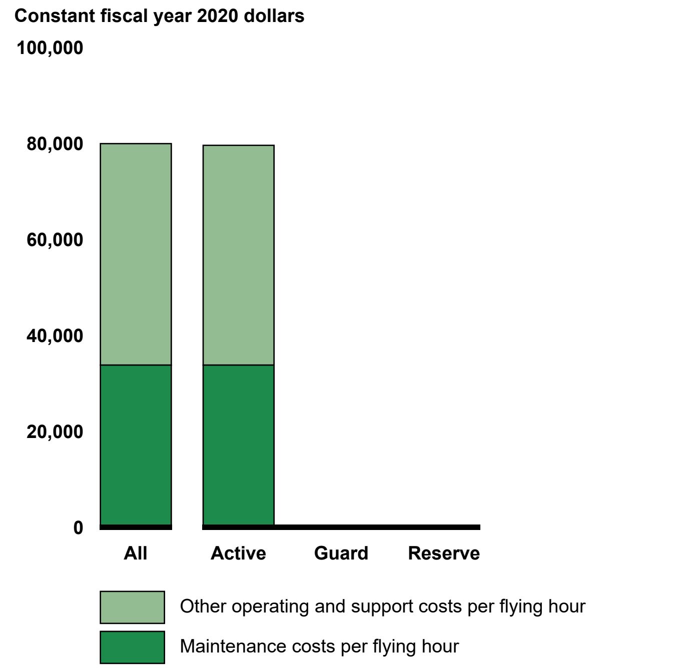
Component-Level Operating and Support Costs

CV-22 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The V-22 Joint Program Office manages the sustainment of the Marine Corps' MV-22B, the Air Force's and U.S. Special Operations Command's CV-22, and the Navy's CMV-22. A combination of personnel from the Navy's Fleet Readiness Centers East and Southwest, and from Bell Boeing, perform depot maintenance on the CV-22 at Air Force installations in Florida and New Mexico under a Joint Performance Based Logistics and Engineering contract, according to program officials. Rolls Royce performs depot maintenance on the engines. The officials said that Air Force personnel perform organizational and intermediate maintenance. The Naval Supply Systems Command and the Defense Logistics Agency provide supply support for the aircraft.

CV-22 Sustainment Challenges

Aging Aircraft

- Delays in acquiring replacement aircraft
- Service life extension
- Unexpected replacement of parts and repairs

Maintenance

- Access to technical data
- Delays in depot maintenance
- Shortage of trained maintenance personnel
- Unscheduled maintenance

Supply Support

- Diminishing manufacturing source
- Parts obsolescence
- Parts shortage and delay

Maintenance: According to program officials, an independent review of the Osprey program found that both the MV-22B and the CV-22 aircraft had too many configurations, which the review said increases the not mission capable rate because of the time it takes maintainers to first determine the configuration on which they are working, and then determine whether the maintenance manual procedures are current, before conducting maintenance. Program officials said that reducing the number of configurations would make the V-22 easier and more affordable to support based on the need for fewer parts, fewer configurations to test, and fewer software configurations to maintain.

To mitigate this issue, officials said that the program office is continuing its ongoing efforts to reduce the number of CV-22 configurations through a three-phase block modification program that will ultimately achieve a 95 percent common CV-22 configuration and also include reliability improvements. Program officials stated that the second phase of the block modification, which began in fiscal year 2019, will end in fiscal year 2024 with the number of CV-22 configurations reduced by 50 percent, from 22 to 11. The third and final phase, according to program officials, will begin in fiscal year 2022 and replace the nacelle (i.e., the housing over the power and propulsion components of the CV-22 aircraft) with a new design and further reduce the configuration variance. Program officials stated that the third phase is scheduled to be completed in fiscal year 2026 and they expect that it will increase aircraft availability and the mission capable rate because the nacelle system and its wiring have been the number one driver of the CV-22 fleet's not mission capable maintenance rate.

To reduce maintenance requirements and the not mission capable maintenance rate, the program office also has processes in place to identify potential reliability improvements for the V-22 platform, including the CV-22, according to program officials. More specifically, the officials said that the program office evaluates break rates and reliability through a Reliability and Maintainability Program. Further, they stated that the program office reviews systems with high not mission capable maintenance contributions during a monthly program Reliability Control Board that was established in fiscal year 2020 to identify and evaluate the root causes of readiness degraders and to develop corrective actions. Officials said that they expect that nacelle improvements will be the main CV-22 reliability improvement initiatives over the next 5 years.

In addition, the Air Force Special Operations Command is planning to implement a strategic initiative for the CV-22 in fiscal years 2022 through 2026 referred to as "Bold Moves", according to program officials. They stated that the initiative will temporarily place 18 CV-22 aircraft in backup storage to be used as a rotatable pool of aircraft to accelerate the installation of modifications and reliability improvements, such as the nacelle replacements and improvements. While this initiative is expected to decrease aircraft availability in the short term by putting the aircraft in backup, it is expected to improve aircraft availability in the future, according to program officials.

Supply Support: The CV-22B has experienced challenges with spare parts shortages and delays due to diminishing manufacturing sources, obsolescence, and reliability issues, according to program officials. For example, the officials stated that the program office has had a significant challenge obtaining avionics parts, especially with circuit cards and displays, due to diminishing manufacturing sources and obsolescence. The officials said that the program office has implemented a Diminishing Manufacturing Sources and Obsolescence Team to evaluate and find solutions to V-22 parts availability issues. The program office also works with vendors and industrial partners to find solutions, such as parts redesign efforts, to diminishing manufacturing sources and obsolescence issues, according to officials.

Program officials also reported that they are also pursuing initiatives to improve the reliability of parts and components to improve readiness. For example, the program office implemented a Program Reliability Control Board for the V-22 to focus on top supply readiness degraders and make supply chain recommendations to the leadership of the Naval Aviation Enterprise, among other things, according to program officials. Further, officials said that the program office is working with the Naval Supply Systems Command to award a fixed-price performance-based logistics contract to Bell-Boeing to incentivize Bell-Boeing to initiate changes to components to increase time on wing and reduce cost.

Program officials also reported that they are also pursuing initiatives to improve the reliability of parts and components to improve readiness. For example, the program office implemented Program Reliability Control Board for the V-22 to focus on top supply readiness degraders and make supply chain recommendations to the leadership of the Naval Aviation Enterprise, among other things, according to program officials. Further, officials said that the program office is working with the Naval Supply Systems Command to award a fixed-price performance-based logistics contract to Bell-Boeing to incentivize Bell-Boeing to initiate changes to components to increase their life span and reduce cost.

Program Office Comments

In commenting on a draft of this assessment, the program office provided technical comments, which we incorporated where appropriate.

HH-60G
Pave Hawk

Program Essentials

Lead Service
Air Force

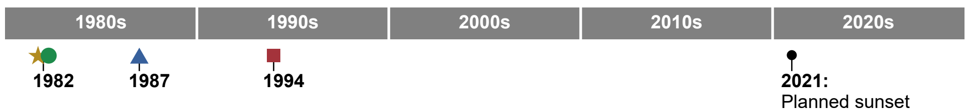
Manufacturer
United Technologies/Sikorsky Aircraft Company

Program Office
Robins Air Force Base, Georgia

Sustainment
Contractors perform unscheduled depot maintenance. Air Force personnel provide field maintenance.

The HH-60G Pave Hawk is a twin-engine helicopter. Its primary mission is to conduct day or night personnel recovery operations into hostile environments during war, but it is also tasked to perform other military operations, such as civil search and rescue and disaster response.

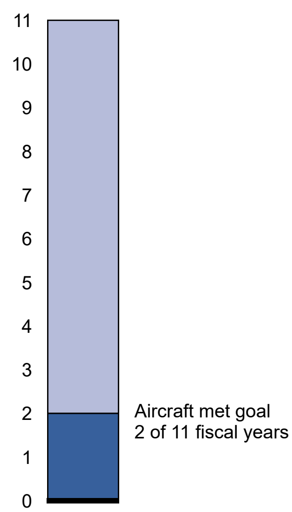
HH-60G Life Cycle Timeline



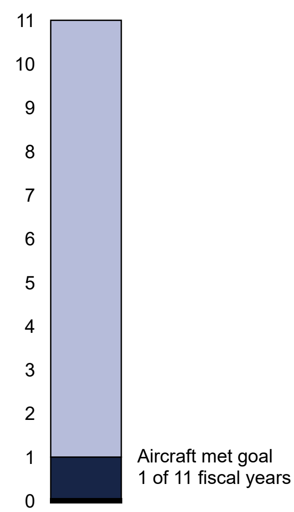
★ First manufactured ● Initial Operational Capability ▲ Full Operational Capability ■ Last production

HH-60G Sustainment Status

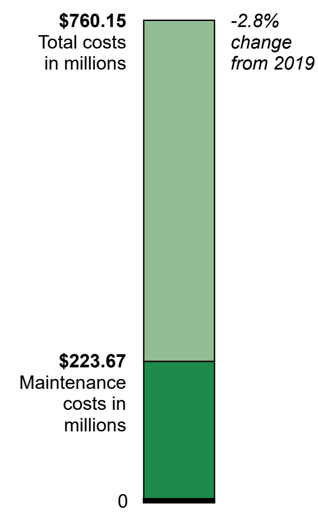
Aircraft availability rate
Fiscal years met goal



Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



Aircraft

107 total aircraft
Fiscal year 2020

25.4 years
Average aircraft age in fiscal year 2021

Flying hours

20,921 flying hours
Fiscal year 2020

5,822 hours
Average lifetime flying hours per aircraft in fiscal year 2021

Operating and support costs per aircraft and flying hour
Fiscal year 2020

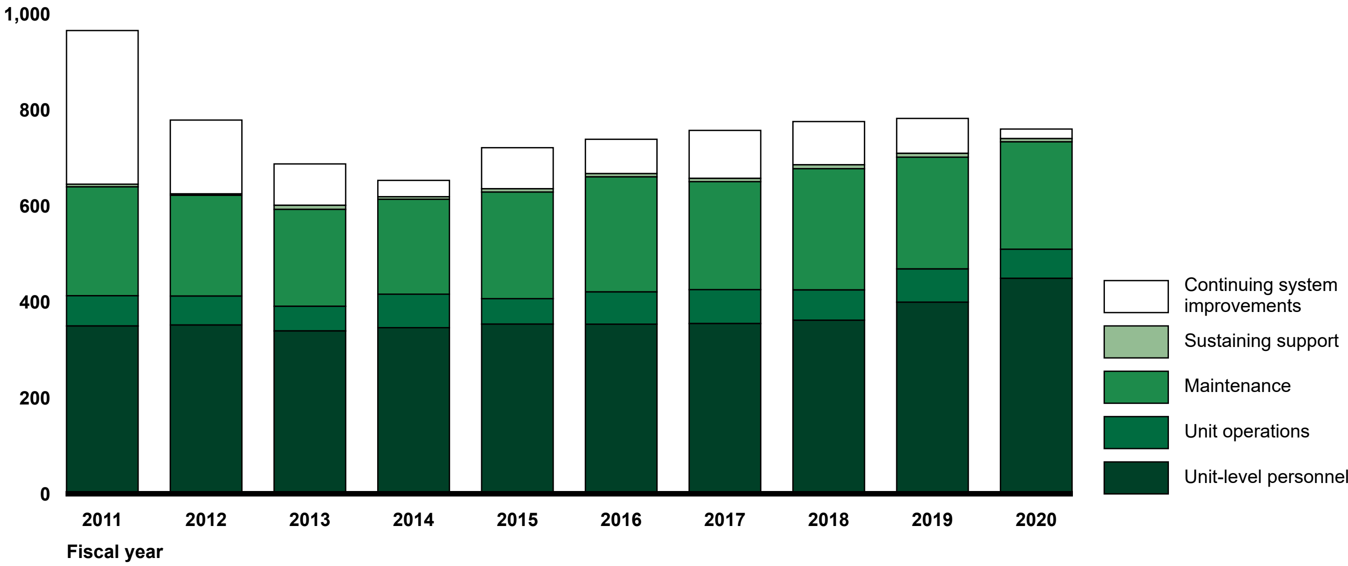
$7.13 million
Total costs per aircraft

$36,335
Total costs per flying hour
+5.1% change from 2019

Operating and Support Costs

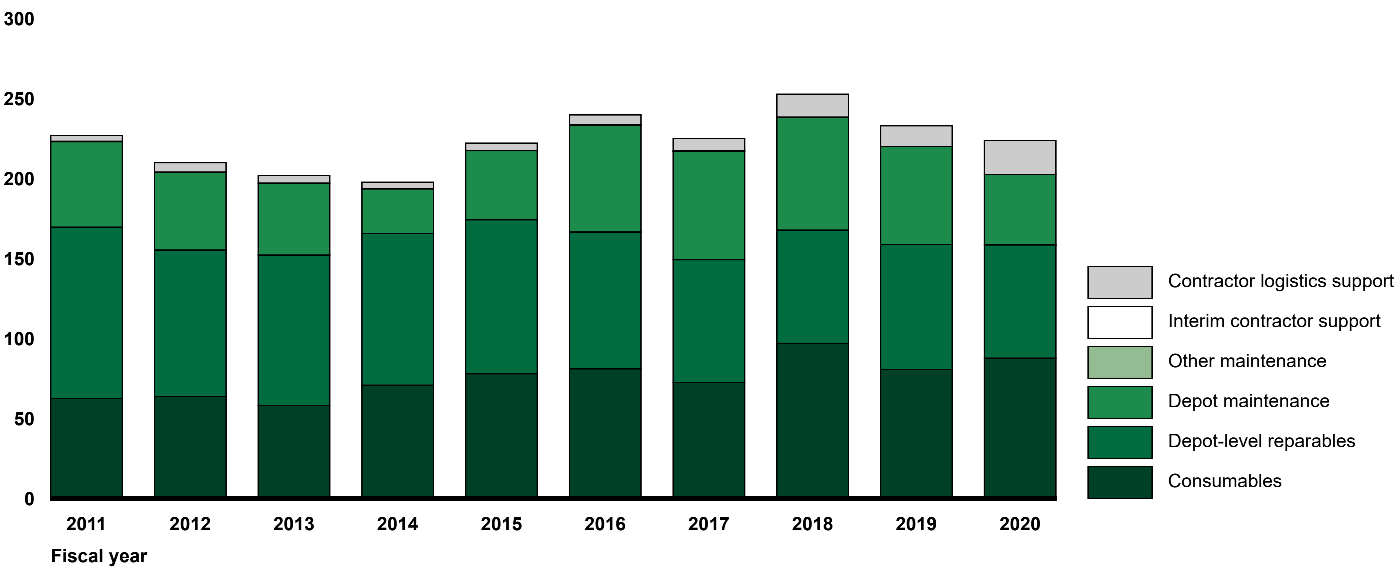
HH-60G Total Operating and Support Costs

Constant fiscal year 2020 dollars (in millions)



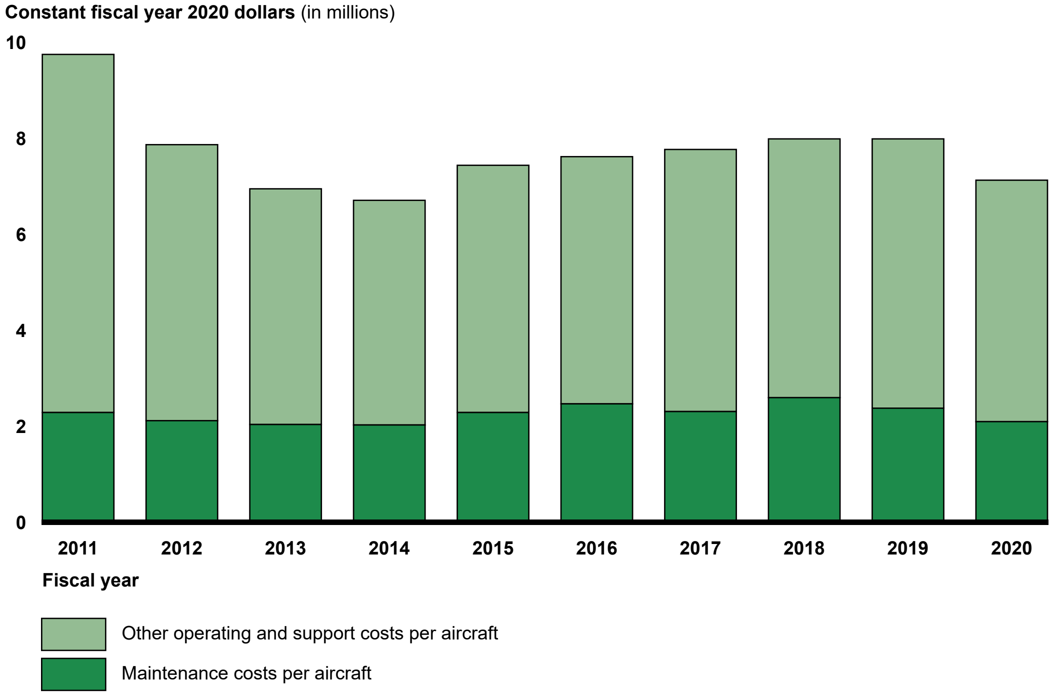
HH-60G Maintenance Costs

Constant fiscal year 2020 dollars (in millions)

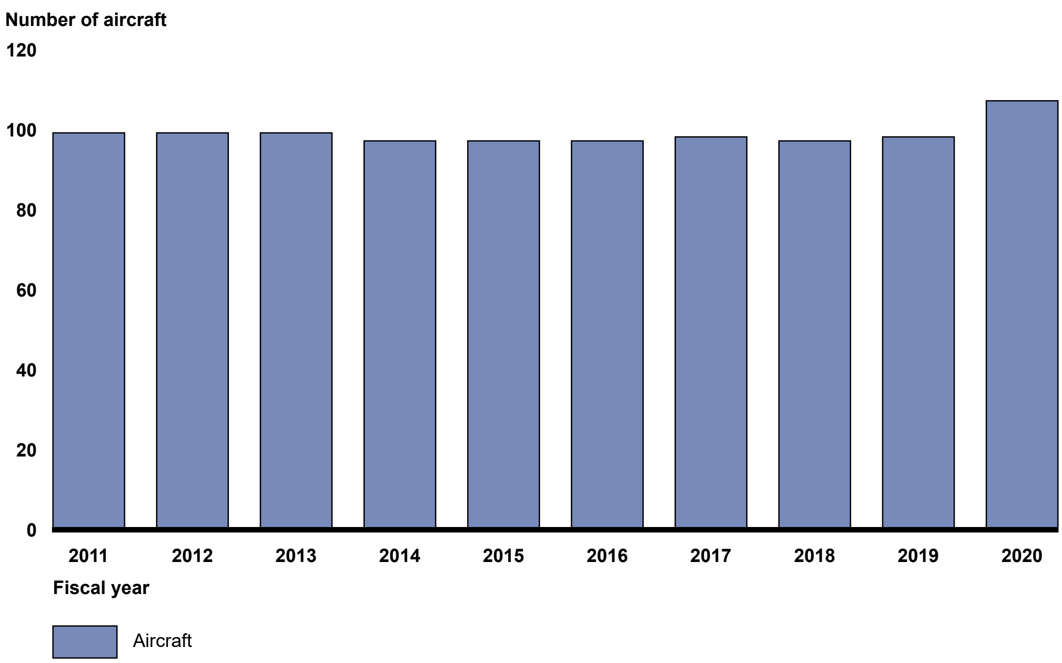


Operating and Support Costs per Aircraft

HH-60G Operating and Support Costs per Aircraft

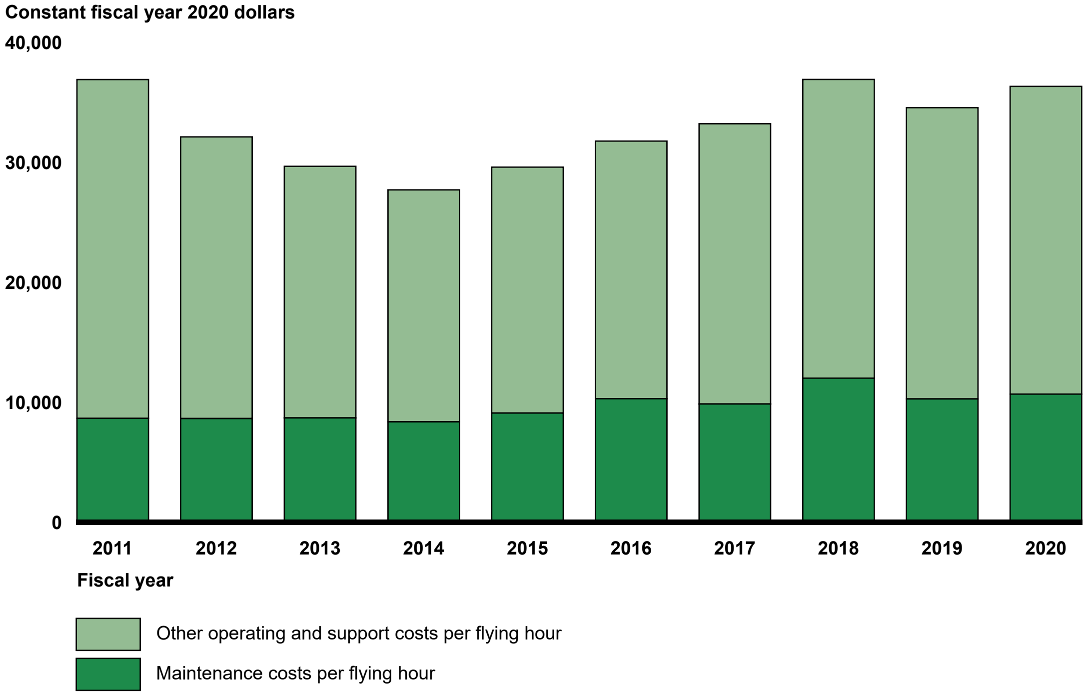


HH-60G Fleet Size

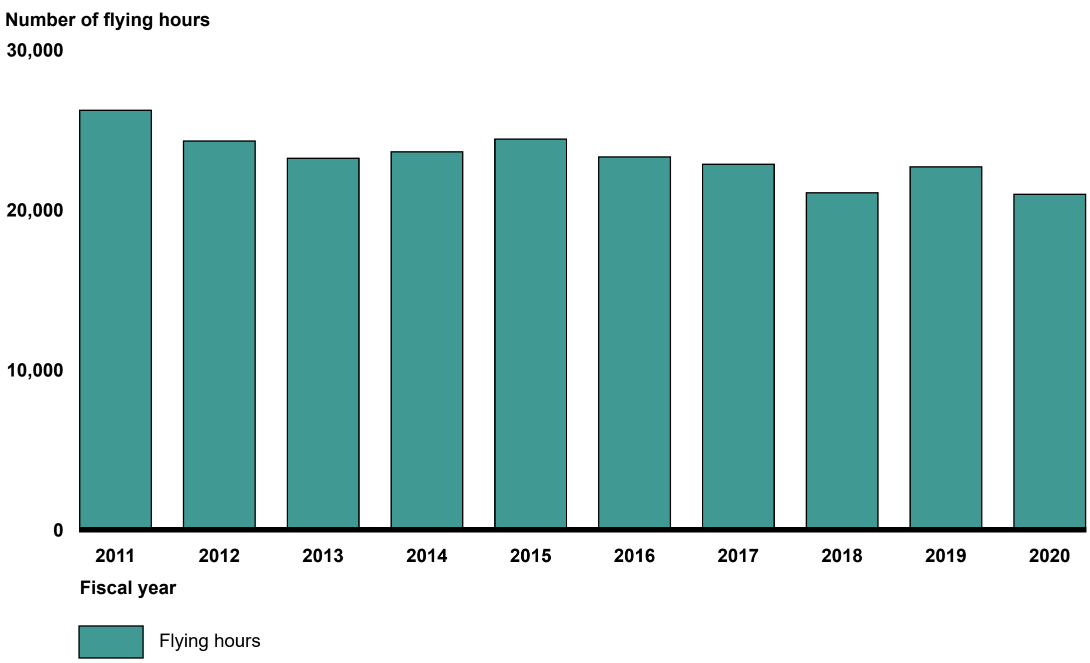


Operating and Support Costs per Flying Hour

HH-60G Operating and Support Costs per Flying Hour



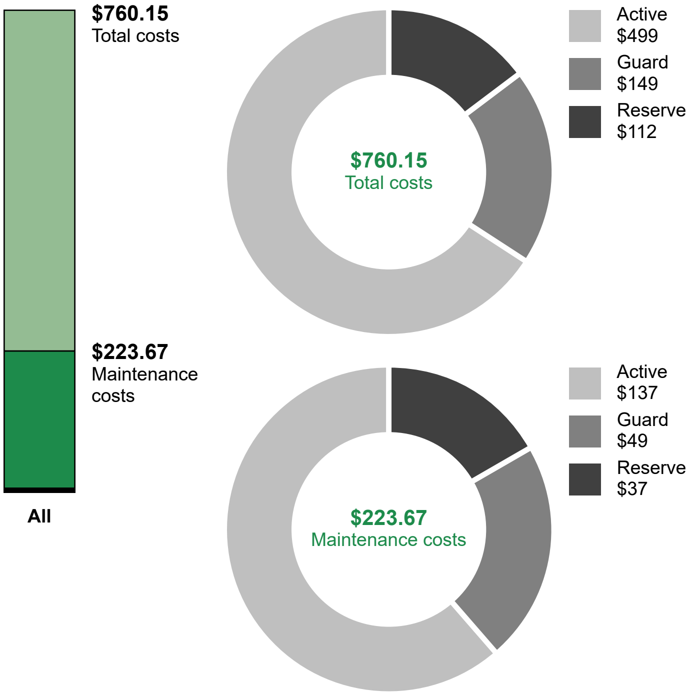
HH-60G Flying Hours



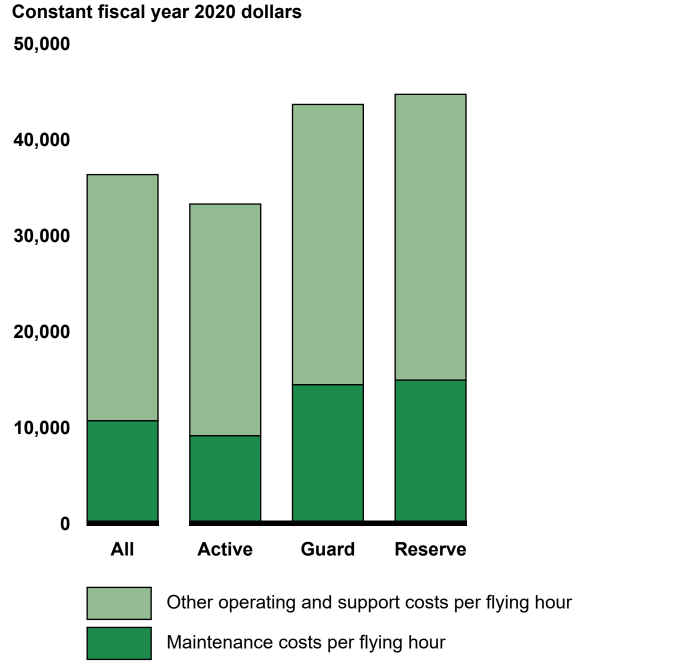
Component-Level Operating and Support Costs

HH-60G Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions
Fiscal year 2020



Operating and support costs per flying hour
Fiscal year 2020



Sustainment Strategy, Challenges, and Mitigation Actions

The HH-60G helicopter is operated by the Air Force, but the basic H-60 helicopter is also operated by the Army, Navy, and Coast Guard, and those services play a role in HH-60G sustainment, in addition to contractors. HH-60G aircraft no longer receive programmed depot maintenance, according to program officials, but government and contractor personnel at the Special Operation Forces Support Activity in Kentucky and Korean Air Lines in South Korea provide required operational safety, suitability, and effectiveness inspections/repairs and unscheduled depot maintenance to ensure operationally safe aircraft. The Corpus Christi Army depot in Texas overhauls/repairs components such as the engine and landing gear and the Tobyhanna Army depot in Pennsylvania repairs avionics components that are common across H-60 model aircraft. The Air Force Sustainment Center, Army Materiel Command, Naval Air Systems Command, and the Defense Logistics Agency manage HH-60G supply support.

HH-60G Sustainment Challenges

Aging Aircraft
- Delays in acquiring replacement aircraft
- Service life extension
- Unexpected replacement of parts and repairs

Maintenance
- Access to technical data
- Delays in depot maintenance
- Shortage of trained maintenance personnel
- Unscheduled maintenance

Supply Support
- Diminishing manufacturing source
- Parts obsolescence
- Parts shortage and delay

Maintenance: Program officials said that continued and growing depot maintenance delays have severely affected the fleet's aircraft availability rate. For example, all three planned depot repairs at Corpus Christi Army Depot that began in fiscal year 2020 were significantly delayed, according to program officials. The officials said the depot completed the maintenance 280 days late on one of the three aircraft. The program office cancelled the remaining maintenance on the other two aircraft in fiscal year 2021, after the depot projected that it would take twice as long, and cost $2 million more, than planned to complete the maintenance. The program office retired the two aircraft, and extended the planned retirement date for two other aircraft.[1]

According to program officials, due to the planned aircraft retirement schedule and deliveries of the replacement aircraft (the HH-60W), the program ended planned depot maintenance in fiscal year 2020. The services began retiring aircraft in fiscal year 2021 and, according to program office officials, they have retired 34 as of February 2022. Under the current retirement plan, the services will retire the last HH-60G aircraft in fiscal year 2026, according to officials.

Supply Support: Program officials said that the aging fleet, the lack of vendors to produce spare parts, and the lack of primary inventory control authority to manage HH-60G parts continue to pose supply support challenges at times. However, the not mission capable supply rate remained about the same in fiscal years 2019 through 2021. Program officials stated that military units and the Aerospace Maintenance and Regeneration Group had significantly mitigated these challenges by removing critical parts from aircraft before and after they were retired. Additionally, they said that the Army had improved its supply support of main rotor blades.

The program office plans to continue coordination with the other H-60 aircraft program offices in the Air Force, Army, Coast Guard, and Navy as well as the H-60 original equipment manufacturer to solve ongoing supply support issues and to benefit from the other services' lessons learned, according to the officials. Further, they stated that the HH-60G program office has assigned an obsolescence/diminishing manufacturing sources and material shortages lead to identify items with immediate or near-term obsolescence issues, assess the population of problem items, and prioritize the items that are most at risk for current and future readiness. Program officials said they will continue these efforts for the HH-60G fleet until retirement and then support the HH-60W as that system is fielded.

Program Office Comments

The program office reviewed a draft of this assessment and did not have any comments.

[1]GAO, *Military Readiness: Air Force Plans to Replace Aging Personnel Recovery Helicopter Fleet*, GAO-18-605 (Washington, D.C.: Aug. 16, 2018). We reported that HH-60G helicopters spent an average of 332 days undergoing depot level maintenance in fiscal year 2017, an increase of 42 percent compared to fiscal year 2007. Air Force officials attributed these challenges to the helicopters exceeding their initially planned service life.

UH-1N
Huey

Program Essentials

Lead Service
Air Force

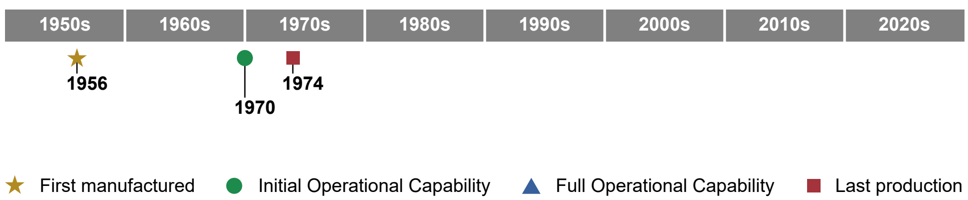
Manufacturer
Bell Helicopter/Textron, Inc.

Program Office
Robins Air Force Base, Georgia

Sustainment
The Navy's Fleet Readiness Center East performs depot maintenance on the airframes and engines. Contractor personnel provide organizational and intermediate maintenance.

The UH-1N Huey is a light-lift utility helicopter used to support various missions. The primary missions include airlift of emergency security forces, security and surveillance of off-base nuclear weapons convoys, and distinguished visitor airlift.

UH-1N Life Cycle Timeline

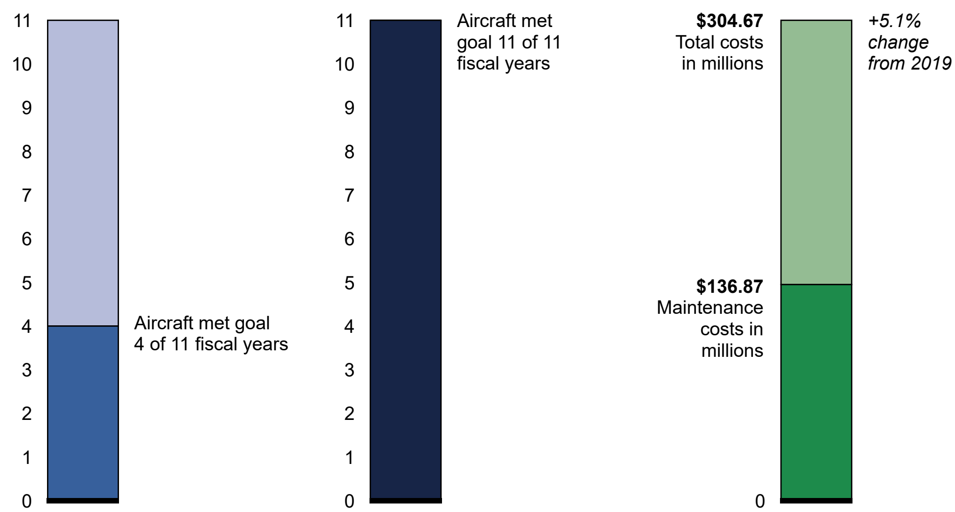


UH-1N Sustainment Status

Aircraft availability rate
Fiscal years met goal

Mission capable rate
Fiscal years met goal

Operating and support costs
Fiscal year 2020



Aircraft

63 total aircraft
Fiscal year 2020

48.0 years
Average aircraft age in fiscal year 2021

Flying hours

21,079 flying hours
Fiscal year 2020

15,389 hours
Average lifetime flying hours per aircraft in fiscal year 2021

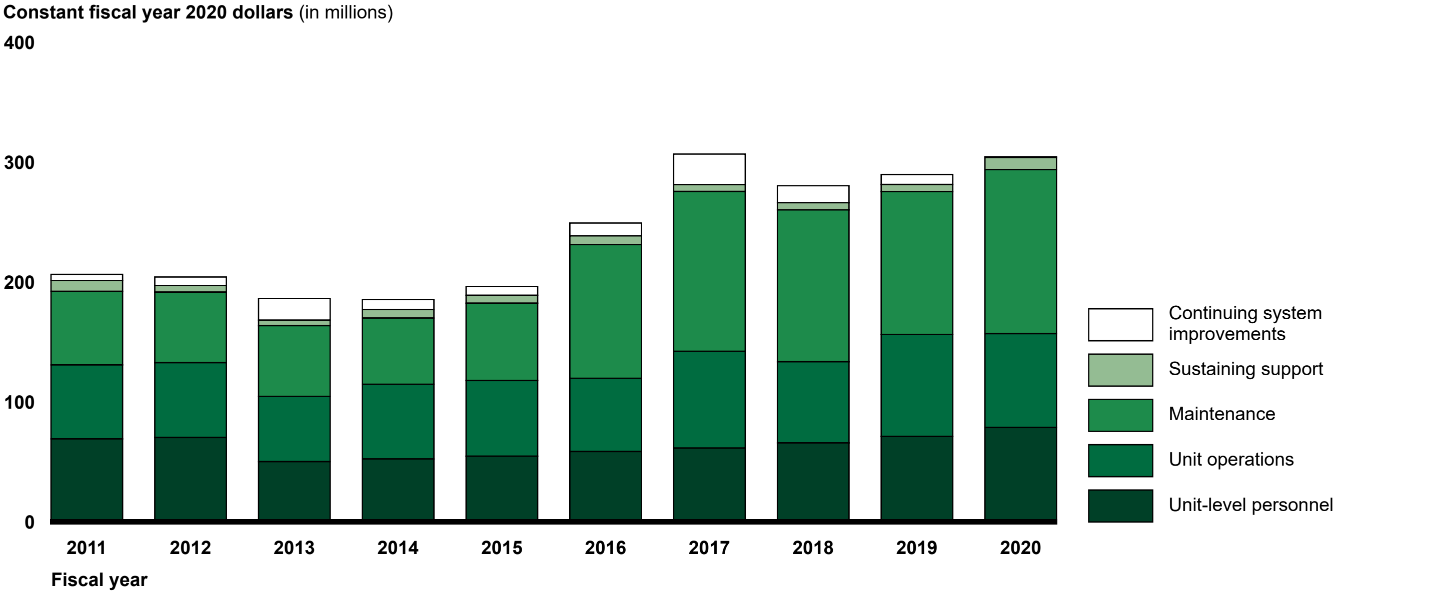
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$4.84 million
Total costs per aircraft

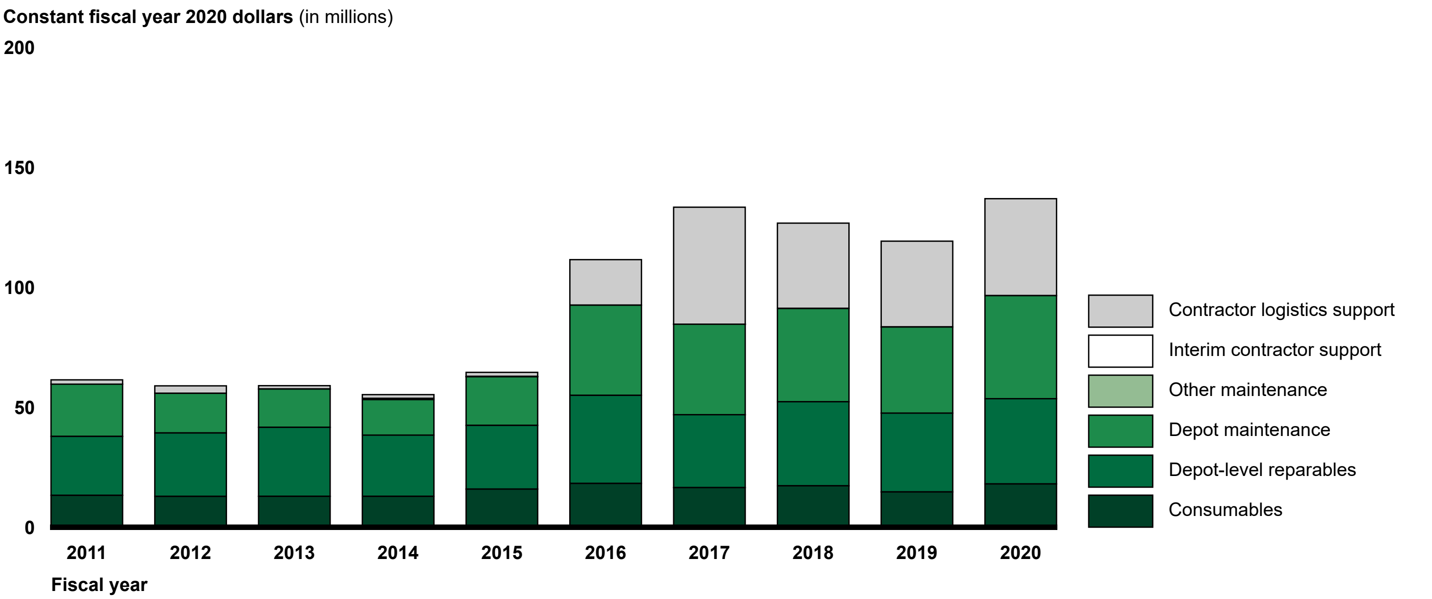
$14,454
Total costs per flying hour
+5.6% change from 2019

Operating and Support Costs

UH-1N Total Operating and Support Costs

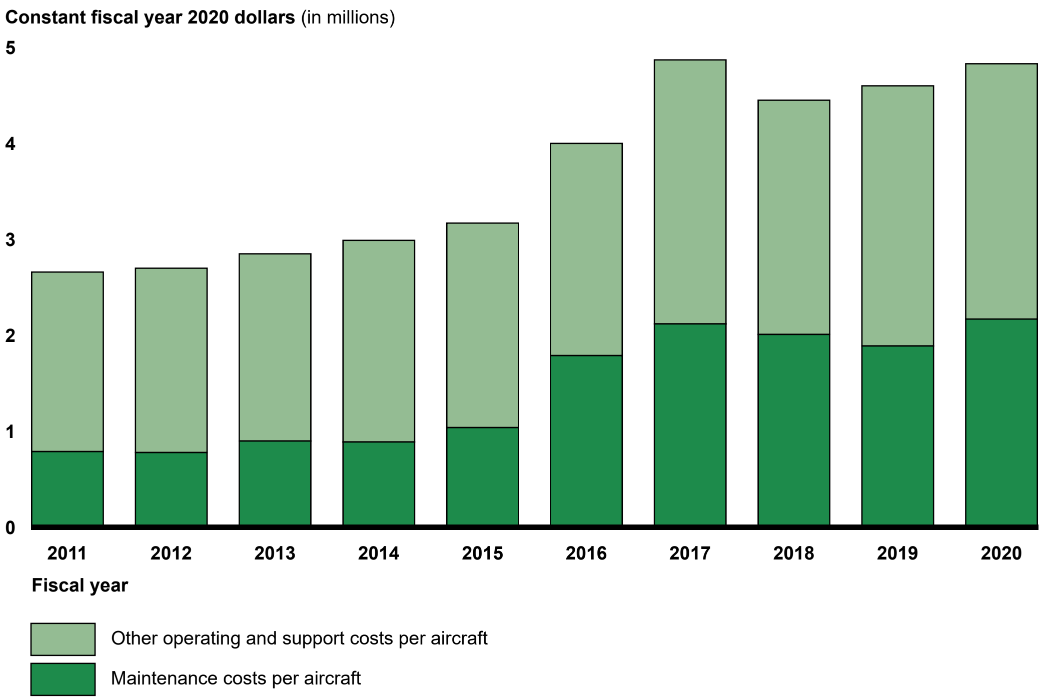


UH-1N Maintenance Costs

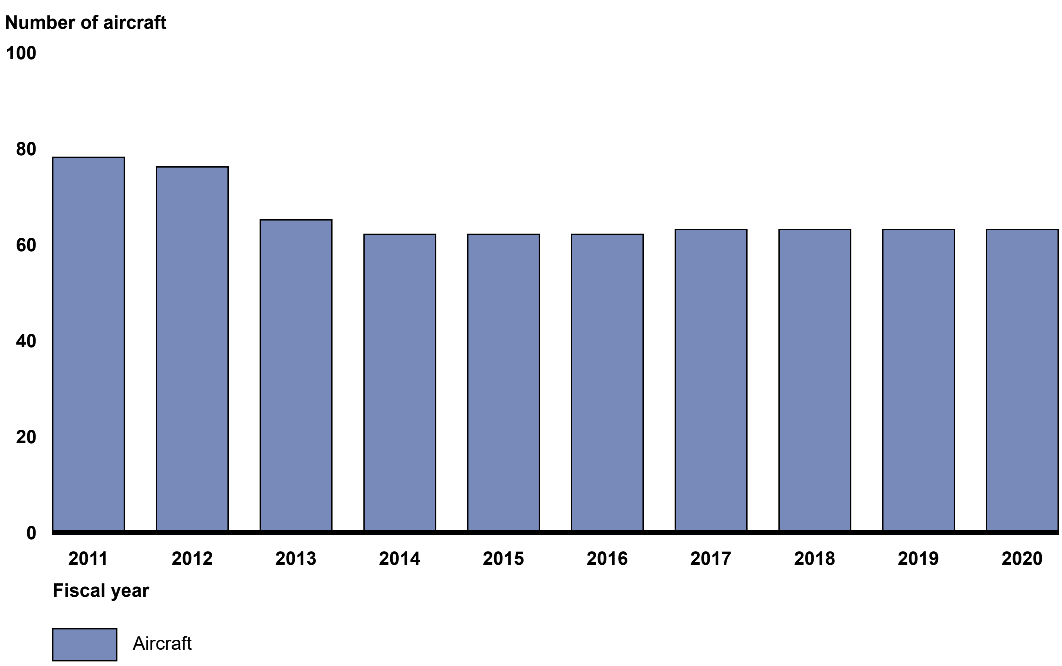


Operating and Support Costs per Aircraft

UH-1N Operating and Support Costs per Aircraft

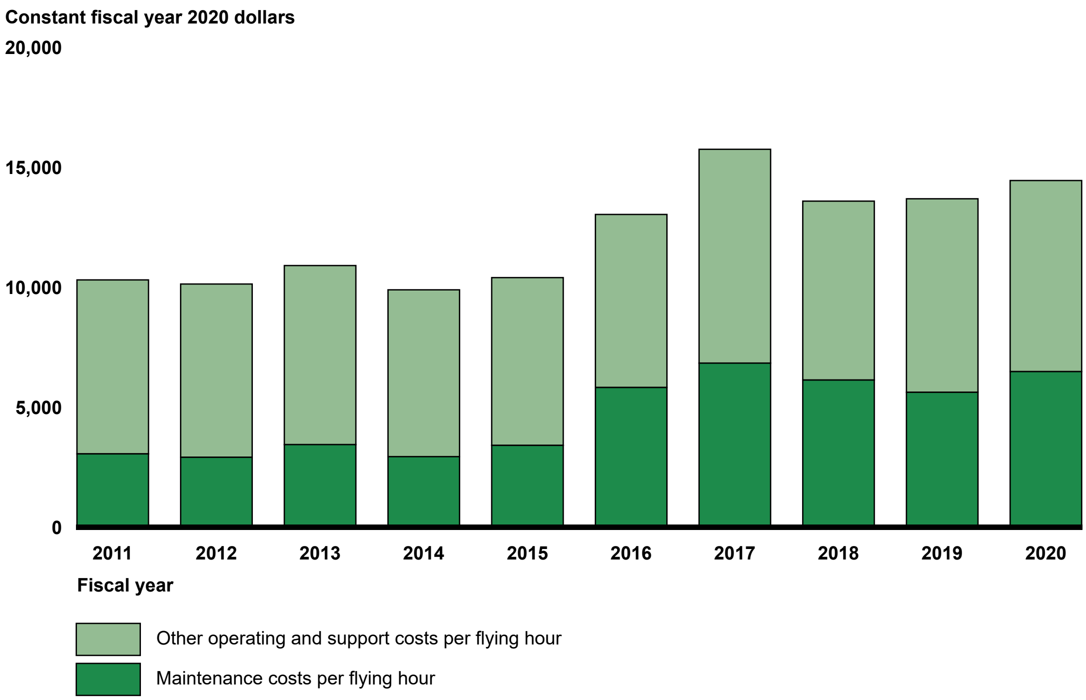


UH-1N Fleet Size

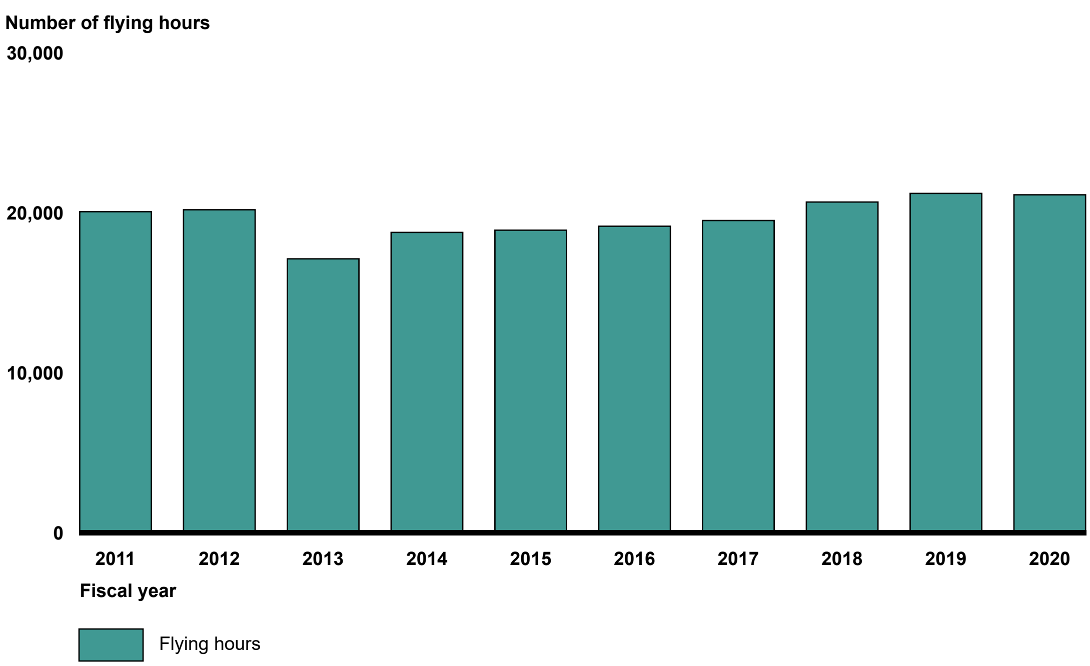


Operating and Support Costs per Flying Hour

UH-1N Operating and Support Costs per Flying Hour



UH-1N Flying Hours



Sustainment Strategy, Challenges, and Mitigation Actions

The Navy's Fleet Readiness Center East conducts depot maintenance on the UH-1N airframes and engines and Corpus Christi Army Depot conducts depot-level maintenance on reparable components. Contractors provide organizational and intermediate maintenance for the UH-1N. Army, Navy, Air Force, and Defense Logistics Agency item managers provide supply support.

UH-1N Sustainment Challenges

Aging Aircraft	Maintenance	Supply Support
Delays in acquiring replacement aircraft	Access to technical data	Diminishing manufacturing source
Service life extension	Delays in depot maintenance	Parts obsolescence
Unexpected replacement of parts and repairs	Shortage of trained maintenance personnel	Parts shortage and delay
	Unscheduled maintenance	

Maintenance: The UH-1N has no ongoing initiatives to improve aircraft availability or the mission capable rate, according to program officials, because the aircraft is generally meeting its goals. Specifically, since fiscal year 2011 the fleet has historically either met, or come close to meeting, its aircraft availability goals and has met its mission capable rate goals. Further, the Air Force plans to replace the UH-1N fleet with the MH-139A Grey Wolf. Program officials said that they were expecting deliveries to start as early as fiscal year 2022. However, the milestone C acquisition decision for the MH-139A—after which low-rate production of the aircraft can begin—was delayed at the end of fiscal year 2021.

Program officials stated that they expect the UH-1N's aircraft availability rate to increase because of depot initiatives to reduce turnaround times for repair of the helicopter. For example, in fiscal year 2021, Fleet Readiness Center East transferred all of its work for H-1 helicopters, including the UH-1N, from its primary facility at Marine Corps Air Station Cherry Point to a newly opened facility in Kinston, North Carolina, according to Naval Air Systems Command. The Navy officials said that the first UH-1N aircraft was completed at the Kinston facility 40 days ahead of the average turnaround time at Cherry Point.

Supply Support: The UH-1N program office has continued to proactively work with the other services, according to program officials, to improve the sustainment program across the common H-1 helicopter platform. The officials stated that they have monitored internal and external sustainment providers to ensure that issues were resolved as quickly as possible for minimal effect on overall aircraft availability. Officials also said that the program office has started to implement an obsolescence program to minimize costs and to offset the detrimental effect of obsolescence on the sustainment of the UH-1N. The obsolescence program will include regular meetings to discuss sustainment issues as they arise, according to program officials.

Program Office Comments

In commenting on a draft of this assessment, the program office stated that it is awaiting major command retirement decisions for the UH-1N based on the MH-139's fielding schedule. The program office said that it will continue to sustain the UH-1N and, given the age of the helicopters, a Service Life Extension Program may be required to continue to meet the required aircraft availability.

Agency Comments and Our Evaluation

We provided a draft of this report to DOD for review and comment. In its written comments, reproduced in appendix III, DOD noted that we amended the report in response to its comments on the sustainment reviews required by statute. We worked closely with DOD to reach agreement on the technical accuracy of the language. We appreciate DOD's willingness to collaborate with us to improve the explanation of sustainment review requirements.

We are sending copes of this report to the appropriate congressional committees, the Secretary of Defense, the Under Secretary of Defense for Acquisition and Sustainment, the Deputy Assistant Secretary of Defense for Materiel Readiness, and the Secretaries of the Army, the Navy, and the Air Force. In addition, the report is available at no charge on the GAO website at https://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-9627 or maurerd@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix IV.

Diana Maurer Director, Defense Capabilities and Management

List of Committees

The Honorable Jack Reed
Chairman
The Honorable James M. Inhofe
Ranking Member
Committee on Armed Services
United States Senate

The Honorable Jon Tester
Chairman
The Honorable Richard Shelby
Ranking Member
Subcommittee on Defense
Committee on Appropriations
United States Senate

The Honorable Adam Smith
Chairman
The Honorable Mike Rogers
Ranking Member
Committee on Armed Services
House of Representatives

The Honorable Betty McCollum
Chair
The Honorable Ken Calvert
Ranking Member
Subcommittee on Defense
Committee on Appropriations
House of Representatives

Appendix I: Objectives, Scope, and Methodology

This report examines (1) the extent to which the military services met established mission capable goals for 49 selected aircraft, including trends since fiscal year 2011 in mission capable rates and any sustainment challenges for those aircraft; and (2) the costs to operate and support these aircraft since fiscal year 2011.

Our observations are based on 49 manned fixed- and rotary-wing aircraft that support combat-related missions in the Departments of the Army, Navy, and Air Force.[1] In selecting these aircraft, we considered a number of factors, such as the mission of the aircraft (e.g., fighters, bombers, or cargo) and the size and age of the inventory for each aircraft.

For example, we did not select aircraft that are used solely for training or are used to meet the operational airlift support mission (i.e., the movement of a limited number of high-priority passengers and cargo with time, place, or mission-sensitive requirements).[2]

Figure 12 lists the aircraft reviewed, by type and military department.

[1]Our review focused on the Air Force, Army, Navy, and Marine Corps and does not include the U.S. Space Force. This report includes two aircraft, the RC-135 S-W (Air Force) and the MH-53E (Navy), not included in our last Sustainment Quick Look reports.

[2]We reported on operational support airlift in June 2017. See GAO, *Operational Support Airlift: Fleet Sufficiency Is Assessed Annually*, GAO-17-582 (Washington, D.C.: June 28, 2017).

Figure 12: Aircraft Selected for Review by GAO, by Type and Military Department

Air refueling		
KC-130T	Hercules	Navy/Marine Corps
KC-130J	Super Hercules	Marine Corps
KC-10	Extender	Air Force
KC-135	Stratotanker	Air Force
Anti-submarine		
EP-3E	Aries II	Navy
P-8A	Poseidon	Navy
Bomber		
B-1B	Lancer	Air Force
B-2	Spirit	Air Force
B-52	Stratofortress	Air Force
Cargo		
C-2A	Greyhound	Navy
C-130T	Hercules	Navy
C-5M	Super Galaxy	Air Force
C-17	Globemaster III	Air Force
C-130H	Hercules	Air Force
C-130J	Super Hercules	Air Force
Command and control		
E-2C	Hawkeye	Navy
E-2D	Advanced Hawkeye	Navy
E-6B	Mercury (Take Charge and Move Out)	Navy
E-3	Sentry (Airborne Warning and Control System)	Air Force
E-4B	National Airborne Operations Center	Air Force
E-8C	Joint Surveillance Target Attack Radar System	Air Force
RC-135S-W	Cobra Ball/Combat Sent/Rivet Joint	Air Force
Fighter		
EA-18G	Growler	Navy
F/A-18A-D	Hornet	Navy/Marine Corps
F/A-18E/F	Super Hornet	Navy
F-35A/B/C	Lightning II Joint Strike Fighter	Navy/Marine Corps/Air Force
AV-8B	Harrier II	Marine Corps
A-10	Thunderbolt II	Air Force
F-15C/D	Eagle	Air Force
F-15E	Strike Eagle	Air Force
F-16	Fighting Falcon	Air Force
F-22	Raptor	Air Force
Rotary		
AH-64D/E	Apache	Army
CH-47F	Chinook	Army
UH/HH-60	Black Hawk	Army
MH-53E	Sea Dragon	Navy
MH-60R	Seahawk	Navy
MH-60S	Seahawk	Navy
AH-1Z	Viper	Marine Corps
CH-53E	Super Stallion	Marine Corps
MV-22B	Osprey	Marine Corps
UH-1Y	Venom	Marine Corps
CV-22	Osprey	Air Force
HH-60G	Pave Hawk	Air Force
UH-1N	Huey	Air Force

Source: GAO. | GAO-23-106217

Text of Figure 12: Aircraft Selected for Review by GAO, by Type and Military Department

- Air refueling
    - KC-130T, Hercules, Navy/Marine Corps
    - KC-130J, Super Hercules, Marine Corps
    - KC-10, Extender, Air Force
    - KC-135, Stratotanker, Air Force
- Anti-submarine
    - EP-3E, Aries II, Navy
    - P-8A, Poseidon, Navy
- Bomber
    - B-1B, Lancer, Air Force
    - B-2, Spirit, Air Force
    - B-52, Stratofortress, Air Force
- Cargo
    - C-2A, Greyhound, Navy
    - C-130T, Hercules, Navy
    - C-5M, Super Galaxy, Air Force
    - C-17, Globemaster III, Air Force
    - C-130H, Hercules, Air Force
    - C-130J, Super Hercules, Air Force
- Command and control
    - E-2C, Hawkeye, Navy
    - E-2D, Advanced Hawkeye, Navy
    - E-6B, Mercury (Take Charge and Move Out), Navy
    - E-3, Sentry (Airborne Warning and Control System), Air Force
    - E-4B, National Airborne Operations Center, Air Force
    - E-8C, Joint Surveillance Target Attack Radar System, Air Force
    - RC-135S-W, Cobra Ball/Combat Sent/Rivet Joint , Air Force
- Fighter

- EA-18G, Growler, Navy
- F/A-18A-D, Hornet, Navy/Marine Corps
- F/A-18E/F, Super Hornet, Navy
- F-35A/B/C, Lightning II Joint Strike Fighter, Navy/Marine Corps/Air Force
- AV-8B, Harrier II, Marine Corps
- A-10, Thunderbolt II, Air Force
- F-15C/D, Eagle, Air Force
- F-15E, Strike Eagle, Air Force
- F-16, Fighting Falcon, Air Force
- F-22, Raptor, Air Force

- Rotary
  - AH-64D/E, Apache, Army
  - CH-47F, Chinook, Army
  - UH/HH-60, Black Hawk, Army
  - MH-53E, Sea Dragon, Navy
  - MH-60R, Seahawk, Navy
  - MH-60S, Seahawk, Navy
  - AH-1Z, Viper, Marine Corps
  - CH-53E, Super Stallion, Marine Corps
  - MV-22B, Osprey, Marine Corps
  - UH-1Y, Venom, Marine Corps
  - CV-22, Osprey, Air Force
  - HH-60G, Pave Hawk, Air Force
  - UH-1N, Huey, Air Force

Source: GAO. | GAO-23-106217

For objective one, we collected and analyzed data from the Army, Navy, and Air Force on key sustainment metrics for each of the 49 aircraft.[3] These metrics included mission capable rates and goals and not mission capable rates for maintenance, supply, and both for fiscal years 2011 through 2021, the last fiscal year for which complete data were available at the time of our work.[4]

The Navy has historically maintained and reported mission capable rate data, as well as other sustainment data, through its Decision Knowledge Programming for Logistics Analysis and Technical Evaluation (DECKPLATE) system. Navy officials commented that, starting in fiscal year 2022, the Navy's official data source for data about mission capable rates will be the Aviation Maintenance Supply Readiness Reporting (AMSRR) system. Navy officials indicated AMSRR data better represents the Navy's mission capability to meet real world operational commitments. According to Navy officials, in previous years the Navy has compared mission capable rates to targets that were not operationally aligned to the mission needs of the Navy.

Navy officials further indicated that in fiscal year 2022, the Navy produced mission capable goals in the form of mission capable aircraft counts vice mission capable rates. These goals are set with the Aircraft Readiness Calculation–Navy methodology and produce a Mission Capable Aircraft

[3]Mission capable rate data were pulled from the Logistics Information Warehouse Readiness Integrated Data Base for the Army; the Decision Knowledge Programming for Logistics and Technical Evaluation (DECKPLATE) and the Aviation Maintenance Supply Readiness Reporting (AMSRR) information systems for the Navy; and the Logistics Installations and Mission Support – Enterprise View system for the Air Force.

[4]Navy officials also commented that the Navy evaluates mission capable based on those aircraft that are in-reporting, meaning assigned to squadrons, which does not include aircraft that are in a depot event or modification event. In determining mission capable status for the reviewed aircraft, we only included those aircraft in operational status category codes A, B, and C. We excluded those in category codes D and E. The Naval Aviation Maintenance Program defines the operational status category codes as follows: Operational Status Category A - Deployed Units. Effective upon embarkation for deployment aboard ship or to a station or facility outside CONUS, including Hawaii. Operational Status Category B - Work Up/Ready Duty/Surge Capable Units. Effective 90 days prior to embarkation for a deployment either aboard ship or to a station or facility outside CONUS, including Hawaii, or upon attainment of surge capability, to include post deployment surge requirements. Operational Status Category C - Deployable Units. Effective upon completion of deployment or surge requirements and not yet within 90 days of the next deployment. Operational Status Category D - Fleet Readiness Squadrons (FRS), only. Operational Status Category E - Non-deployable units. *See* Commander Naval Air Forces Instruction 4790.2D, *The Naval Aviation Maintenance Program (NAMP)* (Feb. 1, 2021) (incorporating change 1, effective Feb. 15, 2022).

Required (MCAR) target for each aircraft program. To measure performance against these MCAR targets, Navy officials told us the Navy uses daily mission capable aircraft counts from AMSRR.

However, Navy officials acknowledged that DECKPLATE provides a more comprehensive measure of the health of aircraft, systems, and components. DECKPLATE measures mission capable rates based on a percentage of the total time the aircraft is available and provides additional insight into the reasons for an aircraft not being mission capable, such as not mission capable maintenance and supply rates. DECKPLATE data is pulled directly from the maintenance management tools at the unit level.

In our previous reporting and in this report, we used sustainment data from DECKPLATE. Given that this report cites mission capable rates prior to fiscal year 2022, we believe that we used an appropriate data source for the scope and timeframes of this review. Using DECKPLATE data allowed us to examine historical trends prior to the Navy's fiscal year 2022 alignment of mission capable goals to the AMSRR system. In our future reviews, we will continue to coordinate with Navy officials on the most appropriate data sources for determining current readiness as well as the sustainment condition of naval aircraft and will make independent assessments about which source or sources to use in our reports.

In appendix II of this report, we present a comparison of fiscal year 2021 AMSRR and DECKPLATE mission capable rates for each of the selected aircraft. Additionally, we provide AMSRR data for fiscal years 2020 and 2021.

For Air Force aircraft and the F-35, we also collected and analyzed data on aircraft availability rates and goals for fiscal years 2011 through 2021.[5] We selected this time frame so that we could identify and obtain insight on mission capable rate trends. In addition, we obtained information from program office officials, including questionnaire responses and discussions, regarding the reasons for changes in mission capable rates and aircraft availability rates as well as any challenges in sustaining these aircraft. We also discussed with program office officials any ongoing and planned actions to address those challenges. We reviewed those challenges and summarized them in three broad categories: aging

[5]Aircraft availability goals are referred to as the aircraft availability standard by the Air Force.

aircraft, maintenance, and supply support. We further summarized these challenges with several sub-categories and presented these challenges in a summary figure. Further, we obtained and reviewed documents, including life-cycle sustainment plans and aircraft availability improvement plans.

For objective two, we collected and analyzed operating and support (O&S) cost data from the Departments of the Army, Navy, and Air Force cost reporting systems.[6] Specifically, we collected O&S cost data for fiscal years 2011 through 2020, the last fiscal year for which complete data were available at the time of our work. We selected this time frame so that we could identify and obtain insight on the historical data trends regarding O&S costs.[7] To understand the effect that factors such as fleet size and usage could have on aircraft costs; we analyzed O&S and maintenance costs on a fleet-wide, per-aircraft, and per-flying hour basis. We also obtained information through questionnaire responses from program office officials about the reasons for changes and trends in O&S costs.

We conducted data reliability assessments for the data provided by the military departments. To do this, we reviewed related documentation; held interviews with knowledgeable agency officials; and performed electronic data testing for missing data, outliers, and obvious errors. Additionally, we shared the mission capable rate and O&S cost data with the program offices that manage each individual type of aircraft for review and comment, to ensure the accuracy of the data being presented. The Army, Navy, and Air Force use these data to manage the sustainment of aircraft. As a result, we determined these data to be sufficiently reliable for reporting the numbers of aircraft, rates, averages, costs, and trends since fiscal year 2011 that we provide in this report.

To develop the Sustainment Quick Looks on each aircraft, we obtained historical and current information, including background on aircraft capabilities and the number of aircraft in the inventory. We also obtained information about manufacturers, sustainment strategies, depot maintenance and squadron locations, and key dates in the life cycle of

[6]Specifically, we obtained information from the Army’s Operating and Support Management Information System (OSMIS), the Navy Visibility and Management of Operating and Support Costs system (VAMOSC), and the Air Force Total Ownership Cost system (AFTOC).

[7]O&S costs are adjusted for inflation and presented in fiscal year 2020 constant dollars.

each aircraft (e.g., first manufactured, initial and full operational capability, last production, and planned sunset year).[8] We used this information, as well as the information collected for objectives one and two on readiness and O&S costs, in each Sustainment Quick Look. In the Quick Looks, we compared mission capable and aircraft availability rates to goals set by the military departments. We analyzed O&S costs, including maintenance sub-categories, and compared the costs to readiness trends. We also obtained and reviewed sustainment documentation on each aircraft, such as life cycle sustainment plans and aircraft availability plans, and we discussed sustainment plans and activities with knowledgeable program officials. Through interviews with these officials and reviewing documentation, we identified sustainment challenges and mitigation actions to address them.

[8]The annual aircraft inventory is the average total aircraft inventory as reported by the military departments’ O&S cost reporting systems. Complete fiscal year 2021 data was not available from all of the services at the time needed to be incorporated into our review. Therefore, we chose to include fiscal year 2020 aircraft inventory and cost data in our Sustainment Quick Looks.

Appendix II: Additional Information on Navy Aircraft Mission Capable Rates

The Navy measures the mission capable rate of Navy and Marine Corps aviation weapon systems with two different information technology systems: Aviation Maintenance Supply Readiness Reporting (AMSRR) and Decision Knowledge Programming for Logistics Analysis and Technical Evaluation (DECKPLATE). AMSRR measures the mission capable rate at a point in time on each day. DECKPLATE measures the mission capable rate based on a percentage of the total time the aircraft is available, and it also provides additional insight into the reasons for an aircraft not being mission capable, with measures such as the not mission capable maintenance and supply rates.

We compared the fiscal year 2021 AMSRR and DECKPLATE mission capable rates for 19 Navy and Marine Corps aircraft, and found that the AMSRR mission capable rates were higher than DECKPLATE mission capable rates for all 19 aircraft.[1] Additionally, while none of the aircraft met their Navy mission capable goal for fiscal year 2021 using the DECKPLATE mission capable rates, six aircraft—EP-3E Aries II, P-8A Poseidon, E-2C Hawkeye, EA-18G Growler, F/A-18E/F Super Hornet, MH-60R Seahawk—met their goal using AMSRR mission capable rates.

We also analyzed the change in AMSRR mission capable rates from fiscal year 2020 to fiscal year 2021 for the 19 Navy and Marine Corps aircraft. Fifteen of the 19 aircraft showed an improvement and four showed a decline in mission capable rates. Specific details on the rates

[1]Of the 24 Navy and Marine Corps aircraft in our report, the F-35B, F-35C, KC-130T, and F/A-18A-D were either not included in the analyses in this appendix or the aircraft were not separated by service. More specifically, the F-35B and F-35C aircraft were not included because we obtained the mission capable rates for these aircraft from the F-35 Joint Program Office, not from the DECKPLATE system. We did not have sufficient AMSRR data to analyze the mission capable rates for KC-130TNavy and Marine Corps aircraft separately, so we analyzed the rate for both services combined. The F/A-18A-D was not included because we did not have sufficient AMSRR data to analyze the mission capable rates for the Navy and Marine Corps aircraft separately or the combined mission capable rate.

for each aircraft were omitted because the information was deemed by DOD to be sensitive.

Appendix III: Comments from the Department of Defense

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
3500 DEFENSE PENTAGON
WASHINGTON, DC 20301-3500

SUSTAINMENT

Ms. Dianna Maurer
Director, Defense Capabilities Management
U.S. Government Accountability Office
441 G Street, NW
Washington DC 20548

Dear Ms. Maurer,

This is the Department of Defense (DoD) response to the Government Accountability Office (GAO) Draft Report GAO-22-105050SU, "WEAPON SYSTEM SUSTAINMENT: Aircraft Mission Capable Goals Were Generally Not Met and Sustainment Costs Varied by Aircraft," dated July 18, 2022 (GAO Code 105050SU).

Enclosed is the sensitivity review, which notes that all availability, mission capable rates, and specific years should be marked as Controlled Unclassified Information (CUI). The Army and Air Force had no further comments, while the Navy provided technical comments which are also enclosed.

DoD worked with GAO to clarify language regarding DoD's sustainment review (SR) policy and the statute that requires SRs (title 10 U.S.C. § 4323). DoD notes that GAO modified its report, after formal DoD critical comments were submitted, to make clear the following points:

- The expanded requirement to submit a remediation plan or critical cost growth certification letter to Congress in the event than a program experienced a critical Operating and Support (O&S) cost growth increase did not exist until the National Defense Authorization Act (NDAA) for Fiscal Year (FY) 2021.
- The Air Force and Navy plan complete sustainment reviews for all required major weapon systems by FY 2026 and this is being done in accordance with the statute and DOD's implementing policy.
- While the GAO recommends accelerating the pace of SRs, this desire clashes with the considerable time, information, and data validation

requirements to properly conduct a sustainment review. This especially pertains to the manpower, time, and validation of independent cost estimates (ICE). Additionally, the SRs are aligned with other statutory requirements, such as the update of Life Cycle Sustainment Plans and revalidation of Product Support Business Case Analyses, which along with the SRs are required to be updated every five years.

The Department appreciates the GAO's willingness to work with the language on SRs to take into account these considerations and make revisions to the draft report.

My point of contact is Mr. Jeff Frankston, who can be reached at jeffrey.w.frankston.civ@mail.mil and phone (571) 256-7052.

Sincerely,

RAMDASS.VICKY.SHASHINDERAJ.1019209780 Digitally signed by RAMDASS.VICKY.SHASHINDERAJ.1019209780 Date: 2022.09.06 14:16:16 -04'00'

Dr. Vic Ramdass
Deputy Assistant Secretary of Defense, Materiel Readiness

Enclosures:
As stated

Text of Appendix III: Comments from the Department of Defense

Ms. Dianna Maurer

Director, Defense Capabilities Management

U.S. Government Accountability Office 441 G Street, NW

Washington DC 20548 Dear Ms. Maurer,

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Sincerely,

Dr. Vic Ramdass

Deputy Assistant Secretary of Defense,

Materiel Readiness

Enclosures:

As stated

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

Diana Maurer, (202) 512-9627 or maurerd@gao.gov.

Staff Acknowledgments

In addition to the contact named above, John Bumgarner (Assistant Director), Susan Tindall (Analyst in Charge), Emily Biskup, Christopher Cronin, Sara Daleski, Christopher Gezon, Chad Hinsch, Michael Holland, Jennifer Leotta, Diana Moldafsky, Lillian Ofili, Richard Powelson, Janine Prybyla, Bryan Rezende, Michael Silver, and Carter Stevens made key contributions to this report.

Appendix V: Additional Source Information for Images and Figures

Air refueling

- **KC-130T** Source: U.S. Marine Corps/Cpl. Timothy Norris (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU
- **KC-130J** Source: U.S. Marine Corps/Lance Cpl. Seth Rosenberg (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU
- **KC-10** Source: U.S. Air Force/Heide Couch (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU
- **KC-135** Source: U.S. Air Force/Senior Airman Alexandria Lee (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU

Anti-submarine

- **EP-3E** Source: U.S. Navy/Mass Communication Specialist 3rd Class Bobby J. Siens (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU
- **P-8A** Source: U.S. Navy/Mass Communication Specialist 1st Class Bryan Niegel (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU

Bomber

- **B-1B** Source: U.S. Air Force/Staff Sgt. Peter Reft (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU
- **B-2** Source: U.S. Air Force/Master Sgt. Russell Scalf (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU
- **B-52** Source: U.S. Air National Guard/Tech. Sgt. Daniel Gagnon (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU

Cargo

- **C-2A** Source: U.S. Navy/Petty Officer 3rd Class Christopher Gaines (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU
- **C-130T** Source: U.S. Air Force/Cynthia Griggs (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU
- **C-5M** Source: U.S. Air Force/Senior Airman Christopher Quail (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU
- **C-17** Source: U.S. Air Force/Senior Airman Christopher Quail (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU
- **C-130H** Source: U.S. Air National Guard/Staff Sgt. Jon Alderman (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU
- **C-130J** Source: U.S. Air Force/Airman 1st Class Mercedes Porter (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU

Command and control

- **E-2C** Source: U.S. Navy/Mass Communication Specialist 3rd Class Grant G. Grady (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU
- **E-2D** Source: U.S. Navy/Mass Communication Specialist Seaman Michael Singley (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU
- **E-6B** Source: U.S. Air Force/Josh Plueger (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU
- **E-3** Source: U.S. Air Force/Master Sgt. William Greer (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU
- **E-4B** Source: U.S. Air Force/Senior Airman Jacob Skovo-Lane (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU
- **E-8C** Source: U.S. Air Force/Greg L. Davis (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU
- **RC-135S-W** Source: U.S. Air Force/Master Sgt. William Greer (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU

Fighter

- **EA-18G** Source: U.S. Navy/Elizabeth A. Wolter (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU
- **F/A-18A-D** Source: U.S Marine Corps/Sgt. Dominic Romero (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU
- **F/A-18E/F** Source: U.S. Navy/Chief Mass Communication Specialist Shannon Renfroe (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU
- **F-35A/B/C** Source: U.S. Air Force/Staff Sgt. Brian Kelly (photo); F-35 Joint Program Office (figures). | GAO-22-105050SU
- **AV-8B** Source: U.S. Marine Corps/Lance Cpl. Becky Cleveland (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU
- **A-10** Source: U.S. Air Force/Tech. Sgt. Paul Labbe (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU
- **F-15C/D** Source: U.S. Air Force/Senior Airman Zachary Bumpus (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU
- **F-15E** Source: U.S. Air National Guard/Airman 1st Class Tiffany A. Emery (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU
- **F-16** Source: U.S. Air Force/Airman 1st Class Matthew Seefeldt (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU
- **F-22** Source: U.S. Air Force/Tech. Sgt. Natasha Stannard (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU

Rotary

- **AH-64D/E** Source: U.S. Army/Captain Brian Harris (photo); GAO analysis of Army data (figures). | GAO-22-105050SU
- **CH-47F** Source: U.S. Army/Scott T. Sturkol (photo); GAO analysis of Army data (figures). | GAO-22-105050SU
- **UH/HH-60** Source: U.S. Army/Scott T. Sturkol (photo); GAO analysis of Army data (figures). | GAO-22-105050SU
- **MH-53E** Source: U.S. Air National Guard/Master Sgt. Matt Hecht (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU

- **MH-60R** Source: U.S. Navy/Mass Communication Specialist 2nd Class Mark Andrew Hays (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU
- **MH-60S** Source: U.S. Navy/Mass Communication Specialist 3rd Class Steven Edgar (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU
- **AH-1Z** Source: U.S. Marine Corps/Sgt. Jesus Sepulveda Torres (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU
- **CH-53E** Source: U.S. Navy/Mass Communication Specialist 2nd Class Kyle Carlstrom (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU
- **MV-22B** Source: U.S. Marine Corps/Sgt. Aaron Henson (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU
- **UH-1Y** Source: U.S. Marine Corps/Staff Sgt. Donald Holbert (photo); GAO analysis of Navy data (figures). | GAO-22-105050SU
- **CV-22** Source: U.S. Air Force/Airman 1st Class Jennifer Zima (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU
- **HH-60G** Source: U.S. Air Force/Senior Airman Greg Nash (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU
- **UH-1N** Source: U.S. Air Force/Senior Airman Jonathan McElderry (photo); GAO analysis of Air Force data (figures). | GAO-22-105050SU

Appendix VI: Accessible Data for Quicklook Section

Table Number of Years Aircraft Met Their Annual Mission Capable Goal, Fiscal Years 2011 through 2021

	Number of fiscal years aircraft met mission capable goal	Number of fiscal years mission capable rate and goal compared
A-10 (Air Force)	0	11
AH-1Z (Marine Corps)	0	11
AH-64D/E (Army)	0	11
AV-8B (Marine Corps)	0	11
B-1B (Air Force)	1	11
B-2 (Air Force)	6	11
B-52 (Air Force)	3	11
C-130H (Air Force)	2	11
C-130J (Air Force)	3	11
C-130T (Navy)	0	11
C-17 (Air Force)	0	11
C-2A (Navy)	0	11
C-5M (Air Force)	2	11
CH-47F (Army)	0	11
CH-53E (Marine Corps)	0	11
CV-22 (Air Force)[a]	0	9
E-2C (Navy)	0	11
E-2D (Navy)[a]	0	8
E-3 (Air Force)	2	11
E-4B (Air Force)	3	11
E-6B (Navy)	5	11
E-8C (Air Force)	1	11
EA-18G (Navy)	2	11
EP-3E (Navy)	7	11

	Number of fiscal years aircraft met mission capable goal	Number of fiscal years mission capable rate and goal compared
F/A-18A-D (Marine Corps)	0	11
F/A-18A-D (Navy)	1	11
F/A-18E/F (Navy)	0	11
F-15C/D (Air Force)	0	11
F-15E (Air Force)	3	11
F-16 (Air Force)	0	11
F-22 (Air Force)	0	11
F-35A (Joint/Air Force)[a]	2	10
F-35B (Joint/Marine Corps)[a]	0	9
F-35C (Joint/Navy)[a]	2	9
HH-60G (Air Force)	1	11
KC-10 (Air Force)	1	11
KC-130J (Marine Corps)	0	11
KC-130T (Marine Corps)	0	11
KC-130T (Navy)[a]	0	8
KC-135 (Air Force)	3	11
MH-53E (Navy)	0	11
MH-60R (Navy)	2	11
MH-60S (Navy)	0	11
MV-22B (Marine Corps)	0	11
P-8A (Navy)[a]	2	9
RC-135S-W (Air Force)	6	11
UH/HH-60 (Army)	0	11
UH-1N (Air Force)	11	11
UH-1Y (Marine Corps)	0	11

Table Annual Operating and Support Costs for Selected Aircraft, Fiscal Year 2020

Constant fiscal year 2020 dollars (in millions)

	Maintenance costs	Other operating and support costs
KC-130T (Navy/Marine Corps)	37.99	58.69
KC-130J (Marine Corps)	224.6	302.33
KC-10 (Air Force)	356.58	529.54
KC-135 (Air Force)	1631.95	2062.13
EP-3E (Navy)	47.57	86.03
P-8A (Navy)	243.85	967.55
B-1B (Air Force)	426.66	752.33
B-2 (Air Force)	403.14	417.1
B-52 (Air Force)	547.2	716.07
C-2A (Navy)	89.96	132.9
C-130T (Navy)	63.64	95.6
C-5M (Air Force)	280.81	705.6
C-17 (Air Force)	1462.52	2355.02
C-130H (Air Force)	338.69	822.95
C-130J (Air Force)	387.8	787.85
E-2C (Navy)	159.54	158.24
E-2D (Navy)	82.99	243.67
E-6B (Navy)	138.03	377.62
E-3 (Air Force)	241.16	620.44
E-4B (Air Force)	240.3	187.81
E-8C (Air Force)	472.69	233.47
RC-135S-W (Air Force)	444.34	484.28
EA-18G (Navy)	358.1	710.1
F/A-18A-D (Navy/Marine Corps)	943.1	880.79
F/A-18E/F (Navy)	1819.1	2155.99
F-35C (Joint/Navy)	78.36	359.07
AV-8B (Marine Corps)	310.58	249.65

	Maintenance costs	Other operating and support costs
F-35B (Joint/Marine Corps)	196.62	511.19
A-10 (Air Force)	503.32	1196.52
F-15C/D (Air Force)	706.13	749.24
F-15E (Air Force)	720.98	1275.27
F-16 (Air Force)	1431.69	2879.82
F-22 (Air Force)	1608.16	726.36
F-35A (Joint/Air Force)	331.27	1520.95
AH-64D/E (Army)	357.99	230.16
CH-47F (Army)	123.02	104.84
UH/HH-60 (Army)	445.77	402.37
MH-53E (Navy)	164.92	181.67
MH-60R (Navy)	458.57	729.23
MH-60S (Navy)	448.81	806.57
AH-1Z (Marine Corps)	153.43	330.06
CH-53E (Marine Corps)	752.09	387.74
MV-22B (Marine Corps)	900.23	1006.55
UH-1Y (Marine Corps)	233.72	292.67
CV-22 (Air Force)	349.3	476.59
HH-60G (Air Force)	223.67	536.48
UH-1N (Air Force)	136.87	167.8

All Aircraft Sustainment Challenges

	Aging Aircraft			Maintenance				Supply Support		
	Delays in acquiring replacement aircraft	Service Life EYestension	UneYespected replacement of parts and repairs	Access to technical data	Delays in depot maintenance	Shortage of trained maintenance personnel	Unscheduled maintenance	Diminishing manufacturing sources	Parts Obsolescence	Parts shortage and delay
A-10	No	No	YES	No	YES	YES	YES	YES	YES	YES
AH-1Z	No	No	YES	No	YES	YES	YES	YES	YES	YES
AH-64	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AV-8B	No	No	YES	No	YES	YES	No	YES	YES	YES
B-1B	No	No	YES	No	No	No	YES	YES	YES	YES
B-2	YES	No	YES	YES	YES	YES	YES	YES	YES	YES
B-52	No	No	YES		YES	YES	YES	YES	YES	YES
C-130H	No	No	No	No	YES	YES	No	YES	YES	No
C-130J	No	No	No	No	YES	YES	No	YES	YES	No
C-130T	No	No	No	No	YES	No	No	No	No	YES
C-17	No	YES	YES	YES	YES	No	YES	YES	YES	YES
C-2A	No	No	No	No	No	YES	No	No	YES	No
C-5M	No	No	YES	No	YES	YES	YES	YES	YES	YES
CH-47	No	No	No	No	Yes	Yes	No	Yes	Yes	Yes
CH-53E	No	No	YES	No	YES	No	No	YES	YES	YES
CV-22	No	No	No	YES	YES	No	YES	YES	YES	YES
E-2C	No	No	No	No	No	YES	No	No	YES	No
E-2D	No	No	No	No	No	YES	YES	YES	YES	YES

	Aging Aircraft			Maintenance				Supply Support		
	Delays in acquiring replacement aircraft	**Service Life EYestension**	**UneYespected replacement of parts and repairs**	**Access to technical data**	**Delays in depot maintenance**	**Shortage of trained maintenance personnel**	**Unscheduled maintenance**	**Diminishing manufacturing sources**	**Parts Obsolescence**	**Parts shortage and delay**
E-3	No	No	YES	No	YES	No	YES	YES	YES	YES
E-4B	YES	YES	YES	No	YES	YES	YES	YES	YES	YES
E-6B	No	No	YES	YES	YES	No	YES	YES	YES	YES
E-8C	No	No	No	No	YES	No	YES	YES	YES	YES
EA-18G	No	YES	YES	YES	No	YES	YES	YES	YES	YES
EP-3	No	No	YES	No	No	No	YES	YES	YES	YES
F-15C/D	No	YES	YES	No	YES	YES	YES	YES	YES	YES
F-15E	No	No	YES	No	YES	YES	YES	YES	YES	YES
F-16	No	YES	YES	YES	YES	YES	YES	YES	YES	YES
F-22A	No	No	YES	YES	No	No	No	YES	YES	YES
FA-18AD Navy and USN	No	No	No	No	No	YES	YES	No	YES	No
FA18-EF	No	YES	YES	YES	No	YES	YES	YES	YES	YES
HH-60G	No	No	No	No	YES	No	No	No	No	No
KC-10	YES	No	No	No	No	No	No	No	No	No
KC-130J	No	No	No	YES	YES	No	No	No	No	YES
KC-130T	No	No	No	No	YES	No	No	No	No	YES
KC-135	No	YES	YES	YES	No	YES	YES	YES	YES	YES
MH-53E	No	No	YES	No	YES	No	No	YES	YES	YES

	Aging Aircraft			Maintenance				Supply Support		
	Delays in acquiring replacement aircraft	**Service Life EYestension**	**UneYespected replacement of parts and repairs**	**Access to technical data**	**Delays in depot maintenance**	**Shortage of trained maintenance personnel**	**Unscheduled maintenance**	**Diminishing manufacturing sources**	**Parts Obsolescence**	**Parts shortage and delay**
MH-60R	No	No	No	YES	YES	YES	No	YES	YES	YES
MH-60S	No	No	No	YES	YES	YES	No	YES	YES	YES
MV-22B	No	No	No	YES	No	No	YES	YES	YES	YES
P-8A	No	No	YES	No	YES	No	No	No	No	YES
RC-135	No	YES	No	No	YES	YES	YES	No	No	YES
UH-/HH-60	No	No	No	No	No	Yes	No	No	No	Yes
UH-1N	YES	No	No	No	YES	No	No	No	No	No
UH-1Y	No	No	YES	No	YES	YES	YES	YES	YES	YES

Air Refueling Aircraft

KC-130T Hercules

KC-130T Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	886.12	356.58	40	-15.4	58.69	0	35701	0	15.10	24820.72	12.4
2021	NA	NA	NA	NA	NA	31.9	NA	9,689	NA	NA	NA

KC-130T Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	55.74	21.96	61.26	3.86	20.20	163.01
2012	54.20	23.36	64.46	4.42	26.97	173.42
2013	53.51	22.06	67.45	3.37	21.82	168.22
2014	69.13	18.54	67.30	3.52	23.90	182.40
2015	42.22	13.21	48.51	3.15	10.54	117.64
2016	38.48	10.94	45.88	2.61	14.74	112.64
2017	42.22	6.68	45.54	2.94	11.58	108.96
2018	38.28	3.06	45.69	2.88	33.17	123.08
2019	37.81	5.98	33.26	2.14	21.62	100.81
2020	34.83	6.60	37.99	2.58	14.68	96.68

KC-130T Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	8.80	13.33	14.48	23.90	0.74	61.26
2012	9.60	9.99	17.06	27.33	0.47	64.46
2013	8.22	13.09	18.30	27.45	0.39	67.45
2014	7.39	12.88	19.86	24.24	2.93	67.30
2015	5.78	10.05	18.32	14.36	0.00	48.51
2016	5.76	8.02	17.53	14.56	0.00	45.88
2017	3.80	4.76	13.92	23.06	0.00	45.54
2018	3.83	8.19	13.87	19.80	0.00	45.69
2019	2.80	8.54	13.23	8.69	0.00	33.26
2020	7.18	8.16	12.45	9.13	1.06	37.99

KC-130T Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	5.82	2.19	3.63
2012	6.19	2.30	3.89
2013	6.01	2.41	3.60
2014	6.76	2.49	4.26
2015	6.19	2.55	3.64
2016	5.93	2.41	3.51
2017	6.41	2.68	3.73
2018	7.24	2.69	4.55
2019	6.72	2.22	4.50
2020	8.06	3.17	4.89

KC-130T Fleet Size

Fiscal year	Total aircraft
2011	28
2012	28

Fiscal year	Total aircraft
2013	28
2014	27
2015	19
2016	19
2017	17
2018	17
2019	15
2020	12

KC-130T Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	21258.83	7988.41	13270.41
2012	21346.70	7934.69	13412.02
2013	21938.13	8796.68	13141.45
2014	28178.68	10397.18	17781.50
2015	26043.08	10739.89	15303.20
2016	30516.99	12429.96	18087.03
2017	45306.06	18935.52	26370.53
2018	119725.35	44442.58	75282.78
2019	49878.93	16456.13	33422.80
2020	35335.48	13886.15	21449.33

KC-130T Flying Hours

Fiscal year	flying hours executed
2011	7668.00
2012	8124.00
2013	7668.00
2014	6473.00
2015	4517.00
2016	3691.00
2017	2405.00
2018	1028.00
2019	2021.00
2020	2736.00

KC-130T Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	96.52	0.00	0.16	96.68	37.91	0.00	0.09	37.99

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	35335.48	13886.15	21449.33
Active Duty	.	.	.
Reserve	35276.98	13854.29	21422.69

KC-130J Super Hercules

KC-130J Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	526.93	224.60	43	9.1	56	0	21799	0	9.41	24172.41	16.7
2021	NA	NA	NA	NA	NA	11.7	NA	6,064	NA	NA	NA

KC-130J Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	108.11	84.23	107.89	17.53	31.00	348.76
2012	109.01	87.05	114.12	15.33	44.32	369.82
2013	103.50	74.23	112.50	14.40	35.65	340.29
2014	96.73	71.60	135.63	11.59	40.37	355.92
2015	153.21	72.96	129.84	13.10	26.12	395.22
2016	112.82	71.51	114.98	13.47	37.83	350.61
2017	111.08	64.72	186.05	15.48	35.94	413.27
2018	110.42	61.66	215.78	15.59	99.89	503.35
2019	108.72	62.76	192.60	41.89	77.24	483.20
2020	120.03	55.84	224.60	45.49	80.97	526.93

KC-130J Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	12.32	27.74	9.30	54.05	4.48	107.89
2012	13.80	28.27	13.03	52.65	6.36	114.12
2013	14.50	25.19	14.44	52.00	6.37	112.50
2014	11.39	25.67	12.97	85.59	0.00	135.63
2015	16.68	31.15	9.85	71.24	0.92	129.84
2016	14.50	29.76	10.89	59.12	0.71	114.98
2017	19.14	44.49	13.66	108.66	0.11	186.05
2018	23.79	39.08	15.55	134.89	2.48	215.78
2019	23.44	21.79	18.00	127.04	2.34	192.60
2020	28.09	36.49	19.55	138.26	2.21	224.60

KC-130J Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	8.11	2.51	5.60
2012	8.22	2.54	5.68
2013	7.56	2.50	5.06
2014	7.91	3.01	4.90
2015	8.41	2.76	5.65
2016	7.30	2.40	4.91
2017	7.95	3.58	4.37
2018	9.87	4.23	5.64
2019	9.12	3.63	5.48
2020	9.41	4.01	5.40

KC-130J Fleet Size

Fiscal year	Total aircraft
2011	43
2012	45
2013	45
2014	45
2015	47
2016	48
2017	52
2018	51
2019	53
2020	56

KC-130J Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	13413.40	4149.57	9263.83
2012	14308.65	4415.22	9893.43
2013	13427.35	4439.09	8988.26
2014	14217.41	5417.75	8799.66
2015	16603.94	5454.88	11149.06
2016	14990.20	4915.93	10074.28
2017	17967.44	8088.85	9878.59

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2018	21306.67	9134.08	12172.59
2019	20714.36	8256.72	12457.64
2020	24172.41	10303.39	13869.03

KC-130J Flying Hours

Fiscal year	flying hours executed
2011	26001.00
2012	25846.00
2013	25343.00
2014	25034.00
2015	23803.00
2016	23389.00
2017	23001.00
2018	23624.00
2019	23327.00
2020	21799.00

KC-130J Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	115.24	0.00	411.69	526.93	47.06	0.00	177.54	224.60

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	24172.41	10303.39	13869.03
Active Duty	23140.40	9979.41	13160.99
Reserve	28753.41	11741.48	17011.93

KC-10 Extender

KC-10 Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	886.12	356.58	40	-15.4	58.69	0	35701	0	15.10	24820.72	12.4
2021	NA	NA	NA	NA	NA	36.0	NA	35,925	NA	NA	NA

KC-10 Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	231.11	763.67	503.95	0.92	13.37	1513.02
2012	231.26	698.96	492.73	0.72	6.06	1429.73
2013	217.45	586.04	415.24	0.76	9.05	1228.53
2014	213.86	586.99	390.44	0.87	51.23	1243.39
2015	209.97	586.84	393.74	0.94	78.99	1270.47
2016	205.60	367.64	468.63	0.16	5.34	1047.36
2017	208.57	372.79	526.03	0.12	3.94	1111.44
2018	209.91	367.35	405.77	0.13	2.86	986.02
2019	216.60	446.09	374.69	1.00	8.51	1046.90
2020	226.58	302.79	356.58	0.13	0.05	886.12

KC-10 Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	5.80	0.00	0	13.78	0.00	0	484.37	503.95
2012	4.58	0.00	0	11.15	0.00	0	477.00	492.73
2013	3.11	0.00	0	11.19	0.00	0	400.93	415.24
2014	3.04	0.00	0	9.40	0.00	0	377.99	390.44
2015	3.94	0.00	0	8.22	0.00	0	381.57	393.74
2016	3.72	0.00	0	8.16	0.00	0	456.75	468.63
2017	4.15	0.00	0	7.14	0.00	0	514.74	526.03
2018	5.14	0.00	0	0.00	0.00	0	400.62	405.77
2019	4.66	0.00	0	0.00	0.00	0	370.04	374.69
2020	4.40	0.00	0	0.00	0.61	0	351.57	356.58

KC-10 Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	25.64	8.54	17.10
2012	24.23	8.35	15.88
2013	20.82	7.04	13.78
2014	21.07	6.62	14.46
2015	21.53	6.67	14.86
2016	17.75	7.94	9.81
2017	18.84	8.92	9.92
2018	16.71	6.88	9.83
2019	17.74	6.35	11.39
2020	15.10	6.08	9.02

KC-10 Fleet Size

Fiscal year	Total aircraft
2011	59

Fiscal year	Total aircraft
2012	59
2013	59
2014	59
2015	59
2016	59
2017	59
2018	59
2019	59
2020	59

KC-10 Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	22655.34	7545.98	15109.36
2012	23138.63	7974.30	15164.32
2013	24988.20	8445.86	16542.34
2014	23817.84	7479.08	16338.76
2015	22565.78	6993.45	15572.32
2016	20302.98	9084.39	11218.59
2017	21153.42	10011.63	11141.79
2018	20778.08	8550.59	12227.49
2019	22092.31	7907.05	14185.26
2020	24820.72	9987.95	14832.77

KC-10 Flying Hours

Fiscal year	flying hours executed
2011	66784.30
2012	61789.70
2013	49164.50
2014	52204.00
2015	56300.60
2016	51586.70
2017	52542.00
2018	47454.90
2019	47387.40
2020	35701.00

KC-10 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	95.64	0.00	790.49	886.12	0.18	0.00	356.40	356.58

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	24820.72	9987.95	14832.77
Active Duty	26428.14	11915.57	14512.57
Reserve	16517.18	30.32	16486.86

KC-135 Stratotanker

KC-135 Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	3694.07	1631.95	44	-2.3	396.02	0	132874.9	0	9.33	27801.14	7.7
2021	NA	NA	NA	NA	NA	60.0	NA	28,248	NA	NA	NA

KC-135 Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	1363.54	1768.61	1360.54	30.10	32.53	4555.31

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2012	1370.67	1397.32	1420.82	31.95	54.04	4274.81
2013	1304.70	1212.13	1531.23	36.53	51.04	4135.63
2014	1338.69	1171.62	1634.54	31.91	59.84	4236.60
2015	1340.70	1359.81	1670.60	35.20	90.93	4497.23
2016	1322.05	916.52	1837.56	36.82	111.18	4224.13
2017	1302.09	841.49	1764.15	43.82	102.63	4054.17
2018	1260.42	942.69	1704.26	37.25	125.04	4069.67
2019	1234.49	968.19	1448.24	28.17	102.39	3781.48
2020	1171.22	773.52	1631.95	35.12	82.27	3694.07

KC-135 Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	143.77	197.62	0	982.67	0.00	0	36.48	1360.54
2012	148.47	209.17	0	1015.52	0.07	0	47.59	1420.82
2013	100.23	192.55	0	1194.70	1.01	0	42.73	1531.23
2014	121.26	225.42	0	1240.32	0.24	0	47.29	1634.54
2015	129.18	250.25	0	1237.94	0.03	0	53.20	1670.60
2016	138.57	254.98	0	1387.19	0.00	0	56.81	1837.56
2017	133.95	236.09	0	1337.82	0.06	0	56.23	1764.15
2018	151.42	202.45	0	1299.29	0.00	0	51.11	1704.26
2019	143.35	207.32	0	1047.40	0.00	0	50.18	1448.24
2020	141.61	205.59	0	1239.98	0.00	0	44.76	1631.95

KC-135 Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	10.95	3.27	7.68
2012	10.28	3.42	6.86

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2013	10.12	3.75	6.38
2014	10.60	4.09	6.51
2015	11.30	4.20	7.10
2016	10.61	4.62	6.00
2017	10.19	4.43	5.75
2018	10.23	4.28	5.94
2019	9.52	3.65	5.87
2020	9.33	4.12	5.21

KC-135 Fleet Size

Fiscal year	Total aircraft
2011	416
2012	416
2013	408
2014	400
2015	398
2016	398
2017	398
2018	398
2019	397
2020	396

KC-135 Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	18438.61	5507.09	12931.52
2012	21150.75	7029.88	14120.87
2013	24611.16	9112.35	15498.80
2014	24139.13	9313.21	14825.92
2015	20377.75	7569.77	12807.98
2016	21511.82	9357.97	12153.85
2017	21900.34	9529.81	12370.53
2018	24369.14	10205.10	14164.04
2019	25823.15	9889.84	15933.32
2020	27801.14	12281.82	15519.31

KC-135 Flying Hours

Fiscal year	flying hours executed
2011	247052.9
2012	202111.6
2013	168038.8
2014	175507.4
2015	220693.3
2016	196363.1
2017	185119.2
2018	167001.0
2019	146437.7
2020	132874.9

KC-135 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	536.79	1390.95	1766.33	3694.07	204.07	655.94	771.93	1631.95

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	27801.14	12281.82	15519.31
Active Duty	28692.38	12539.33	16153.05
National Guard	26589.07	12538.79	14050.28
Reserve	28250.65	10740.07	17510.58

Anti-Submarine Aircraft

EP-3E Aries II

EP-3E Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	133.60	47.57	36	5.1	11	0	5729	0	12.15	23319.23	20.9
2021	NA	NA	NA	NA	NA	44.2	NA	23,444	NA	NA	NA

EP-3E Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	71.58	31.62	46.63	4.07	169.28	323.18
2012	43.23	23.73	44.14	3.78	153.99	268.86
2013	47.03	21.28	43.81	6.72	139.16	258.00
2014	50.08	19.86	29.63	6.27	84.26	190.10
2015	48.30	20.52	28.10	5.86	164.90	267.67
2016	39.72	19.16	41.10	5.25	80.40	185.62
2017	41.78	18.65	46.84	4.22	46.82	158.31
2018	39.35	19.21	47.57	4.90	46.24	157.27
2019	39.21	18.10	40.47	7.62	21.72	127.13
2020	36.89	15.98	47.57	4.56	28.60	133.60

EP-3E Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	6.90	25.16	3.20	11.23	0.13	46.63
2012	4.61	22.80	5.02	11.59	0.13	44.14
2013	3.91	24.60	3.15	11.87	0.29	43.81
2014	3.69	18.78	4.12	2.60	0.43	29.63
2015	3.52	14.62	6.99	1.06	1.90	28.10
2016	5.19	17.63	10.77	4.68	2.83	41.10
2017	5.37	17.67	11.60	9.34	2.87	46.84
2018	4.88	16.97	9.24	10.89	5.59	47.57
2019	5.03	15.57	4.19	13.41	2.27	40.47
2020	8.31	13.80	4.79	10.08	10.57	47.57

EP-3E Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	20.20	2.91	17.28
2012	17.92	2.94	14.98
2013	17.20	2.92	14.28
2014	12.67	1.98	10.70
2015	19.12	2.01	17.11
2016	15.47	3.42	12.04
2017	13.19	3.90	9.29
2018	13.11	3.96	9.14
2019	11.56	3.68	7.88
2020	12.15	4.32	7.82

EP-3E Fleet Size

Fiscal year	Total aircraft
2011	16
2012	15
2013	15
2014	15

Fiscal year	Total aircraft
2015	14
2016	12
2017	12
2018	12
2019	11
2020	11

EP-3E Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	31674.75	4570.06	27104.69
2012	30783.71	5053.77	25729.94
2013	34109.13	5792.52	28316.61
2014	27312.94	4256.47	23056.48
2015	36497.07	3831.13	32665.94
2016	27232.96	6029.66	21203.30
2017	24950.54	7382.61	17567.93
2018	25268.15	7642.80	17625.36
2019	19285.84	6139.81	13146.03
2020	23319.23	8302.64	15016.59

EP-3E Flying Hours

Fiscal year	flying hours executed
2011	10203.00
2012	8734.00
2013	7564.00
2014	6960.00
2015	7334.00
2016	6816.00
2017	6345.00
2018	6224.00
2019	6592.00
2020	5729.00
2021	0.00

P-8A Poseidon

P-8A Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	1211.40	243.85	20	21.3	99	0	60891	0	12.24	19894.62	6.5
2021	NA	NA	NA	NA	NA	4.3	NA	2,990	NA	NA	NA

P-8A Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2012	0.00	3.65	1.27	0.40	0.03	5.34
2013	77.87	29.26	4.13	6.22	12.84	130.32
2014	107.46	62.95	6.50	5.69	14.78	197.37
2015	181.88	95.33	14.04	9.76	15.82	316.82
2016	223.83	134.44	120.22	11.65	34.06	524.21
2017	292.65	177.58	139.38	21.28	47.20	678.10
2018	315.85	196.59	188.17	31.73	68.75	801.09
2019	382.27	222.28	175.81	33.43	184.65	998.45
2020	393.66	258.43	243.85	46.41	269.05	1211.40

P-8A Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2012	0.07	0.00	0	0.00	1.20	1.27
2013	1.22	0.29	0	0.00	2.62	4.13
2014	3.58	1.03	0.02	0.33	1.54	6.50

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2015	6.11	2.83	0.00	0.43	4.66	14.04
2016	20.70	79.48	7.89	3.45	8.70	120.22
2017	21.55	68.94	30.31	8.71	9.86	139.38
2018	25.28	83.68	49.35	16.26	13.61	188.17
2019	28.76	60.58	58.70	15.61	12.17	175.81
2020	29.76	76.40	91.34	29.96	16.39	243.85

P-8A Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2012	0.89	0.21	0.68
2013	9.31	0.30	9.01
2014	10.39	0.34	10.05
2015	10.22	0.45	9.77
2016	11.91	2.73	9.18
2017	11.12	2.28	8.83
2018	11.13	2.61	8.51
2019	11.22	1.98	9.24
2020	12.24	2.46	9.77

P-8A Fleet Size

Fiscal year	Total aircraft
2012	6
2013	14
2014	19
2015	31
2016	44
2017	61
2018	72
2019	89
2020	99

P-8A Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2012	2721.75	644.91	2076.85
2013	18654.92	591.53	18063.39
2014	13228.78	435.34	12793.44
2015	15322.36	678.85	14643.52
2016	18019.63	4132.56	13887.07
2017	18190.33	3739.05	14451.28
2018	16571.95	3892.62	12679.34
2019	18674.87	3288.40	15386.47
2020	19894.62	4004.73	15889.90

P-8A Flying Hours

Fiscal year	Flying hours executed
2012	1963.00
2013	6986.00
2014	14920.00
2015	20677.00
2016	29091.00
2017	37278.00
2018	48340.00
2019	53465.00
2020	60891.00

Bomber Aircraft

B-1B Lancer

B-1B Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	1178.99	426.66	36	7.4	62	0	6814.4	0	19.02	173013.83	38.0
2021	NA	NA	NA	NA	NA	34.1	NA	9,560	NA	NA	NA

B-1B Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	354.64	380.75	619.50	149.07	353.34	1857.30
2012	353.05	454.76	646.84	108.88	414.16	1977.71
2013	328.80	412.49	634.80	49.59	187.87	1613.55
2014	317.31	343.96	533.27	43.41	273.19	1511.14
2015	302.09	339.01	514.80	73.21	401.97	1631.08
2016	297.84	174.40	411.41	61.55	232.71	1177.91
2017	314.23	143.43	378.11	70.59	284.62	1190.98
2018	327.73	160.13	350.01	142.38	215.03	1195.28
2019	332.52	141.55	337.59	122.82	163.21	1097.69
2020	328.01	102.01	426.66	155.85	166.47	1178.99

B-1B Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	95.60	378.11	0	136.96	0.00	0	8.83	619.50
2012	101.33	413.97	0	121.32	0.25	0	9.98	646.84
2013	81.38	421.94	0	123.97	0.03	0	7.48	634.80
2014	85.69	317.93	0	119.99	0.00	0	9.66	533.27
2015	92.81	297.49	0	104.73	0.00	0	19.77	514.80
2016	72.22	205.44	0	115.13	0.00	0	18.62	411.41
2017	70.17	160.33	0	129.40	0.00	0	18.19	378.11
2018	63.00	147.55	0	126.26	0.00	0	13.20	350.01
2019	52.21	129.39	0	146.94	0.00	0	9.06	337.59
2020	56.35	183.87	0	146.75	0.00	0	39.69	426.66

B-1B Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	28.14	9.39	18.75
2012	29.98	9.81	20.18
2013	25.66	10.10	15.57
2014	24.37	8.60	15.77
2015	26.31	8.30	18.00
2016	19.00	6.64	12.36
2017	19.21	6.10	13.11
2018	19.28	5.65	13.63
2019	17.70	5.44	12.26
2020	19.02	6.88	12.13

B-1B Fleet Size

Fiscal year	Total aircraft
2011	66
2012	66
2013	63

Fiscal year	Total aircraft
2014	62
2015	62
2016	62
2017	62
2018	62
2019	62
2020	62

B-1B Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	78870.64	26307.13	52563.51
2012	68969.99	22557.83	46412.16
2013	65496.87	25767.69	39729.18
2014	69696.06	24595.39	45100.67
2015	72716.90	22950.76	49766.14
2016	89873.04	31390.06	58482.98
2017	109475.72	34755.91	74719.80
2018	110207.54	32271.81	77935.73
2019	125328.42	38544.06	86784.36
2020	173013.83	62611.28	110402.54

B-1B Flying Hours

Fiscal year	Flying hours executed
2011	23548.70
2012	28674.90
2013	24635.60
2014	21681.90
2015	22430.60
2016	13106.40
2017	10878.90
2018	10845.70
2019	8758.50
2020	6814.40

B-1B Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	13.65	0.00	1165.33	1178.99	0.09	0.00	426.57	426.66

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	173013.83	62611.28	110402.54
Active Duty	184548.71	67554.24	116994.47
Reserve	27310.66	174.27	27136.39

B-2 Spirit

B-2 Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	820.24	403.14	49	0.5	20	0	5441.4	0	41.01	150740.65	10.0
2021	NA	NA	NA	NA	NA	27.2	NA	7,459	NA	NA	NA

B-2 Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	204.52	76.79	363.95	53.92	156.97	856.15
2012	216.41	71.90	351.21	50.16	197.52	887.20
2013	203.43	68.57	334.49	44.90	179.51	830.90
2014	200.50	67.10	352.15	45.46	148.24	813.45
2015	202.77	64.02	387.91	50.92	149.43	855.05
2016	199.89	52.21	385.09	44.70	155.59	837.47
2017	201.64	60.43	413.27	42.28	138.45	856.07
2018	206.68	72.15	386.77	46.84	214.49	926.93
2019	207.24	57.65	350.37	41.11	160.19	816.56
2020	211.31	49.97	403.14	37.44	118.38	820.24

B-2 Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	14.55	49.14	0	202.15	0.00	18.20	79.91	363.95
2012	15.10	66.37	0	171.76	0.00	33.09	64.89	351.21
2013	12.64	74.21	0	155.33	0.00	26.11	66.21	334.49
2014	15.65	77.81	0	157.76	0.00	24.79	76.14	352.15
2015	16.13	74.45	0	170.08	0.00	28.60	98.66	387.91
2016	15.99	78.70	0	156.31	2.18	27.70	104.21	385.09
2017	19.54	81.43	0	205.01	0.02	28.12	79.15	413.27
2018	17.62	74.51	0	191.32	0.04	27.66	75.64	386.77
2019	16.76	54.72	0	173.28	0.06	27.03	78.51	350.37
2020	21.36	66.85	0	207.29	0.06	26.18	81.40	403.14

B-2 Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	42.81	18.20	24.61
2012	44.36	17.56	26.80
2013	41.55	16.72	24.82
2014	40.67	17.61	23.07
2015	42.75	19.40	23.36
2016	41.87	19.25	22.62
2017	42.80	20.66	22.14
2018	46.35	19.34	27.01
2019	40.83	17.52	23.31
2020	41.01	20.16	20.86

B-2 Fleet Size

Fiscal year	Total aircraft
2011	20
2012	20
2013	20
2014	20
2015	20
2016	20
2017	20
2018	20
2019	20
2020	20

B-2 Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	147935.61	62887.48	85048.12
2012	151158.58	59838.16	91320.43
2013	166513.67	67032.97	99480.70
2014	135928.93	58844.62	77084.32
2015	135909.43	61658.38	74251.05
2016	129938.44	59748.64	70189.80
2017	131325.30	63397.54	67927.76

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2018	141128.46	58887.75	82240.71
2019	137029.99	58796.91	78233.08
2020	150740.65	74087.55	76653.10

B-2 Flying Hours

Fiscal year	flying hours executed
2011	5787.30
2012	5869.30
2013	4990.00
2014	5984.40
2015	6291.30
2016	6445.10
2017	6518.70
2018	6568.00
2019	5959.00
2020	5441.40

B-2 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	0.00	31.45	788.79	820.24	0.00	0.73	402.41	403.14

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	150740.65	74087.55	76653.10
Active Duty	144961.24	73953.93	71007.31
National Guard	NA	NA	NA

B-52 Stratofortress

B-52 Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	1263.27	547.20	43	-2.9	76	0	14297.9	0	16.62	88353.54	4.4
2021	NA	NA	NA	NA	NA	61	NA	21,193	NA	NA	NA

B-52 Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	453.98	267.01	463.30	50.51	51.49	1286.30
2012	457.38	267.86	480.29	37.18	145.51	1388.22
2013	441.57	246.72	422.22	34.84	31.35	1176.70
2014	445.39	288.53	478.28	41.67	116.55	1370.43
2015	407.51	273.31	506.56	38.19	201.74	1427.32
2016	390.64	231.64	476.93	45.61	201.54	1346.36
2017	390.26	228.58	467.07	47.85	181.97	1315.73
2018	399.29	207.08	529.11	59.00	177.55	1372.04
2019	393.73	221.39	522.16	33.11	130.87	1301.26
2020	401.08	209.11	547.20	27.62	78.25	1263.27

B-52 Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	40.45	133.75	0	281.55	0.04	0	7.52	463.30
2012	39.21	143.80	0	286.08	0.00	0	11.20	480.29
2013	35.76	136.39	0	239.78	0.00	0	10.29	422.22
2014	40.77	130.91	0	295.26	0.39	0	10.95	478.28
2015	41.37	137.24	0	312.14	1.62	0.14	14.05	506.56
2016	40.75	136.96	0	282.12	0.00	3.81	13.31	476.93
2017	49.42	149.67	0	214.69	1.46	19.49	32.33	467.07
2018	45.74	140.39	0	331.75	0.05	0.19	10.99	529.11
2019	48.20	146.23	0	301.80	3.59	12.40	9.94	522.16
2020	51.88	117.31	0	362.85	4.77	0.28	10.11	547.20

B-52 Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	16.92	6.10	10.83
2012	18.27	6.32	11.95
2013	15.48	5.56	9.93
2014	18.03	6.29	11.74
2015	18.54	6.58	11.96
2016	17.57	6.22	11.35
2017	17.35	6.16	11.19
2018	18.29	7.05	11.24
2019	17.26	6.93	10.33
2020	16.62	7.20	9.42

B-52 Fleet Size

Fiscal year	Total aircraft
2011	76
2012	76

Fiscal year	Total aircraft
2013	76
2014	76
2015	77
2016	77
2017	76
2018	75
2019	75
2020	76

B-52 Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	68751.83	24763.25	43988.58
2012	74118.77	25643.32	48475.46
2013	72230.85	25917.59	46313.26
2014	74937.22	26153.36	48783.86
2015	77118.47	27369.78	49748.69
2016	70048.73	24813.93	45234.80
2017	53308.26	18923.70	34384.56
2018	71914.17	27732.81	44181.35
2019	84666.44	33974.62	50691.82
2020	88353.54	38271.39	50082.15

B-52 Flying Hours

Fiscal year	Flying hours executed
2011	18709.30
2012	18729.70
2013	16290.80
2014	18287.70
2015	18508.10
2016	19220.40
2017	24681.60
2018	19078.80
2019	15369.20
2020	14297.90

B-52 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	162.05	0.00	1101.22	1263.27	109.44	0.00	437.76	547.20

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	88353.54	38271.39	50082.15
Active Duty	96678.19	38431.67	58246.52
Reserve	55738.12	37643.41	18094.71

Cargo Aircraft

C-2A Greyhound

C-2A Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	222.86	89.96	40	-6.8	32	0	7257	0	6.96	30710.22	-0.2
2021	NA	NA	NA	NA	NA	34.1	NA	11,238	NA	NA	NA

C-2A Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	100.27	26.23	97.02	5.48	23.32	252.32
2012	92.41	24.17	83.29	6.51	22.53	228.91
2013	86.31	20.21	78.32	4.44	8.02	197.30
2014	81.05	21.20	93.53	5.12	3.50	204.39
2015	83.40	19.70	115.37	10.84	4.24	233.55
2016	90.05	19.76	110.69	6.35	7.82	234.67
2017	90.43	17.70	114.94	7.83	14.81	245.71
2018	86.00	17.15	102.86	8.66	13.81	228.47
2019	79.85	12.58	121.42	8.16	17.14	239.16
2020	92.12	15.33	89.96	6.23	19.22	222.86

C-2A Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	22.66	38.65	10.99	20.56	4.15	97.02
2012	15.84	24.34	9.42	28.75	4.94	83.29
2013	16.71	21.72	7.58	24.69	7.61	78.32
2014	16.54	24.30	10.90	36.49	5.30	93.53
2015	19.61	47.15	14.43	26.04	8.15	115.37
2016	18.13	48.17	18.58	19.57	6.23	110.69
2017	16.64	65.00	14.72	12.53	6.04	114.94
2018	20.11	32.92	15.44	26.27	8.13	102.86
2019	18.38	52.18	14.49	29.10	7.27	121.42
2020	17.37	32.53	12.88	19.86	7.33	89.96

C-2A Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	7.42	2.85	4.57
2012	6.73	2.45	4.28

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2013	5.80	2.30	3.50
2014	6.39	2.92	3.46
2015	6.87	3.39	3.48
2016	6.90	3.26	3.65
2017	7.23	3.38	3.85
2018	6.92	3.12	3.81
2019	7.47	3.79	3.68
2020	6.96	2.81	4.15

C-2A Fleet Size

Fiscal year	Total aircraft
2011	34
2012	34
2013	34
2014	32
2015	34
2016	34
2017	34
2018	33
2019	32
2020	32

C-2A Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	24853.89	9556.83	15297.06
2012	24653.96	8970.60	15683.36
2013	21626.56	8584.42	13042.15
2014	22597.27	10340.29	12256.98
2015	27697.63	13682.63	14015.00
2016	27350.30	12900.57	14449.73
2017	30052.13	14057.76	15994.37
2018	31021.18	13965.83	17055.35
2019	30779.49	15626.99	15152.49
2020	30710.22	12396.53	18313.69

C-2A Flying Hours

Fiscal year	Flying hours executed
2011	10152.00
2012	9285.00
2013	9123.00
2014	9045.00
2015	8432.00
2016	8580.00
2017	8176.00
2018	7365.00
2019	7770.00
2020	7257.00

C-130T Hercules

C-130T Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	159.24	63.64	40	-8.3	18	0	7711	0	8.85	20650.56	-5.7
2021	NA	NA	NA	NA	NA	27.4	NA	19,411	NA	NA	NA

C-130T Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	81.51	42.57	54.43	2.02	13.82	194.35
2012	81.45	44.74	59.20	2.62	19.26	207.28
2013	75.05	34.39	49.09	1.87	15.43	175.83
2014	60.83	35.53	64.47	2.24	17.53	180.60

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2015	56.47	29.98	56.86	2.37	10.35	156.03
2016	53.06	29.43	57.46	2.64	14.74	157.33
2017	55.99	23.06	63.64	2.88	12.95	158.51
2018	56.94	11.66	69.22	2.98	36.93	177.73
2019	60.05	17.80	68.45	2.70	24.58	173.57
2020	52.91	17.58	63.64	3.54	21.57	159.24

C-130T Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	12.00	17.90	6.72	17.81	0.00	54.43
2012	12.11	14.78	6.58	25.73	0.00	59.20
2013	11.36	11.65	9.45	16.63	0.00	49.09
2014	11.88	16.15	13.25	23.19	0.00	64.47
2015	10.54	17.06	10.63	18.63	0.00	56.86
2016	10.54	15.14	16.12	15.67	0.00	57.46
2017	9.80	21.65	14.48	17.72	0.00	63.64
2018	9.66	19.47	12.17	27.92	0.00	69.22
2019	10.60	19.93	11.42	21.18	5.30	68.45
2020	13.45	15.05	11.23	18.52	5.38	63.64

C-130T Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	9.72	2.72	7.00
2012	10.36	2.96	7.40
2013	8.79	2.45	6.34
2014	9.03	3.22	5.81
2015	8.21	2.99	5.22
2016	8.28	3.02	5.26
2017	8.34	3.35	4.99

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2018	9.35	3.64	5.71
2019	9.64	3.80	5.84
2020	8.85	3.54	5.31

C-130T Fleet Size

Fiscal year	Total aircraft
2011	20
2012	20
2013	20
2014	20
2015	19
2016	19
2017	19
2018	19
2019	18
2020	18

C-130T Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	12899.20	3612.64	9286.56
2012	12972.64	3704.96	9267.68
2013	12204.19	3407.22	8796.98
2014	12213.16	4359.77	7853.38
2015	12719.87	4635.41	8084.46
2016	13183.68	4815.07	8368.61
2017	15316.79	6149.30	9167.49
2018	33603.36	13087.30	20516.06
2019	21910.39	8639.87	13270.52
2020	20650.56	8252.60	12397.96

C-130T Flying Hours

Fiscal year	Flying hours executed
2011	15067.00
2012	15978.00

Fiscal year	Flying hours executed
2013	14407.00
2014	14787.00
2015	12267.00
2016	11934.00
2017	10349.00
2018	5289.00
2019	7922.00
2020	7711.00

C-130T Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	159.19	0.00	0.05	159.24	63.64	0.00	0.00	63.64

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	20650.56	8252.60	12397.96
Active Duty	NA	NA	NA
Reserve	20644.54	8252.60	12391.94

C-5M Super Galaxy

C-5M Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	986.41	280.81	28	-11.3	52	0	17152.6	0	18.97	57507.80	-5.8
2021	NA	NA	NA	NA	NA	34	NA	22,716	NA	NA	NA

C-5M Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	695.77	578.65	1014.76	54.32	992.63	3336.13
2012	606.36	485.35	755.34	44.64	1055.89	2947.58
2013	539.03	427.04	396.42	30.64	1120.04	2513.17
2014	484.28	323.78	398.79	45.66	932.17	2184.68
2015	396.71	300.23	351.53	32.38	288.56	1369.42
2016	375.00	223.18	384.47	36.07	19.88	1038.60
2017	369.56	202.34	418.57	36.27	39.06	1065.80
2018	367.35	201.08	400.74	42.80	41.54	1053.50
2019	365.15	220.49	364.16	69.97	91.88	1111.65
2020	381.86	190.71	280.81	65.53	67.50	986.41

C-5M Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	118.59	204.38	0.00	634.90	0.83	0.00	56.06	1014.76
2012	94.88	168.95	0	437.10	1.75	0	52.67	755.34
2013	72.67	126.22	0	128.91	0.22	0	68.39	396.42
2014	63.07	104.88	0	147.77	1.45	0	81.61	398.79
2015	61.78	77.23	0	127.06	0.68	0	84.78	351.53
2016	58.49	64.42	0	201.12	0.13	0	60.31	384.47
2017	56.58	58.79	0	218.77	0.56	0	83.87	418.57
2018	54.67	46.69	0	215.47	0.00	0	83.91	400.74
2019	55.39	56.51	0	173.25	0.00	0	79.00	364.16
2020	52.77	47.61	0	103.94	0.04	0	76.46	280.81

C-5M Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	32.09	9.76	22.33
2012	32.26	8.27	23.99
2013	35.01	5.52	29.49
2014	34.15	6.23	27.91
2015	26.93	6.91	20.01
2016	22.78	8.43	14.35
2017	22.93	9.01	13.92
2018	21.46	8.16	13.29
2019	21.38	7.00	14.37
2020	18.97	5.40	13.57

C-5M Fleet Size

Fiscal year	Total aircraft
2011	104
2012	91

Fiscal year	Total aircraft
2013	72
2014	64
2015	51
2016	46
2017	46
2018	49
2019	52
2020	52

C-5M Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	89141.50	27114.51	62027.00
2012	95401.39	24447.44	70953.95
2013	97055.23	15309.07	81746.16
2014	102624.03	18733.04	83890.99
2015	63807.39	16379.56	47427.83
2016	45138.00	16709.25	28428.75
2017	47271.06	18564.59	28706.47
2018	51399.17	19551.49	31847.68
2019	61074.37	20006.97	41067.40
2020	57507.80	16371.11	41136.69

C-5M Flying Hours

Fiscal year	Flying hours executed
2011	37425.10
2012	30896.60
2013	25894.20
2014	21288.20
2015	21461.80
2016	23009.50
2017	22546.60
2018	20496.40
2019	18201.50
2020	17152.60

C-5M Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	324.23	5.17	657.00	986.41	132.73	0.02	148.05	280.81

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	57507.80	16371.11	41136.69
Active Duty	56190.63	12662.31	43528.31
National Guard	NA	NA	NA
Reserve	59381.01	24309.33	35071.68

C-17 Globemaster III

C-17 Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	3817.54	1462.52	38	3.2	222	0	125666.1	0	17.20	30378.42	10.9
2021	NA	NA	NA	NA	NA	18	NA	15,797	NA	NA	NA

C-17 Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	1033.03	2561.00	1624.03	25.52	405.51	5649.09
2012	1114.62	2400.98	1642.15	17.59	174.46	5349.79
2013	1062.01	2225.33	1715.85	8.20	223.20	5234.60
2014	1101.09	2164.55	1674.42	7.85	134.96	5082.86
2015	1127.41	1934.61	1562.36	9.93	100.62	4734.94
2016	1079.80	1260.79	1683.12	9.86	59.07	4092.64
2017	1044.76	1136.89	1566.98	48.38	16.42	3813.43
2018	1041.20	1113.25	1291.59	31.74	101.49	3579.27
2019	1071.04	1297.15	1272.39	20.10	36.87	3697.54
2020	1103.51	1097.46	1462.52	101.89	52.16	3817.54

C-17 Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	69.26	45.61	0	0.13	0.00	0	1509.03	1624.03
2012	76.21	45.21	0	0.15	0.00	0	1520.58	1642.15
2013	60.49	57.72	0	0.20	0.00	0	1597.45	1715.85
2014	67.08	50.94	0	0.54	0.00	0	1555.86	1674.42
2015	85.66	78.73	0	0.33	0.00	1.54	1396.10	1562.36
2016	88.15	82.37	0	0.14	1.42	2.59	1508.45	1683.12
2017	64.95	68.99	0	0.00	1.14	0	1431.90	1566.98
2018	86.33	60.43	0	0.67	0.21	0	1143.94	1291.59
2019	76.79	55.20	0	0.22	0.32	0	1139.86	1272.39
2020	83.06	58.26	0	0.28	0.33	0	1320.59	1462.52

C-17 Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	27.16	7.81	19.35
2012	24.92	7.65	17.27
2013	23.91	7.84	16.07
2014	22.90	7.54	15.35
2015	21.33	7.04	14.29
2016	18.44	7.58	10.85
2017	17.18	7.06	10.12
2018	16.12	5.82	10.30
2019	16.66	5.73	10.92
2020	17.20	6.59	10.61

C-17 Fleet Size

Fiscal year	Total aircraft
2011	208
2012	215
2013	219
2014	222
2015	222
2016	222
2017	222
2018	222
2019	222
2020	222

C-17 Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	25538.49	7341.94	18196.55
2012	26379.89	8097.46	18282.42
2013	29163.01	9559.38	19603.63
2014	27530.88	9069.36	18461.53
2015	26656.06	8795.56	17860.50
2016	25193.24	10360.85	14832.39
2017	24761.87	10174.91	14586.96

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2018	25166.62	9081.44	16085.18
2019	27391.27	9425.80	17965.47
2020	30378.42	11638.15	18740.27

C-17 Flying Hours

Fiscal year	Flying hours executed
2011	221199.0
2012	202798.0
2013	179494.4
2014	184624.0
2015	177630.9
2016	162449.8
2017	154004.0
2018	142223.0
2019	134989.8
2020	125666.1

C-17 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	412.03	625.28	2780.22	3817.54	112.30	251.19	1099.03	1462.52

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	30378.42	11638.15	18740.27
Active Duty	36051.48	14251.25	21800.23
National Guard	27857.92	11191.16	16666.76
Reserve	15785.20	4302.32	11482.87

C-130H Hercules

C-130H Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	1161.64	338.69	29	-19.1	168.54	0	41012	0	6.89	28324.31	-13.7
2021	NA	NA	NA	NA	NA	29.4	NA	11,710	NA	NA	NA

C-130H Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	1024.00	466.92	814.67	19.20	243.88	2568.67
2012	982.14	415.79	694.88	8.75	127.47	2229.03
2013	917.36	351.59	661.46	16.59	39.15	1986.14
2014	869.80	270.90	620.50	5.87	79.26	1846.33
2015	784.36	251.49	584.44	6.65	77.53	1704.47
2016	767.88	171.02	582.01	3.04	102.60	1626.55
2017	711.35	145.61	560.46	5.75	216.69	1639.85
2018	623.13	135.86	502.15	19.25	207.89	1488.28
2019	623.50	149.83	473.57	14.72	174.35	1435.96
2020	588.81	118.41	338.69	12.67	103.06	1161.64

C-130H Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	130.79	324.39	0	282.37	0.01	0	77.11	814.67
2012	120.13	271.69	0	258.83	0.18	0	44.05	694.88
2013	100.04	214.54	0	271.02	0.28	0	75.58	661.46
2014	117.16	263.26	0	177.43	0.00	0	62.65	620.50
2015	103.78	274.63	0	145.96	0.07	0	60.00	584.44
2016	105.49	268.33	0	166.89	0.72	0	40.58	582.01
2017	101.55	278.74	0	136.49	0.45	0	43.22	560.46
2018	98.94	219.01	0	144.93	0.49	0	38.78	502.15
2019	100.14	193.07	0	169.28	0.38	0	10.69	473.57
2020	81.68	161.78	0	84.48	0.02	0	10.72	338.69

C-130H Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	9.58	3.04	6.54
2012	8.38	2.61	5.77
2013	7.53	2.51	5.02
2014	7.14	2.40	4.74
2015	6.69	2.29	4.40
2016	6.97	2.49	4.47
2017	7.91	2.70	5.21
2018	8.30	2.80	5.50
2019	8.32	2.74	5.58
2020	6.89	2.01	4.88

C-130H Fleet Size

Fiscal year	Total aircraft
2011	268
2012	266
2013	264

Fiscal year	Total aircraft
2014	259
2015	255
2016	233
2017	207
2018	179
2019	173
2020	169

C-130H Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	21405.56	6788.93	14616.62
2012	20575.10	6414.08	14161.02
2013	23250.71	7743.32	15507.39
2014	26419.99	8879.07	17540.93
2015	23802.24	8161.51	15640.73
2016	24489.27	8762.79	15726.48
2017	26931.72	9204.51	17727.21
2018	28271.27	9538.85	18732.42
2019	32833.38	10828.14	22005.23
2020	28324.31	8258.23	20066.08

C-130H Flying Hours

Fiscal year	Flying hours executed
2011	120000.2
2012	108336.2
2013	85422.70
2014	69884.00
2015	71609.80
2016	66418.70
2017	60889.30
2018	52643.00
2019	43734.70
2020	41012.00

C-130H Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	317.89	714.36	129.39	1161.64	109.49	227.78	1.42	338.69

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	28324.31	8258.23	20066.08
Active Duty	159325.54	1746.62	157578.92
National Guard	24219.84	7722.71	16497.13
Reserve	29695.17	10227.71	19467.46

C-130J Super Hercules

C-130J Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	1175.65	387.80	33	-1.2	133.93	0	61316.1	0	8.78	19173.65	12.4
2021	NA	NA	NA	NA	NA	11.2	NA	5,329	NA	NA	NA

C-130J Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	317.31	188.54	178.22	11.56	82.09	777.73
2012	423.53	125.14	244.69	3.99	63.31	860.66
2013	421.09	128.35	209.19	3.79	50.39	812.80
2014	503.84	165.51	272.40	11.16	21.31	974.22
2015	488.87	172.39	265.17	19.52	39.70	985.65
2016	443.78	126.69	278.48	7.09	51.56	907.61
2017	434.95	124.47	317.86	29.09	172.71	1079.08
2018	471.64	164.03	341.06	13.82	110.35	1100.89
2019	492.30	206.14	378.44	8.72	104.45	1190.05
2020	517.94	158.33	387.80	14.09	97.50	1175.65

C-130J Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	18.73	19.98	0	3.08	0.00	5.73	130.69	178.22
2012	24.92	33.34	0	29.05	0.02	0.59	156.76	244.69
2013	25.30	28.52	0	15.51	0.03	0.50	139.32	209.19
2014	22.79	28.86	0	21.19	0.00	0.96	198.60	272.40
2015	31.43	32.95	0	28.61	0.12	1.60	170.47	265.17
2016	36.69	34.21	0	22.97	1.84	0.00	182.76	278.48
2017	41.49	39.25	0	33.71	1.55	0	201.84	317.86
2018	50.92	42.38	0	68.84	0.00	0	178.92	341.06
2019	60.78	46.94	0	53.73	0.00	0	216.99	378.44
2020	61.41	48.00	0	58.49	0.00	0	219.89	387.80

C-130J Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	10.90	2.50	8.40
2012	10.34	2.94	7.40
2013	8.83	2.27	6.56
2014	9.86	2.76	7.10
2015	9.55	2.57	6.98
2016	8.60	2.64	5.96
2017	9.80	2.89	6.91
2018	9.14	2.83	6.31
2019	9.22	2.93	6.29
2020	8.78	2.90	5.88

C-130J Fleet Size

Fiscal year	Total aircraft
2011	71
2012	83
2013	92
2014	99
2015	103
2016	106
2017	110
2018	120
2019	129
2020	134

C-130J Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	19990.99	4581.07	15409.92
2012	18707.61	5318.63	13388.98
2013	18108.56	4660.62	13447.95
2014	18314.81	5120.91	13193.90
2015	17338.06	4664.50	12673.56
2016	16227.00	4978.97	11248.03
2017	19538.97	5755.42	13783.54

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2018	17216.90	5333.83	11883.07
2019	17059.54	5424.95	11634.59
2020	19173.65	6324.58	12849.06

C-130J Flying Hours

Fiscal year	Flying hours executed
2011	38904.00
2012	46006.00
2013	44885.00
2014	53193.20
2015	56849.20
2016	55931.80
2017	55227.10
2018	63942.50
2019	69758.50
2020	61316.10

C-130J Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	65.94	113.19	996.52	1175.65	27.77	52.72	307.31	387.80

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	19173.65	6324.58	12849.06
Active Duty	18429.33	5683.29	12746.04
National Guard	24048.90	11201.34	12847.56
Reserve	25993.31	10945.58	15047.73

Command and Control Aircraft

E-2C Hawkeye

E-2C Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	317.79	159.54	50	3.7	26	0	8122	0	12.22	39126.91	19.7
2021	NA	NA	NA	NA	NA	17.6	NA	6,249	NA	NA	NA

E-2C Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	191.84	35.37	253.36	13.41	85.82	579.80
2012	193.70	32.55	248.87	16.14	80.75	572.02
2013	159.85	25.74	199.42	12.16	39.29	436.46
2014	165.19	23.25	207.18	18.90	42.26	456.78
2015	146.96	21.62	184.41	23.34	34.07	410.40
2016	132.73	21.22	190.74	10.05	33.72	388.46
2017	112.66	16.92	158.07	14.06	20.96	322.66
2018	112.96	15.44	141.12	11.14	30.76	311.42
2019	92.08	14.13	145.46	10.74	43.93	306.34
2020	76.12	10.30	159.54	10.07	61.75	317.79

E-2C Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	41.50	71.12	50.38	72.43	17.93	253.36
2012	36.11	76.02	44.84	80.77	11.13	248.87
2013	30.98	54.53	41.14	59.00	13.78	199.42
2014	26.61	39.21	53.01	79.88	8.47	207.18
2015	27.61	38.85	53.73	53.01	11.21	184.41
2016	29.67	61.68	47.47	44.48	7.43	190.74
2017	20.43	42.72	40.83	45.15	8.93	158.07
2018	18.12	42.85	31.17	37.98	11.02	141.12
2019	23.24	34.00	31.45	50.08	6.70	145.46
2020	24.05	47.19	40.32	41.44	6.54	159.54

E-2C Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	10.00	4.37	5.63
2012	9.86	4.29	5.57
2013	8.24	3.76	4.47
2014	9.14	4.14	4.99
2015	8.55	3.84	4.71
2016	9.25	4.54	4.71
2017	8.07	3.95	4.11
2018	8.42	3.81	4.60
2019	9.88	4.69	5.19
2020	12.22	6.14	6.09

E-2C Fleet Size

Fiscal year	Total aircraft
2011	58
2012	58
2013	53
2014	50
2015	48

Fiscal year	Total aircraft
2016	42
2017	40
2018	37
2019	31
2020	26

E-2C Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	25446.75	11119.67	14327.08
2012	27018.82	11755.11	15263.71
2013	25836.57	11804.75	14031.82
2014	27820.26	12618.61	15201.65
2015	29335.09	13181.70	16153.39
2016	27123.48	13317.67	13805.81
2017	26090.30	12781.41	13308.89
2018	29031.48	13155.85	15875.63
2019	32682.88	15519.40	17163.48
2020	39126.91	19643.54	19483.37

E-2C Flying Hours

Fiscal year	Flying hours executed
2011	22785.00
2012	21171.00
2013	16893.00
2014	16419.00
2015	13990.00
2016	14322.00
2017	12367.00
2018	10727.00
2019	9373.00
2020	8122.00

E-2D Advanced Hawkeye

E-2D Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	326.66	82.99	25	25.8	36	0	10811	0	9.07	30215.71	24.6
2021	NA	NA	NA	NA	NA	5.5	NA	1,676	NA	NA	NA

E-2D Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	0.00	0.00	0	0.00	0	0.00
2012	0.00	0.64	1.00	0.00	0.20	1.83
2013	15.71	1.35	2.85	1.25	2.87	24.03
2014	33.19	4.25	8.87	5.69	5.23	57.24
2015	49.81	8.02	17.67	7.95	8.13	91.58
2016	64.49	7.07	50.49	7.17	9.65	138.87
2017	71.49	12.41	64.91	6.45	15.86	171.13
2018	74.66	12.61	90.56	13.11	27.35	218.29
2019	87.11	13.08	94.43	11.61	53.43	259.65
2020	113.19	15.15	82.99	21.39	93.94	326.66

E-2D Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	0.00	0.00	0	0.00	0.00	0
2012	0.17	0.14	0.02	0.00	0.66	1.00

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2013	0.44	0.70	0.02	0.00	1.69	2.85
2014	2.16	1.54	1.43	0.41	3.33	8.87
2015	4.21	5.66	2.61	0.53	4.65	17.67
2016	9.34	26.18	4.48	5.74	4.75	50.49
2017	12.69	36.31	4.76	5.36	5.79	64.91
2018	13.20	56.31	4.98	7.55	8.52	90.56
2019	15.53	42.29	8.70	18.72	9.19	94.43
2020	11.67	38.37	10.92	14.96	7.07	82.99

E-2D Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	0.00	0	0.00
2012	0.37	0.20	0.17
2013	4.00	0.47	3.53
2014	4.77	0.74	4.03
2015	6.11	1.18	4.93
2016	6.94	2.52	4.42
2017	7.13	2.70	4.43
2018	8.40	3.48	4.91
2019	7.87	2.86	5.01
2020	9.07	2.31	6.77

E-2D Fleet Size

Fiscal year	Total aircraft
2011	3
2012	5
2013	6
2014	12
2015	15
2016	20
2017	24
2018	26

Fiscal year	Total aircraft
2019	33
2020	36

E-2D Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	.	.	.
2012	3527.55	1923.18	1604.37
2013	25837.42	3063.09	22774.33
2014	21955.43	3402.79	18552.64
2015	16295.90	3144.01	13151.89
2016	31282.99	11373.97	19909.02
2017	20314.02	7705.08	12608.94
2018	24663.15	10231.56	14431.59
2019	24243.50	8816.56	15426.94
2020	30215.71	7676.66	22539.05

E-2D Flying Hours

Fiscal year	Flying hours executed
2011	0.00
2012	520.00
2013	930.00
2014	2607.00
2015	5620.00
2016	4439.00
2017	8424.00
2018	8851.00
2019	10710.00
2020	10811.00

E-6B Mercury

E-6B Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	515.65	138.03	27	-15.2	16	0	9403	0	32.23	54838.65	-2.5
2021	NA	NA	NA	NA	NA	30.8	NA	26,281	NA	NA	NA

E-6B Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	128.72	62.71	85.37	12.00	182.44	471.24
2012	131.49	61.98	79.97	12.50	159.83	445.77
2013	126.24	59.17	86.03	26.48	172.28	470.20
2014	128.90	60.82	102.91	33.05	154.22	479.90
2015	120.68	59.85	101.16	35.53	225.22	542.44
2016	121.90	53.79	113.78	26.08	162.96	478.51
2017	119.56	50.25	127.73	24.66	197.90	520.10
2018	121.61	54.56	134.46	19.72	181.69	512.04
2019	127.35	55.28	160.86	28.17	236.58	608.24
2020	131.16	47.46	138.03	24.81	174.19	515.65

E-6B Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	3.50	31.62	0	41.10	9.14	85.37
2012	3.35	29.61	0	39.14	7.87	79.97

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2013	3.48	34.98	0	39.57	7.99	86.03
2014	3.39	40.60	0	47.78	11.14	102.91
2015	3.34	30.29	0	51.23	16.30	101.16
2016	3.78	32.51	0	67.41	10.08	113.78
2017	4.35	39.13	0	73.39	10.86	127.73
2018	5.13	35.79	0	77.73	15.81	134.46
2019	5.38	52.04	0	87.19	16.26	160.86
2020	5.13	44.67	0	69.86	18.37	138.03

E-6B Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	31.42	5.69	25.72
2012	29.72	5.33	24.39
2013	31.35	5.74	25.61
2014	31.99	6.86	25.13
2015	36.16	6.74	29.42
2016	34.18	8.13	26.05
2017	34.67	8.52	26.16
2018	36.57	9.60	26.97
2019	40.55	10.72	29.83
2020	32.23	8.63	23.60

E-6B Fleet Size

Fiscal year	Total aircraft
2011	15
2012	15
2013	15
2014	15
2015	15
2016	14
2017	15
2018	14

Fiscal year	Total aircraft
2019	15
2020	16

E-6B Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	39276.22	7115.03	32161.19
2012	37437.42	6715.80	30721.62
2013	40699.04	7446.33	33252.72
2014	42397.87	9091.82	33306.05
2015	50842.84	9481.89	41360.96
2016	50851.47	12091.60	38759.87
2017	51885.50	12742.18	39143.32
2018	47521.53	12479.02	35042.51
2019	56224.93	14869.94	41354.99
2020	54838.65	14679.52	40159.14

E-6B Flying Hours

Fiscal year	Flying hours executed
2011	11998.00
2012	11907.00
2013	11553.00
2014	11319.00
2015	10669.00
2016	9410.00
2017	10024.00
2018	10775.00
2019	10818.00
2020	9403.00

E-3 Sentry

E-3 Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	861.60	241.16	28	-2.8	28.8	0	13029.6	0	29.92	66126.36	4.5
2021	NA	NA	NA	NA	NA	40	NA	29,380	NA	NA	NA

E-3 Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	408.63	236.98	228.07	28.62	204.71	1107.02
2012	407.05	240.68	252.35	13.26	149.19	1062.53
2013	385.19	181.24	189.63	11.41	186.48	953.96
2014	377.09	195.01	262.46	17.69	153.36	1005.61
2015	365.40	209.04	246.71	15.46	248.81	1085.42
2016	357.56	119.44	223.00	29.61	195.48	925.08
2017	352.91	115.91	234.80	15.53	364.79	1083.95
2018	350.63	113.74	203.86	26.34	268.33	962.91
2019	350.56	122.65	272.96	17.49	122.70	886.37
2020	364.16	107.05	241.16	11.20	138.03	861.60

E-3 Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	28.40	86.55	0	110.64	0.03	0	2.46	228.07
2012	27.10	89.76	0	132.01	0.07	0	3.42	252.35
2013	23.51	86.02	0	76.21	0.13	0	3.76	189.63
2014	26.03	78.00	0	154.08	0.32	0	4.03	262.46
2015	25.82	77.13	0	137.15	0.17	0	6.44	246.71
2016	27.91	64.02	0	123.58	0.00	0	7.49	223.00
2017	26.82	66.23	0	134.59	0.00	0	7.15	234.80
2018	32.13	47.12	0	120.73	0.00	0	3.88	203.86
2019	27.93	123.88	0	118.26	0.00	0	2.89	272.96
2020	27.45	55.93	0	131.74	0.00	0	26.04	241.16

E-3 Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	34.69	7.15	27.54
2012	33.62	7.99	25.64
2013	30.57	6.08	24.49
2014	32.44	8.47	23.97
2015	35.20	8.00	27.20
2016	29.84	7.19	22.65
2017	35.64	7.72	27.92
2018	31.62	6.69	24.93
2019	29.13	8.97	20.16
2020	29.92	8.37	21.54

E-3 Fleet Size

Fiscal year	Total aircraft
2011	32
2012	32
2013	31

Fiscal year	Total aircraft
2014	31
2015	31
2016	31
2017	30
2018	30
2019	30
2020	29

E-3 Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	50786.82	10463.34	40323.48
2012	47378.86	11252.44	36126.43
2013	55560.58	11044.73	44515.85
2014	50664.52	13223.13	37441.39
2015	49904.59	11343.19	38561.40
2016	51426.79	12397.05	39029.73
2017	59710.80	12934.48	46776.31
2018	57974.69	12274.01	45700.68
2019	63275.67	19486.06	43789.61
2020	66126.36	18508.49	47617.87

E-3 Flying Hours

Fiscal year	Flying hours executed
2011	21797.40
2012	22426.30
2013	17169.70
2014	19848.50
2015	21749.90
2016	17988.30
2017	18153.30
2018	16609.10
2019	14008.00
2020	13029.60

E-3 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	20.75	0.00	840.85	861.60	0.22	0.00	240.94	241.16

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	66126.36	18508.49	47617.87
Active Duty	66822.19	19147.31	47674.87
Reserve	46503.12	492.95	46010.17

E-4B National Airborne Operations Center

E-4B Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	428.11	240.30	56	-3.5	4	0	1149.3	0	107.03	372495.56	14.9
2021	NA	NA	NA	NA	NA	47	NA	19,177	NA	NA	NA

E-4B Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	66.68	52.16	118.45	3.15	49.24	289.68
2012	66.95	48.16	130.34	0.39	74.49	320.32
2013	63.39	46.79	110.75	7.15	57.11	285.19
2014	62.36	42.39	126.09	1.17	62.51	294.52
2015	61.50	42.79	106.88	1.85	22.71	235.72
2016	62.21	46.68	147.98	3.45	24.48	284.80
2017	66.02	42.98	197.55	4.12	67.59	378.25
2018	69.54	80.53	173.05	2.89	26.18	352.19
2019	72.86	60.93	242.20	3.11	64.43	443.54
2020	77.03	71.72	240.30	4.25	34.81	428.11

E-4B Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	1.62	1.26	0	0.00	0.00	0	115.57	118.45
2012	1.65	0.18	0	0.60	0.00	0	127.91	130.34
2013	1.24	2.19	0	0.29	0.00	0	107.03	110.75
2014	1.38	2.02	0	0.16	0.00	0	122.52	126.09
2015	1.99	2.27	0	0.00	0.00	0	102.62	106.88
2016	1.69	2.56	0	0.00	0.00	0	143.72	147.98
2017	2.66	3.22	0	0.00	0.00	0	191.66	197.55
2018	2.55	2.71	0	0.00	0.00	0	167.79	173.05
2019	5.07	3.90	0	0.00	0.00	0	233.23	242.20
2020	2.88	3.42	0	0.00	0.00	0	234.00	240.30

E-4B Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	72.42	29.61	42.81
2012	80.08	32.59	47.50
2013	71.30	27.69	43.61
2014	73.63	31.52	42.11
2015	58.93	26.72	32.21
2016	71.20	37.00	34.20
2017	94.56	49.39	45.18
2018	88.05	43.26	44.78
2019	110.88	60.55	50.34
2020	107.03	60.08	46.95

E-4B Fleet Size

Fiscal year	Total aircraft
2011	4
2012	4
2013	4
2014	4
2015	4
2016	4
2017	4
2018	4
2019	4
2020	4

E-4B Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	201962.90	82580.76	119382.13
2012	200841.03	81723.13	119117.90
2013	181196.61	70366.77	110829.85
2014	186807.14	79973.67	106833.47
2015	159206.57	72184.34	87022.22
2016	169553.90	88099.38	81454.52
2017	244568.15	127729.69	116838.47

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2018	207522.78	101969.34	105553.44
2019	324223.79	177045.32	147178.47
2020	372495.56	209085.84	163409.72

E-4B Flying Hours

Fiscal year	Flying hours executed
2011	1434.30
2012	1594.90
2013	1573.90
2014	1576.60
2015	1480.60
2016	1679.70
2017	1546.60
2018	1697.10
2019	1368.00
2020	1149.30

E-8C Joint Surveillance Target Attack Radar System

E-8C Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	706.16	472.69	67	1.7	16	0	5878	0	44.14	120136.52	14.7
2021	NA	NA	NA	NA	NA	53.3	NA	61,288	NA	NA	NA

E-8C Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	195.30	127.93	263.30	0.00	78.57	665.10
2012	204.69	132.47	449.26	0.00	37.73	824.16
2013	192.49	129.90	424.90	0.00	46.97	794.26
2014	197.11	102.45	432.34	0.00	60.43	792.33
2015	194.97	81.46	411.67	0.00	4.91	693.02
2016	185.15	58.60	466.80	0.00	29.34	739.90
2017	183.10	45.01	580.52	0.00	40.77	849.40
2018	184.71	41.35	638.20	0.00	15.86	880.12
2019	177.95	46.19	465.58	0.00	4.80	694.52
2020	178.02	44.61	472.69	1.06	9.77	706.16

E-8C Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	9.16	12.67	0	19.98	0.00	0	221.48	263.30
2012	9.63	14.38	0	50.73	0.00	0	374.53	449.26
2013	8.82	13.66	0	55.83	0.00	0	346.59	424.90
2014	9.30	12.93	0	35.73	0.00	0	374.37	432.34
2015	9.38	7.83	0	27.93	0.00	0	366.53	411.67
2016	9.88	8.56	0	6.29	0.00	0	442.08	466.80
2017	9.78	8.49	0	22.62	0.00	0	539.63	580.52
2018	11.23	6.69	0	41.52	0.00	0	578.76	638.20
2019	11.04	6.83	0	22.17	0.00	0	425.55	465.58
2020	10.76	8.25	0	44.30	0.00	0	409.37	472.69

E-8C Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	39.12	15.49	23.64
2012	48.48	26.43	22.05
2013	48.31	25.85	22.47
2014	49.52	27.02	22.50
2015	43.31	25.73	17.58
2016	46.24	29.18	17.07
2017	53.09	36.28	16.80
2018	55.01	39.89	15.12
2019	43.41	29.10	14.31
2020	44.14	29.54	14.59

E-8C Fleet Size

Fiscal year	Total aircraft
2011	17
2012	17
2013	16
2014	16
2015	16
2016	16
2017	16
2018	16
2019	16
2020	16

E-8C Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	47501.04	18804.83	28696.20
2012	60183.81	32807.42	27376.39
2013	69080.39	36955.18	32125.21
2014	75827.05	41375.09	34451.96
2015	77003.47	45742.00	31261.47
2016	87613.75	55275.62	32338.13
2017	107913.39	73753.00	34160.38

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2018	141437.43	102560.38	38877.05
2019	104743.55	70215.86	34527.69
2020	120136.52	80417.19	39719.33

E-8C Flying Hours

Fiscal year	Flying hours executed
2011	14001.70
2012	13694.00
2013	11497.60
2014	10449.20
2015	8999.80
2016	8445.00
2017	7871.10
2018	6222.70
2019	6630.70
2020	5878.00

E-8C Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	0.00	536.44	169.72	706.16	0.00	470.45	2.24	472.69

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	120136.52	80417.19	39719.33
Active Duty	41418.45	546.46	40871.99
National Guard	301335.77	264269.71	37066.06

RC-135S-W Cobra Ball, Combat Sent, Rivet Joint

RC-135S-W Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	928.62	444.34	48	-14.0	22	0	9740.2	0	42.21	95338.80	2.9
2021	NA	NA	NA	NA	NA	58.2	NA	S: 36,319 U: 29,932 V: 42,692 W: 51,924	NA	NA	NA

RC-135S-W Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	228.89	155.81	419.53	0.25	123.46	927.94
2012	215.45	137.42	535.43	0.14	198.61	1087.05
2013	211.04	135.61	422.67	0.21	165.04	934.57
2014	210.06	132.32	479.58	0.24	164.85	987.06
2015	225.00	112.77	479.59	0.24	153.89	971.50
2016	217.57	80.61	487.77	0.45	151.39	937.80
2017	221.43	79.60	433.83	0.61	199.17	934.63
2018	217.84	78.54	455.43	0.71	180.25	932.78
2019	231.39	87.65	438.60	0.43	321.88	1079.94
2020	231.63	68.16	444.34	1.27	183.22	928.62

RC-135S-W Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	18.85	19.10	0	19.44	0.00	0.00	362.14	419.53
2012	18.05	16.24	0	108.62	0.00	0	392.52	535.43
2013	15.33	19.06	0	6.12	0.00	0	382.15	422.67
2014	14.65	20.97	0	5.63	0.00	0	438.32	479.58
2015	13.37	15.41	0	10.17	0.00	0	440.65	479.59
2016	17.26	26.02	0	8.22	0.00	0	436.27	487.77
2017	18.51	14.99	0	1.84	0.00	0	398.49	433.83
2018	15.14	21.63	0	6.58	0.00	0	412.08	455.43
2019	15.60	22.42	0	17.13	0.00	0	383.44	438.60
2020	18.38	20.41	0	21.57	0.00	0	383.98	444.34

RC-135S-W Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	42.18	19.07	23.11
2012	49.41	24.34	25.07
2013	42.48	19.21	23.27
2014	44.87	21.80	23.07
2015	44.16	21.80	22.36
2016	42.63	22.17	20.46
2017	42.48	19.72	22.76
2018	42.40	20.70	21.70
2019	49.09	19.94	29.15
2020	42.21	20.20	22.01

RC-135S-W Fleet Size

Fiscal year	Total aircraft
2011	22
2012	22
2013	22

Fiscal year	Total aircraft
2014	22
2015	22
2016	22
2017	22
2018	22
2019	22
2020	22

RC-135S-W Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	54623.66	24695.53	29928.13
2012	69173.15	34071.40	35101.76
2013	58783.75	26585.54	32198.20
2014	65204.66	31680.92	33523.74
2015	70281.14	34695.29	35585.84
2016	69257.01	36022.45	33234.57
2017	72430.72	33620.27	38810.44
2018	83705.29	40869.38	42835.91
2019	92686.81	37642.85	55043.96
2020	95338.80	45618.80	49720.00

RC-135S-W Flying Hours

Fiscal year	Flying hours executed
2011	16987.90
2012	15714.90
2013	15898.40
2014	15137.80
2015	13823.00
2016	13540.80
2017	12903.80
2018	11143.60
2019	11651.50
2020	9740.20

Fighter Aircraft

EA-18G Growler

EA-18G Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	1068.20	358.10	34	1.2	131	0	39551	0	8.15	27008.20	2.1
2021	NA	NA	NA	NA	NA	8.4	NA	2,375	NA	NA	NA

EA-18G Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	111.71	77.09	85.37	9.47	72.30	355.94
2012	129.49	84.70	108.16	9.76	62.75	394.86
2013	170.11	101.18	186.29	9.61	74.75	541.94
2014	215.68	125.29	186.54	19.11	114.18	660.81
2015	252.77	159.43	271.28	21.53	94.92	799.93
2016	282.83	175.70	303.18	20.35	187.61	969.67
2017	282.60	171.63	371.90	25.64	220.16	1071.93
2018	286.22	173.07	310.15	39.00	129.10	937.54
2019	294.23	164.31	342.99	42.52	211.21	1055.25
2020	308.16	168.78	358.10	43.65	189.52	1068.20

EA-18G Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	13.17	32.88	2.92	19.27	17.13	85.37
2012	22.41	42.91	3.68	19.65	19.50	108.16
2013	37.11	62.09	5.91	61.17	20.03	186.29
2014	32.15	71.28	10.90	54.15	18.06	186.54
2015	48.43	79.99	17.58	101.05	24.23	271.28
2016	55.05	96.18	23.62	117.19	11.13	303.18
2017	64.97	116.53	25.57	139.99	24.84	371.90
2018	63.78	115.68	29.40	75.96	25.32	310.15
2019	70.57	123.18	35.25	89.78	24.21	342.99
2020	72.98	130.44	36.15	94.50	24.02	358.10

EA-18G Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	6.59	1.58	5.01
2012	5.41	1.48	3.93
2013	6.09	2.09	4.00
2014	6.29	1.78	4.52
2015	7.27	2.47	4.81
2016	8.43	2.64	5.80
2017	8.25	2.86	5.38
2018	6.79	2.25	4.55
2019	7.82	2.54	5.28
2020	8.15	2.73	5.42

EA-18G Fleet Size

Fiscal year	Total aircraft
2011	54
2012	73
2013	89
2014	105
2015	110

Fiscal year	Total aircraft
2016	115
2017	130
2018	138
2019	135
2020	131

EA-18G Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	21400.93	5133.11	16267.82
2012	21631.47	5925.46	15706.01
2013	25582.59	8794.07	16788.52
2014	24941.74	7040.87	17900.87
2015	23393.81	7933.57	15460.23
2016	25934.56	8108.83	17825.73
2017	27104.48	9403.86	17700.62
2018	23878.56	7899.18	15979.39
2019	26449.43	8596.89	17852.54
2020	27008.20	9054.07	17954.12

EA-18G Flying Hours

Fiscal year	Flying hours executed
2011	16632.00
2012	18254.00
2013	21184.00
2014	26494.00
2015	34194.00
2016	37389.00
2017	39548.00
2018	39263.00
2019	39897.00
2020	39551.00

EA-18G Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	47.58	0.00	1020.62	1068.20	14.12	0.00	343.98	358.10

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	27008.20	9054.07	17954.12
Active Duty	26969.06	9089.32	17879.74
Reserve	27875.86	8272.68	19603.18

F/A-18A-D Hornet

F/A-18A-D Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	1823.89	943.10	52	-11.9	305	0	35896	0	5.98	50810.42	4.7
2021	NA	NA	NA	NA	NA	28.2	NA	7,652	NA	NA	NA

F/A-18A-D Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	675.68	653.17	1440.31	49.32	446.14	3264.61
2012	621.84	644.76	1392.85	50.66	428.78	3138.89

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2013	592.21	574.43	1245.24	43.30	417.86	2873.04
2014	573.39	504.11	1107.14	61.28	424.91	2670.82
2015	529.18	441.52	1249.70	86.81	421.25	2728.46
2016	474.98	382.98	1114.64	75.06	606.83	2654.49
2017	438.83	381.30	1138.32	80.96	582.21	2621.62
2018	346.38	322.99	914.83	71.24	373.97	2029.41
2019	270.38	256.60	918.97	68.50	556.83	2071.28
2020	223.52	189.77	943.10	59.90	407.60	1823.89

F/A-18A-D Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	296.08	631.09	330.88	119.81	62.46	1440.31
2012	256.61	586.16	318.02	176.95	55.12	1392.85
2013	241.13	526.86	284.23	151.70	41.31	1245.24
2014	193.02	437.15	251.12	194.31	31.53	1107.14
2015	200.67	624.02	222.05	174.32	28.65	1249.70
2016	184.54	429.53	227.13	237.27	36.16	1114.64
2017	178.92	450.89	219.27	242.33	46.92	1138.32
2018	157.02	374.38	205.60	115.27	62.56	914.83
2019	131.69	357.83	184.65	184.57	60.22	918.97
2020	123.04	371.97	160.06	220.75	67.29	943.10

F/A-18A-D Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	5.62	2.48	3.14
2012	5.41	2.40	3.01
2013	5.02	2.18	2.85
2014	4.80	1.99	2.81
2015	5.01	2.29	2.71

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2016	4.94	2.08	2.87
2017	5.31	2.30	3.00
2018	4.61	2.08	2.53
2019	5.63	2.50	3.13
2020	5.98	3.09	2.89

F/A-18A-D Fleet Size

Fiscal year	Total aircraft
2011	581
2012	580
2013	572
2014	557
2015	545
2016	537
2017	494
2018	440
2019	368
2020	305

F/A-18A-D Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	23334.84	10295.03	13039.81
2012	24595.96	10914.19	13681.77
2013	27023.61	11712.61	15311.00
2014	28163.75	11674.72	16489.03
2015	35300.22	16168.36	19131.86
2016	41446.60	17403.69	24042.91
2017	43364.16	18828.86	24535.30
2018	34567.80	15582.64	18985.16
2019	48535.12	21533.54	27001.58
2020	50810.42	26273.13	24537.29

F/A-18A-D Flying Hours

Fiscal year	Flying hours executed
2011	139903.0
2012	127618.0
2013	106316.0
2014	94832.00
2015	77293.00
2016	64046.00
2017	60456.00
2018	58708.00
2019	42676.00
2020	35896.00

F/A-18A-D Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	257.60	0.00	1566.29	1823.89	101.02	0.00	842.08	943.10

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	50810.42	26273.13	24537.29
Active Duty	52678.51	28321.31	24357.20
Reserve	41797.94	16391.80	25406.14

F/A-18E/F Super Hornet

F/A-18E/F Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	3975.10	1819.10	46	3.8	530	0	130743	0	7.50	30403.90	7.2
2021	NA	NA	NA	NA	NA	13.5	NA	3,922	NA	NA	NA

F/A-18E/F Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	574.30	606.41	782.94	30.42	303.28	2297.35
2012	585.27	631.28	1190.93	36.68	307.20	2751.36
2013	586.61	594.16	1177.81	30.64	323.83	2713.05
2014	634.12	583.75	1100.17	56.74	369.22	2744.01
2015	663.31	613.41	1243.93	58.97	393.68	2973.31
2016	672.62	641.77	1449.17	58.93	604.04	3426.53
2017	644.76	620.92	1573.01	68.49	619.14	3526.31
2018	724.84	580.35	1494.93	77.72	434.78	3312.62
2019	807.84	539.80	1594.51	98.12	787.56	3827.84
2020	798.12	541.28	1819.10	119.75	696.84	3975.10

F/A-18E/F Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	157.14	319.89	104.49	172.84	28.58	782.94
2012	266.35	387.53	121.19	372.87	43.00	1190.93

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2013	222.31	468.70	108.85	322.49	55.46	1177.81
2014	248.00	456.61	94.77	263.61	37.19	1100.17
2015	233.39	403.17	135.29	414.72	57.36	1243.93
2016	267.06	492.02	169.01	476.28	44.79	1449.17
2017	285.74	499.03	166.13	541.01	81.10	1573.01
2018	294.79	570.57	212.97	308.97	107.63	1494.93
2019	324.55	639.08	216.45	363.02	51.41	1594.51
2020	343.10	803.05	207.75	354.46	110.75	1819.10

F/A-18E/F Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	5.92	2.02	3.90
2012	6.65	2.88	3.77
2013	6.17	2.68	3.49
2014	5.81	2.33	3.48
2015	5.97	2.50	3.47
2016	6.79	2.87	3.92
2017	7.01	3.13	3.88
2018	6.46	2.91	3.54
2019	7.33	3.05	4.28
2020	7.50	3.43	4.07

F/A-18E/F Fleet Size

Fiscal year	Total aircraft
2011	388
2012	414
2013	440
2014	472
2015	498
2016	505
2017	503
2018	513

Fiscal year	Total aircraft
2019	522
2020	530

F/A-18E/F Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	17314.08	5900.69	11413.40
2012	19295.73	8352.21	10943.52
2013	21777.04	9454.00	12323.04
2014	21849.15	8760.12	13089.03
2015	21817.21	9127.55	12689.66
2016	24689.84	10441.99	14247.85
2017	24821.81	11072.48	13749.33
2018	25290.61	11413.28	13877.33
2019	28367.80	11816.82	16550.98
2020	30403.90	13913.59	16490.31

F/A-18E/F Flying Hours

Fiscal year	Flying hours executed
2011	132687.0
2012	142589.0
2013	124583.0
2014	125589.0
2015	136283.0
2016	138783.0
2017	142065.0
2018	130982.0
2019	134936.0
2020	130743.0

F/A-18E/F Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	0	0	3975.10	3975.10	0	0	1819.10	1819.10

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	30403.90	13913.59	16490.31
Active Duty	30403.90	13913.59	16490.31

F-35A/B/C Lightning II Joint Strike Fighter

F-35A Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	1852.22	331.27	18	27.8	230.8	0	48757.3	0	8.03	37988.57	-7.5
2021	NA	NA	NA	NA	NA	3.8	NA	696	NA	NA	NA

F-35B Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	707.81	196.62	28	22.7	91	0	14119	0	7.78	50131.96	10.1
2021	NA	NA	NA	NA	NA	4.3	NA	666	NA	NA	NA

F-35C Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	437.44	78.36	18	41.2	43	0	8516	0	10.17	51366.35	6.6
2021	NA	NA	NA	NA	NA	4.3	NA	895	NA	NA	NA

F-35A Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	23.68	7.20	0.03	16.34	0.01	47.25
2012	36.74	12.32	4.95	40.10	2.96	97.07
2013	74.49	15.59	49.02	2.89	0.05	142.03
2014	84.00	31.15	71.27	58.44	0.12	245.00
2015	130.09	57.70	124.97	80.81	0.23	393.80
2016	188.69	74.12	168.40	157.05	8.33	596.58
2017	266.83	114.81	294.07	221.04	11.92	908.69

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2018	381.48	189.76	279.90	214.66	69.03	1134.84
2019	443.90	263.90	251.15	460.12	29.81	1448.87
2020	507.65	307.35	331.27	667.21	38.74	1852.22

F-35A Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	0.01	0.00	0.02	0.00	0.00	0	0	0.03
2012	4.86	0.00	0.09	0.00	0.00	0	0	4.95
2013	48.80	0.00	0.22	0.00	0.00	0	0	49.02
2014	70.81	0.00	0.46	0.00	0.00	0	0	71.27
2015	124.26	0.00	0.72	0.00	0.00	0	0	124.97
2016	167.52	0.00	0.88	0.00	0.00	0	0	168.40
2017	292.56	0.00	1.51	0.00	0.00	0	0	294.07
2018	278.58	0.00	1.32	0.00	0.00	0	0	279.90
2019	242.85	0.00	8.30	0.00	0.00	0	0	251.15
2020	321.77	0.00	9.50	0.00	0.00	0	0	331.27

F-35B Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	0.00	0.00	0.00	0.00	0.00	0.00
2012	0.41	0.00	80.13	0.00	0.00	80.54
2013	14.57	18.43	77.59	0.24	0.00	110.83
2014	34.34	21.89	69.06	36.03	0.03	161.35
2015	48.51	31.21	82.97	46.00	0.03	208.72
2016	74.80	41.36	110.67	78.79	4.01	309.64
2017	87.08	49.64	139.75	98.32	9.22	384.01
2018	103.77	53.24	130.00	205.19	35.35	527.55

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2019	110.44	67.52	157.33	201.01	40.59	576.89
2020	106.30	75.20	196.62	286.19	43.50	707.81

F-35B Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	0.00	0.00	0.00	0.00	0.00	0.00
2012	80.13	0.00	0.00	0.00	0.00	80.13
2013	34.78	0.16	42.65	0.00	0.00	77.59
2014	68.87	0.19	0.00	0.00	0.00	69.06
2015	82.80	0.18	0.00	0.00	0.00	82.97
2016	110.53	0.14	0.00	0.00	0.00	110.67
2017	139.60	0.14	0.00	0.00	0.00	139.75
2018	122.35	0.14	7.51	0.00	0.00	130.00
2019	140.88	0.21	16.25	0.00	0.00	157.33
2020	189.66	0.08	6.88	0.00	0.00	196.62

F-35C Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	0.00	0.00	0.00	0.00	0.00	0.00
2012	0.00	0.00	0.00	0.00	0.00	0.00
2013	8.35	0.20	6.78	0.02	0.00	15.35
2014	14.25	2.93	18.80	9.27	0.00	45.26
2015	20.27	7.40	34.79	19.91	0.01	82.38
2016	29.60	12.41	32.03	46.16	4.00	124.20
2017	47.41	16.44	52.05	62.41	5.89	184.20
2018	50.72	20.36	59.32	127.87	52.28	310.55
2019	56.05	27.88	59.05	126.38	40.41	309.78
2020	84.36	37.62	78.36	185.45	51.65	437.44

F-35C Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	0.00	0.00	0.00	0.00	0.00	0.00
2012	0.00	0.00	0.00	0.00	0.00	0.00
2013	3.07	0.00	3.71	0.00	0.00	6.78
2014	18.80	0.00	0.00	0.00	0.00	18.80
2015	34.79	0.00	0.00	0.00	0.00	34.79
2016	32.03	0.00	0.00	0.00	0.00	32.03
2017	51.64	0.42	0.00	0.00	0.00	52.05
2018	50.92	0.02	8.38	0.00	0.00	59.32
2019	48.56	0.41	10.08	0.00	0.00	59.05
2020	76.07	0.82	1.48	0.00	0.00	78.36

F-35A Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	26.25	0.02	26.23
2012	11.03	0.56	10.47
2013	7.85	2.71	5.14
2014	6.46	1.88	4.58
2015	6.48	2.06	4.42
2016	6.83	1.93	4.90
2017	8.52	2.76	5.76
2018	8.44	2.08	6.36
2019	7.85	1.36	6.49
2020	8.03	1.44	6.59

F-35A Fleet Size

Fiscal year	Total aircraft
2011	2
2012	9
2013	18
2014	38
2015	61

Fiscal year	Total aircraft
2016	87
2017	107
2018	134
2019	185
2020	231

F-35B Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	0	0	0
2012	8.05	8.01	0.04
2013	4.82	3.37	1.45
2014	5.76	2.47	3.30
2015	5.64	2.24	3.40
2016	7.20	2.57	4.63
2017	7.53	2.74	4.79
2018	9.10	2.24	6.85
2019	7.69	2.10	5.59
2020	7.78	2.16	5.62

F-35B Fleet Size

Fiscal year	Total aircraft
2011	-
2012	10
2013	23
2014	28
2015	37
2016	43
2017	51
2018	58
2019	75
2020	91

F-35C Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	0	0	0
2012	0	0	0
2013	7.68	3.39	4.29
2014	5.03	2.09	2.94
2015	4.85	2.05	2.80
2016	5.17	1.33	3.84
2017	6.82	1.93	4.89
2018	11.09	2.12	8.97
2019	9.68	1.85	7.84
2020	10.17	1.82	8.35

F-35C Fleet Size

Fiscal year	Total aircraft
2011	-
2012	-
2013	2
2014	9
2015	17
2016	24
2017	27
2018	28
2019	32
2020	43

F-35A Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	6848397.02	4935.20	6843461.82
2012	445061.10	22684.09	422377.01
2013	85342.07	29451.76	55890.31
2014	65128.02	18946.52	46181.50
2015	44575.80	14146.38	30429.42
2016	40751.42	11503.30	29248.12
2017	48576.71	15720.49	32856.22

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2018	43664.76	10769.79	32894.97
2019	41081.81	7121.13	33960.68
2020	37988.57	6794.25	31194.32

F-35A Flying Hours

Fiscal year	Flying hours executed
2011	6.90
2012	218.10
2013	1664.30
2014	3761.80
2015	8834.30
2016	14639.50
2017	18706.20
2018	25989.80
2019	35268.00
2020	48757.30

F-35B Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	NA	NA	NA
2012	NA	NA	NA
2013	64325.58	45032.97	19292.61
2014	43929.41	18801.79	25127.62
2015	39470.14	15690.59	23779.55
2016	42116.45	15053.14	27063.31
2017	48918.11	17802.13	31115.99
2018	54051.77	13319.23	40732.54
2019	45517.71	12413.83	33103.88
2020	50131.96	13925.99	36205.98

F-35B Flying Hours

Fiscal year	Flying hours executed
2011	0.00
2012	0.00
2013	1723.00

Fiscal year	Flying hours executed
2014	3673.00
2015	5288.00
2016	7352.00
2017	7850.00
2018	9760.00
2019	12674.00
2020	14119.00

F-35C Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	NA	NA	NA
2012	NA	NA	NA
2013	767659.80	339106.55	428553.25
2014	67449.45	28016.97	39432.49
2015	43291.40	18280.09	25011.32
2016	43548.33	11229.39	32318.93
2017	47610.27	13453.45	34156.81
2018	60558.72	11567.19	48991.52
2019	48206.69	9189.30	39017.39
2020	51366.35	9201.92	42164.43

F-35C Flying Hours

Fiscal year	Flying hours executed
2011	0.00
2012	0.00
2013	20.00
2014	671.00
2015	1903.00
2016	2852.00
2017	3869.00
2018	5128.00
2019	6426.00
2020	8516.00

F-35A Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	42.89	132.59	1676.74	1852.22	0.00	33.53	297.71	331.27

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	37988.57	6794.25	31194.32
Active Duty	35849.15	6365.09	29484.07
National Guard	66795.65	16889.84	49905.81
Reserve	NA	NA	NA

AV-8B Harrier II

AV-8B Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	560.22	310.58	55	-6.2	77	0	14354	0	7.28	39028.98	32.8
2021	NA	NA	NA	NA	NA	24.5	NA	4,934	NA	NA	NA

AV-8B Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	150.88	129.44	408.23	36.81	150.85	876.21

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2012	153.43	133.85	473.69	34.67	128.09	923.72
2013	131.70	94.83	460.43	30.72	105.97	823.65
2014	132.05	86.78	366.39	31.21	129.37	745.81
2015	124.63	87.17	386.51	32.50	84.45	715.26
2016	103.59	94.05	368.57	37.09	103.78	707.07
2017	107.58	74.47	312.16	46.17	104.18	644.55
2018	95.93	72.52	315.22	41.11	56.44	581.22
2019	98.18	69.89	317.01	46.30	66.15	597.53
2020	90.42	56.39	310.58	48.38	54.45	560.22

AV-8B Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	67.25	153.24	101.00	74.27	12.48	408.23
2012	70.35	147.88	108.84	131.92	14.70	473.69
2013	67.34	188.77	106.00	85.18	13.13	460.43
2014	58.19	115.89	105.99	79.54	6.78	366.39
2015	61.24	120.10	98.51	98.34	8.32	386.51
2016	56.43	111.65	104.74	87.18	8.57	368.57
2017	51.90	117.46	91.89	44.72	6.20	312.16
2018	53.93	121.27	88.38	45.61	6.03	315.22
2019	55.65	121.63	83.46	49.38	6.90	317.01
2020	56.63	127.63	78.21	40.52	7.58	310.58

AV-8B Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	7.36	3.43	3.93
2012	8.40	4.31	4.09
2013	7.29	4.07	3.21
2014	6.72	3.30	3.42

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2015	6.56	3.55	3.02
2016	6.61	3.44	3.16
2017	6.20	3.00	3.20
2018	6.05	3.28	2.77
2019	7.20	3.82	3.38
2020	7.28	4.03	3.24

AV-8B Fleet Size

Fiscal year	Total aircraft
2011	119
2012	110
2013	113
2014	111
2015	109
2016	107
2017	104
2018	96
2019	83
2020	77

AV-8B Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	30023.61	13988.31	16035.31
2012	29552.52	15154.60	14397.92
2013	30930.38	17290.43	13639.96
2014	34233.68	16817.73	17415.95
2015	31577.63	17063.67	14513.97
2016	31646.28	16495.79	15150.49
2017	32734.93	15853.65	16881.28
2018	33896.11	18383.64	15512.48
2019	29388.78	15591.85	13796.93
2020	39028.98	21636.84	17392.14

AV-8B Flying Hours

Fiscal year	Flying hours executed
2011	29184.00
2012	31257.00
2013	26629.00
2014	21786.00
2015	22651.00
2016	22343.00
2017	19690.00
2018	17147.00
2019	20332.00
2020	14354.00

A-10 Thunderbolt II

A-10 Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	1699.84	503.32	30	-1.2	280.9	0	75443.4	0	6.05	22531.32	4.5
2021	NA	NA	NA	NA	NA	40.4	NA	12,213	NA	NA	NA

A-10 Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	818.81	394.77	641.16	52.28	249.94	2156.96
2012	832.41	438.18	566.42	40.63	45.21	1922.85
2013	792.13	439.52	422.16	32.59	270.69	1957.10
2014	756.59	390.16	429.29	35.86	14.76	1626.66

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2015	715.18	359.90	404.89	27.37	31.37	1538.71
2016	661.35	293.97	457.42	36.07	47.56	1496.37
2017	670.83	349.73	528.99	39.88	114.71	1704.14
2018	681.24	315.55	511.02	46.26	151.59	1705.67
2019	682.41	339.46	476.62	47.49	173.94	1719.91
2020	699.97	308.91	503.32	47.31	140.33	1699.84

A-10 Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	137.82	368.22	0	119.48	0.02	0.00	15.61	641.16
2012	117.10	313.97	0	110.37	0.00	0	24.97	566.42
2013	91.20	220.29	0	88.48	1.44	0	20.74	422.16
2014	87.22	174.64	0	132.63	0.44	0.32	34.05	429.29
2015	99.55	189.48	0	98.24	0.04	0	17.58	404.89
2016	118.79	179.51	0	129.28	0.06	0	29.77	457.42
2017	132.73	185.44	0	181.54	0.04	0	29.24	528.99
2018	133.69	154.84	0	207.82	0.00	0	14.67	511.02
2019	113.31	168.44	0	172.12	0.11	0	22.64	476.62
2020	117.79	165.69	0	206.41	0.00	0.00	13.43	503.32

A-10 Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	6.24	1.85	4.38
2012	5.57	1.64	3.93
2013	5.88	1.27	4.62
2014	5.58	1.47	4.11
2015	5.42	1.43	4.00
2016	5.29	1.62	3.67

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2017	6.02	1.87	4.15
2018	6.05	1.81	4.24
2019	6.12	1.70	4.42
2020	6.05	1.79	4.26

A-10 Fleet Size

Fiscal year	Total aircraft
2011	346
2012	345
2013	333
2014	291
2015	284
2016	283
2017	283
2018	282
2019	281
2020	281

A-10 Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	20768.51	6173.45	14595.07
2012	18996.15	5595.75	13400.40
2013	20784.81	4483.40	16301.41
2014	19480.45	5141.11	14339.34
2015	17661.46	4647.31	13014.15
2016	18376.87	5617.57	12759.30
2017	20249.36	6285.67	13963.69
2018	21861.32	6549.73	15311.59
2019	21551.33	5972.22	15579.10
2020	22531.32	6671.50	15859.82

A-10 Flying Hours

Fiscal year	Flying hours executed
2011	103857.2

Fiscal year	Flying hours executed
2012	101222.9
2013	94160.00
2014	83502.30
2015	87122.70
2016	81426.70
2017	84157.50
2018	78022.20
2019	79805.30
2020	75443.40

A-10 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	194.50	291.30	1214.04	1699.84	71.98	116.50	314.84	503.32

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	22531.32	6671.50	15859.82
Active Duty	28452.74	7378.80	21073.94
National Guard	13848.44	5538.52	8309.92
Reserve	16567.32	6130.83	10436.49

F-15C/D Eagle

F-15C/D Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	1455.37	706.13	49	-6.2	233.71	0	37637.4	0	6.23	38668.19	4.2
2021	NA	NA	NA	NA	NA	37.2	NA	8,699	NA	NA	NA

F-15C/D Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	527.52	340.41	759.91	17.43	210.82	1856.09
2012	548.63	342.14	807.52	17.93	172.34	1888.56
2013	523.39	331.60	698.25	14.66	145.68	1713.57
2014	505.75	323.37	754.49	27.78	212.83	1824.22
2015	481.33	296.45	843.98	27.97	367.51	2017.24
2016	465.83	191.09	665.00	24.96	269.17	1616.05
2017	461.16	187.63	654.76	36.71	13.85	1354.10
2018	456.75	194.26	594.40	25.73	169.39	1440.52
2019	451.50	226.21	615.27	58.04	200.87	1551.90
2020	462.27	195.38	706.13	34.67	56.92	1455.37

F-15C/D Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	85.24	374.03	0	221.85	0.00	0	78.79	759.91
2012	81.95	372.56	0	277.03	0.00	0	75.97	807.52
2013	75.02	303.59	0	248.57	0.00	0	71.07	698.25
2014	73.07	335.44	0	273.81	0.00	0	72.17	754.49
2015	83.89	376.65	0	295.27	0.00	0	88.17	843.98
2016	80.07	336.42	0	162.58	0.07	0	85.85	665.00
2017	76.71	315.43	0	165.13	0.02	0	97.47	654.76
2018	83.63	247.96	0	144.82	0.00	0	117.99	594.40
2019	90.32	329.03	0	57.71	0.00	0	138.21	615.27
2020	90.69	284.57	0	209.64	0.00	0	121.23	706.13

F-15C/D Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	7.42	3.04	4.38
2012	7.58	3.24	4.34
2013	6.89	2.81	4.08
2014	7.36	3.04	4.31
2015	8.21	3.43	4.77
2016	6.60	2.72	3.89
2017	5.74	2.78	2.96
2018	6.13	2.53	3.60
2019	6.63	2.63	4.00
2020	6.23	3.02	3.21

F-15C/D Fleet Size

Fiscal year	Total aircraft
2011	250
2012	249
2013	249

Fiscal year	Total aircraft
2014	248
2015	246
2016	245
2017	236
2018	235
2019	234
2020	234

F-15C/D Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	45108.89	18468.35	26640.54
2012	44727.68	19124.85	25602.84
2013	43969.70	17916.83	26052.86
2014	44760.40	18512.84	26247.56
2015	49371.48	20656.25	28715.23
2016	40951.23	16851.26	24099.97
2017	34069.81	16473.97	17595.84
2018	36799.18	15184.26	21614.93
2019	37104.48	14710.67	22393.81
2020	38668.19	18761.51	19906.68

F-15C/D Flying Hours

Fiscal year	Flying hours executed
2011	41146.80
2012	42223.60
2013	38971.70
2014	40755.20
2015	40858.40
2016	39462.70
2017	39744.90
2018	39145.50
2019	41825.00
2020	37637.40

F-15C/D Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	18.66	621.23	815.48	1455.37	0.11	262.52	443.51	706.13

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	38668.19	18761.51	19906.68
Active Duty	44216.50	24047.82	20168.68
National Guard	33559.18	14181.22	19377.96
Reserve	27318.99	156.62	27162.36

F-15E Strike Eagle

F-15E Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	1996.26	720.98	36	0.6	218	0	60169.2	0	9.16	33177.43	7.6
2021	NA	NA	NA	NA	NA	29.5	NA	8,344	NA	NA	NA

F-15E Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	609.33	534.37	875.69	22.07	144.15	2185.61
2012	605.46	479.89	840.03	28.58	88.59	2042.56
2013	564.00	393.85	600.49	30.53	63.30	1652.17
2014	558.25	463.11	746.94	26.38	163.14	1957.82
2015	542.23	531.15	808.26	21.81	184.91	2088.37
2016	529.88	358.80	674.66	25.85	357.05	1946.23
2017	534.50	348.69	756.35	33.25	149.37	1822.15
2018	559.79	369.75	712.20	34.39	290.53	1966.65
2019	581.85	416.62	657.09	31.06	297.96	1984.59
2020	597.99	361.44	720.98	33.00	282.84	1996.26

F-15E Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	120.95	584.55	0	160.63	0.00	0	9.57	875.69
2012	102.76	545.74	0	173.76	0.00	0	17.76	840.03
2013	75.33	369.65	0	146.62	0.00	0	8.90	600.49
2014	83.53	477.47	0	172.90	0.00	0	13.04	746.94
2015	96.16	530.57	0	167.69	0.06	0	13.78	808.26
2016	99.43	430.15	0	131.52	0.08	0	13.49	674.66
2017	98.77	503.53	0	146.74	0.05	0	7.26	756.35
2018	111.81	433.54	0	156.21	0.00	0	10.64	712.20
2019	105.82	387.28	0	155.97	0.00	0	8.03	657.09
2020	123.85	404.52	0	182.45	0.00	0	10.17	720.98

F-15E Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	9.90	3.97	5.94
2012	9.33	3.84	5.49
2013	7.58	2.75	4.82
2014	8.98	3.43	5.55
2015	9.58	3.71	5.87
2016	8.93	3.09	5.83
2017	8.36	3.47	4.89
2018	9.02	3.27	5.75
2019	9.10	3.01	6.09
2020	9.16	3.31	5.85

F-15E Fleet Size

Fiscal year	Total aircraft
2011	221
2012	219
2013	218
2014	218
2015	218
2016	218
2017	218
2018	218
2019	218
2020	218

F-15E Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	33713.07	13507.54	20205.52
2012	38576.54	15865.08	22711.47
2013	41449.93	15065.24	26384.69
2014	38477.90	14680.06	23797.84
2015	31444.88	12170.13	19274.75
2016	30506.52	10575.09	19931.42
2017	27698.17	11497.07	16201.10

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2018	31906.98	11554.68	20352.30
2019	30829.52	10207.58	20621.94
2020	33177.43	11982.62	21194.81

F-15E Flying Hours

Fiscal year	flying hours executed
2011	64829.90
2012	52948.20
2013	39859.40
2014	50881.60
2015	66413.60
2016	63797.20
2017	65786.10
2018	61637.10
2019	64372.90
2020	60169.20

F-15E Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	8.67	0.00	1987.59	1996.26	0.06	0.00	720.93	720.98

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	33177.43	11982.62	21194.81
Active Duty	33462.63	12137.42	21325.21
Reserve	11234.17	72.50	11161.67

F-16 Fighting Falcon

F-16 Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	4311.51	1431.69	33	-2.4	936.19	0	160116.3	0	4.61	26927.34	16.3
2021	NA	NA	NA	NA	NA	31	NA	C: 7,357 D: 6,604	NA	NA	NA

F-16 Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	2141.69	1136.54	1444.38	61.73	296.70	5081.04
2012	2015.21	1049.39	1298.26	57.80	195.92	4616.58
2013	1935.87	1023.84	1166.91	56.84	259.24	4442.70
2014	1871.26	1004.02	1372.04	64.53	132.96	4444.81
2015	1816.95	1009.50	1394.71	65.32	146.64	4433.12
2016	1775.27	749.43	1269.00	66.33	215.66	4075.68
2017	1705.23	661.24	1291.24	65.65	479.02	4202.39
2018	1712.10	736.79	1295.48	76.41	511.00	4331.79
2019	1802.04	840.78	1361.18	65.37	347.23	4416.59
2020	1787.63	698.51	1431.69	74.84	318.85	4311.51

F-16 Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	304.13	885.11	0	202.04	0.12	3.08	49.89	1444.38
2012	294.45	831.95	0	108.02	0.11	0.04	63.69	1298.26
2013	248.50	749.48	0	75.45	1.07	1.83	90.57	1166.91
2014	298.08	890.65	0	92.78	0.71	0.13	89.68	1372.04
2015	315.92	869.10	0	91.68	0.28	0.21	117.53	1394.71
2016	327.72	750.89	0	88.71	0.26	0.40	101.03	1269.00
2017	336.48	762.59	0	86.02	0.22	0	105.93	1291.24
2018	366.48	722.66	0	99.36	0.12	0.50	106.37	1295.48
2019	367.80	766.69	0	140.76	0.00	0.67	85.25	1361.18
2020	384.78	821.61	0	122.62	0.00	2.53	100.15	1431.69

F-16 Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	4.99	1.42	3.57
2012	4.55	1.28	3.27
2013	4.41	1.16	3.25
2014	4.58	1.41	3.16
2015	4.61	1.45	3.16
2016	4.28	1.33	2.95
2017	4.45	1.37	3.08
2018	4.61	1.38	3.23
2019	4.71	1.45	3.26
2020	4.61	1.53	3.08

F-16 Fleet Size

Fiscal year	Total aircraft
2011	1019
2012	1016
2013	1008

Fiscal year	Total aircraft
2014	971
2015	963
2016	951
2017	944
2018	940
2019	937
2020	936

F-16 Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	21897.61	6224.80	15672.82
2012	22311.07	6274.25	16036.83
2013	23489.57	6169.73	17319.84
2014	22783.36	7032.82	15750.53
2015	21071.09	6629.20	14441.88
2016	19730.90	6143.39	13587.51
2017	22257.08	6838.80	15418.29
2018	21937.70	6560.79	15376.91
2019	23159.68	7137.72	16021.96
2020	26927.34	8941.54	17985.80

F-16 Flying Hours

Fiscal year	flying hours executed
2011	232036.1
2012	206918.9
2013	189135.2
2014	195090.4
2015	210388.7
2016	206563.3
2017	188811.3
2018	197458.5
2019	190701.8
2020	160116.3

F-16 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	240.32	1212.27	2858.92	4311.51	93.90	453.26	884.52	1431.69

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	26927.34	8941.54	17985.80
Active Duty	27387.94	8473.56	18914.38
National Guard	26392.09	9867.96	16524.13
Reserve	24529.23	9584.30	14944.93

F-22 Raptor

F-22 Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	2334.52	1608.16	69	-14.9	186	0	27360.3	0	12.55	85325.08	-13.4
2021	NA	NA	NA	NA	NA	14	NA	2,201	NA	NA	NA

F-22 Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	566.91	190.98	1064.38	1.55	466.13	2289.95

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2012	527.22	279.16	924.30	1.04	260.95	1992.67
2013	480.08	280.32	969.03	1.01	274.68	2005.12
2014	480.25	267.16	954.14	8.41	233.67	1943.63
2015	477.72	264.71	1270.62	8.74	197.37	2219.16
2016	464.92	174.39	1321.45	1.80	189.82	2152.38
2017	455.16	176.28	1585.70	32.15	218.24	2467.52
2018	455.34	204.37	1640.11	28.69	237.96	2566.47
2019	435.78	229.60	1902.64	2.07	172.71	2742.80
2020	453.97	185.34	1608.16	2.52	84.54	2334.52

F-22 Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	29.70	1.05	0	2.78	0.00	0	1030.85	1064.38
2012	26.12	3.94	0	2.81	0.00	0	891.44	924.30
2013	25.41	1.15	0	2.26	0.00	0	940.21	969.03
2014	26.21	3.21	0	2.28	0.00	0.49	921.95	954.14
2015	24.32	1.83	0	1.88	0.00	0.65	1241.94	1270.62
2016	25.99	1.49	0	28.11	0.07	0	1265.79	1321.45
2017	31.67	2.12	0	2.00	0.04	0	1549.87	1585.70
2018	36.09	1.44	0	1.58	0.00	0	1601.00	1640.11
2019	36.22	25.17	0	1.45	0.00	0	1839.80	1902.64
2020	31.41	1.46	0	12.66	0.00	0	1562.64	1608.16

F-22 Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	14.02	6.51	7.50
2012	11.17	5.18	5.99
2013	10.98	5.31	5.68

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2014	10.67	5.24	5.43
2015	12.14	6.95	5.19
2016	11.81	7.25	4.56
2017	13.55	8.71	4.84
2018	14.09	9.00	5.09
2019	14.75	10.23	4.52
2020	12.55	8.65	3.91

F-22 Fleet Size

Fiscal year	Total aircraft
2011	163
2012	178
2013	183
2014	182
2015	183
2016	182
2017	182
2018	182
2019	186
2020	186

F-22 Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	148772.61	69150.41	79622.20
2012	75380.11	34965.16	40414.95
2013	76817.84	37124.35	39693.50
2014	64415.71	31622.02	32793.69
2015	68629.04	39294.85	29334.19
2016	69841.11	42878.63	26962.48
2017	73131.11	46996.21	26134.90
2018	66735.15	42647.17	24087.98
2019	98564.82	68372.96	30191.86
2020	85325.08	58777.15	26547.93

F-22 Flying Hours

Fiscal year	flying hours executed
2011	15392.30
2012	26434.90
2013	26102.30
2014	30173.30
2015	32335.60
2016	30818.30
2017	33741.00
2018	38457.60
2019	27827.40
2020	27360.30

F-22 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	42.94	226.57	2065.01	2334.52	0.29	139.08	1468.79	1608.16

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	85325.08	58777.15	26547.93
Active Duty	95400.51	67855.89	27544.62
National Guard	61899.34	37997.06	23902.27
Reserve	20901.89	141.95	20759.94

Rotary Aircraft

AH-64D/E Apache

AH-64D/E Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	588.15	357.99	61	-11.9	648	0	113734	0	0.91	5171.29	5.6
2021	NA	NA	NA	NA	NA	D: 12.7 E: 4.1	NA	D: 3,673 E: 359	NA	NA	NA

AH-64D/E Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	136.20	134.68	852.14	0.00	0	1123.02
2012	128.11	314.34	650.01	0.00	0	1092.46
2013	132.72	290.47	482.90	0.00	0	906.09
2014	142.79	240.13	598.76	3.24	0	984.92
2015	127.91	157.03	535.99	3.24	0	824.17
2016	130.93	146.94	560.29	3.14	0	841.31
2017	152.53	145.14	519.02	3.72	0	820.41
2018	199.43	266.88	444.94	0.00	0	911.26
2019	143.14	143.58	367.66	13.23	0	667.61
2020	117.51	101.36	357.99	11.29	0	588.15

AH-64D/E Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	121.54	632.73	0	1.17	96.70	852.14
2012	88.18	455.82	0	0.00	106.01	650.01
2013	64.83	366.93	0	0.55	50.59	482.90
2014	113.28	413.75	0	0.00	71.73	598.76
2015	89.11	353.47	0	0.09	93.33	535.99
2016	106.11	408.56	0	0.06	45.56	560.29
2017	107.75	375.68	0	0.12	35.47	519.02
2018	112.92	331.92	0	0.11	0.00	444.94
2019	80.63	287.00	0	0.03	0.00	367.66
2020	64.93	290.11	0	2.95	0.00	357.99

AH-64D/E Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	1.83	1.39	0.44
2012	1.72	1.02	0.70
2013	1.40	0.74	0.65
2014	1.63	0.99	0.64
2015	1.46	0.95	0.51
2016	1.67	1.11	0.56
2017	1.51	0.95	0.55
2018	1.41	0.69	0.72
2019	1.04	0.57	0.47
2020	0.91	0.55	0.36

AH-64D/E Fleet Size

Fiscal year	Total aircraft
2011	612
2012	635
2013	649
2014	606
2015	565

Fiscal year	Total aircraft
2016	504
2017	545
2018	647
2019	643
2020	648

AH-64D/E Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	6162.37	4675.96	1486.41
2012	6352.54	3779.75	2572.78
2013	5348.49	2850.47	2498.03
2014	6266.09	3809.33	2456.76
2015	6729.65	4376.56	2353.09
2016	6686.42	4453.04	2233.38
2017	6044.85	3824.20	2220.65
2018	6536.10	3191.41	3344.69
2019	4899.31	2698.12	2201.19
2020	5171.29	3147.60	2023.69

AH-64D/E Flying Hours

Fiscal year	flying hours executed
2011	182238.0
2012	171972.0
2013	169411.0
2014	157183.0
2015	122469.0
2016	125823.0
2017	135721.0
2018	139419.0
2019	136266.0
2020	113734.0

AH-64D/E Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	0.00	50.50	523.41	588.15	0.00	37.64	317.39	357.99

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	5171.29	3147.60	2023.69
Active Duty	5099.96	3092.60	2007.36
National Guard	4547.74	3390.14	1157.60

CH-47F Chinook

CH-47F Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	227.87	123.02	54	-11.5	417	0	58125	0	0.55	3920.31	1.0
2021	NA	NA	NA	NA	NA	8.7	NA	1,390	NA	NA	NA

CH-47F Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	127.68	83.53	438.09	0.00	0	649.31
2012	132.81	90.91	346.07	0.00	0	569.79
2013	150.41	80.77	246.80	0.00	0	477.99
2014	157.31	84.90	261.00	4.60	0	507.81
2015	149.84	85.87	238.27	10.30	0	484.29
2016	137.51	85.96	168.48	2.21	0	394.16

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2017	135.14	82.79	186.51	3.12	0	407.55
2018	82.82	59.55	191.09	0.00	0	333.46
2019	51.84	59.62	144.49	1.51	0	257.47
2020	52.24	50.40	123.02	2.21	0	227.87

CH-47F Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	112.20	252.91	0	0.00	72.99	438.09
2012	90.20	199.02	0	0.00	56.85	346.07
2013	65.02	133.74	0	0.55	47.49	246.80
2014	65.02	153.66	0	0.00	42.33	261.00
2015	56.54	131.17	0	0.28	50.28	238.27
2016	45.70	106.17	0	0.25	16.36	168.48
2017	45.60	122.06	0	0.00	18.85	186.51
2018	60.87	130.22	0	0.00	0.00	191.09
2019	41.45	103.04	0	0.00	0.00	144.49
2020	31.09	91.93	0	0.00	0.00	123.02

CH-47F Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	1.72	1.16	0.56
2012	1.46	0.89	0.57
2013	1.20	0.62	0.58
2014	1.28	0.66	0.62
2015	1.27	0.63	0.65
2016	1.07	0.46	0.61
2017	1.25	0.57	0.68
2018	0.86	0.50	0.37
2019	0.62	0.35	0.27

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2020	0.55	0.30	0.25

CH-47F Fleet Size

Fiscal year	Total aircraft
2011	377
2012	391
2013	400
2014	397
2015	381
2016	369
2017	327
2018	386
2019	413
2020	417

CH-47F Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	7612.56	5136.29	2476.27
2012	7922.46	4811.85	3110.62
2013	7685.46	3968.25	3717.21
2014	8452.15	4344.19	4107.96
2015	8062.90	3966.95	4095.95
2016	6237.00	2665.99	3571.01
2017	6237.98	2854.65	3383.34
2018	5384.08	3085.37	2298.71
2019	3879.86	2177.37	1702.48
2020	3920.31	2116.53	1803.78

CH-47F Flying Hours

Fiscal year	flying hours executed
2011	85294.00
2012	71921.00
2013	62194.00
2014	60081.00

Fiscal year	flying hours executed
2015	60064.00
2016	63197.00
2017	65334.00
2018	61935.00
2019	66361.00
2020	58125.00

CH-47F Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	11.03	83.53	131.10	227.87	6.43	52.44	64.15	123.02

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	3920.31	2116.53	1803.78
Active Duty	3539.41	1731.86	1807.55
National Guard	4522.10	2839.09	1683.01
Reserve	4220.38	2460.50	1759.88

UH/HH-60 Black Hawk

UH/HH-60 Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	848.14	445.77	53	-11.2	1968	0	272179	0	0.43	3116.10	7.6

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2021	NA	NA	NA	NA	NA	16.1	NA	149	NA	NA	NA

UH/HH-60 Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	414.98	127.71	1298.72	0.00	1.33	1842.73
2012	446.90	147.07	1164.44	0.00	0	1758.42
2013	426.16	136.94	855.81	0.00	0	1418.91
2014	463.45	135.85	1007.97	1.44	0	1608.71
2015	471.39	138.90	820.09	1.71	0	1432.09
2016	437.28	145.61	874.78	1.78	0	1459.45
2017	468.76	140.42	694.65	3.35	0.00	1307.20
2018	455.35	114.59	490.15	0.00	0	1060.09
2019	318.90	101.37	522.58	11.83	0.10	954.78
2020	309.66	82.03	445.77	10.12	0.56	848.14

UH/HH-60 Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	159.54	677.47	207.26	1.04	253.41	1298.72
2012	132.77	601.60	207.07	0.00	223.01	1164.44
2013	110.51	448.25	187.61	0.00	109.45	855.81
2014	150.03	523.36	179.44	0.00	155.12	1007.97
2015	111.87	391.51	179.83	0.98	135.91	820.09
2016	113.24	420.98	280.64	0.18	59.74	874.78

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2017	114.85	366.31	172.90	0.00	40.61	694.65
2018	116.49	373.66	0	0.00	0.00	490.15
2019	105.82	311.86	0	104.89	0.00	522.58
2020	90.56	264.13	0	91.07	0.00	445.77

UH/HH-60 Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	1.07	0.75	0.32
2012	0.99	0.66	0.34
2013	0.77	0.47	0.31
2014	0.87	0.55	0.33
2015	0.79	0.45	0.34
2016	0.81	0.48	0.32
2017	0.70	0.37	0.33
2018	0.55	0.25	0.30
2019	0.49	0.27	0.22
2020	0.43	0.23	0.20

UH/HH-60 Fleet Size

Fiscal year	Total aircraft
2011	1722
2012	1769
2013	1836
2014	1839
2015	1812
2016	1811
2017	1867
2018	1923
2019	1967
2020	1968

UH/HH-60 Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	5166.12	3640.96	1525.16
2012	5270.33	3490.06	1780.27
2013	4577.08	2760.65	1816.43
2014	5324.64	3336.27	1988.37
2015	4710.70	2697.61	2013.10
2016	4750.38	2847.33	1903.05
2017	4047.41	2150.82	1896.59
2018	3213.20	1485.68	1727.52
2019	2895.70	1584.89	1310.80
2020	3116.10	1637.76	1478.33

UH/HH-60 Flying Hours

Fiscal year	flying hours executed
2011	356696.0
2012	333646.0
2013	310004.0
2014	302125.0
2015	304008.0
2016	307228.0
2017	322972.0
2018	329916.0
2019	329723.0
2020	272179.0

UH/HH-60 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	36.73	211.56	498.66	848.14	26.33	139.17	189.20	445.77

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	3116.10	1637.76	1478.33
Active Duty	3276.02	1242.99	2033.03
National Guard	1977.79	1301.04	676.75
Reserve	2826.09	2025.42	800.67

MH-53E Sea Dragon

MH-53E Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	346.59	164.92	48	-6.4	28	0	7141	0	12.38	48535.12	4.2
2021	NA	NA	NA	NA	NA	29.6	NA	6,255	NA	NA	NA

MH-53E Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	120.72	26.41	130.79	4.74	19.52	302.17
2012	116.30	30.33	128.70	5.90	26.35	307.57
2013	106.07	25.48	128.05	5.10	11.17	275.87
2014	109.17	21.63	103.67	6.87	8.98	250.33
2015	111.10	21.53	112.38	8.37	9.35	262.74
2016	118.00	25.39	146.91	7.86	9.76	307.91
2017	128.75	26.46	151.32	8.67	14.20	329.41
2018	129.48	27.87	151.01	8.48	9.71	326.55
2019	135.78	27.69	185.29	9.32	12.40	370.48
2020	133.46	23.63	164.92	8.89	15.69	346.59

MH-53E Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	49.23	52.54	6.08	22.17	0.77	130.79
2012	28.20	62.65	0.55	37.24	0.07	128.70
2013	33.06	67.49	0.44	24.17	2.89	128.05
2014	31.84	42.38	9.37	17.91	2.17	103.67
2015	22.03	46.89	10.23	26.78	6.46	112.38
2016	27.76	73.36	12.35	24.31	9.14	146.91
2017	33.34	75.16	13.84	22.30	6.68	151.32
2018	35.37	72.94	12.77	25.27	4.66	151.01
2019	39.09	98.19	11.21	33.41	3.40	185.29
2020	27.31	81.57	13.00	42.98	0.06	164.92

MH-53E Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	10.07	4.36	5.71
2012	11.39	4.77	6.63
2013	9.51	4.42	5.10
2014	9.27	3.84	5.43
2015	9.73	4.16	5.57
2016	10.26	4.90	5.37
2017	11.36	5.22	6.14
2018	12.09	5.59	6.50
2019	12.35	6.18	6.17
2020	12.38	5.89	6.49

MH-53E Fleet Size

Fiscal year	Total aircraft
2011	30
2012	27
2013	29
2014	27
2015	27

Fiscal year	Total aircraft
2016	30
2017	29
2018	27
2019	30
2020	28

MH-53E Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	43390.96	18780.77	24610.19
2012	46286.61	19367.85	26918.76
2013	44726.46	20760.97	23965.49
2014	49443.54	20476.70	28966.84
2015	60357.58	25816.22	34541.37
2016	45167.23	21550.04	23617.20
2017	41666.08	19140.44	22525.64
2018	49201.38	22753.32	26448.06
2019	46577.70	23295.75	23281.95
2020	48535.12	23094.47	25440.64

MH-53E Flying Hours

Fiscal year	flying hours executed
2011	6964.00
2012	6645.00
2013	6168.00
2014	5063.00
2015	4353.00
2016	6817.00
2017	7906.00
2018	6637.00
2019	7954.00
2020	7141.00

MH-53E Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	25.50	0.00	321.09	346.59	18.56	0.00	146.36	164.92

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	48535.12	23094.47	25440.64
Active Duty	48886.95	22283.14	26603.81
Reserve	44502.17	32394.37	12107.81

MH-60R Seahawk

MH-60R Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	1187.80	458.57	39	1.4	220	0	81608	0	5.40	14554.89	4.3
2021	NA	NA	NA	NA	NA	8.2	NA	2,836	NA	NA	NA

MH-60R Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	231.23	25.59	121.74	9.28	31.78	419.62
2012	289.26	29.18	167.45	15.22	42.64	543.75
2013	346.28	54.47	226.22	17.06	45.51	689.54
2014	442.09	57.65	294.64	22.10	58.37	874.85
2015	487.27	66.66	379.51	34.08	79.38	1046.91
2016	512.99	68.09	426.04	27.00	76.63	1110.74

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2017	493.85	88.60	488.84	30.95	105.84	1208.08
2018	493.27	66.74	468.50	33.80	91.40	1153.71
2019	510.72	63.19	441.52	33.73	122.40	1171.56
2020	521.09	51.88	458.57	39.27	116.99	1187.80

MH-60R Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	15.60	84.98	9.43	3.76	7.97	121.74
2012	22.58	108.99	17.14	5.91	12.82	167.45
2013	33.38	148.40	17.79	15.04	11.61	226.22
2014	47.09	174.83	35.11	21.34	16.27	294.64
2015	61.36	230.39	54.17	25.07	8.52	379.51
2016	70.38	214.27	105.98	28.12	7.29	426.04
2017	76.48	256.18	108.94	29.92	17.31	488.84
2018	76.06	248.82	87.37	36.30	19.94	468.50
2019	77.76	193.11	97.79	48.89	23.98	441.52
2020	78.64	208.12	96.78	50.18	24.85	458.57

MH-60R Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	4.56	1.32	3.24
2012	4.65	1.43	3.22
2013	4.51	1.48	3.03
2014	5.00	1.68	3.32
2015	5.45	1.98	3.48
2016	5.24	2.01	3.23
2017	5.37	2.17	3.20
2018	5.08	2.06	3.02
2019	5.23	1.97	3.26

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2020	5.40	2.08	3.31

MH-60R Fleet Size

Fiscal year	Total aircraft
2011	92
2012	117
2013	153
2014	175
2015	192
2016	212
2017	225
2018	227
2019	224
2020	220

MH-60R Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	12977.96	3765.12	9212.84
2012	13728.38	4227.64	9500.74
2013	12414.77	4073.04	8341.74
2014	12706.64	4279.43	8427.21
2015	13505.67	4895.89	8609.78
2016	13036.56	5000.31	8036.25
2017	14002.62	5666.02	8336.60
2018	13914.03	5650.19	8263.84
2019	13952.67	5258.29	8694.37
2020	14554.89	5619.17	8935.72

MH-60R Flying Hours

Fiscal year	flying hours executed
2011	32333.00
2012	39608.00
2013	55542.00
2014	68850.00

Fiscal year	flying hours executed
2015	77516.00
2016	85202.00
2017	86275.00
2018	82917.00
2019	83967.00
2020	81608.00

MH-60R Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	30.91	0.00	1156.88	1187.80	11.06	0.00	447.51	458.57

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	14554.89	5619.17	8935.72
Active Duty	14420.29	5578.15	8842.14
Reserve	22368.10	8000.09	14368.02

MH-60S Seahawk

MH-60S Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	1255.38	448.81	36	1.2	237	0	76906	0	5.30	16323.54	2.9
2021	NA	NA	NA	NA	NA	12.5	NA	4,264	NA	NA	NA

MH-60S Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	434.04	50.52	218.94	15.76	62.52	781.78
2012	476.20	50.84	253.43	19.94	68.16	868.56
2013	484.56	67.27	260.69	18.52	59.48	890.53
2014	510.78	70.01	350.01	28.52	71.38	1030.70
2015	507.34	72.60	361.64	34.67	94.68	1070.93
2016	536.92	57.49	410.70	25.40	82.42	1112.92
2017	504.36	59.94	439.02	28.75	104.43	1136.50
2018	532.85	65.00	473.95	32.59	91.81	1196.21
2019	563.20	61.65	466.61	35.48	113.39	1240.33
2020	581.77	58.62	448.81	40.44	125.74	1255.38

MH-60S Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	44.38	104.82	31.15	24.03	14.56	218.94
2012	50.60	123.74	25.76	26.98	26.35	253.43
2013	52.86	134.05	23.37	26.17	24.24	260.69
2014	63.27	180.53	37.70	35.54	32.98	350.01
2015	65.45	188.70	49.52	37.91	20.07	361.64
2016	76.76	206.85	75.14	30.70	21.24	410.70
2017	78.14	200.06	87.00	40.76	33.06	439.02
2018	83.51	217.12	85.30	54.55	33.49	473.95
2019	91.52	176.11	99.62	58.50	40.85	466.61
2020	88.20	155.06	101.39	65.28	38.87	448.81

MH-60S Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	4.32	1.21	3.11
2012	4.64	1.36	3.29

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2013	4.45	1.30	3.15
2014	4.82	1.64	3.18
2015	4.68	1.58	3.10
2016	4.88	1.80	3.08
2017	5.12	1.98	3.14
2018	5.25	2.08	3.17
2019	5.51	2.07	3.44
2020	5.30	1.89	3.40

MH-60S Fleet Size

Fiscal year	Total aircraft
2011	181
2012	187
2013	200
2014	214
2015	229
2016	228
2017	222
2018	228
2019	225
2020	237

MH-60S Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	13138.02	3679.35	9458.67
2012	13341.16	3892.68	9448.47
2013	12285.49	3596.47	8689.02
2014	13857.40	4705.78	9151.62
2015	13936.07	4706.05	9230.02
2016	14465.54	5338.16	9127.38
2017	14634.65	5653.24	8981.42
2018	16171.54	6407.38	9764.16
2019	15868.26	5969.68	9898.59
2020	16323.54	5835.79	10487.75

MH-60S Flying Hours

Fiscal year	flying hours executed
2011	59505.00
2012	65104.00
2013	72486.00
2014	74379.00
2015	76846.00
2016	76936.00
2017	77658.00
2018	73970.00
2019	78164.00
2020	76906.00

MH-60S Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	68.19	0.00	1187.19	1255.38	22.25	0.00	426.56	448.81

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	16323.54	5835.79	10487.75
Active Duty	15957.49	5733.59	10223.91
Reserve	27177.53	8866.32	18311.21

AH-1Z Viper

AH-1Z Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	483.49	153.43	32	20.8	143	0	23423	0	3.38	20641.88	16.7
2021	NA	NA	NA	NA	NA	4.2	NA	912	NA	NA	NA

AH-1Z Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	24.06	8.85	8.76	2.02	1.32	45.01
2012	38.42	14.92	20.72	2.99	3.08	80.13
2013	57.61	13.99	31.24	2.84	2.38	108.06
2014	56.54	20.23	48.11	3.28	8.26	136.42
2015	56.06	23.97	56.51	4.21	8.56	149.30
2016	54.76	31.13	64.32	6.08	16.35	172.63
2017	72.36	48.25	86.41	9.64	32.07	248.73
2018	98.71	53.52	105.85	14.31	40.42	312.81
2019	125.87	64.22	139.91	19.57	50.74	400.32
2020	142.70	56.00	153.43	25.06	106.30	483.49

AH-1Z Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	2.66	2.35	2.29	0.22	1.25	8.76
2012	4.48	7.91	4.67	0.47	3.21	20.72

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2013	7.47	12.04	7.89	0.76	3.08	31.24
2014	8.89	21.09	12.12	1.40	4.61	48.11
2015	13.09	24.12	15.72	1.55	2.03	56.51
2016	12.67	29.38	17.76	1.90	2.61	64.32
2017	15.89	45.37	17.49	3.96	3.69	86.41
2018	25.04	42.23	27.01	5.79	5.78	105.85
2019	29.59	67.60	31.68	5.17	5.86	139.91
2020	34.97	79.25	28.07	4.48	6.66	153.43

AH-1Z Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	2.81	0.55	2.27
2012	3.34	0.86	2.48
2013	3.60	1.04	2.56
2014	4.13	1.46	2.68
2015	4.04	1.53	2.51
2016	3.26	1.21	2.04
2017	3.41	1.18	2.22
2018	3.29	1.11	2.18
2019	3.64	1.27	2.37
2020	3.38	1.07	2.31

AH-1Z Fleet Size

Fiscal year	Total aircraft
2011	16
2012	24
2013	30
2014	33
2015	37
2016	53
2017	73
2018	95

Fiscal year	Total aircraft
2019	110
2020	143

AH-1Z Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	16524.00	3216.18	13307.82
2012	18010.71	4658.10	13352.61
2013	17819.37	5151.83	12667.54
2014	13468.30	4749.44	8718.86
2015	13119.65	4965.45	8154.19
2016	12786.74	4764.18	8022.56
2017	16029.75	5568.67	10461.08
2018	15408.00	5213.90	10194.11
2019	17681.83	6179.78	11502.05
2020	20641.88	6550.54	14091.34

AH-1Z Flying Hours

Fiscal year	flying hours executed
2011	2724.00
2012	4449.00
2013	6064.00
2014	10129.00
2015	11380.00
2016	13501.00
2017	15517.00
2018	20302.00
2019	22640.00
2020	23423.00

AH-1Z Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	32.59	0.00	450.91	483.49	5.61	0.00	147.83	153.43

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	20641.88	6550.54	14091.34
Active Duty	20220.12	6629.06	13591.06
Reserve	29017.08	4991.38	24025.70

CH-53E Super Stallion

CH-53E Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	1139.83	752.09	66	11.6	139	0	24990	0	8.20	45611.54	20.6
2021	NA	NA	NA	NA	NA	32.7	NA	6,244	NA	NA	NA

CH-53E Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	256.54	60.48	613.65	17.33	120.92	1068.92
2012	260.82	62.74	636.07	21.02	151.42	1132.07
2013	263.11	57.54	570.21	17.76	74.25	982.86
2014	261.59	55.14	595.74	22.99	61.66	997.13
2015	251.93	44.88	570.32	25.81	49.87	942.80
2016	244.45	45.47	684.64	26.67	89.42	1090.64

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2017	236.99	44.70	696.78	32.11	72.76	1083.34
2018	228.13	45.72	736.50	31.20	49.25	1090.80
2019	214.04	47.41	671.05	32.49	56.65	1021.65
2020	212.71	40.66	752.09	34.86	99.52	1139.83

CH-53E Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	91.13	325.26	107.79	79.67	9.80	613.65
2012	91.95	288.87	114.74	132.73	7.78	636.07
2013	90.91	280.66	100.43	87.74	10.46	570.21
2014	82.58	271.06	116.53	118.38	7.20	595.74
2015	86.36	265.98	104.06	110.41	3.52	570.32
2016	106.23	353.22	99.77	111.47	13.95	684.64
2017	99.38	393.66	101.09	74.45	28.19	696.78
2018	110.16	377.22	106.09	118.71	24.32	736.50
2019	101.59	333.81	85.45	93.33	56.87	671.05
2020	124.56	392.27	91.80	101.65	41.80	752.09

CH-53E Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	7.08	4.06	3.02
2012	7.60	4.27	3.33
2013	6.64	3.85	2.79
2014	6.74	4.03	2.71
2015	6.59	3.99	2.60
2016	7.47	4.69	2.78
2017	7.52	4.84	2.68
2018	7.74	5.22	2.51
2019	7.30	4.79	2.50

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2020	8.20	5.41	2.79

CH-53E Fleet Size

Fiscal year	Total aircraft
2011	151
2012	149
2013	148
2014	148
2015	143
2016	146
2017	144
2018	141
2019	140
2020	139

CH-53E Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	34460.04	19782.91	14677.13
2012	35405.83	19893.38	15512.45
2013	29762.01	17266.43	12495.58
2014	35624.50	21284.21	14340.29
2015	45292.07	27398.17	17893.89
2016	47870.77	30050.44	17820.33
2017	42639.34	27424.61	15214.73
2018	40587.89	27404.77	13183.12
2019	37819.30	24840.97	12978.33
2020	45611.54	30095.57	15515.97

CH-53E Flying Hours

Fiscal year	flying hours executed
2011	31019.00
2012	31974.00
2013	33024.00
2014	27990.00

Fiscal year	flying hours executed
2015	20816.00
2016	22783.00
2017	25407.00
2018	26875.00
2019	27014.00
2020	24990.00

CH-53E Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	45.73	0.00	1094.10	1139.83	28.98	0.00	723.11	752.09

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	45611.54	30095.57	15515.97
Active Duty	44904.59	29678.14	15226.46
Reserve	73171.06	46368.66	26802.40

MV-22B Osprey

MV-22B Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	1906.78	900.23	47	10.0	301	0	44585	0	6.33	42767.27	21.8
2021	NA	NA	NA	NA	NA	9.2	NA	1,607	NA	NA	NA

MV-22B Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	191.06	46.36	430.90	74.77	112.85	855.95
2012	229.23	59.40	430.24	85.52	132.15	936.54
2013	233.25	61.07	470.58	87.21	105.21	957.31
2014	265.29	81.92	527.20	80.68	152.30	1107.39
2015	281.74	83.34	545.22	90.29	123.60	1124.18
2016	297.94	82.57	699.77	98.60	51.94	1230.82
2017	307.91	74.07	761.32	113.89	164.23	1421.41
2018	305.65	82.23	866.13	114.64	409.11	1777.76
2019	314.83	88.80	907.67	107.34	314.78	1733.42
2020	321.71	73.65	900.23	183.26	427.94	1906.78

MV-22B Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	91.23	135.90	67.21	132.16	4.40	430.90
2012	101.90	158.71	71.45	95.20	2.99	430.24
2013	106.04	187.03	80.11	94.44	2.95	470.58
2014	103.26	181.62	87.75	150.83	3.75	527.20
2015	119.23	209.55	95.41	116.40	4.63	545.22
2016	151.30	310.19	97.55	132.01	8.72	699.77
2017	148.50	336.01	103.31	155.87	17.62	761.32
2018	171.54	400.20	108.86	168.09	17.43	866.13
2019	174.20	414.39	119.80	177.94	21.34	907.67
2020	200.90	376.61	112.47	183.88	26.36	900.23

MV-22B Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	6.90	3.48	3.43
2012	6.08	2.79	3.29

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2013	5.26	2.59	2.67
2014	5.13	2.44	2.69
2015	4.78	2.32	2.46
2016	4.79	2.72	2.07
2017	5.36	2.87	2.49
2018	6.26	3.05	3.21
2019	5.96	3.12	2.84
2020	6.33	2.99	3.34

MV-22B Fleet Size

Fiscal year	Total aircraft
2011	124
2012	154
2013	182
2014	216
2015	235
2016	257
2017	265
2018	284
2019	291
2020	301

MV-22B Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	35540.10	17891.69	17648.41
2012	31023.57	14252.07	16771.50
2013	29444.94	14474.00	14970.94
2014	30821.75	14673.40	16148.36
2015	28732.35	13934.96	14797.39
2016	30495.18	17337.87	13157.30
2017	35091.24	18795.12	16296.12
2018	40740.65	19849.01	20891.63
2019	35120.14	18389.95	16730.19
2020	42767.27	20191.22	22576.04

MV-22B Flying Hours

Fiscal year	flying hours executed
2011	24084.00
2012	30188.00
2013	32512.00
2014	35929.00
2015	39126.00
2016	40361.00
2017	40506.00
2018	43636.00
2019	49357.00
2020	44585.00

MV-22B Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	113.87	0.00	1792.91	1906.78	46.97	0.00	853.26	900.23

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	42767.27	20191.22	22576.04
Active Duty	42247.78	20106.04	22141.73
Reserve	53035.64	21874.88	31160.76

UH-1Y Venom

UH-1Y Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	526.39	233.72	44	8.1	126	0	21151	0	4.18	24887.06	18.2
2021	NA	NA	NA	NA	NA	8.1	NA	1,676	NA	NA	NA

UH-1Y Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	84.30	18.46	40.75	5.21	5.16	153.87
2012	104.75	29.92	76.09	6.72	7.67	225.16
2013	123.93	25.15	92.71	6.50	5.61	253.90
2014	147.87	34.50	109.58	8.75	22.73	323.44
2015	157.67	46.97	176.37	10.97	23.78	415.77
2016	149.92	51.02	160.24	12.94	34.02	408.14
2017	152.51	53.50	181.88	18.49	51.87	458.24
2018	149.72	50.40	222.73	21.67	53.60	498.12
2019	143.54	46.39	209.72	24.55	62.68	486.88
2020	137.79	32.05	233.72	23.28	99.55	526.39

UH-1Y Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	14.63	15.27	6.86	0.91	3.08	40.75
2012	17.10	34.90	13.49	3.38	7.21	76.09

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2013	24.03	41.49	15.94	3.24	8.02	92.71
2014	28.41	45.29	24.18	5.40	6.30	109.58
2015	36.17	99.66	30.82	6.89	2.84	176.37
2016	39.36	81.85	31.48	3.83	3.72	160.24
2017	37.93	96.77	37.51	6.05	3.63	181.88
2018	53.60	112.62	38.68	12.60	5.23	222.73
2019	54.06	91.86	44.96	14.50	4.35	209.72
2020	52.13	118.88	43.03	13.83	5.86	233.72

UH-1Y Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	3.35	0.89	2.46
2012	3.69	1.25	2.44
2013	3.26	1.19	2.07
2014	3.37	1.14	2.23
2015	3.68	1.56	2.12
2016	3.16	1.24	1.92
2017	3.25	1.29	1.96
2018	3.51	1.57	1.94
2019	3.77	1.63	2.15
2020	4.18	1.85	2.32

UH-1Y Fleet Size

Fiscal year	Total aircraft
2011	46
2012	61
2013	78
2014	96
2015	113
2016	129
2017	141
2018	142

Fiscal year	Total aircraft
2019	129
2020	126

UH-1Y Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	10030.88	2656.69	7374.19
2012	12603.22	4259.08	8344.14
2013	12196.27	4453.55	7742.72
2014	13612.21	4611.70	9000.51
2015	17862.72	7577.49	10285.23
2016	16515.68	6484.23	10031.45
2017	18222.61	7232.67	10989.94
2018	20224.88	9043.30	11181.58
2019	21046.14	9065.26	11980.89
2020	24887.06	11050.10	13836.96

UH-1Y Flying Hours

Fiscal year	flying hours executed
2011	15340.00
2012	17865.00
2013	20818.00
2014	23761.00
2015	23276.00
2016	24712.00
2017	25147.00
2018	24629.00
2019	23134.00
2020	21151.00

UH-1Y Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	40.64	0.00	485.74	526.39	13.06	0.00	220.66	233.72

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	24887.06	11050.10	13836.96
Active Duty	25135.50	11418.48	13717.02
Reserve	22257.80	7151.50	15106.30

CV-22 Osprey

CV-22 Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	825.89	349.30	42	-0.9	50.33	0	10329	0	16.41	79958.48	5.5
2021	NA	NA	NA	NA	NA	9.3	NA	2,206	NA	NA	NA

CV-22 Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	145.21	39.41	215.66	10.57	26.32	437.18
2012	180.60	44.90	251.54	3.14	28.12	508.30
2013	220.22	46.02	261.93	4.71	36.85	569.74
2014	244.87	47.44	303.76	1.78	42.49	640.35
2015	266.68	58.74	281.32	2.92	94.57	704.24
2016	275.92	60.18	273.26	2.59	67.19	679.14

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2017	274.91	78.31	323.66	12.49	75.51	764.88
2018	280.88	86.16	366.21	9.09	82.34	824.68
2019	276.11	84.62	358.16	8.39	106.28	833.57
2020	300.88	73.31	349.30	10.20	92.19	825.89

CV-22 Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	27.40	59.47	0	24.58	0.00	0	104.21	215.66
2012	34.58	89.71	0	2.22	0.01	0	125.02	251.54
2013	43.27	100.20	0	3.76	0.10	0	114.61	261.93
2014	49.79	120.82	0	1.68	0.07	0	131.40	303.76
2015	57.51	126.42	0	0.10	0.21	0.01	97.07	281.32
2016	62.33	99.73	0	3.36	0.03	0	107.81	273.26
2017	72.38	136.89	0	9.32	0.03	0	105.05	323.66
2018	77.18	164.03	0	15.99	0.15	0	108.86	366.21
2019	81.81	163.32	0	15.23	0.11	0	97.69	358.16
2020	83.89	145.72	0	14.54	0.34	0	104.81	349.30

CV-22 Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	24.17	11.92	12.25
2012	21.25	10.52	10.73
2013	18.15	8.34	9.81
2014	17.02	8.07	8.95
2015	16.39	6.55	9.84
2016	14.53	5.85	8.68
2017	15.36	6.50	8.86
2018	16.49	7.32	9.17

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2019	16.67	7.16	9.51
2020	16.41	6.94	9.47

CV-22 Fleet Size

Fiscal year	Total aircraft
2011	18
2012	24
2013	31
2014	38
2015	43
2016	47
2017	50
2018	50
2019	50
2020	50

CV-22 Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	82057.04	40479.26	41577.78
2012	85233.62	42179.90	43053.73
2013	70011.12	32186.92	37824.21
2014	68392.90	32443.07	35949.83
2015	72056.19	28784.33	43271.86
2016	65493.84	26352.40	39141.44
2017	61983.11	26228.59	35754.52
2018	70383.40	31254.84	39128.56
2019	75822.19	32578.60	43243.60
2020	79958.48	33817.68	46140.80

CV-22 Flying Hours

Fiscal year	flying hours executed
2011	5327.70
2012	5963.60
2013	8137.80

Fiscal year	flying hours executed
2014	9362.80
2015	9773.50
2016	10369.50
2017	12340.10
2018	11717.00
2019	10993.70
2020	10329.00

CV-22 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	0.00	3.69	822.20	825.89	0.00	0.00	349.30	349.30

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	79958.48	33817.68	46140.80
Active Duty	79600.75	33817.68	45783.07
National Guard	NA	NA	NA

HH-60G Pave Hawk

HH-60G Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	760.15	223.67	29	-2.8	106.64	0	20920.7	0	7.13	36334.83	5.1

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2021	NA	NA	NA	NA	NA	48	NA	15,389	NA	NA	NA

HH-60G Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	349.86	63.04	226.80	5.58	320.10	965.39
2012	351.85	60.35	209.86	2.94	153.86	778.86
2013	339.52	51.40	201.78	8.62	86.16	687.47
2014	346.35	69.80	197.62	5.34	34.06	653.18
2015	353.80	53.00	222.06	6.91	85.52	721.29
2016	353.66	67.12	239.70	6.88	71.46	738.84
2017	354.94	70.65	224.96	6.81	99.94	757.30
2018	361.92	63.00	252.65	8.14	90.06	775.78
2019	399.52	69.15	232.91	7.92	72.76	782.26
2020	449.08	60.70	223.67	6.86	19.84	760.15

HH-60G Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	62.47	107.00	0	53.49	0.00	0.21	3.63	226.80
2012	63.73	91.44	0	48.54	0.00	0.20	5.95	209.86
2013	58.07	93.96	0	44.93	0.00	0	4.82	201.78
2014	70.69	94.86	0	27.86	0.00	0	4.22	197.62
2015	77.93	96.22	0	43.23	0.07	0	4.60	222.06

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2016	80.96	85.50	0	66.79	0.24	0	6.21	239.70
2017	72.44	76.76	0	67.80	0.01	0	7.95	224.96
2018	96.88	70.75	0	70.57	0.00	0	14.44	252.65
2019	80.59	78.06	0	61.24	0.00	0	13.02	232.91
2020	87.60	70.82	0	43.98	0.00	0	21.27	223.67

HH-60G Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	9.75	2.29	7.46
2012	7.87	2.12	5.75
2013	6.96	2.04	4.91
2014	6.72	2.03	4.68
2015	7.44	2.29	5.15
2016	7.62	2.47	5.15
2017	7.76	2.31	5.46
2018	8.00	2.60	5.39
2019	7.99	2.38	5.61
2020	7.13	2.10	5.03

HH-60G Fleet Size

Fiscal year	Total aircraft
2011	99
2012	99
2013	99
2014	97
2015	97
2016	97
2017	98
2018	97
2019	98
2020	107

HH-60G Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	36905.79	8670.40	28235.39
2012	32128.17	8656.66	23471.51
2013	29674.99	8709.75	20965.25
2014	27712.88	8384.62	19328.27
2015	29607.18	9114.88	20492.30
2016	31777.47	10309.60	21467.87
2017	33223.67	9869.36	23354.31
2018	36913.42	12021.66	24891.75
2019	34563.16	10290.95	24272.21
2020	36334.83	10691.16	25643.68

HH-60G Flying Hours

Fiscal year	flying hours executed
2011	26158.20
2012	24242.20
2013	23166.70
2014	23569.40
2015	24362.00
2016	23250.40
2017	22794.10
2018	21016.30
2019	22632.70
2020	20920.70

HH-60G Active and Reserve Total Operating and Support Costs and Costs per Flying Hour

Total operating and support costs in millions, Fiscal Year 2020

Fiscal year	Total Cost, Reserve	Total Cost, Guard	Total Cost, Active Duty	Total Cost, Total Components (calculated)	Maintenance Cost, Reserve	Maintenance Cost, Guard	Maintenance Cost, Active Duty	Maintenance Cost, Total Components (calculated)
2020	112.10	149.33	498.72	760.15	37.44	49.42	136.81	223.67

Operating and support costs per flying hour, Fiscal Year 2020

Component	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Cost per flying hour, non-maintenance costs
All Components	36334.83	10691.16	25643.68
Active Duty	33267.99	9126.15	24141.84
National Guard	43643.24	14443.49	29199.75
Reserve	44695.24	14926.26	29768.98

UH-1N Huey

UH-1N Sustainment Status

Fiscal year	Total cost, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	Maintenance as percent of total cost	Percent change in total cost from previous to current fiscal year	Total aircraft	Average aircraft age (in years)	flying hours executed	Average aircraft lifetime flying hours	Cost per aircraft, in FY20 millions of dollars	Cost per flying hour, in FY20 dollars	Percent change in total cost per flying hour from previous to current fiscal year
2020	304.67	136.87	45	5.1	62.99	0	21078.7	0	4.84	14453.98	5.6
2021	NA	NA	NA	NA	NA	48	NA	15,389	NA	NA	NA

UH-1N Total Operating and Support Costs

Fiscal year	1.0 Unit level personnel cost, constant FY20 dollars	2.0 Unit operations cost, constant FY20 dollars	3.0 Maintenance cost, constant FY20 dollars	4.0 Sustaining support cost, constant FY20 dollars	5.0 Continuing system improvement cost, constant FY20 dollars	Total cost, constant year FY20 dollars
2011	69.30	61.70	61.37	8.95	5.21	206.53
2012	70.45	62.39	58.88	5.46	7.14	204.31
2013	50.32	54.43	58.97	4.60	18.12	186.45
2014	52.57	62.27	55.25	7.05	8.33	185.46
2015	54.87	63.09	64.52	6.59	7.38	196.45
2016	58.75	61.08	111.48	7.32	10.70	249.33
2017	61.64	80.71	133.33	5.70	25.46	306.84
2018	65.96	67.66	126.67	5.98	14.18	280.44
2019	71.32	85.11	119.17	5.90	8.31	289.81
2020	78.81	78.24	136.87	10.13	0.61	304.67

UH-1N Maintenance Costs

Fiscal year	3.1 Consumable materials and repair parts, constant year FY20 dollars	3.2 Depot level reparables, constant year FY20 dollars	3.3 Intermediate maintenance, constant year FY20 dollars	3.4 Depot maintenance, constant year FY20 dollars	3.5 Other maintenance, constant year FY20 dollars	3.6 Interim contractor support costs, constant year FY20 dollars	3.7 Contractor logistics support, constant year FY20 dollars	3.0 Maintenance cost, constant FY20 dollars
2011	13.26	24.56	0	21.76	0.00	0	1.80	61.37
2012	12.82	26.43	0	16.53	0.01	0	3.09	58.88
2013	12.85	28.75	0	15.95	0.00	0	1.41	58.97
2014	12.84	25.51	0	14.80	0.47	0	1.61	55.25
2015	15.87	26.54	0	20.26	0.12	0	1.71	64.52
2016	18.22	36.71	0	37.57	0.02	0	18.95	111.48
2017	16.50	30.36	0	37.70	0.01	0	48.75	133.33
2018	17.24	35.03	0	38.84	0.00	0	35.57	126.67
2019	14.68	32.84	0	35.88	0.00	0	35.77	119.17
2020	18.01	35.53	0	42.94	0.00	0	40.39	136.87

UH-1N Operating and Support Costs per Aircraft

Fiscal year	Cost per aircraft, in FY20 millions of dollars	Maintenance cost per aircraft, in FY20 millions of dollars	Other O&S costs per aircraft (calculated)
2011	2.66	0.79	1.87
2012	2.70	0.78	1.92
2013	2.86	0.90	1.95
2014	2.99	0.89	2.10
2015	3.17	1.04	2.13
2016	4.00	1.79	2.21
2017	4.87	2.12	2.75
2018	4.45	2.01	2.44
2019	4.60	1.89	2.71
2020	4.84	2.17	2.66

UH-1N Fleet Size

Fiscal year	Total aircraft
2011	78
2012	76
2013	65

Fiscal year	Total aircraft
2014	62
2015	62
2016	62
2017	63
2018	63
2019	63
2020	63

UH-1N Operating and Support Costs per Flying Hour

Fiscal year	Cost per flying hour, in FY20 dollars	Maintenance cost per flying hour, in FY20 dollars	Other O&S costs per flying hour (calculated)
2011	10312.86	3064.35	7248.51
2012	10141.37	2922.63	7218.74
2013	10911.13	3451.07	7460.06
2014	9899.63	2949.08	6950.54
2015	10408.85	3418.40	6990.45
2016	13040.29	5830.47	7209.82
2017	15755.04	6845.79	8909.26
2018	13595.58	6140.58	7455.00
2019	13693.40	5630.68	8062.72
2020	14453.98	6493.37	7960.60

UH-1N Flying Hours

Fiscal year	flying hours executed
2011	20026.20
2012	20146.30
2013	17087.60
2014	18733.60
2015	18873.20
2016	19119.90
2017	19475.50
2018	20627.60
2019	21164.40
2020	21078.70

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