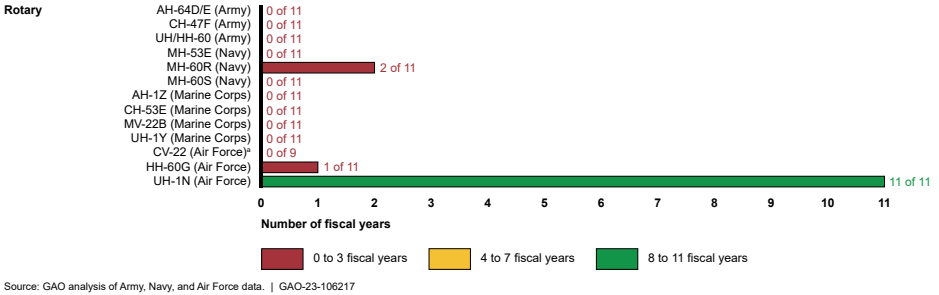
Rotary Aircraft

AH-64D/E Apache

Source: U.S. Army/Captain Brian Harris. | GAO-23-106217

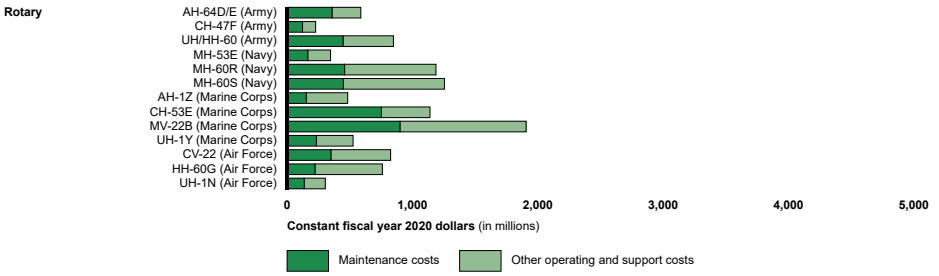
Number of Years Selected Aircraft Met Their Annual Mission Capable Goal, Fiscal Years 2011 through 2021



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

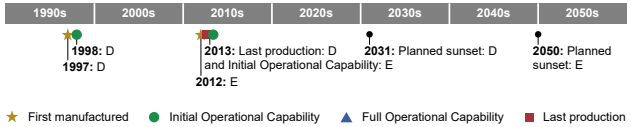
Manufacturer
Boeing Company Integrated Defense Systems

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.

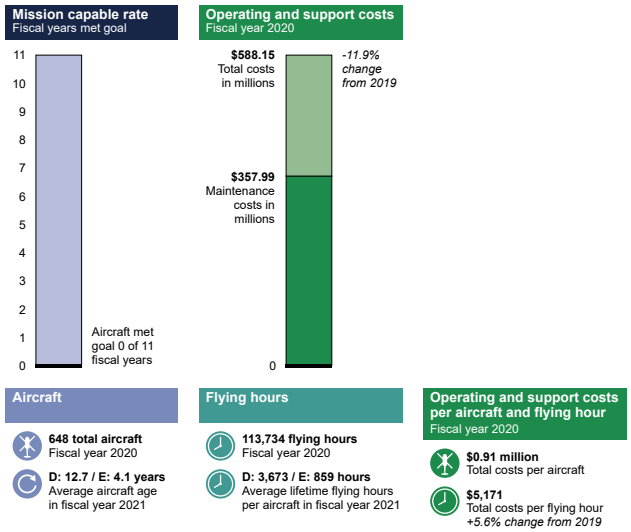
The AH-64D/E Apache is a twin-engine, four-blade tandem-seat, attack helicopter that can perform a variety of missions including ground force security, fixed base operations, aerial escorts, and reconnaissance.

AH-64D/E Life Cycle Timeline



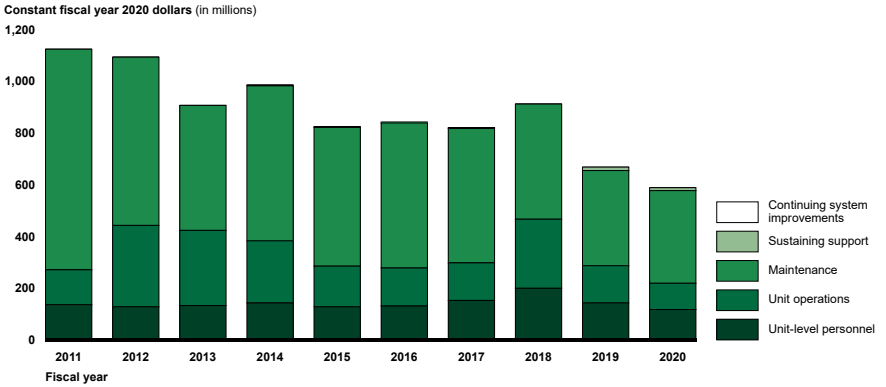
Note: Many of the AH-64Ds were rebuilt from the AH-64As, which were first manufactured in 1985.

AH-64D/E Sustainment Status

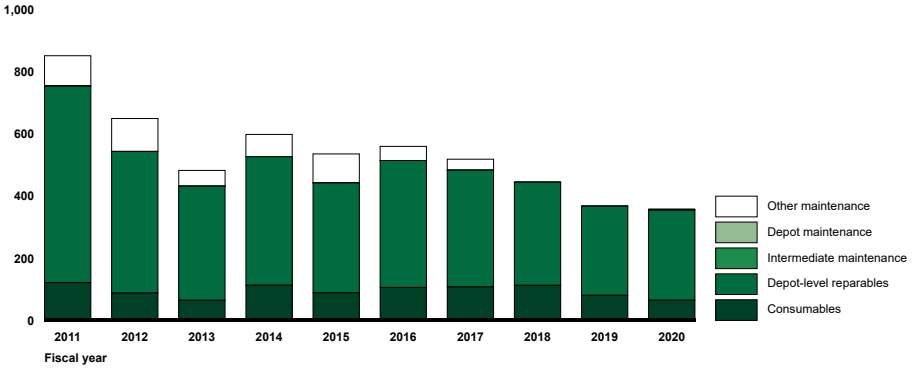


Operating and Support Costs

AH-64D/E Total Operating and Support Costs

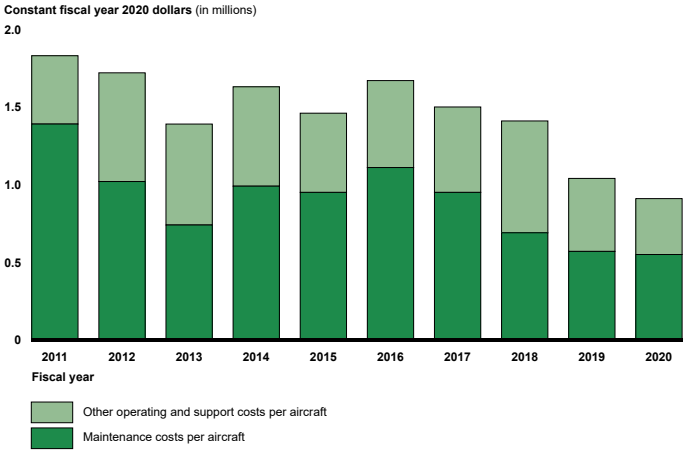


AH-64D/E Maintenance Costs

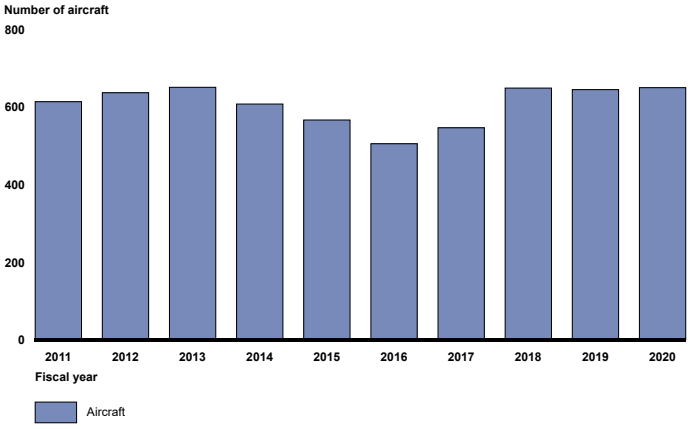


Operating and Support Costs per Aircraft

AH-64D/E Operating and Support Costs per Aircraft

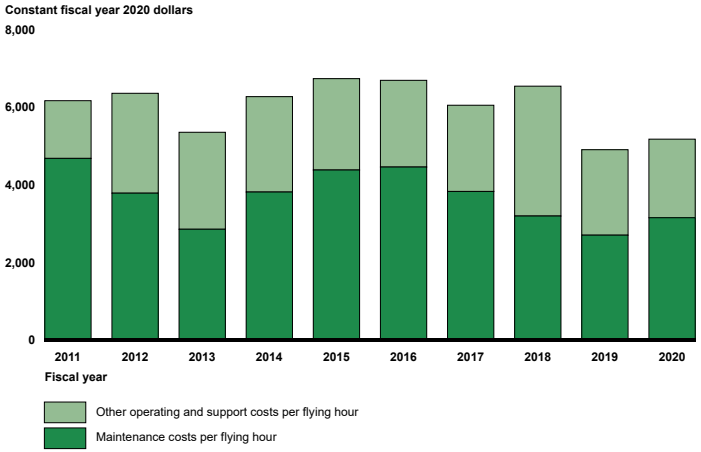


AH-64D/E Fleet Size

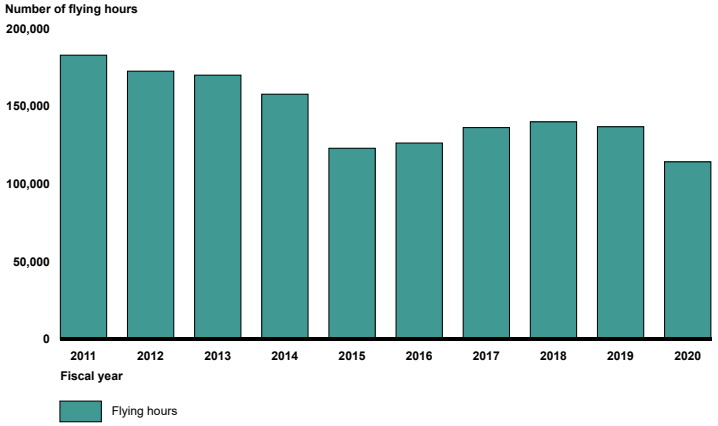


Operating and Support Costs per Flying Hour

AH-64D/E Operating and Support Costs per Flying Hour

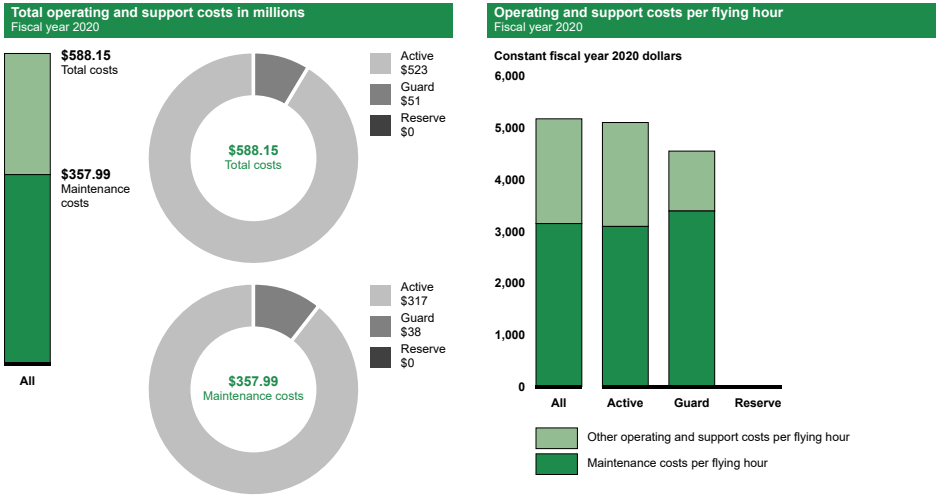


AH-64D/E Flying Hours



Component-Level Operating and Support Costs

AH-64D/E Active and Reserve Total Operating and Support Costs and Costs per Flying Hour



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

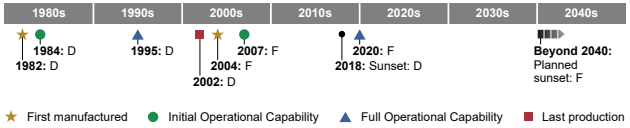
Manufacturer
Boeing

Program Office
Project Manager Cargo Helicopters, Redstone Arsenal, Alabama

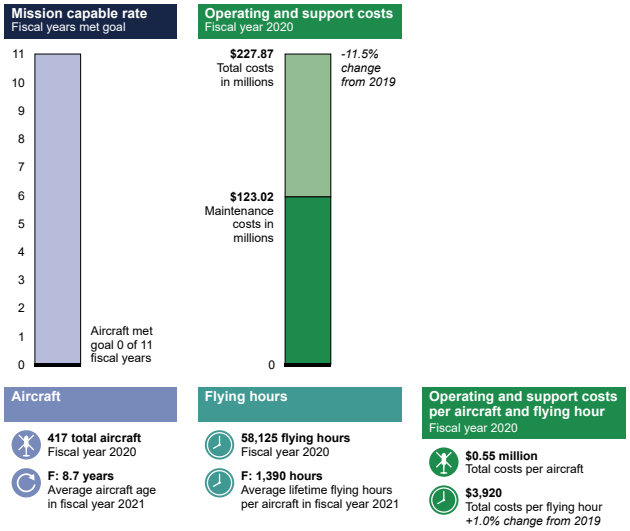
Sustainment
Corpus Christi Army Depot and several Army Theater Aviation Sustainment Maintenance Groups perform depot maintenance. Army personnel perform field maintenance.

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

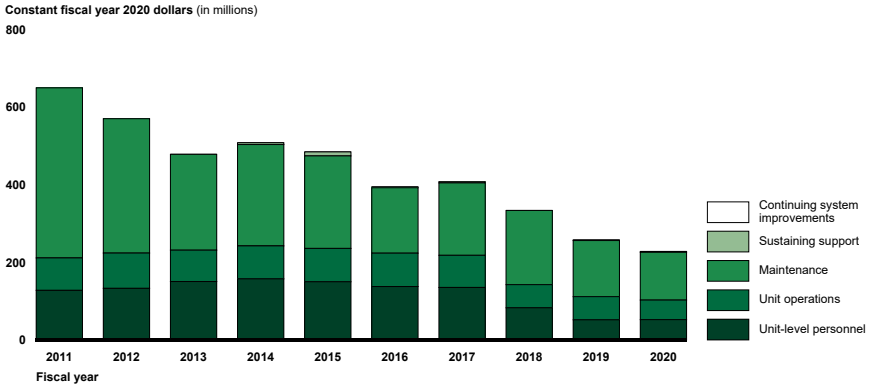


CH-47F Sustainment Status

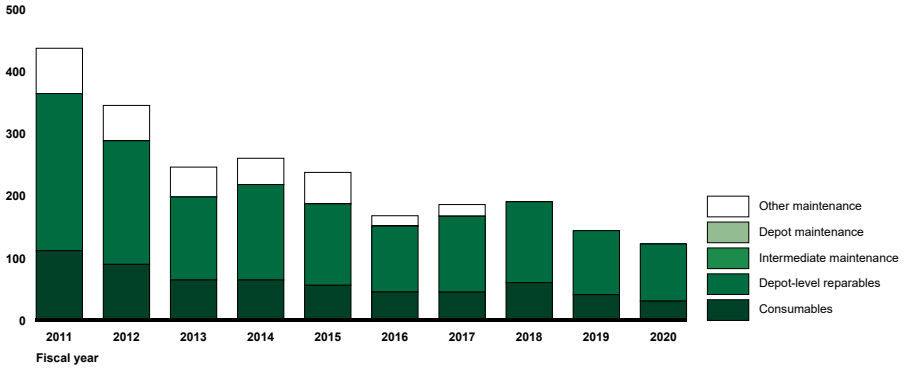


Operating and Support Costs

CH-47F Total Operating and Support Costs

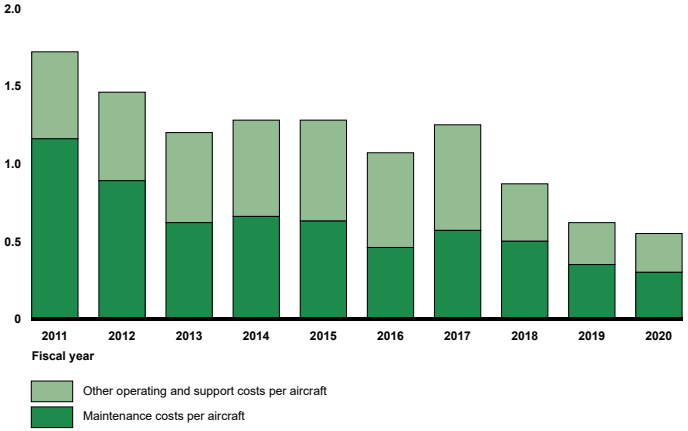


CH-47F Maintenance Costs

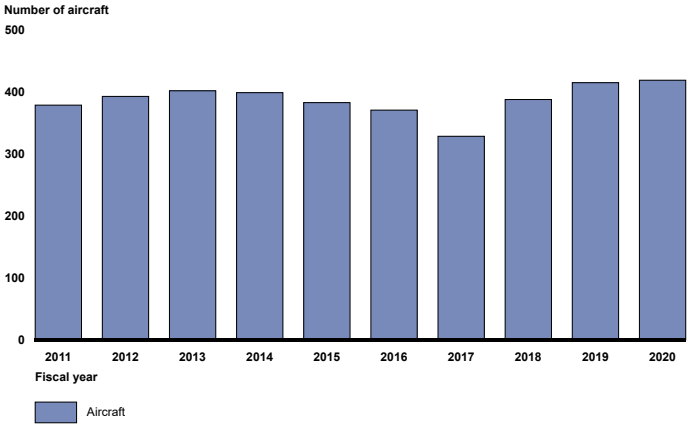


Operating and Support Costs per Aircraft

CH-47F Operating and Support Costs per Aircraft

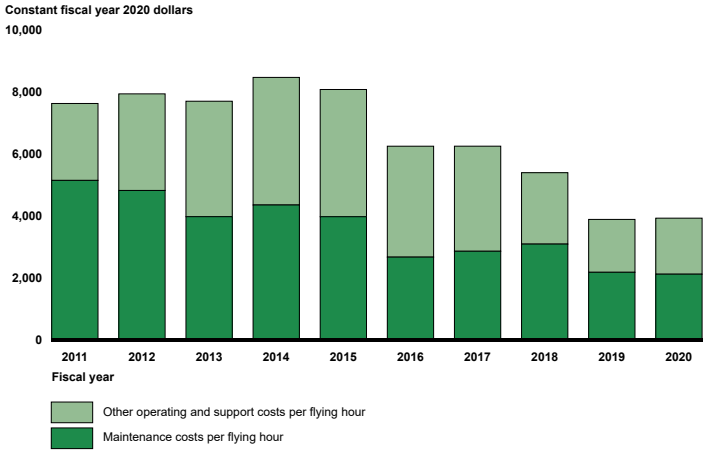


CH-47F Fleet Size

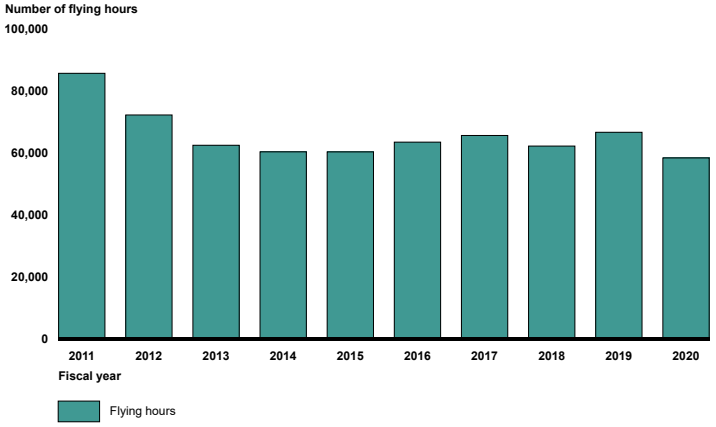


Operating and Support Costs per Flying Hour

CH-47F Operating and Support Costs per Flying Hour

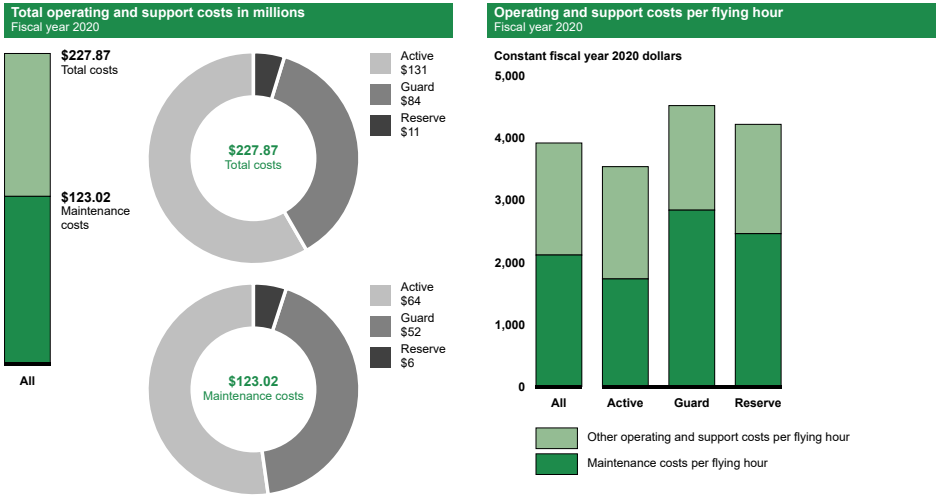


CH-47F Flying Hours



Component-Level Operating and Support Costs

CH-47F Active and Reserve Total Operating and Support Costs and Costs per Flying Hour



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

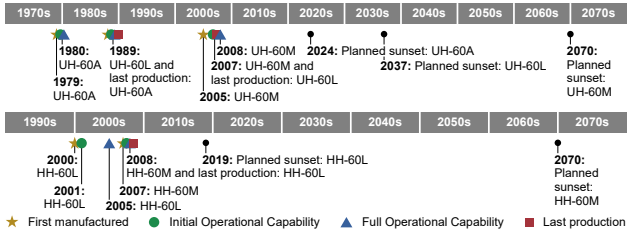
Manufacturer
Sikorsky Aircraft Corporation

Program Office
Program Manager Utility Helicopters, Redstone Arsenal, Alabama

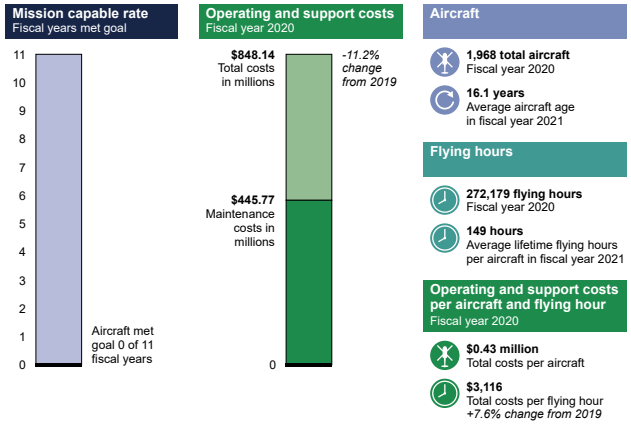
Sustainment
Corpus Christi Army Depot performs airframe depot maintenance. Army personnel provide field maintenance with assistance from contractor representatives.

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



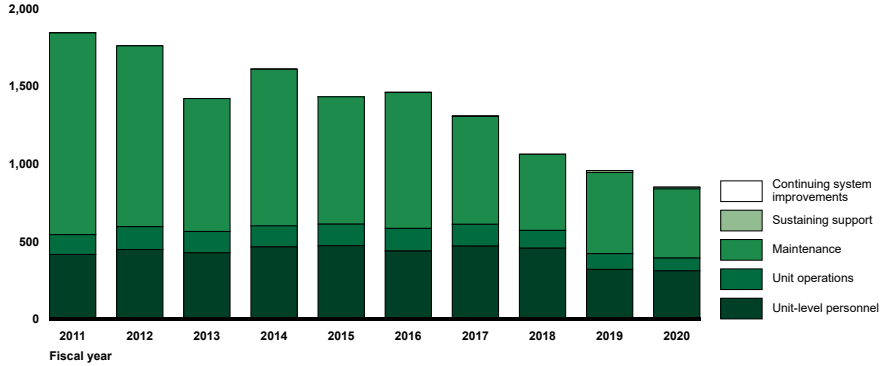
UH/HH-60 Sustainment Status



Operating and Support Costs

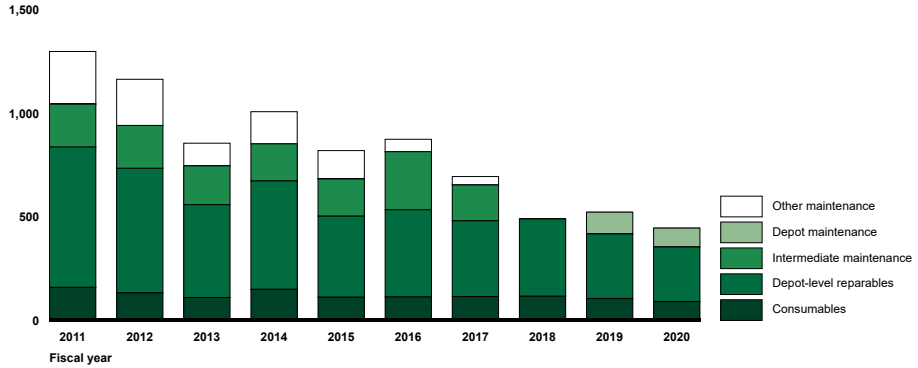
UH/HH-60 Total Operating and Support Costs

Constant fiscal year 2020 dollars (in millions)



UH/HH-60 Maintenance Costs

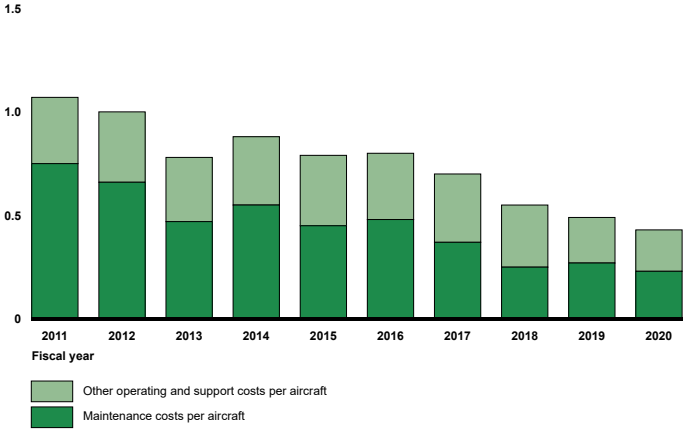
Constant fiscal year 2020 dollars (in millions)



Operating and Support Costs per Aircraft

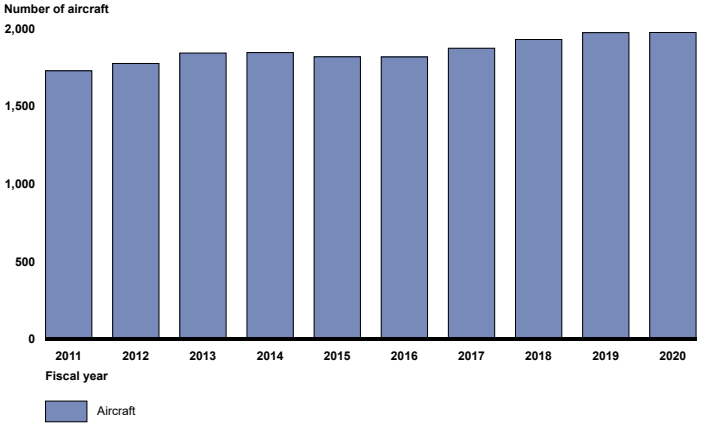
UH/HH-60 Operating and Support Costs per Aircraft

Constant fiscal year 2020 dollars (in millions)



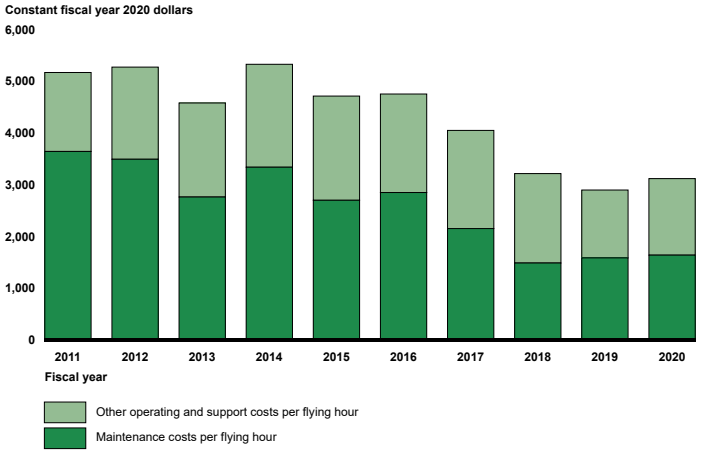
UH/HH-60 Fleet Size

Number of aircraft

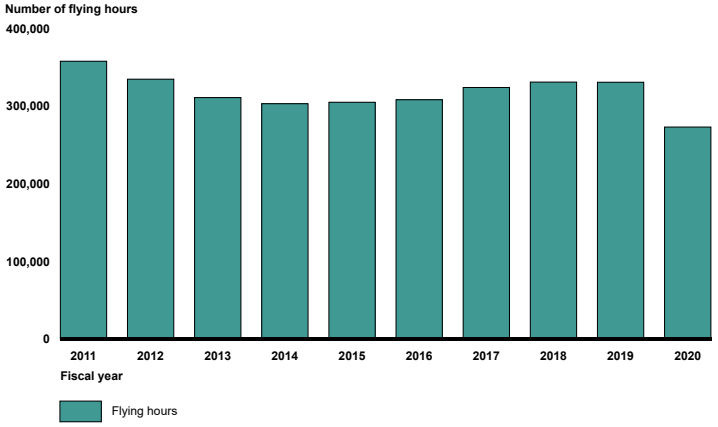


Operating and Support Costs per Flying Hour

UH/HH-60 Operating and Support Costs per Flying Hour

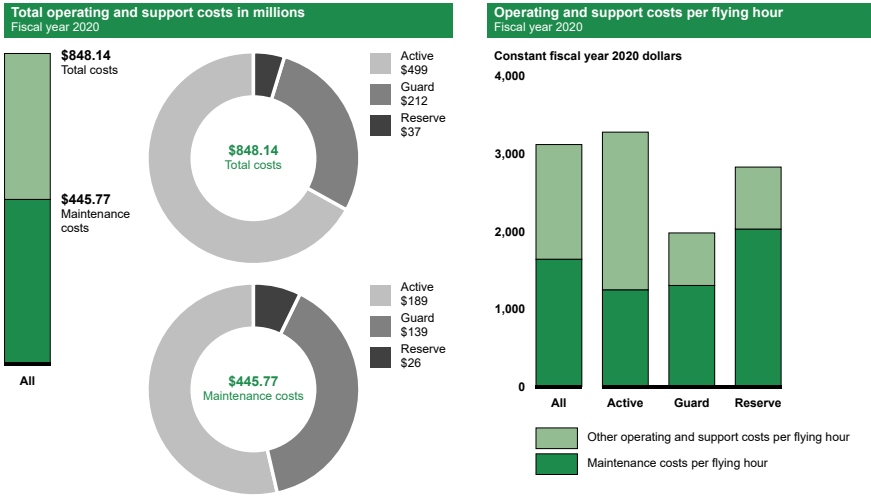


UH/HH-60 Flying Hours



Component-Level Operating and Support Costs

UH/HH-60 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour



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	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: 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

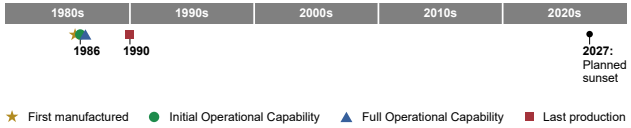
Manufacturer
Lockheed Martin/Sikorsky

Program Office
Program Manager – Air 261, Naval Air Systems Command, Patuxent River, Maryland

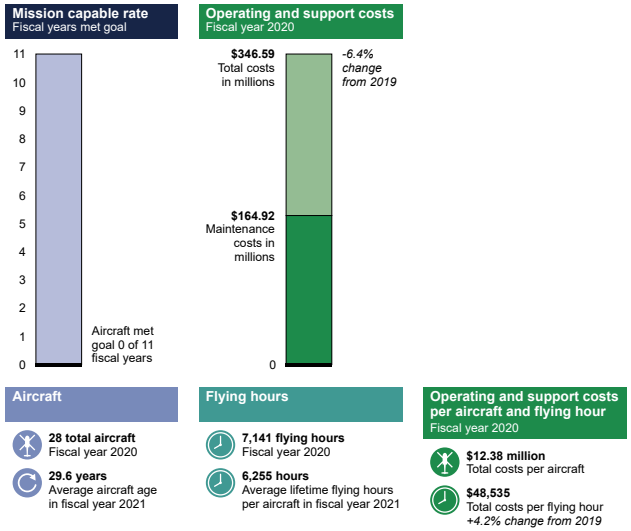
Sustainment
The Navy's Fleet Readiness Center East performs depot maintenance. Navy personnel perform organizational maintenance.

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

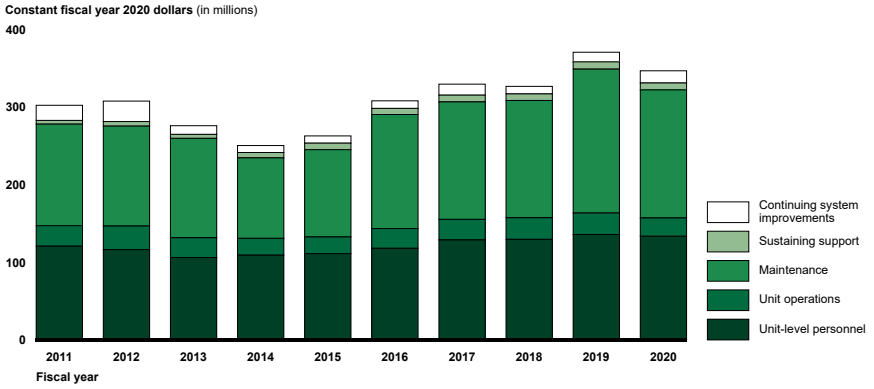


MH-53E Sustainment Status

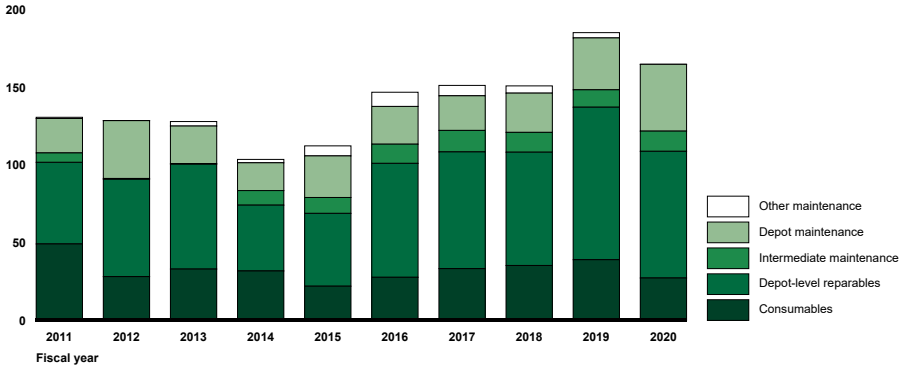


Operating and Support Costs

MH-53E Total Operating and Support Costs

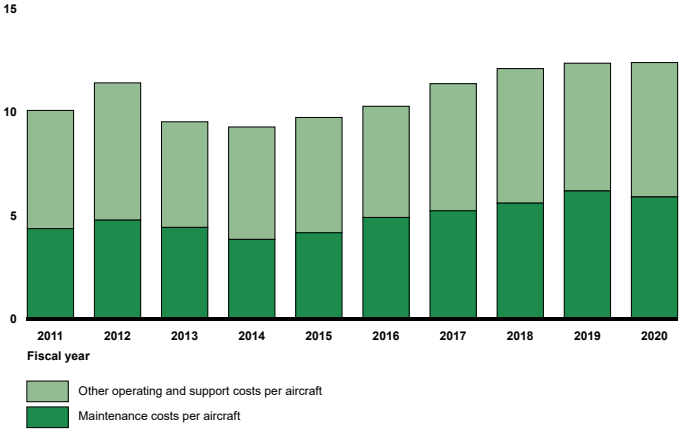


MH-53E Maintenance Costs

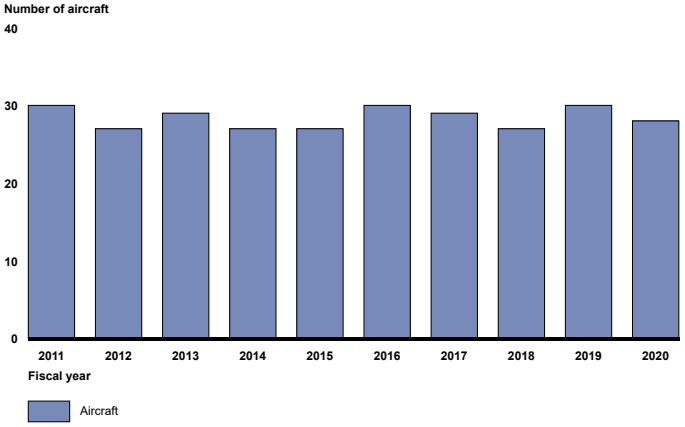


Operating and Support Costs per Aircraft

MH-53E Operating and Support Costs per Aircraft

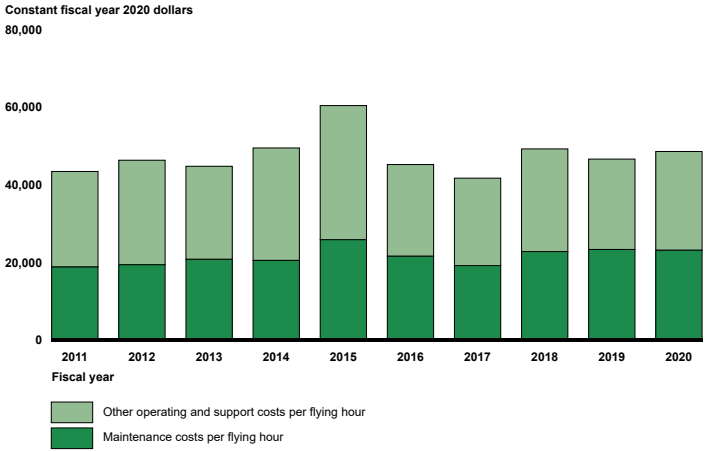


MH-53E Fleet Size

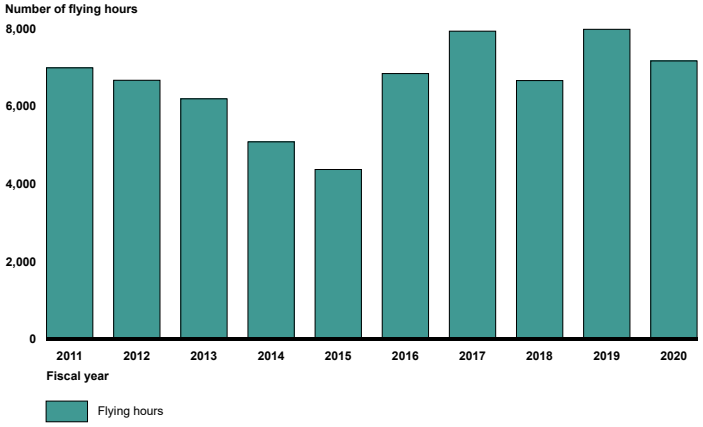


Operating and Support Costs per Flying Hour

MH-53E Operating and Support Costs per Flying Hour

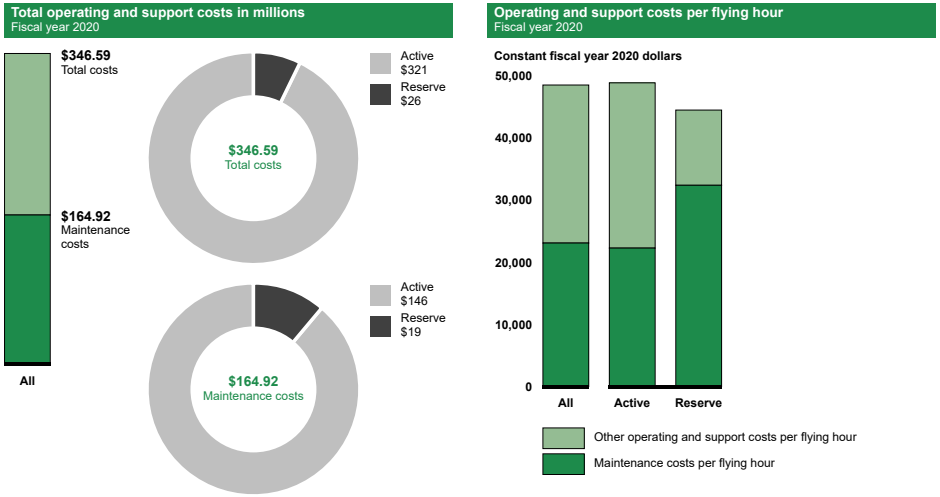


MH-53E Flying Hours



Component-Level Operating and Support Costs

MH-53E Active and Reserve Total Operating and Support Costs and Costs per Flying Hour



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

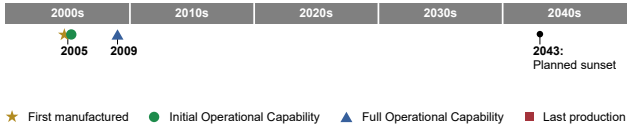
Manufacturer
Lockheed Martin/Sikorsky

Program Office
Program Manager – Air 299, Naval Air Systems Command, Patuxent River, Maryland

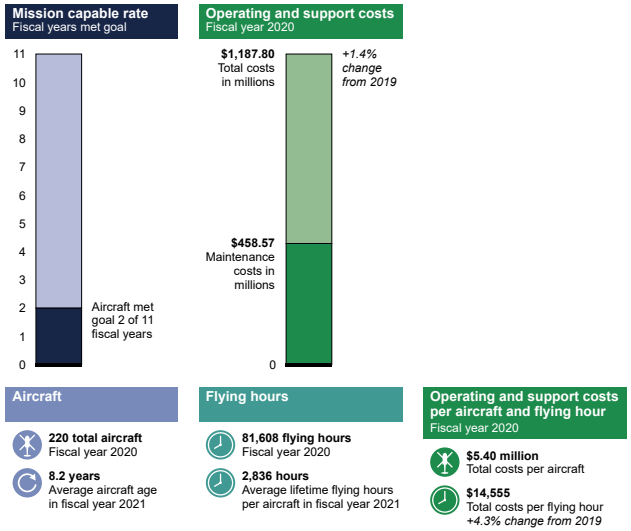
Sustainment
The Navy's Fleet Readiness Centers Southeast, Southwest, Mid-Atlantic and Western Pacific perform planned depot maintenance. Navy personnel perform field maintenance.

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

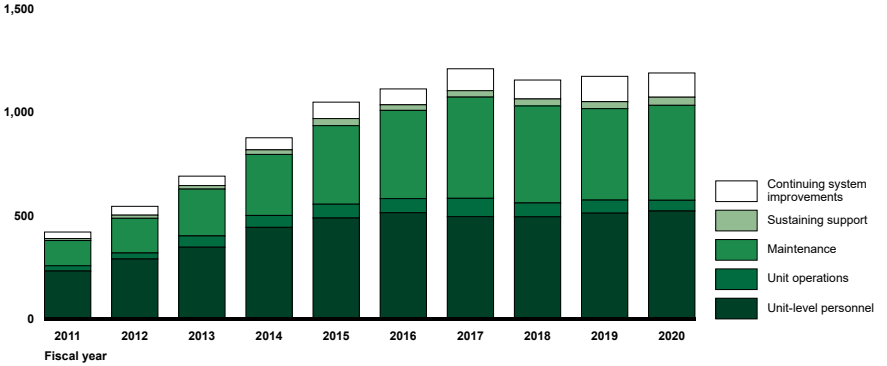


MH-60R Sustainment Status

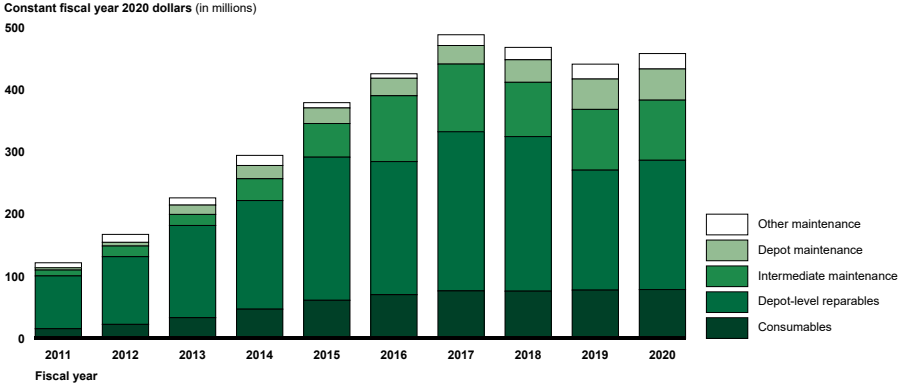


Operating and Support Costs

MH-60R Total Operating and Support Costs

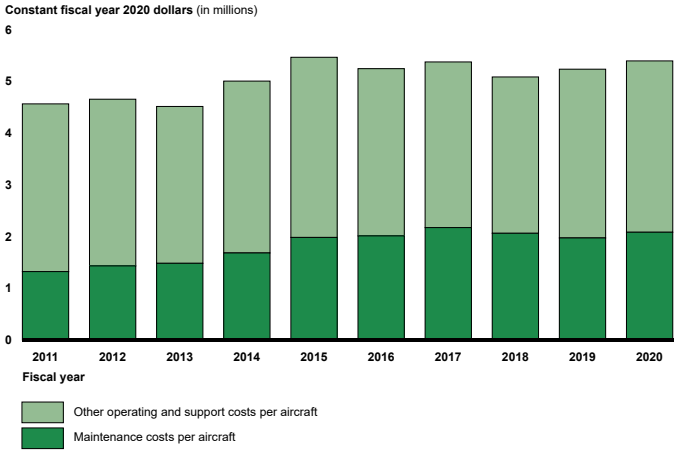


MH-60R Maintenance Costs

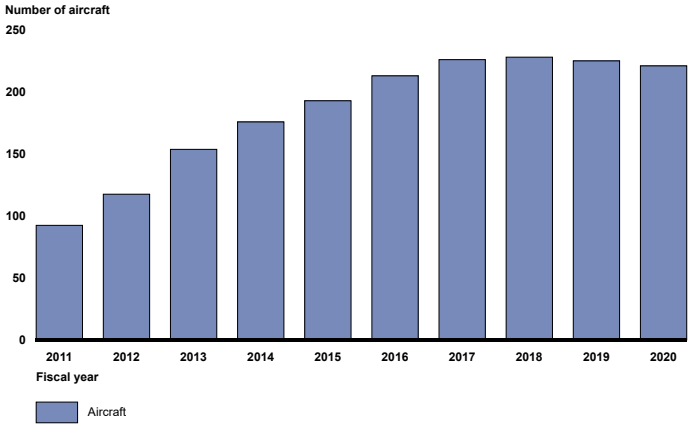


Operating and Support Costs per Aircraft

MH-60R Operating and Support Costs per Aircraft

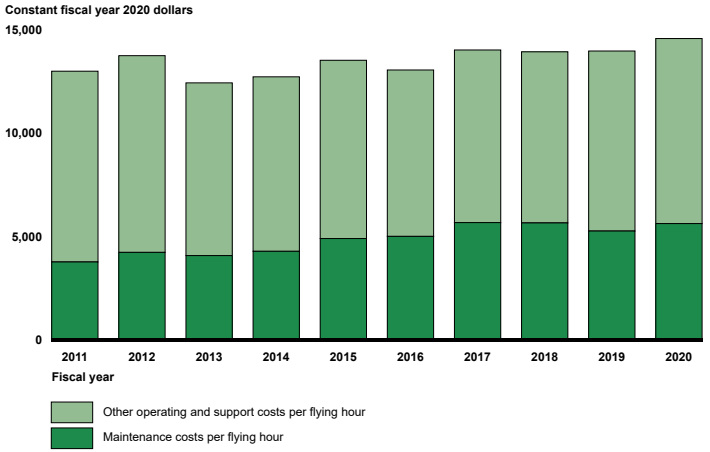


MH-60R Fleet Size

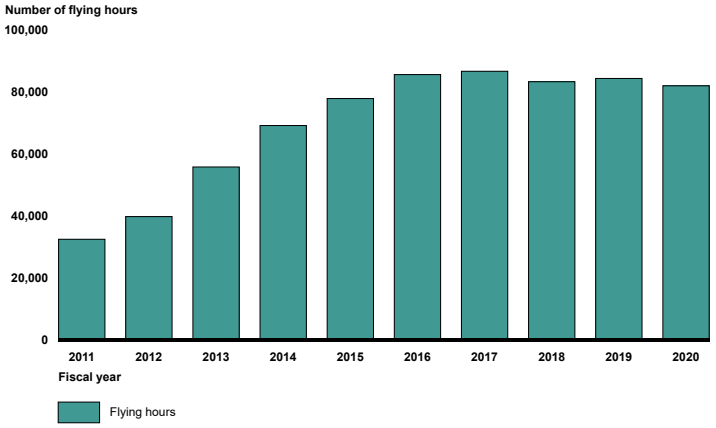


Operating and Support Costs per Flying Hour

MH-60R Operating and Support Costs per Flying Hour

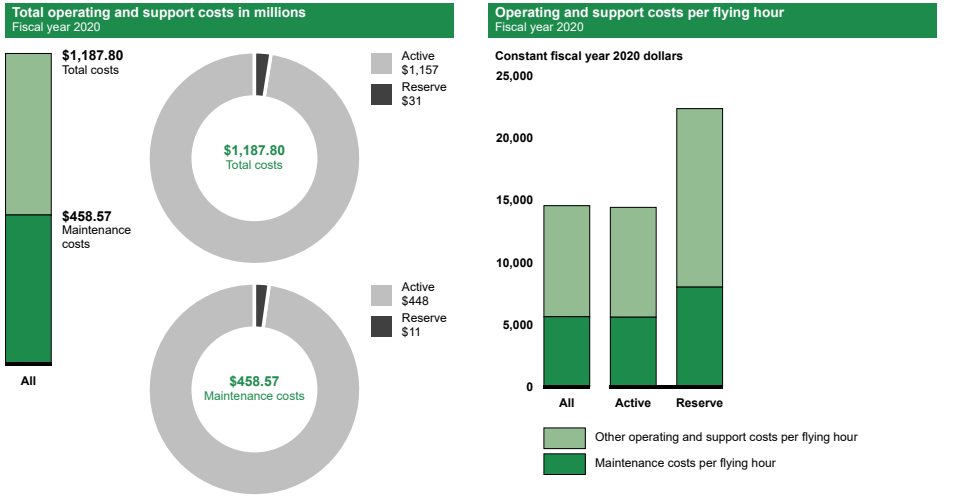


MH-60R Flying Hours



Component-Level Operating and Support Costs

MH-60R Active and Reserve Total Operating and Support Costs and Costs per Flying Hour



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	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: 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

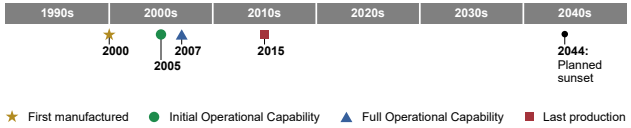
Manufacturer
Lockheed Martin/Sikorsky

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.

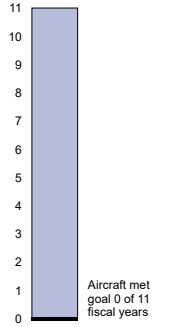
The MH-60S Seahawk is a multimission twin-engine helicopter. Its primary missions are anti-surface warfare, combat search and rescue, organic airborne mine countermeasure, combat support, aeromedical evacuation, and humanitarian disaster relief.

MH-60S Life Cycle Timeline

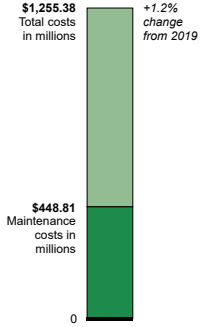


MH-60S Sustainment Status

Mission capable rate
Fiscal years met goal



Operating and support costs
Fiscal year 2020



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

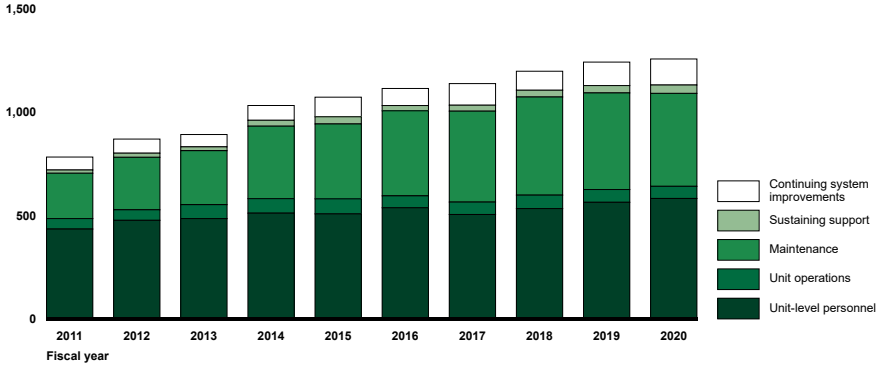
$5.30 million
Total costs per aircraft

$16,324
Total costs per flying hour
+2.9% change from 2019

Operating and Support Costs

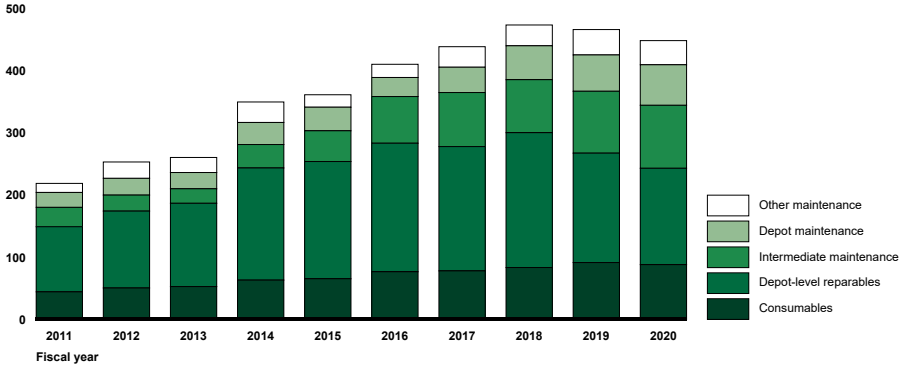
MH-60S Total Operating and Support Costs

Constant fiscal year 2020 dollars (in millions)



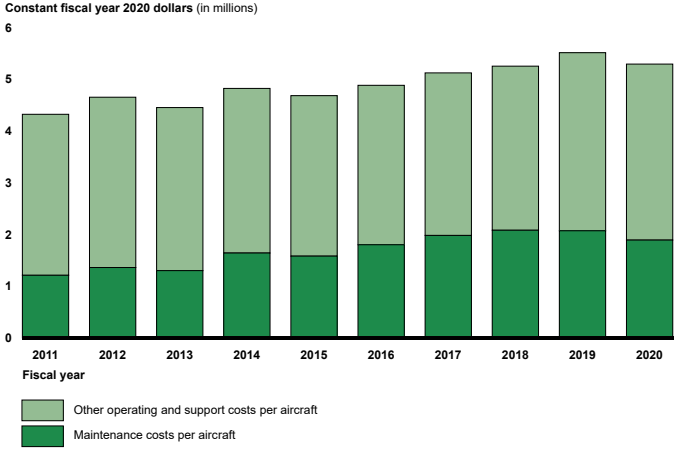
MH-60S Maintenance Costs

Constant fiscal year 2020 dollars (in millions)

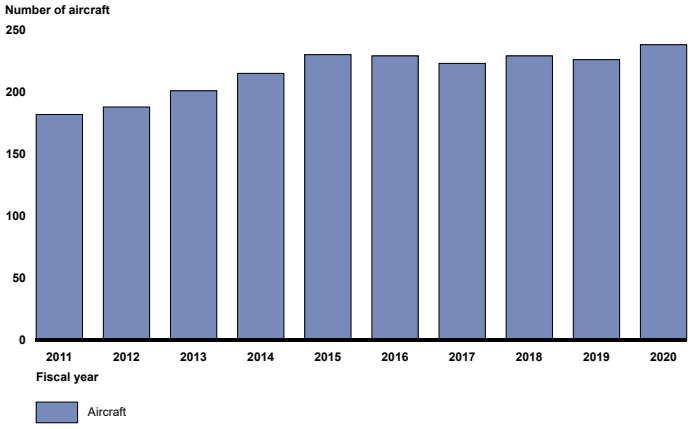


Operating and Support Costs per Aircraft

MH-60S Operating and Support Costs per Aircraft

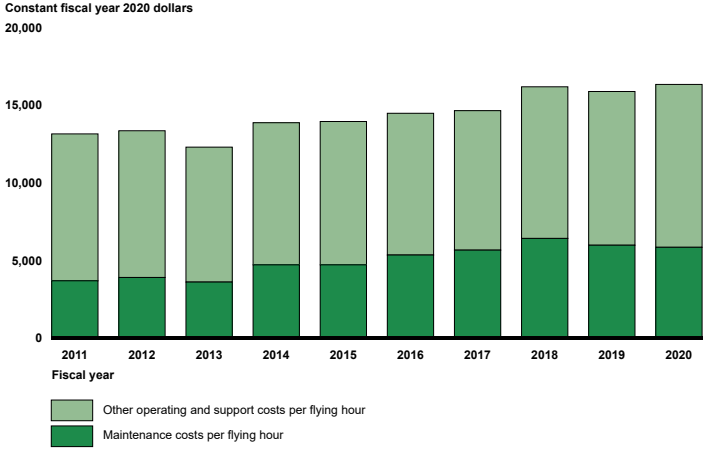


MH-60S Fleet Size

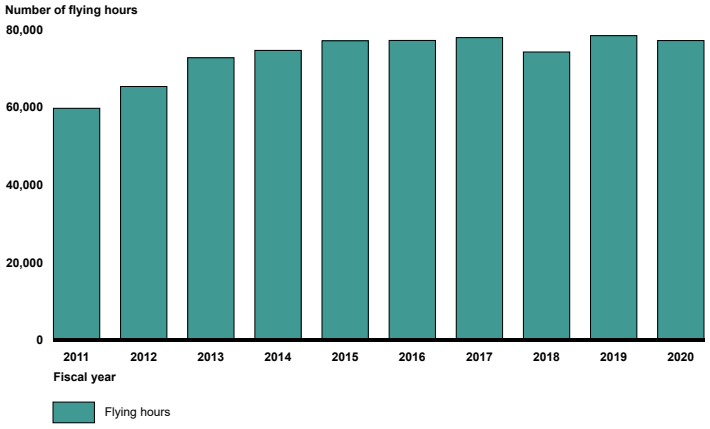


Operating and Support Costs per Flying Hour

MH-60S Operating and Support Costs per Flying Hour

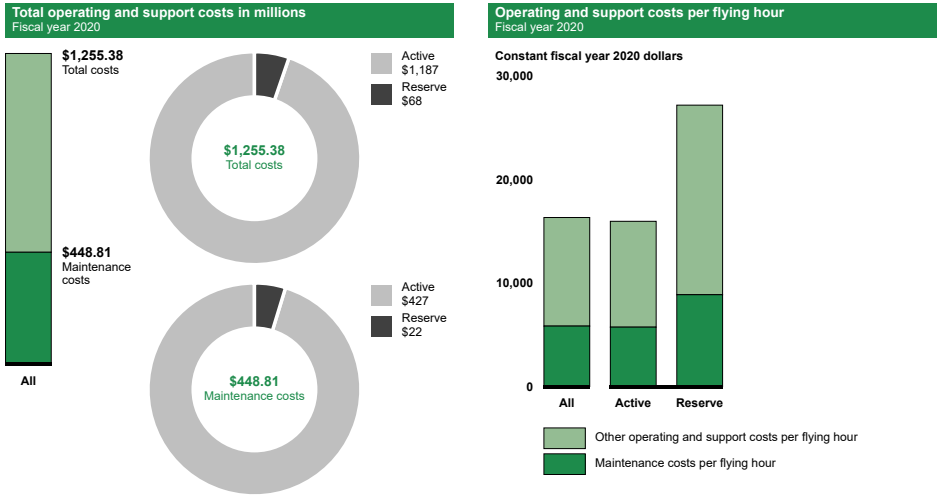


MH-60S Flying Hours



Component-Level Operating and Support Costs

MH-60S Active and Reserve Total Operating and Support Costs and Costs per Flying Hour



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

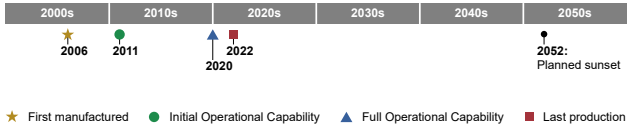
Manufacturer
Bell Helicopter Textron, Inc.

Program Office
Program Managers – Air 276, Naval Air Systems Command, Patuxent River, Maryland

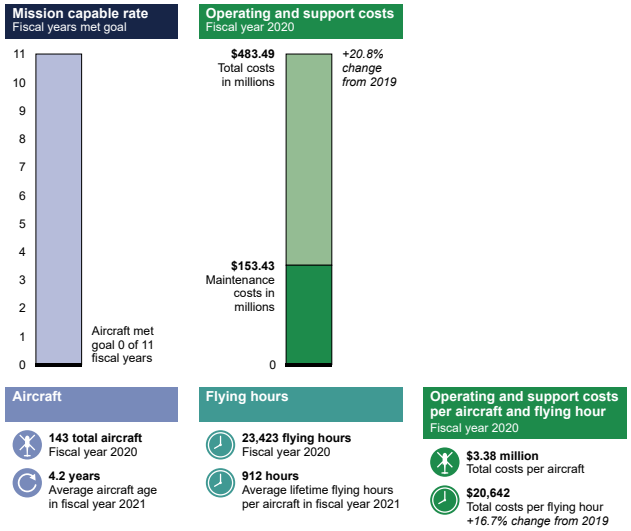
Sustainment
The Navy's Fleet Readiness Centers East, Southwest, and Western Pacific perform depot maintenance. Marine Corps personnel perform field maintenance.

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

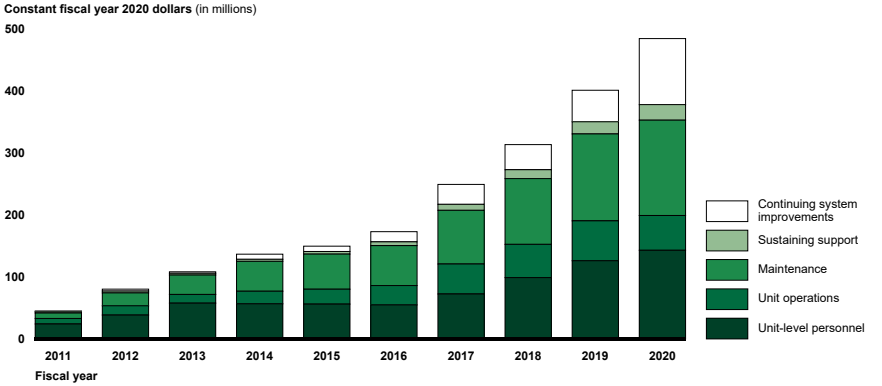


AH-1Z Sustainment Status

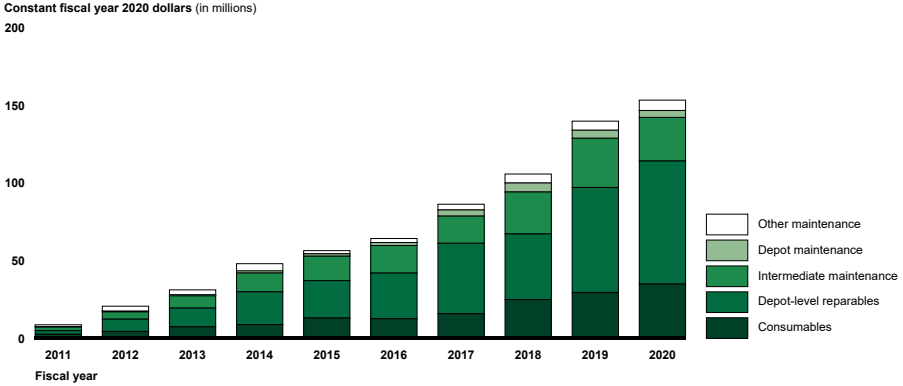


Operating and Support Costs

AH-1Z Total Operating and Support Costs

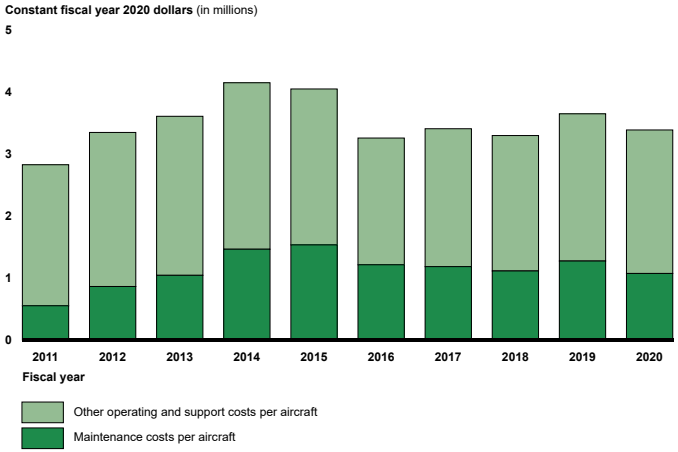


AH-1Z Maintenance Costs

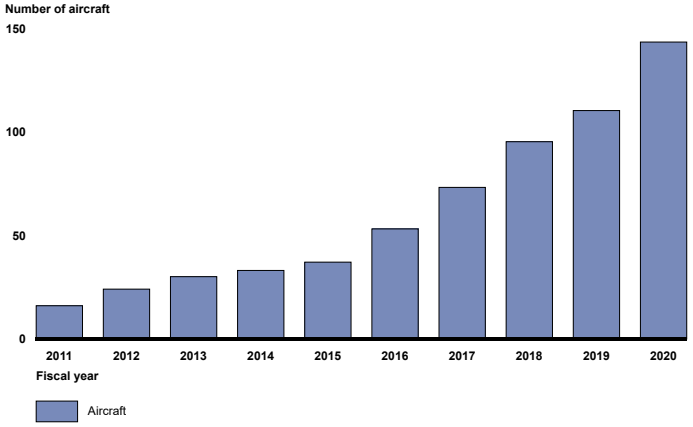


Operating and Support Costs per Aircraft

AH-1Z Operating and Support Costs per Aircraft

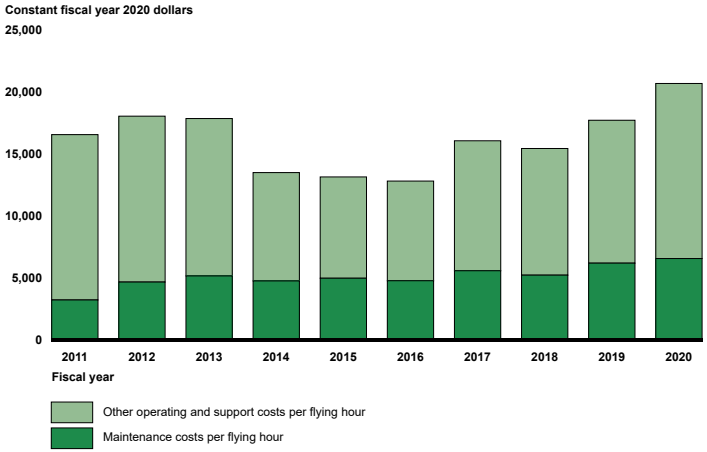


AH-1Z Fleet Size

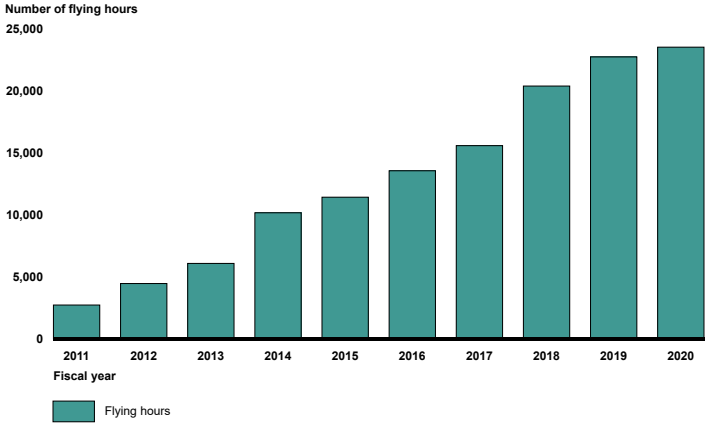


Operating and Support Costs per Flying Hour

AH-1Z Operating and Support Costs per Flying Hour

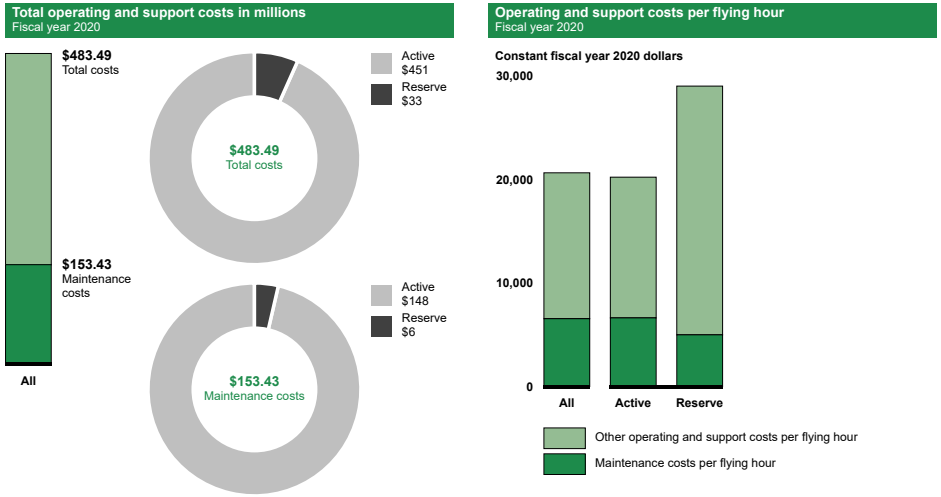


AH-1Z Flying Hours



Component-Level Operating and Support Costs

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



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

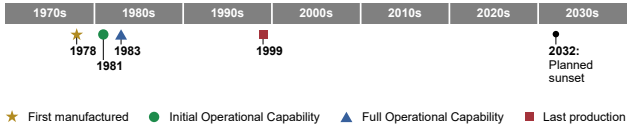
Manufacturer
Sikorsky

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.

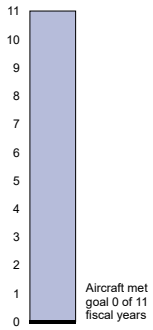
The CH-53E helicopter's mission is the transportation of heavy equipment and supplies for amphibious assault. The aircraft incorporates secure communications capability, a global positioning system, and aviator night-vision imaging systems heads-up display sensors.

CH-53E Life Cycle Timeline

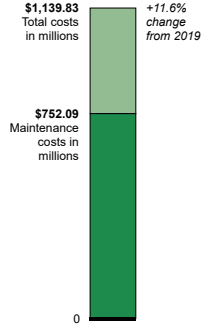


CH-53E Sustainment Status

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

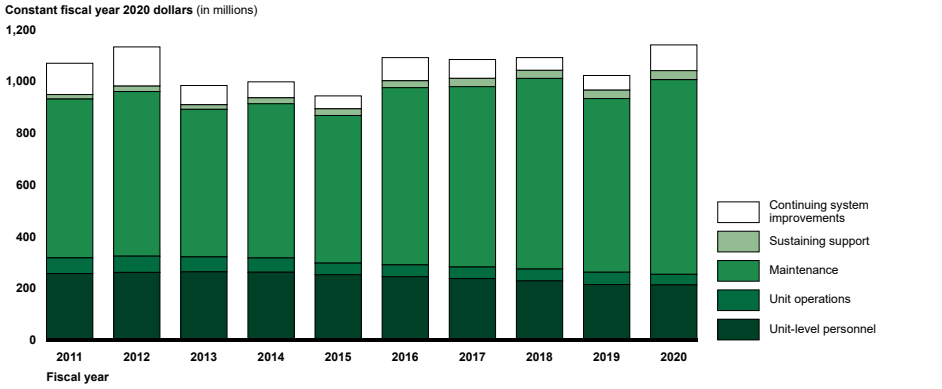
Operating and support costs per aircraft and flying hour
Fiscal year 2020

$8.20 million
Total costs per aircraft

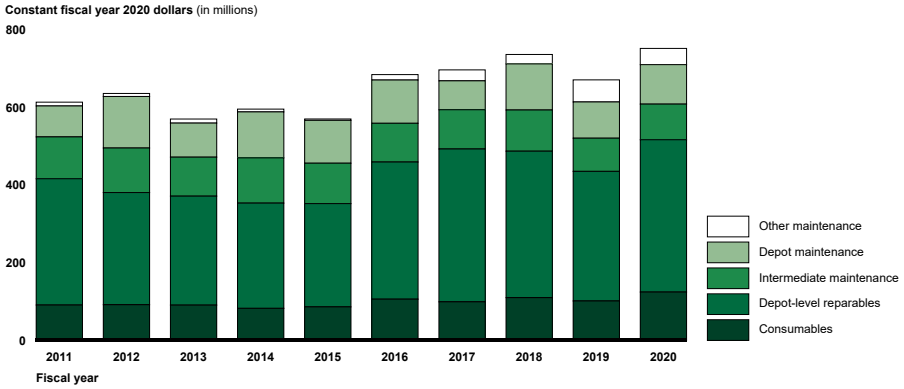
$45,612
Total costs per flying hour
+20.6% change from 2019

Operating and Support Costs

CH-53E Total Operating and Support Costs

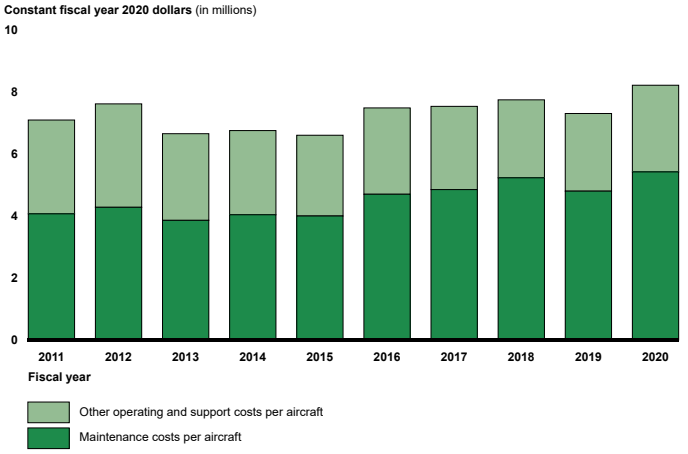


CH-53E Maintenance Costs

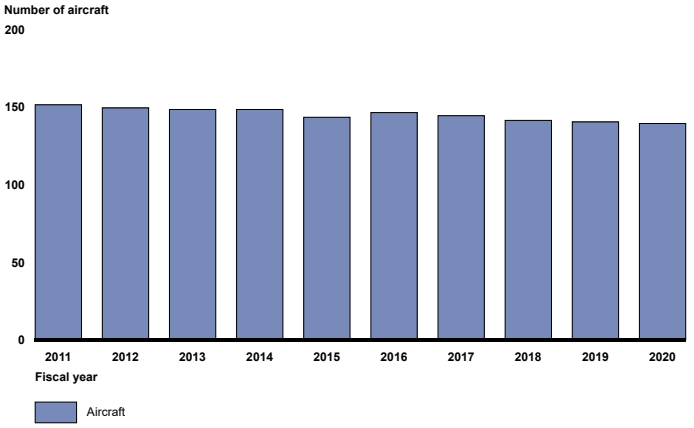


Operating and Support Costs per Aircraft

CH-53E Operating and Support Costs per Aircraft

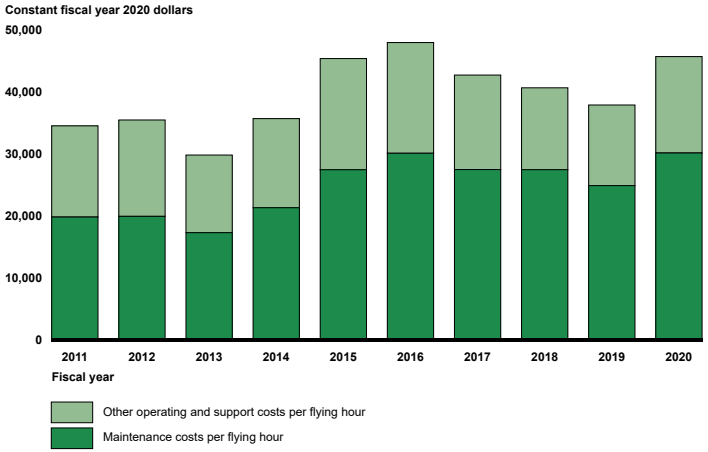


CH-53E Fleet Size

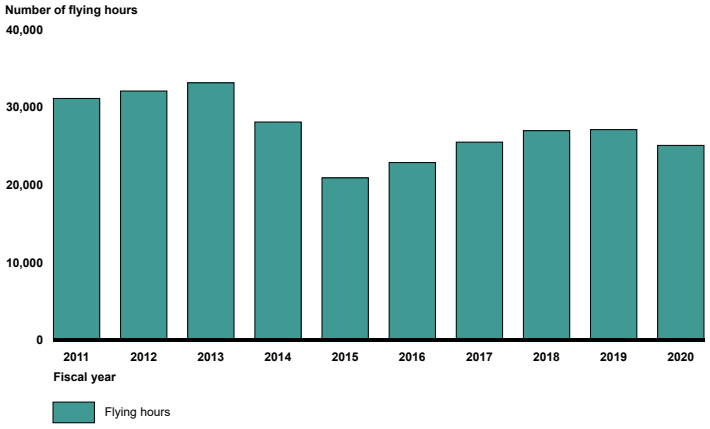


Operating and Support Costs per Flying Hour

CH-53E Operating and Support Costs per Flying Hour

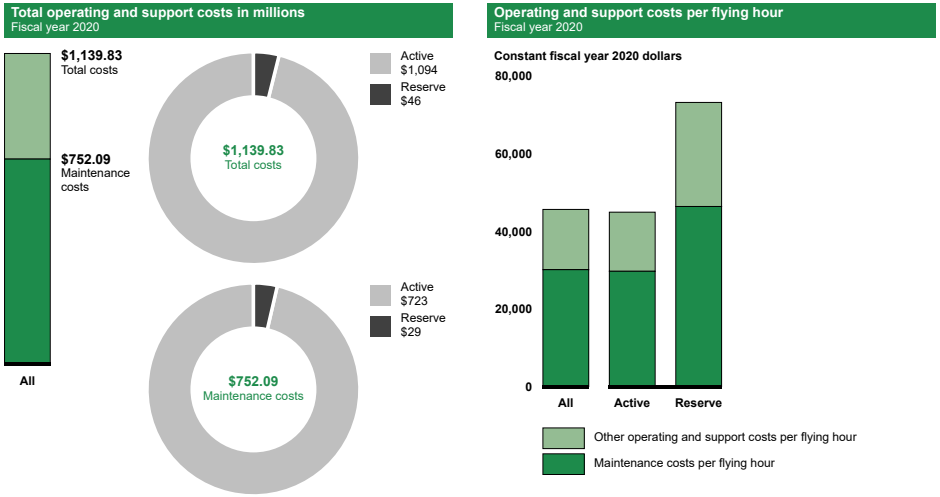


CH-53E Flying Hours



Component-Level Operating and Support Costs

CH-53E Active and Reserve Total Operating and Support Costs and Costs per Flying Hour



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	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 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

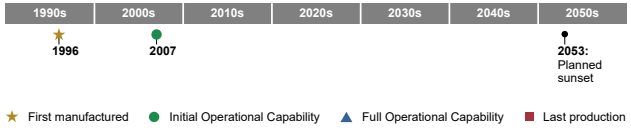
Manufacturer
Bell-Boeing Joint Program Office

Program Office
V-22 Joint Program Office – Air 275, Naval Air Systems Command, Patuxent River, Maryland

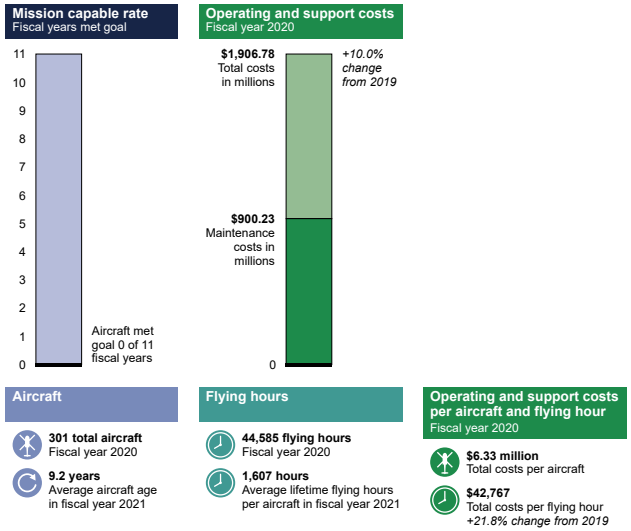
Sustainment
Depot maintenance is performed at the Navy's Fleet Readiness Centers East and Southwest and at field locations in Japan and Hawaii. Rolls Royce performs depot maintenance on the engines. Marine Corps personnel perform organizational maintenance.

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

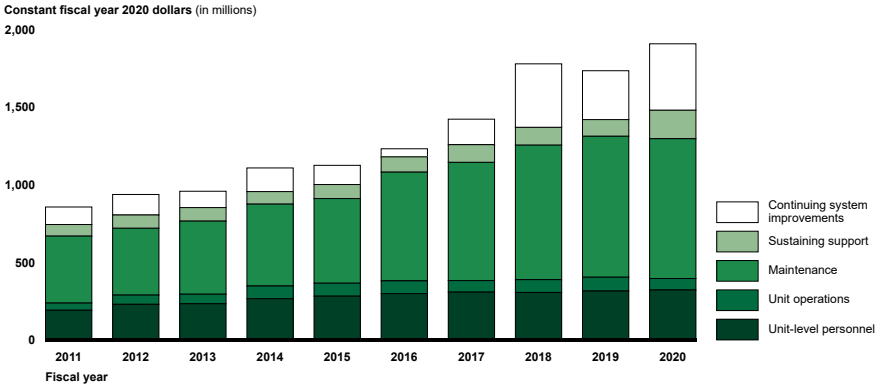


MV-22B Sustainment Status

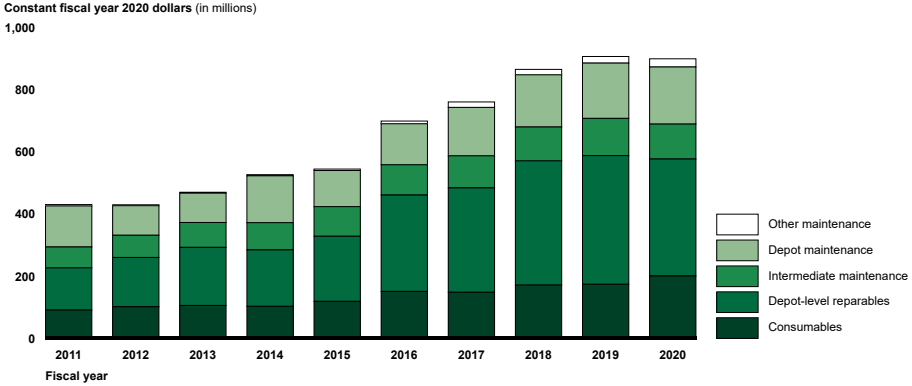


Operating and Support Costs

MV-22B Total Operating and Support Costs

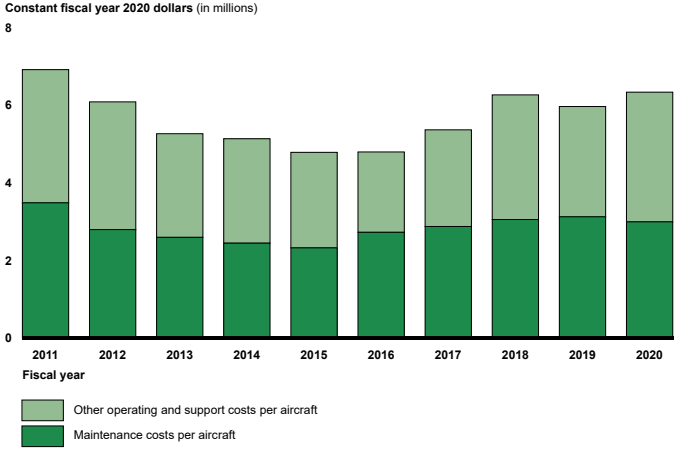


MV-22B Maintenance Costs

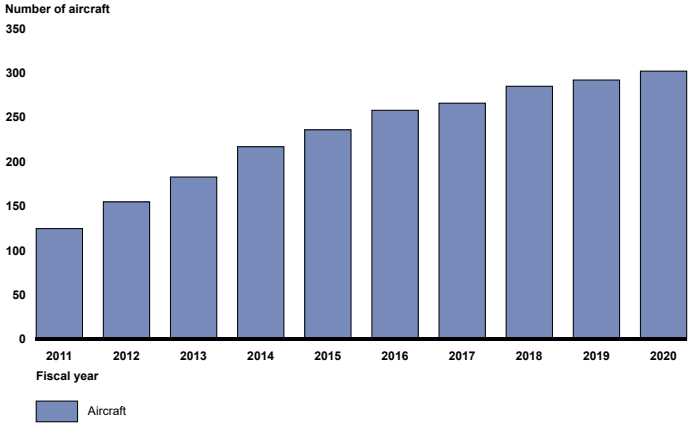


Operating and Support Costs per Aircraft

MV-22B Operating and Support Costs per Aircraft

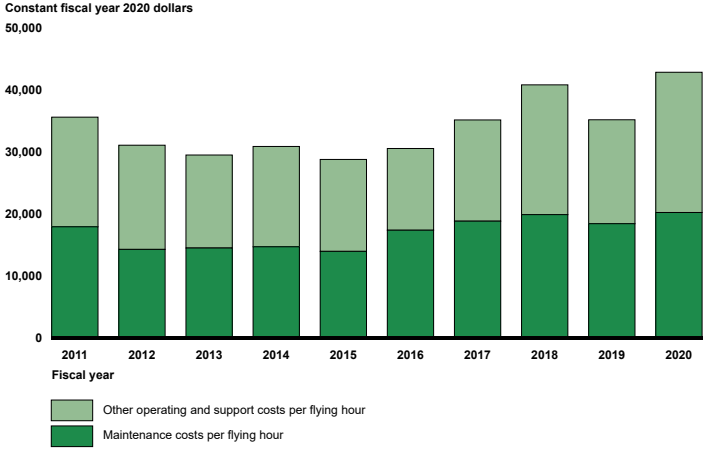


MV-22B Fleet Size

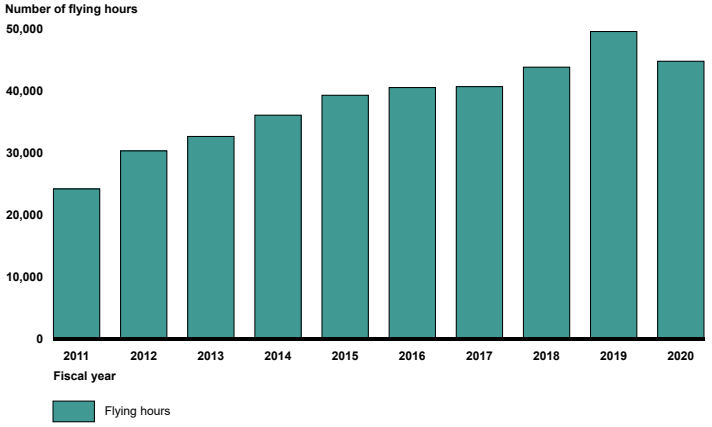


Operating and Support Costs per Flying Hour

MV-22B Operating and Support Costs per Flying Hour

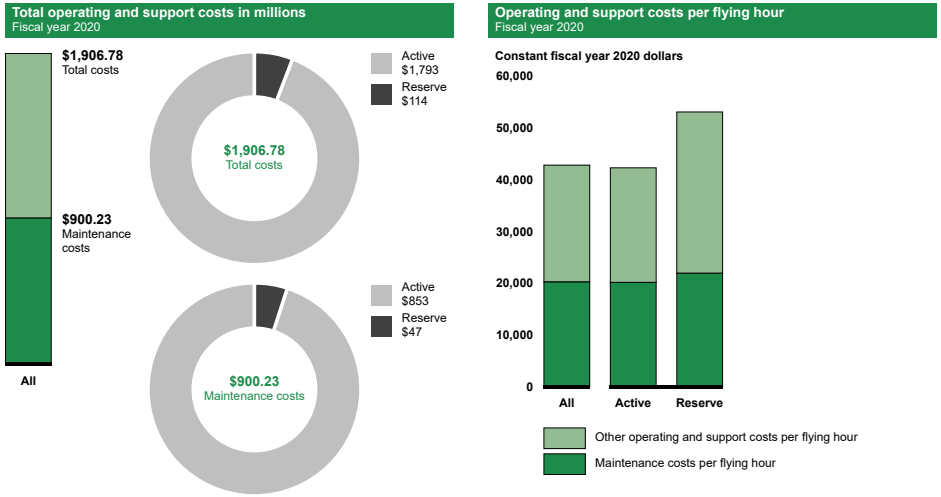


MV-22B Flying Hours



Component-Level Operating and Support Costs

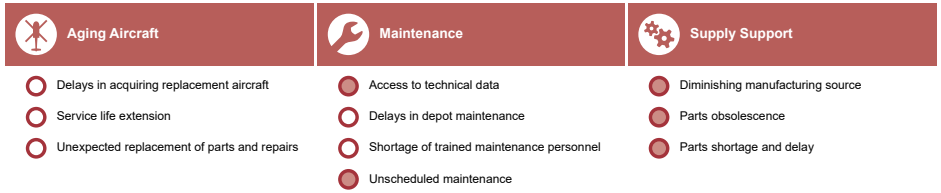
MV-22B Active and Reserve Total Operating and Support Costs and Costs per Flying Hour



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: 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

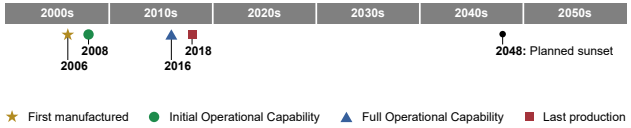
Manufacturer
Bell Helicopter Textron, Inc.

Program Office
Program Manager – Air 276, Naval Air Systems Command, Patuxent River, Maryland

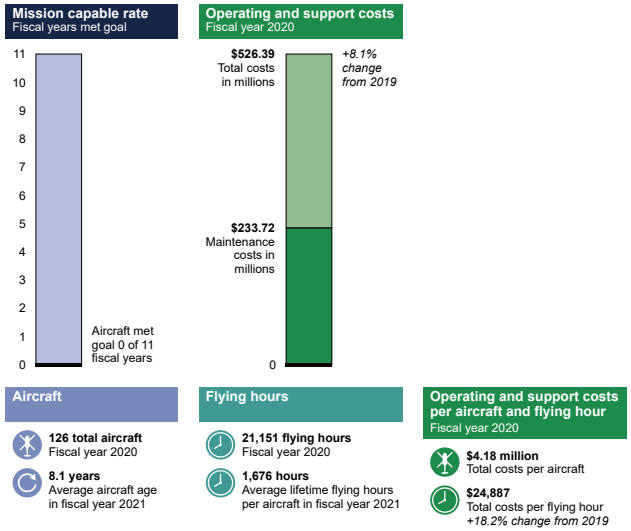
Sustainment
The Navy's Fleet Readiness Centers East, Southwest, and Western Pacific perform depot maintenance. Marine Corps personnel perform organizational maintenance.

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

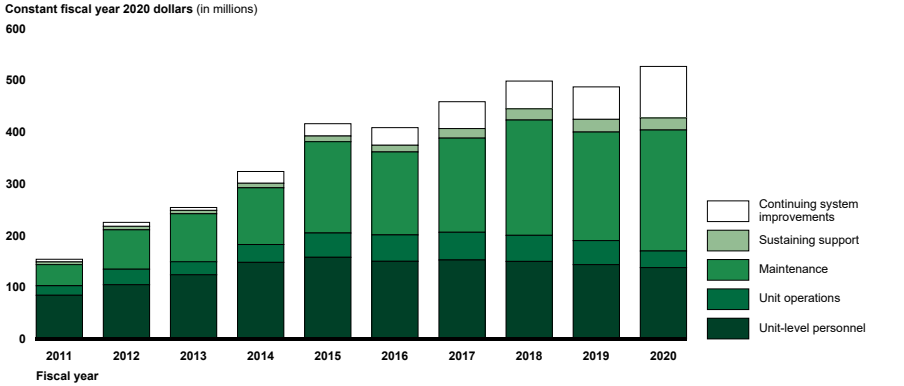


UH-1Y Sustainment Status

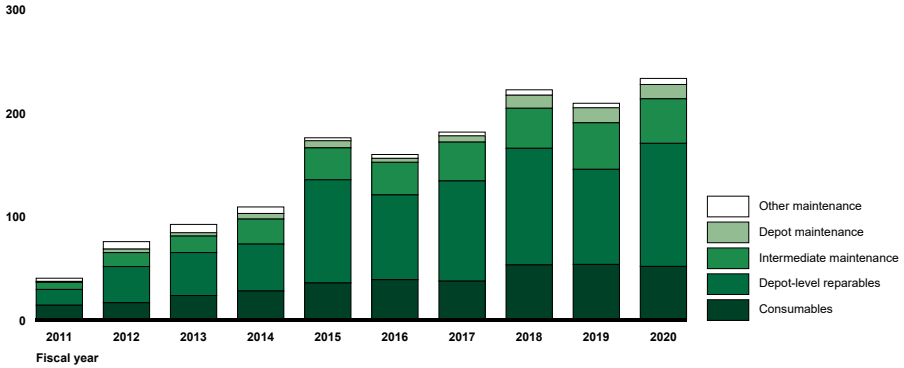


Operating and Support Costs

UH-1Y Total Operating and Support Costs

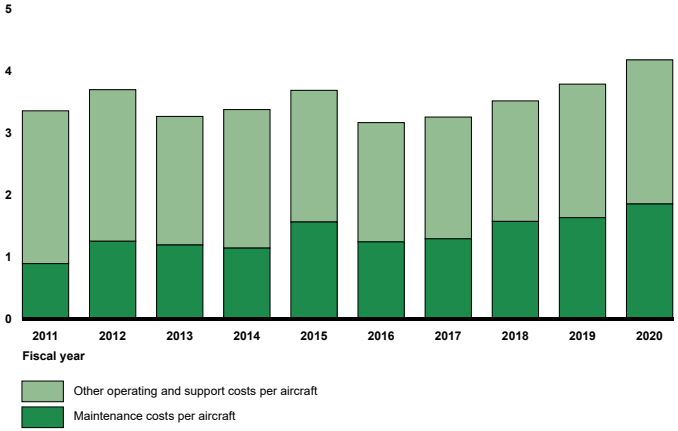


UH-1Y Maintenance Costs

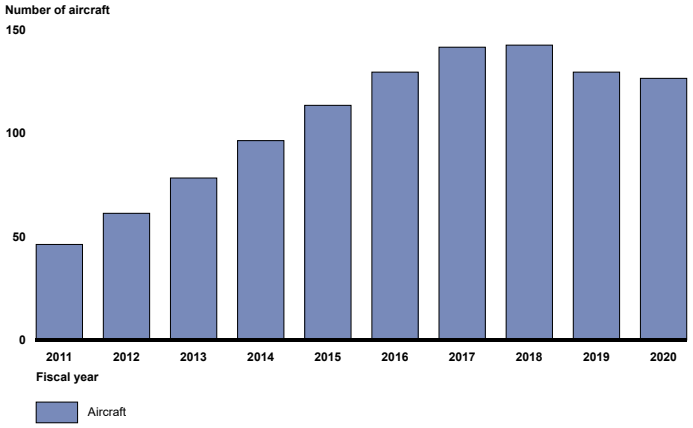


Operating and Support Costs per Aircraft

UH-1Y Operating and Support Costs per Aircraft

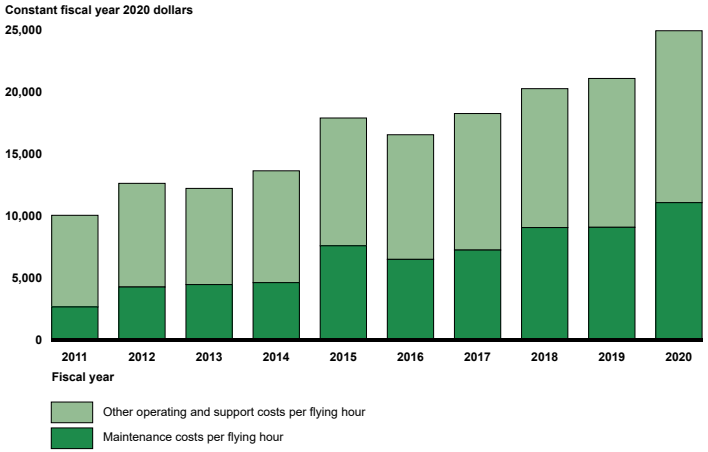


UH-1Y Fleet Size

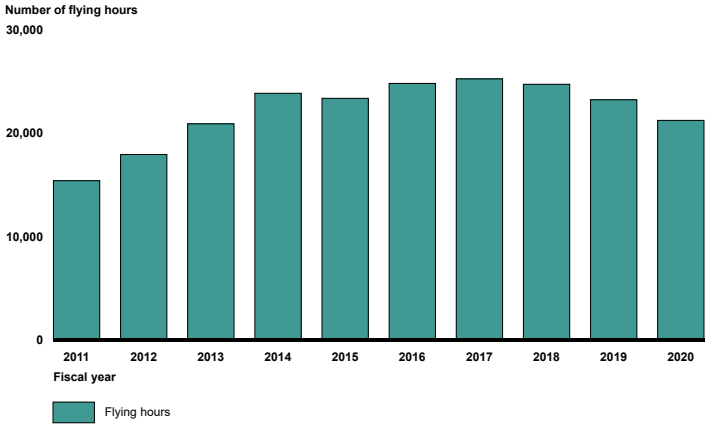


Operating and Support Costs per Flying Hour

UH-1Y Operating and Support Costs per Flying Hour

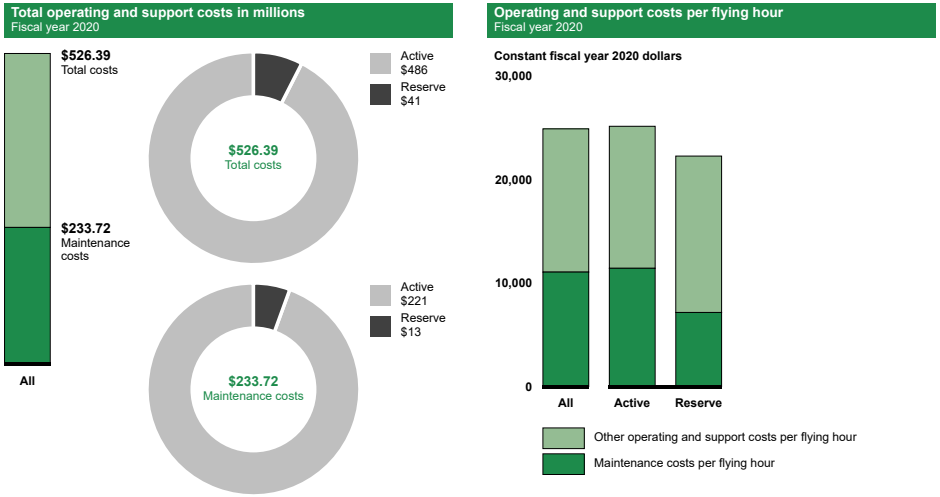


UH-1Y Flying Hours



Component-Level Operating and Support Costs

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



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	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, 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

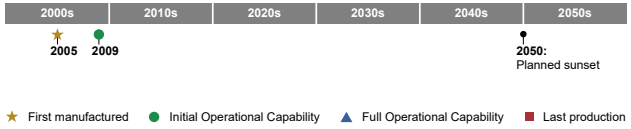
Manufacturer
Bell-Boeing Joint Program Office

Program Office
V-22 Joint Program Office – Air 275, Naval Air Systems Command, Patuxent River, Maryland

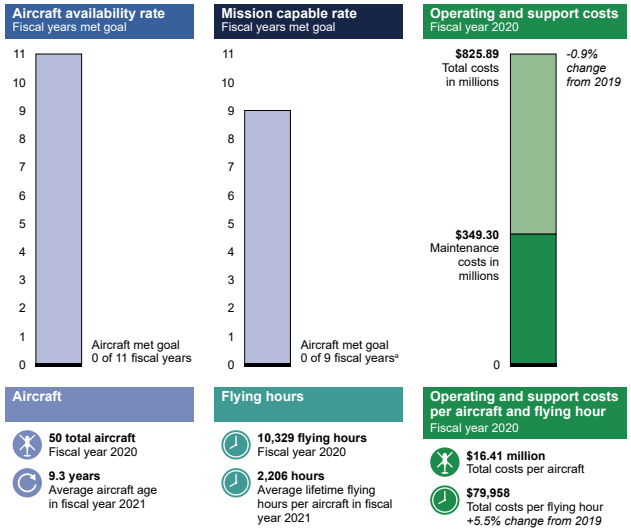
Sustainment
Personnel from the Navy's Fleet Readiness Centers East and Southwest, and from Bell Boeing, perform depot maintenance at two Air Force installations under a Joint Performance Based Logistics and Engineering contract, according to program officials.

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



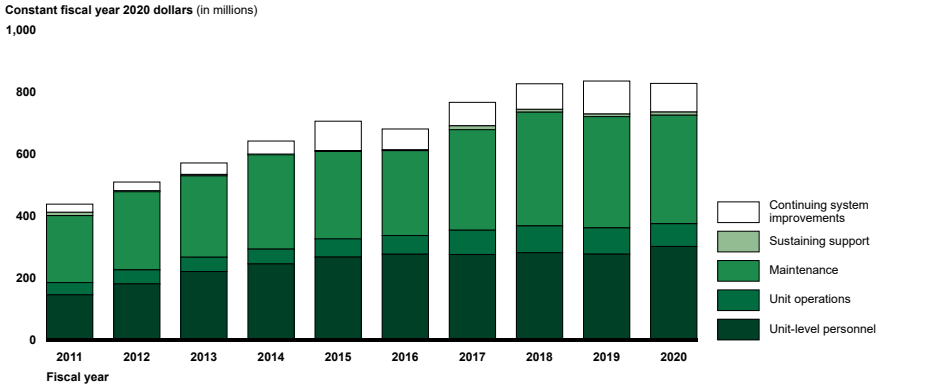
CV-22 Sustainment Status



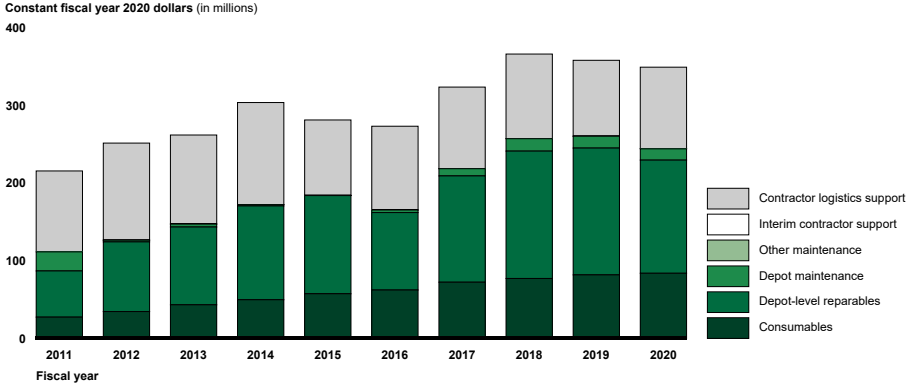
[a]For this aircraft, the military department did not provide a mission capable goal for all eleven years.

Operating and Support Costs

CV-22 Total Operating and Support Costs

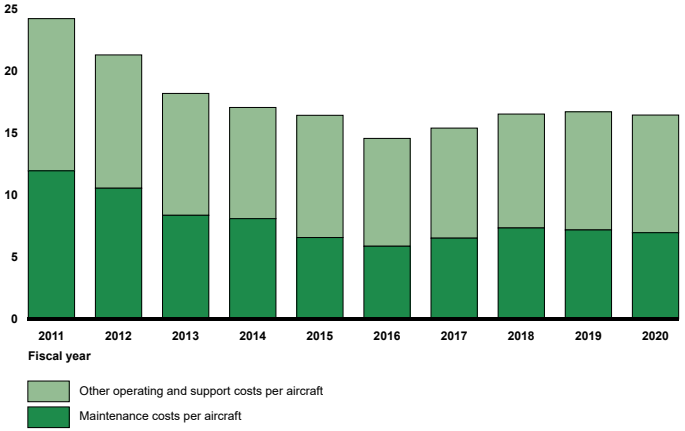


CV-22 Maintenance Costs

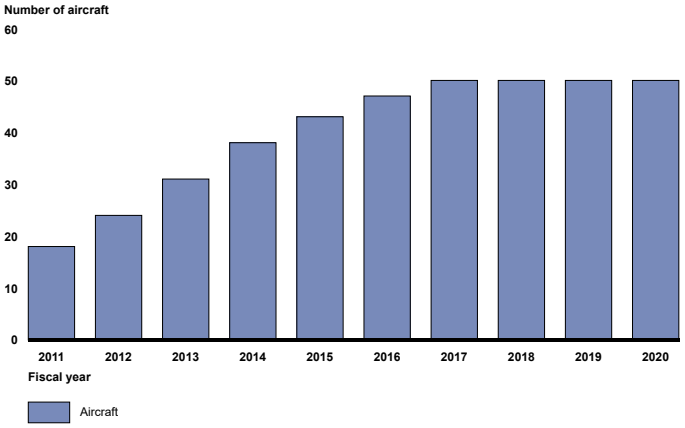


Operating and Support Costs per Aircraft

CV-22 Operating and Support Costs per Aircraft

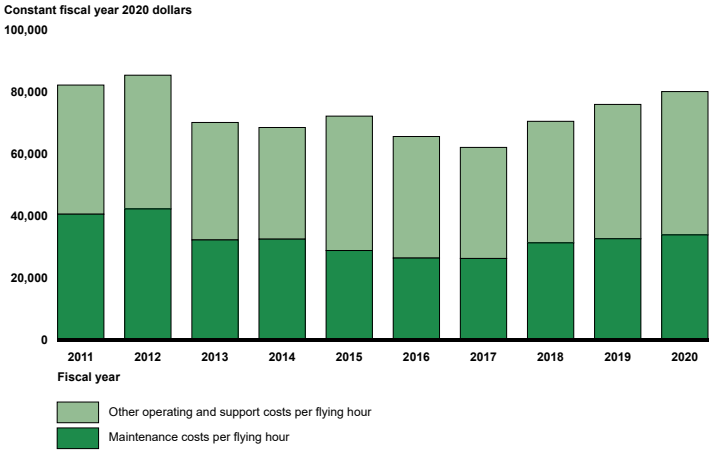


CV-22 Fleet Size

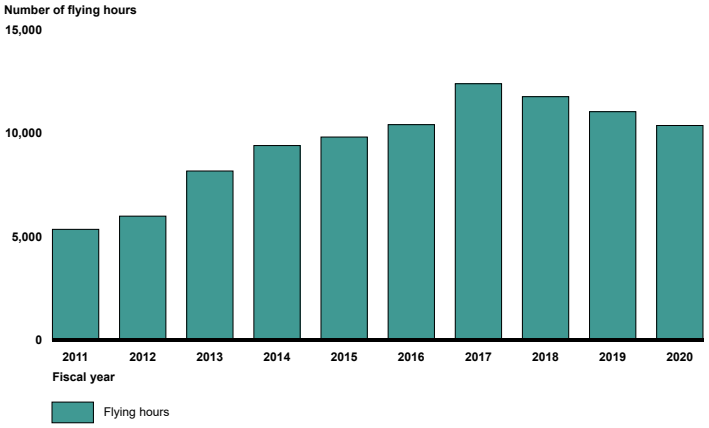


Operating and Support Costs per Flying Hour

CV-22 Operating and Support Costs per Flying Hour

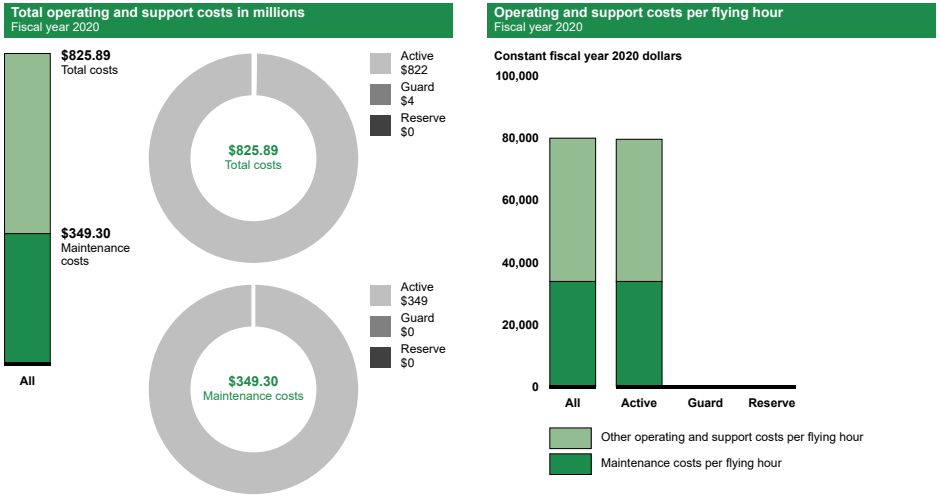


CV-22 Flying Hours



Component-Level Operating and Support Costs

CV-22 Active and Reserve Total Operating and Support Costs and Costs per Flying Hour



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.

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Program Office Comments

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