



February 2024

WEAPON SYSTEM SUSTAINMENT

DOD Identified
Operating and
Support Cost Growth
but Needs to Improve
the Consistency and
Completeness of
Information to
Congress

Accessible Version

GAO Highlights

Highlights of [GAO-24-107378](#), a report to congressional committees

Why GAO Did This Study

DOD spends billions of dollars to sustain its weapon systems. O&S costs are about 70 percent of a system's total life-cycle cost. In response to a statutory provision, DOD is required to annually submit sustainment reviews that include O&S cost estimates and the reasons for any critical cost growth.

The William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 included a provision for GAO to review DOD's annual sustainment reviews and O&S cost estimates through 2025. GAO's report evaluates the extent to which DOD (1) developed sustainment reviews for fiscal year 2022 that identified critical O&S cost growth and related causes; and (2) identified and implemented any lessons learned for critical O&S cost growth from conducting the reviews.

GAO reviewed and analyzed DOD guidance and documentation, the submitted fiscal year 2022 reviews, and the supporting independent cost estimates. GAO interviewed DOD officials who conducted the reviews. This is a public version of a sensitive report that GAO is issuing concurrently. GAO omitted information that DOD deemed sensitive.

What GAO Recommends

GAO is recommending that DOD implement clarifying guidance for sustainment review submissions to ensure that the military departments are consistently presenting cost information, such as the time frame of the cost estimate, the cost categories, and the effects of inflation. DOD agreed with the recommendation.

View [GAO-24-107378](#). For more information, contact Diana Maurer at (202) 512-9627 or maurerd@gao.gov.

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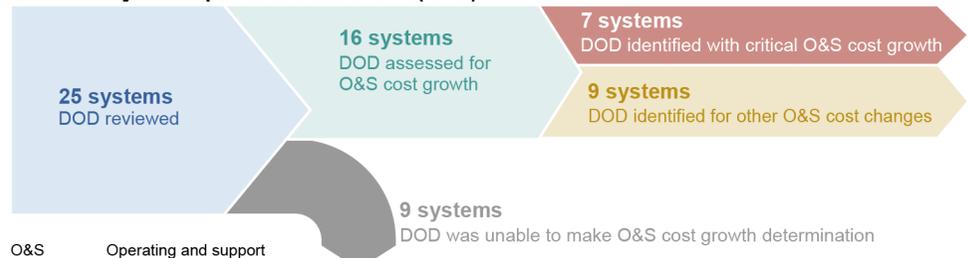
WEAPON SYSTEM SUSTAINMENT

DOD Identified Operating and Support Cost Growth but Needs to Improve the Consistency and Completeness of Information to Congress

What GAO Found

The Department of Defense (DOD) conducted sustainment reviews for 25 weapon systems for fiscal year 2022, including developing operating and support (O&S) cost estimates for the remainder of each system's life cycle. O&S costs are comprised of costs for repair parts, maintenance activities, contract services, and personnel. DOD assessed O&S cost growth for 16 systems but was unable to make cost growth determinations for the nine remaining systems, due to a lack of available information to conduct the comparison (see first figure). DOD identified critical cost growth for seven of the 16 systems and the reasons for that growth (see second figure). A statute defines critical O&S cost growth as at least 25 percent more than the estimate documented in the most recent independent cost estimate; or at least 50 percent more than the estimate documented in the original baseline cost estimate for the system. The other nine systems experienced O&S cost changes, but any growth identified did not meet the critical O&S cost growth criteria.

Number of Weapon Systems Reviewed and Operating and Support (O&S) Cost Growth Identified by the Department of Defense (DOD) in Fiscal Year 2022



Source: GAO analysis of Department of Defense (DOD) data. | GAO-24-107378

Causes of Critical Operating and Support (O&S) Cost Growth in Seven Systems

Military dept.	System	Number of systems increased	Extended operational life	Software or hardware updates	Other
Army	Common Remotely Operated Weapon Station	✓	✓		✓
	Excalibur Precision 155mm Projectiles	✓		✓	
	Tactical Mission Command-Maneuver Control System		✓		✓
	Warfighter Information Network-Tactical Increment 1	✓	✓		
Navy	EA-18G Growler	✓	✓	✓	
	F/A-18E/F Super Hornet	✓	✓	✓	
	Navy Multiband Terminal		✓	✓	✓

Source: GAO analysis of Department of Defense information. | GAO-24-107378

DOD's Office of Cost Assessment and Program Evaluation updated its guidance based on lessons learned from the most recent sustainment reviews. However, military departments vary in how they report the details of cost estimates. For example, they presented cost information differently in several areas, including the time frames for the estimate, the breakdown of information across cost categories, and the effects of inflation. Without the development and implementation of clear guidance on the presentation of such information, DOD stakeholders and Congress will not have consistent and complete information for effective decision making and oversight.

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Abbreviations

CAPE	Office of Cost Assessment and Program Evaluation
DOD	Department of Defense
NDAA	National Defense Authorization Act
O&S	operating and support
USD(A&S)	Under Secretary of Defense for Acquisition and Sustainment

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February 29, 2024

Congressional Committees

The Department of Defense (DOD) spends tens of billions of dollars annually to sustain its weapon systems, from aircraft to ships to ground combat vehicles. These dollars are meant to ensure that these weapon systems are available to simultaneously support today's military operations and maintain the capability to meet future defense requirements. Operating and support (O&S) costs historically account for approximately 70 percent of a weapon system's total life-cycle cost, which is the cost to operate and sustain the system from initial operations through the end of its life. Included in the costs are repair parts, depot and field maintenance, contract services, engineering support, and personnel, among other things. Weapon systems are costly to sustain in part because they often incorporate a complex array of technical subsystems and components and need expensive repair parts and logistics support to meet required readiness levels. Additionally, DOD's strategic management framework includes an objective to reduce O&S costs to maximize readiness.¹

Section 4323 of title 10, U.S. Code, requires the secretaries of the military departments to annually submit to the congressional defense committees covered weapon system (hereafter referred to in this report as weapon systems) sustainment reviews completed for the prior fiscal year that include information on O&S costs.² For any weapon system experiencing critical O&S cost growth, the provision requires the submitted sustainment reviews to include a remediation plan to reduce O&S costs or a certification by the secretary concerned that such critical O&S cost growth

¹Department of Defense (DOD), *DOD Strategic Management Plan for Fiscal Years 2022–2026* (March 2023).

²10 U.S.C. § 4323(d). The statute defines a covered system as (1) a major defense acquisition program as defined in section 4201 of title 10, U.S. Code, or (2) an acquisition program or project carried out using the rapid fielding or rapid prototyping acquisition pathway under section 804 of the National Defense Authorization Act for Fiscal Year 2016, Pub. L. No. 114-92, that is estimated by the Secretary of Defense to have an eventual total expenditure of more than \$300 million for research, development, test, and evaluation or \$1.8 billion for procurement (dollar amounts are in fiscal year 1990 constant dollars). 10 U.S.C. § 4324(d)(5).

is necessary to meet national security requirements.³ The statute defines critical O&S cost growth as O&S cost growth of (a) at least 25 percent more than the estimate documented in the most recent independent cost estimate for the system; or (b) at least 50 percent more than the estimate documented in the original baseline cost estimate for the system.⁴ For the purposes of this report, we refer to these categories of critical cost growth as Category A and Category B.

Section 802 of the William M. (Mac) Thornberry National Defense Authorization Act (NDAA) for Fiscal Year 2021 included a provision for us to review sustainment reviews conducted by DOD on an annual basis through 2025.⁵ Specifically, the provision requires that we annually select 10 weapon systems for which a sustainment review has been submitted by the military departments to the congressional defense committees under section 4323 and assess the military departments' efforts to quantify and address critical O&S cost growth for those systems. In March 2023, we reported on the first set of weapon system sustainment reviews DOD conducted for fiscal year 2021. We found that the Army and the Air Force developed sustainment reviews for a total of 13 weapon systems, and the Navy did not submit any reviews. Of these systems, the Army identified two with critical O&S cost growth.⁶

This report (1) describes the extent to which DOD developed weapon system sustainment reviews for fiscal year 2022 that identified critical O&S cost growth and the causes of that growth; and (2) examines the extent to which DOD identified and implemented any lessons learned from conducting the sustainment reviews.

³10 U.S.C. § 4323(d)(3).

⁴10 U.S.C. § 4323(e)(2). The statute defines an original baseline cost estimate for a weapon system as the baseline description established with respect to a weapon system acquisition program before it enters system development and demonstration, or at program initiation, whichever occurs later, without adjustment or revision, with some exceptions. See 10 U.S.C. §§ 4323(e)(2)(B), 4214(d)(1).

⁵Pub. L. No. 116-283, § 802(d) (2021).

⁶GAO, *Weapon System Sustainment: The Army and Air Force Conducted Reviews and the Army Identified Operating and Support Cost Growth*, [GAO-23-106341](#) (Washington, D.C.: Mar. 30, 2023).

This report is a public version of a sensitive report that we issued in February 2024.⁷ DOD deemed some of the information in our February report to be sensitive, which must be protected from public disclosure. Therefore, this report omits sensitive information about quantities, operational life extensions, and dollar amounts related to cost changes for the weapon systems. Although the information provided in this report is more limited, the report addresses the same objectives as the sensitive report and uses the same methodology.

For our objectives, we reviewed and analyzed documentation including guidance for conducting sustainment reviews, the sustainment reviews submitted to the congressional defense committees for fiscal year 2022, and memorandums and cost analysis briefs on the independent cost estimates developed to support these sustainment reviews.⁸ An independent cost estimate includes all costs of development, procurement, military construction, operations and support, disposal, and trained staff to operate, maintain, and support the system upon full operational deployment, without regard to funding source or management control.⁹ We reviewed DOD's independent cost estimates and efforts to ensure estimates were conducted and presented consistently in alignment with DOD guidance for cost estimates and with GAO's leading practices for conducting and presenting consistent cost estimates.¹⁰ We also interviewed officials from the offices of the Under Secretary of Defense for Acquisition and Sustainment (USD(A&S)), Deputy Assistant Secretary of Defense for Materiel Readiness, Cost Assessment and Program Evaluation (CAPE), and each of the military departments,

⁷GAO, *Weapon System Sustainment: DOD Identified Operating and Support Cost Growth but Needs to Improve the Consistency and Completeness of Information to Congress*, GAO-24-106897SU (Washington, D.C.: Feb. 29, 2024).

⁸This report focuses on the fiscal year 2022 sustainment review submissions. According to Army officials, the Army provided its fiscal year 2023 sustainment review submission to the congressional defense committees in September 2023. According to a Navy official, the Navy is planning to provide its submission in December 2023. According to Air Force officials, the Air Force is still working on providing its submission but, as of December 2023, did not have a projected submission date. We will evaluate the fiscal year 2023 sustainment review submissions in a future GAO report.

⁹DOD Instruction 5000.73, *Cost Analysis Guidance and Procedures* (Mar. 13, 2020).

¹⁰DOD Cost Assessment and Program Evaluation (CAPE), *Operating and Support Cost-Estimating Guide* (September 2020). GAO, *Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Program Costs*, [GAO-20-195G](#) (Washington, D.C.: Mar. 12, 2020).

including officials from the weapon system program offices for those programs with critical O&S cost growth.

We conducted this performance audit from June 2023 to February 2024 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

O&S Costs for Weapon Systems

DOD's Operating and Support Cost-Estimating Guide provides direction to the military departments on developing estimates of O&S costs that support various analyses and reviews throughout the life cycle of the program.¹¹ According to the guide, O&S costs are organized into five cost categories (see table 1).

Table 1: Operating and Support (O&S) Cost Element Structure

Cost Category	Description
Unit-Level Personnel ^a	Cost of operators, maintainers, and other support personnel assigned to operating units
Unit Operations	Cost of unit operating materiel (such as fuel and training materiel) and unit support services
Maintenance	Cost of system maintenance, including depot- and intermediate-level maintenance, other than personnel assigned to operating units
Sustaining Support	Cost of system-support activities other than maintenance that can be attributed to a system and are provided by organizations other than the system's operating units
Continuing System Improvements	Cost of system hardware and software modifications to keep the system operating and operationally current

Source: GAO analysis of Department of Defense's (DOD) Operating and Support Cost-Estimating Guide. | GAO-24-107378

^aThe Department of Defense refers to this cost category as unit-level manpower.

¹¹DOD CAPE, *Operating and Support Cost-Estimating Guide* (September 2020).

Statutory Requirements for Conducting Sustainment Reviews

Section 4323 of title 10, U.S. Code, requires the secretary of each military department to conduct a sustainment review for each weapon system no later than 5 years after declaration of initial operational capability and every 5 years afterward throughout its life cycle to assess the product support strategy, performance, and O&S costs.¹² The sustainment reviews must, at a minimum, assess execution of the life-cycle sustainment plans for the weapon systems and, among other things, include an independent cost estimate for the remainder of the life cycle of each system.

As a part of the sustainment review process, the military departments must evaluate each weapon system to determine if there has been critical O&S cost growth. This evaluation uses the independent cost estimates that are prepared for each sustainment review, which forecasts costs for the remainder of a system's life cycle.

Roles and Responsibilities

There are several DOD and military department entities that have roles and responsibilities related to sustaining weapon systems and conducting sustainment reviews. Specifically:

Under Secretary of Defense for Acquisition and Sustainment (USD(A&S)) is the principal staff assistant and advisor to the Secretary of Defense for all matters relating to acquisition and sustainment in the DOD.¹³ Among his or her responsibilities, the USD(A&S) establishes policies on and supervises all elements of DOD relating to sustainment, including logistics, maintenance, and materiel readiness.

Deputy Assistant Secretary of Defense for Materiel Readiness serves as the principal advisor to the USD(A&S) on policies and procedures for maintenance support of major weapon systems and military equipment.

¹²10 U.S.C. §4323(a). Initial operational capability is generally when some organizations in the force structure scheduled to receive a system have received it and have the ability to employ and maintain it.

¹³DOD Directive 5135.02, *Under Secretary of Defense for Acquisition and Sustainment (USD (A&S))* (July 15, 2020).

Director of Cost Assessment and Program Evaluation (CAPE)

oversees implementation of the procedures and prepares clarifying guidance as needed for the conduct of cost estimating and analysis to all elements of DOD, among other responsibilities.¹⁴

Department of the Army entities include the Office of the Assistant Secretary of the Army for Acquisition, Logistics, and Technology, which is designated as the single office within the headquarters of the Department of the Army for acquisition and development functions.¹⁵ In addition, the U.S. Army Materiel Command is the Army's primary logistics and sustainment command, responsible for managing the global supply chain and ensuring installation materiel readiness solutions for the Army.

Department of the Navy entities include the Office of the Assistant Secretary of the Navy for Research, Development and Acquisition, which is responsible for all the acquisition functions and programs for the Navy and Marine Corps.¹⁶ In addition, the Naval Air Systems Command's mission is to provide full life-cycle support of naval aviation aircraft, weapons, and systems. The Naval Sea Systems Command provides sustainment oversight for ships, submarines, and systems. The Naval Information Warfare Systems Command's mission includes sustaining information warfare capabilities and services.

Department of the Air Force entities include the Office of the Assistant Secretary of the Air Force for Acquisition, Technology and Logistics, which has overall responsibility for acquisition of systems, including product support, for the Department of the Air Force.¹⁷ In addition, the Air Force Materiel Command develops, acquires, and sustains weapon systems through research, development, testing, evaluation, acquisition, maintenance, and program management of the systems and their components.

¹⁴DOD Instruction 5000.73, *Cost Analysis Guidance and Procedures* (Mar. 13, 2020).

¹⁵Army Regulation 70-1, *Army Operation of the Adaptive Acquisition Framework* (Nov. 28, 2023).

¹⁶See Secretary of the Navy Instruction 5400.15D, *Department of the Navy Research and Development, Acquisition, Associated Life-Cycle Management, and Sustainment Responsibilities and Accountability* (Jan. 19, 2021).

¹⁷Air Force Mission Directive 1-10, *Assistant Secretary of the Air Force (Acquisition)* (Sept. 2, 2016).

Weapon system program managers within each military department lead the development, delivery, and sustainment of individual weapon systems throughout their life cycles. They are responsible for accomplishing a program's sustainment objectives to meet its users' operational needs, as well as for conducting each system's sustainment review. Further, they are typically supported by a complex supplier network that can include a prime contractor, subcontractors, and various tiers of parts suppliers.

Fiscal Year 2022 Sustainment Reviews

The military departments conducted sustainment reviews of 25 weapon systems and submitted them to the congressional defense committees for fiscal year 2022.¹⁸ See the weapon systems that each military department reviewed in figures 1 (Army), 2 (Navy), and 3 (Air Force).

¹⁸Of the 25 weapon systems, the Army reviewed 11; the Navy, eight; and the Air Force, six.

Figure 1: Army Weapon Systems Included in the Department of Defense’s Fiscal Year 2022 Sustainment Reviews

Army	
	Air-to-Ground Missile (AGM-114) Hellfire (Laser Hellfire) is a semi-active laser-guided air-to-ground missile launched from various aircraft, naval assets, and land-based systems.
	Black Hawk Utility Helicopter UH-60A/L are part of the legacy fleet and predecessors to the UH-60M.
	Black Hawk Utility Helicopter UH-60M is a utility transport helicopter that provides air assault, general support, command and control, and special operations support.
	Common Remotely Operated Weapon Station (CROWS) is an externally mounted weapon system for multiple types of vehicles that allows the gunner to remain safely inside the vehicle while firing the weapon.
	Excalibur Precision 155 mm Projectiles are a family of GPS-guided cannon artillery that provides improved range and accuracy.
	MIM-104 Patriot Surface-to-Air Missile System is a very low-to-very high altitude, long-range, all-weather system designed to find, track, and engage multiple types of threats.
	Patriot Advanced Capability-3 (PAC-3) —the Army’s premier guided air and missile defense system—provides highly reactive hit-to-kill capability in both range and altitude.
	Patriot Advanced Capability-3 Missile Segment Enhancement (PAC-3 MSE) is an upgrade to the predecessor PAC-3 missile, providing better lethality and a longer range.
	RQ-7B Shadow Tactical Unmanned Aircraft System provides reconnaissance, surveillance, and target acquisition and force protection at the brigade level.
	Tactical Mission Command-Maneuver Control System (TMC-MCS) is a suite of hardware and software products that provide commanders and their staff real-time situational awareness through a user-defined common operational picture, among other capabilities.
	Warfighter Information Network-Tactical (WIN-T) Increment 1 is a satellite-based network that enables the exchange of audio, video, and data throughout the battlefield.

Source: GAO analysis of Department of Defense information (text); U.S. Army/Capt. K. Abraham, Air National Guard/Master Sgt. M. Olsen, U.S. Army/Capt. S. James, Army National Guard/Pfc. I. Matthews, U.S. Army, U.S. Marine Corps/Lance Cpl. A. Chuluda, U.S. Army/ D. Ames, 94th Airlift Wing, U.S. Army/G. Zach, U.S. Army Acquisition Support Center, and U.S. Army (photos). | GAO-24-107378

Figure 2: Navy Weapon Systems Included in the Department of Defense's Fiscal Year 2022 Sustainment Reviews

Navy



Cooperative Engagement Capability (CEC) is a sensor network that provides the same near real-time radar and other data to all ships and aircraft in the battle group.



Littoral Combat Ships (LCS) are a class of small-surface combatants designed to achieve the Navy's security objectives while making available more expensive, multi-mission, large-surface combatants like cruisers and destroyers.



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



Navy Multiband Terminal (NMT)—installed on ship, shore, and submarine platforms—enables communication with satellite systems using various frequency bands, communications protocols, and data rates.



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



T-45 Goshawk is a tandem-seat, carrier-capable jet trainer whose mission is to train Navy and Marine Corps pilots.



KC-130J Super Hercules is an aircraft that provides air-to-air refueling, tactical troop transport, aerial delivery of personnel and cargo, medical evacuation, multisensor image reconnaissance, and close-air support capabilities.



Tactical Tomahawk (TACTOM) is a long-range cruise missile launched from surface ships and submarines.

Source: GAO analysis of Department of Defense information (text); U.S. Navy/Mass Communication Specialist 3rd Class K. Leitner, U.S. Navy, U.S. Navy/Chief Mass Communication Specialist S. Renfro, U.S. Marine Corps/Lance Cpl. L. Walker, U.S. Navy/Chief Mass Communication Specialist K. DeVinney, U.S. Fleet Cyber Command/D. Baumeister, U.S. Navy/Mass Communication Specialist 3rd Class B. Roberson, and U.S. Navy/Ens. S. Ianno (photos). | GAO-24-107378

Figure 3: Air Force Weapon Systems Included in the Department of Defense’s Fiscal Year 2022 Sustainment Reviews

Air Force



C-5M Super Galaxy—the largest aircraft in the Air Force inventory—primarily transports cargo and personnel.



HC/MC-130J is an aircraft used for all-weather combat personnel recovery operations, aerial refueling, and to support special operations forces.



E-4B Advanced Airborne Command Post (Nightwatch)—a militarized version of the Boeing 747-200—serves as the National Airborne Operations Center and is used to direct U.S. forces, execute emergency war orders, and coordinate actions by civil authorities.



Joint Direct Attack Munition (JDAM) is a GPS-guided kit attached to conventional bombs to increase weapon accuracy.



F-22A Raptor is a fifth-generation fighter aircraft designed to engage air targets at great distances and is air-to-ground capable.



T-6A Texan II is a single-engine, two-seat primary trainer designed to train entry-level students in the fundamentals of flying.

Source: GAO analysis of Department of Defense information (text); U.S. Air Force/Senior Airman R. Bruce, U.S. Air Force/L. Briscese, U.S. Air Force/2nd Lt. S. Eckholm, U.S. Air Force/Senior Airman C. Miller, U.S. Air Force/Tech. Sgt. P. Labbe, and U.S. Air Force/Airman 1st Class Z. Heal (photos). | GAO-24-107378

DOD Conducted Sustainment Reviews for 25 Weapon Systems; Identified Seven Systems with Critical O&S Cost Growth and Causes for the Growth

DOD, via the military departments, conducted sustainment reviews for 25 weapon systems for fiscal year 2022 and assessed 16 of those for O&S cost growth. Of these 16 systems, the military departments identified changes to O&S cost estimates for all 16 systems, and critical O&S cost growth for seven systems. The Army and Navy identified causes for the critical cost growth for the seven systems and reported taking actions to mitigate costs for three of them. The military departments were unable to make O&S cost estimate growth determinations for nine of the 25 systems due to what the departments identified as a lack of available information from previous cost estimates.

DOD Reviewed 25 Systems; Assessed 16 for Cost Growth and Identified Seven with Critical Cost Growth

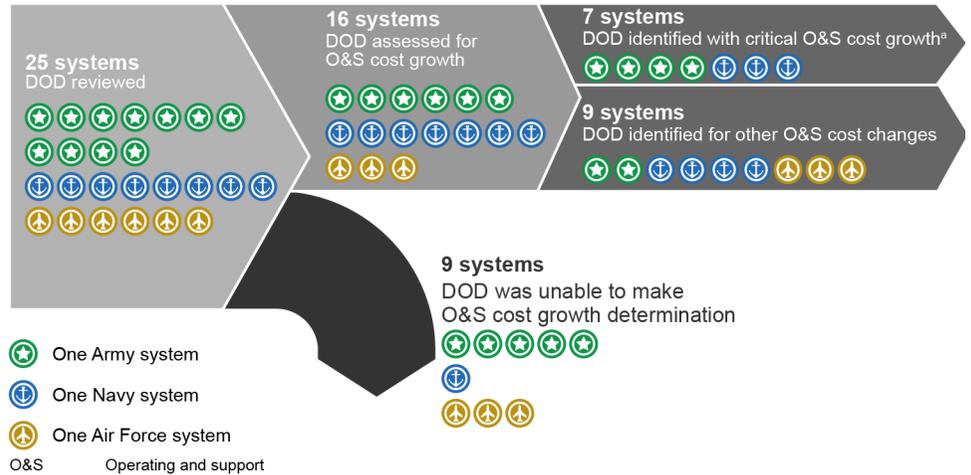
As shown in figure 4 below, the military departments

- conducted sustainment reviews of 25 weapon systems—11 by the Army, eight by the Navy, and six by the Air Force—and, as a part of these sustainment reviews, developed independent cost estimates as required.¹⁹
- assessed 16 weapon systems for O&S cost growth, identifying seven weapon systems that have experienced critical O&S cost growth—four Army and three Navy systems. The Air Force did not identify any systems experiencing critical O&S cost growth. According to the military departments' submissions, nine weapon systems experienced O&S cost changes but did not experience critical O&S cost growth as defined in statute.²⁰
- were unable to make O&S cost growth determinations for nine weapon systems—five Army, one Navy, and three Air Force due to what DOD and the military departments identified as a lack of available information from previous cost estimates.

¹⁹See 10 U.S.C. § 4323(b)(1).

²⁰Specifically, section 4323 of title 10, U.S. Code, defines critical O&S cost growth as O&S cost growth of (a) at least 25 percent more than the estimate documented in the most recent independent cost estimate for the system; or (b) at least 50 percent more than the estimate documented in the original baseline cost estimate for the system. For the purposes of this report, we refer to these categories of critical cost growth as Category A and Category B, respectively. 10 U.S.C. § 4323(e)(2).

Figure 4: Number of Weapon Systems with Operating and Support (O&S) Cost Growth Identified by the Department of Defense (DOD) in Fiscal Year 2022



Source: GAO analysis of Department of Defense (DOD) data. | GAO-24-107378

^aSection 4323 of title 10, U.S. Code, defines critical O&S cost growth as O&S cost growth of (a) at least 25 percent more than the estimate documented in the most recent independent cost estimate for the system; or (b) at least 50 percent more than the estimate documented in the original baseline cost estimate for the system. 10 U.S.C. § 4323(e)(2).

Figures 5 and 6 show the critical O&S cost growth for the Army and Navy systems, respectively. As discussed earlier, Category A is O&S cost growth since the most recent independent cost estimate for the system. Category B is O&S cost growth since the original baseline cost estimate for the system. We omitted specific details about the dollar amount cost changes because DOD deemed the information sensitive. See appendix I for details about the critical O&S cost growth of these seven systems as well as the cost changes experienced by nine other systems that did not experience critical O&S growth.

Figure 5: Army Weapon Systems with Critical Operating and Support (O&S) Cost Growth

Common Remotely Operated Weapon Station (CROWS)



▲ 335%

Category A estimate percent change, 2017 to 2022

▲ 32%

Category B estimate percent change, 2012 to 2022

Excalibur Precision 155 mm Projectiles



▲ 6%

Category A estimate percent change, 2017 to 2022

▲ 183%

Category B estimate percent change, 2011 to 2022

Tactical Mission Command-Maneuver Control System (TMC-MCS)



▼ -30%

Category A estimate percent change, 2017 to 2022^a

▲ 464%

Category B estimate percent change, 2008 to 2022

Warfighter Information Network-Tactical (WIN-T) Increment 1^b



▲ 32%

Category A estimate percent change, 2007 to 2022

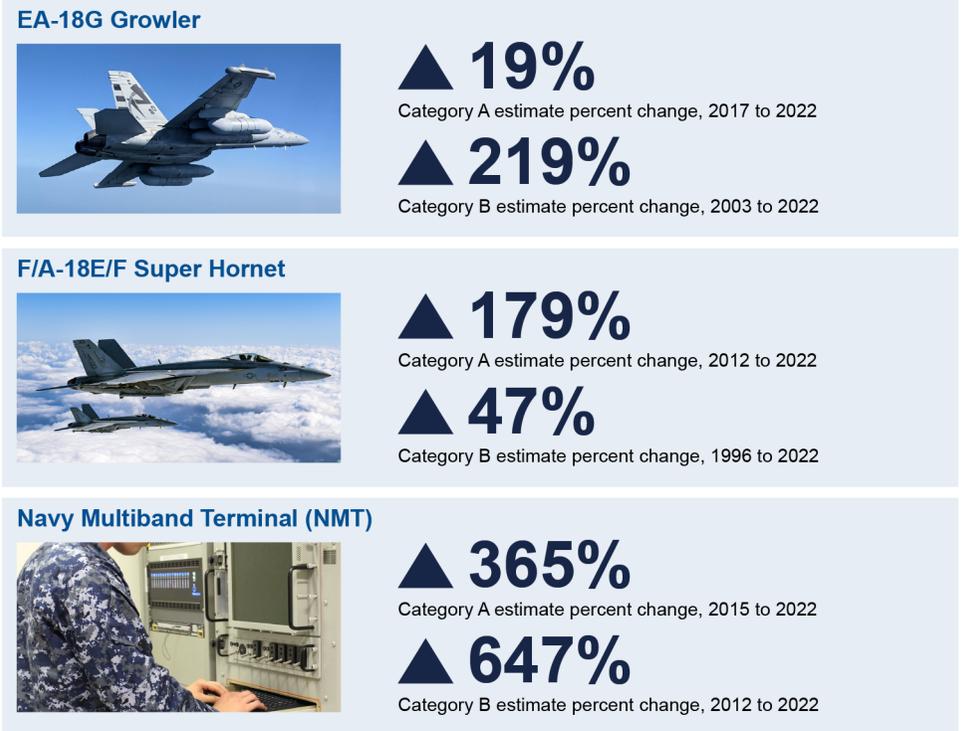
Source: GAO analysis of Department of Defense data; Army National Guard/Pfc. I. Matthews, U.S. Army, U.S. Army Acquisition Support Center, and U.S. Army (photos). | GAO-24-107378

Note: Category A is critical O&S cost growth when there is at least 25 percent more growth than the estimate documented in the most recent independent cost estimate for the system. Category B is critical O&S cost growth when there is at least 50 percent more growth than the estimate documented in the original baseline cost estimate for the system.

^aAccording to Army officials, the TMC-MCS's Category A cost decline was due to funding that was no longer needed but had been included in the 2017 independent cost estimate for a technical refresh of the system.

^bAccording to the Army's submission, the WIN-T did not have a Category B comparison because no original baseline cost estimate for this system existed.

Figure 6: Navy Weapon Systems with Critical Operating and Support (O&S) Cost Growth



Source: GAO analysis of Department of Defense data; U.S. Navy, U.S. Navy/Chief Mass Communication Specialist S. Renfro and U.S. Fleet Cyber Command/D. Baumeister (photos). | GAO-24-107378

Note: Category A is critical O&S cost growth when there is at least 25 percent more growth than the estimate documented in the most recent independent cost estimate for the system. Category B is critical O&S cost growth when there is at least 50 percent more growth than the estimate documented in the original baseline cost estimate for the system.

Army and Navy Identified Causes of Critical Cost Growth and Reported Taking Action for Three Systems

When identifying critical O&S cost growth, DOD guidance requires the military departments to submit a summary of the reasons for the system's cost growth along with any mitigating circumstances.²¹ Although each weapon system has unique characteristics and challenges, commonalities exist in the reasons for critical O&S cost growth. As shown below, submissions for the seven systems with critical O&S cost growth

²¹Under Secretary of Defense for Acquisition and Sustainment Memorandum, *Implementation of Sustainment Reviews* (June 2, 2021).

indicated that five experienced an increase in the number of systems procured than was originally planned, six experienced an extended operational life, and four experienced software or hardware updates (see figure 7). Other reasons for critical O&S cost growth indicated in the submissions include, among other things, excessive parts costs, errors in calculating baseline costs, and software or hardware obsolescence issues.²²

Figure 7: Identified Causes of Critical Operating and Support (O&S) Cost Growth

Military department	System	Number of systems increased	Extended operational life	Software or hardware updates	Other
Army	Common Remotely Operated Weapon Station (CROWS)	✓	✓		✓
	Excalibur Precision 155mm Projectiles	✓		✓	
	Tactical Mission Command-Maneuver Control System (TMC-MCS)		✓		✓
	Warfighter Information Network-Tactical (WIN-T) Increment 1	✓	✓		
Navy	EA-18G Growler	✓	✓	✓	
	F/A-18E/F Super Hornet	✓	✓	✓	
	Navy Multiband Terminal (NMT)		✓	✓	✓

Source: GAO analysis of Department of Defense information. | GAO-24-107378

Note: Section 4323 of title 10, U.S. Code, defines critical O&S cost growth as O&S cost growth of (a) at least 25 percent more than the estimate documented in the most recent independent cost estimate for the system; or (b) at least 50 percent more than the estimate documented in the original baseline cost estimate for the system. 10 U.S.C. § 4323(e)(2).

Section 4323 of title 10, U.S. Code, requires the sustainment reviews for systems with critical O&S cost growth to include a remediation plan to reduce O&S costs or a certification by the Secretary concerned that such cost growth is necessary to meet national security requirements.²³ The Army certified that the critical O&S cost growth for three of its systems was necessitated by national security considerations. The Army developed a remediation plan for its other system with critical O&S cost growth. The Navy certified that the critical O&S cost growth for three of its systems was necessitated by national security considerations. The Navy also described in its submission how it has taken action to mitigate costs for two of its systems that have experienced critical O&S cost growth. Below are details on the causes of this critical O&S cost growth and any efforts to mitigate them.

²²Obsolescence refers to a lack of availability of a part due to its lack of usefulness or due to it no longer being current or available for production.

²³10 U.S.C. § 4323(d)(3).

Army. The Army identified causes for systems that experienced critical cost growth and developed an associated remediation plan, where applicable. In the Army's submission to the congressional defense committees, the Secretary of the Army submitted a remediation plan for one system—Common Remotely Operated Weapon Station (CROWS)—and certified the critical O&S cost growth for the other three weapon systems—Excalibur Precision 155mm Projectiles, Tactical Mission Command – Maneuver Control System (TMC-MCS), and Warfighter Information Network – Tactical Increment 1 (WIN-T). Specifically:

- *Common Remotely Operated Weapon Station (CROWS):* The Army's sustainment review submission estimated the Category A critical O&S cost growth to be 335 percent above the previous cost estimate developed in 2017. The Army's submission attributed the cost growth to multiple reasons. Specifically, the number of CROWS systems increased from the 2017 to the 2022 independent cost estimate. In addition, the Army increased the CROWS's operational life. We omitted specific details about these increases because DOD deemed the information sensitive. Further, the Army revised the maintenance cost calculation methodology from a 3-year average to a historical ratio. Last, the Army identified excessive parts maintenance costs for two of the system's components.²⁴

To address the parts maintenance cost growth, the program office developed a remediation plan. Per the plan, the Army has redesigned certain parts of the system that frequently require replacement and planned to update the system's software. In November 2023, Army officials shared that they plan to replace the redesigned parts—one of which is in production—over time via a system attrition strategy. Further, officials indicated they expect to release the software update in 2024.

- *Excalibur Precision 155mm Projectiles:* The Army's sustainment review submission estimated the Category B critical O&S cost growth to be 183 percent above the baseline cost estimate developed in 2011. The Army's submission attributed the cost growth to two reasons. First, the number of projectiles increased from the 2011 estimate to the 2022 independent cost estimate. We omitted specific details about this increase because DOD deemed the information sensitive. Second, the new Excalibur variant included hardware modifications and software upgrade costs. The baseline cost estimate

²⁴According to the Army's sustainment review submission, the two system components with excessive parts costs are the main frame assembly and the thermal imaging module.

did not include any such hardware and software costs because, according to the submission, the Army enhanced the Excalibur's strike capabilities with advanced positioning and navigation technologies.

The Army's submission stated that this growth was necessary to meet national security requirements and further stated the Excalibur is the Army's most mature munition to meet long-range precision fires requirements.

- *Tactical Mission Command – Maneuver Control System (TMC-MCS)*: The Army's sustainment review submission estimated the Category B critical O&S cost growth to be 464 percent above the baseline cost estimate developed in 2008. The Army's submission attributed the cost growth to three reasons. First, the baseline estimate excluded unit-level personnel and maintenance costs, which accounted for a majority of the cost growth. Second, according to the Army's submission and officials, when the Army decided to terminate its planned replacement it extended the TMC-MCS's operational life. The operational life was extended again to account for full deployment of the next replacement program. We omitted specific details about this extension because DOD deemed the information sensitive. Third, the Army has required additional equipment for the TMC-MCS to meet cybersecurity obsolescence issues since the 2008 baseline cost estimate.

The Army's submission stated that the critical O&S cost growth was necessary to meet national security requirements. Further, it highlighted that the TMC-MCS is the only existing Army capability that provides commanders the ability to collect, coordinate, and act on near real-time battlefield information.

- *Warfighter Information Network – Tactical Increment 1 (WIN-T)*: The Army's sustainment review submission estimated the Category A critical O&S cost growth to be 32 percent above the previous cost estimate developed in 2007. The Army's submission attributed the cost growth to two reasons. First, the number of WIN-T nodes increased from the 2007 to the 2022 independent cost estimate.²⁵ Second, according to its submission, the Army extended the WIN-T's

²⁵A node is a unit capable of connecting to the local information network through both DOD and non-DOD transport systems and is capable of providing a deployed force with networks and services at both the unclassified and classified levels. Joint Chiefs of Staff, Joint Pub. 6-0, *Joint Communications System* (June 10, 2015) (incorporating change 1, effective Oct. 4, 2019).

operational life. We omitted specific details about these increases because DOD deemed the information sensitive.

The Army's submission stated that the critical O&S cost growth was necessary to meet national security requirements. Further, it highlighted the WIN-T's capabilities to control operations, the flow of battlefield information, and connect Army soldiers with joint and multinational partners.

Navy. The Navy identified causes for systems that experienced critical cost growth. In the Navy's submission to the congressional defense committees, the Acting Assistant Secretary of the Navy for Research, Development and Acquisition certified that the critical O&S cost growth for three weapon systems were necessary to meet national security requirements.²⁶ The Navy also described in the submission action it is taking to reduce critical O&S cost growth for two systems. Specifically:

- *EA-18G:* The Navy's sustainment review submission estimated the Category B critical O&S cost growth to be 219 percent since the baseline estimate was developed in 2003. The Navy's submission and independent cost estimate documentation attributed the cost growth to three reasons. First, the Navy extended the EA-18G's operational life. We omitted specific details about this extension because DOD deemed the information sensitive. Second, the Navy has procured 70 additional aircraft. Third, the Navy has enhanced the aircraft's capabilities since the baseline estimate. For example, according to the independent cost estimate documentation and a Navy official, the Navy has updated several components on each aircraft, including the addition of Next Generation Jammer capabilities.²⁷

According to the Navy's submission, the Navy has initiatives underway to mitigate the critical O&S cost growth. For example, the program is working to decrease the need for part repairs through reliability investments and improving product support elements. Additionally, according to officials, the Navy has implemented a Reliability Control Board for the EA-18G, which collects all data from

²⁶The Principal Civilian Deputy Assistant Secretary of the Navy for Research, Development and Acquisition performing the duties of the Assistant Secretary of the Navy for Research, Development and Acquisition conducted the certification.

²⁷Next Generation Jammer capabilities disrupt enemy ground communications and air defense systems, bring increased power and longer-range jamming, and allow for rapid software and hardware updates.

the aircraft, identifies the causes of ineffective performance, and develops corrective actions.

- *F/A-18E/F Super Hornet*: The Navy's sustainment review submission estimated the Category A critical O&S cost growth to be 179 percent since the previous estimate was developed in 2012. The Navy's submission and independent cost estimate documentation attributed the cost growth to three reasons. First, the Navy extended the F/A-18E/F's operational life. We omitted specific details about this extension because DOD deemed the information sensitive. Second, the Navy has procured 83 additional aircraft. Third, the Navy has enhanced the aircraft's capabilities since the previous estimate. For example, according to the submission and a Navy official, the Navy updated several components on each aircraft, including the addition of Infrared Search and Track capabilities.²⁸

According to the Navy's submission, the Navy has initiatives underway to mitigate the critical O&S cost growth. For example, the program is working on decreasing the need for repairs through reliability investments and improving product support elements. Additionally, according to officials, the Navy has implemented a Reliability Control Board for the F/A-18E/F, which collects all data from the aircraft, identifies the causes of ineffective performance, and develops corrective actions.

- *Navy Multiband Terminal (NMT)*: The Navy's sustainment review submission estimated the Category A critical O&S cost growth to be 365 percent above the previous cost estimate developed in 2015. The Navy's submission also estimated the Category B cost growth increase to be 647 percent above the baseline cost estimate developed in 2012. The Navy's submission and independent cost estimate documentation attributed the cost growth to three reasons. First, the Navy extended the terminal's operational life. We omitted specific details about this extension because DOD deemed the information sensitive. Second, the Navy has added new capabilities to the terminal. Examples Navy officials cited include improving the terminal's wideband modem and upgrading its software approximately every 2 years. Third, the terminal is facing increasing obsolescence challenges. For example, Navy officials have identified numerous components that will become obsolete and have determined that

²⁸Infrared Search and Track capabilities provide a passive fire-control system intended to search, detect, track, and engage airborne targets at long range.

these components will require either redevelopment or redesign.²⁹ We omitted specific details about the number of components because DOD deemed the information sensitive.

DOD Was Unable to Make Cost Growth Determinations for Nine Systems Due to Lack of Data

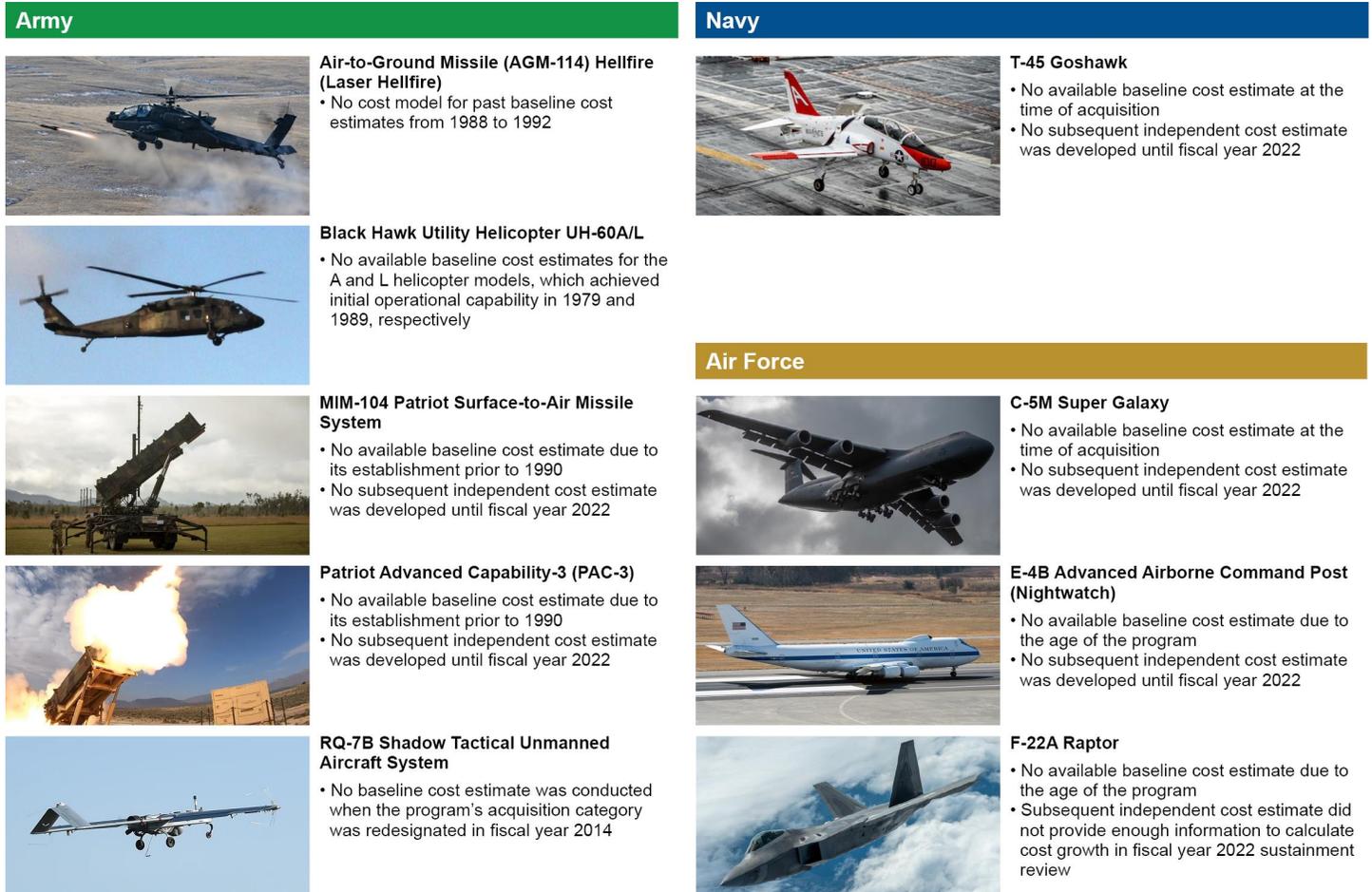
The military departments were unable to make a critical O&S cost growth determination for either Category A or B for nine systems. According to their submissions to the congressional defense committees, the weapon systems did not have a previous or original baseline cost estimate needed to determine cost growth. Specifically:

- The **Army** was unable to determine whether five of the 11 weapon systems for which it conducted sustainment reviews experienced critical cost growth.
- The **Navy** was unable to make the determination for one of the eight weapon systems it reviewed.
- The **Air Force** was unable to make the determination for three of the six weapon systems that it reviewed.

See figure 8 for details related to each weapon system that DOD was unable to address.

²⁹According to a Navy official, the Navy Multiband Terminal program has several efforts underway to mitigate O&S costs. For example, the program is combining purchases of spare parts and hardware with other customers such as the Coast Guard.

Figure 8: Weapon Systems the Military Departments Were Unable to Make a Critical Operating and Support (O&S) Cost Growth Determination and Reasons Cited



Source: GAO analysis of Department of Defense information (text); U.S. Army/Capt. K. Abraham, Air National Guard/Master Sgt. M. Olsen, U.S. Marine Corps/Lance Cpl. A. Chuluda, U.S. Army/ D. Ames, U.S. Army/G. Zach, U.S. Navy/ Mass Communication Specialist 3rd Class B. Roberson, U.S. Air Force/Senior Airman R. Bruce, U.S. Air Force/L. Briscese, and U.S. Air Force/2nd Lt. S. Eckholm (photos). | GAO-24-107378

DOD guidance provided instructions to the military departments on how to determine Categories A and B critical O&S cost growth for older weapon systems. Specifically, USD(A&S)'s guidance for implementing the sustainment reviews states that for older weapon systems that do not have a recent sufficient independent cost estimate, the first sustainment review conducted will set the new baseline to assess Category A critical O&S cost growth.³⁰ Additionally, it states that for older weapon systems

³⁰Under Secretary of Defense for Acquisition and Sustainment Memorandum, *Implementation of Sustainment Reviews* (June 2, 2021).

without a Milestone B baseline value (which generally began in the mid-1990s), the comparison requirement for Category B critical O&S cost growth is not applicable.³¹

DOD officials explained that the lack of past cost estimates was due to the age of some of the weapon systems and the lack of requirements for these type of cost estimates at the time. Further, officials stated that while some past cost estimates existed those cost estimates were missing important contextual information needed for analysis and a comparison to more recent cost estimates. For example, a cost estimate may have included projected costs but did not have the documented methodology necessary to make a meaningful comparison. According to the sustainment reviews submitted to the congressional defense committees, the independent cost estimate conducted as part of the fiscal year 2022 sustainment reviews will be used to assess cost growth in future sustainment reviews.

DOD Implemented Lessons Learned from Sustainment Reviews, but Reviews Vary in Presentation of Cost Estimate Information for Congress

The Office of Cost Assessment and Program Evaluation (CAPE) updated its guidance for developing independent cost estimates based on lessons learned from the most recent sustainment reviews and made specific recommendations to each military department to improve future reviews. However, military departments vary in how they report the details of cost estimates used for determining cost growth in their sustainment review submissions to the congressional defense committees.

³¹The Milestone B decision authorizes a major capability acquisition program to enter into the engineering and manufacturing development phase and commit the required investment resources to support the award of phase contracts. DOD Instruction 5000.85, *Major Capability Acquisition* (Aug. 6, 2020) (incorporating change 1, effective Nov. 4, 2021).

CAPE Updated Guidance Based on Lessons Learned and Made Recommendations on Submissions

To continue to support the military departments' efforts in conducting the annual sustainment reviews and preparing submissions to the congressional defense committees, in March 2022 the Director of CAPE issued specific guidance for developing the independent cost estimates for the fiscal year 2022 sustainment reviews.³² The CAPE Director delegated the requirement for developing the independent cost estimates to the military departments for all weapon systems reviewed in fiscal year 2022.³³ Additionally, CAPE required that the military departments follow DOD guidance on cost analysis to conduct the independent cost estimate and established a process for reviewing the materials provided for the military departments' sustainment reviews, including the independent cost estimates.³⁴ Specifically, the CAPE guidance stated that after the military departments submitted the sustainment reviews to the congressional defense committees, CAPE would review the materials provided for each review and submit a report of its findings to the secretaries of the military departments.

As we previously reported, CAPE has continued to identify lessons learned from the military departments' efforts to develop independent cost estimates to support the sustainment reviews.³⁵ For the fiscal year 2022 independent cost estimates, CAPE identified two areas for improvement: (1) capturing all costs and (2) following existing guidance for conducting

³²Director, Cost Assessment and Program Evaluation (CAPE) Memorandum, *Implementation of Cost Estimating, Document Collection, and Data Reporting for Fiscal Year 2022 Sustainment Reviews* (Mar. 22, 2022).

³³CAPE also issued guidance for the fiscal year 2023 sustainment reviews in November 2022. According to that guidance, CAPE will prepare the independent cost estimate for the SSN-774 Virginia Class Submarine and the military departments will prepare the independent cost estimates for the remainder of the systems reviewed for fiscal year 2023. Director, CAPE Memorandum, *Implementation of Cost Estimating, Document Collection, and Data Reporting for Fiscal Year 2023 Sustainment Reviews* (Nov. 9, 2022).

³⁴Specifically, the guidance required the military departments to conduct the independent cost estimate in accordance with guidance provided in DOD Instruction 5000.73, *Cost Analysis Guidance and Procedures* (Mar. 13, 2020).

³⁵We previously reported that CAPE's review of the Army's and Air Force's fiscal year 2021 independent cost estimates identified the following two areas for improvement: (1) capturing the details of all support costs to ensure the visibility of historical weapon system costs and (2) including any planned modification costs—i.e., efforts to modernize or upgrade a weapon system—in the independent cost estimate for a weapon system. [GAO-23-106341](#).

the cost estimate, such as preparing formal documentation and using proper price indices in calculations. As a result, CAPE provided additional direction based on the findings from its assessments of the fiscal year 2022 submissions as part of its guidance for fiscal year 2023 sustainment reviews. This clarifying guidance included requiring what information, at a minimum, the military departments should include when documenting the independent cost estimates and the critical cost growth comparison.³⁶ Examples include the total estimated cost by life-cycle phase, units and dollar type of the cost estimate, and the total number of years in the estimate.

Further, CAPE has continued to make specific recommendations to each of the military departments based on its review of the information and methods used to prepare each independent cost estimate, as documented in a memorandum addressed to the secretary of each military department. Typically, CAPE directed these recommendations to the military departments (except in one instance when the recommendation was directed to CAPE and the USD(A&S)).³⁷

The military departments varied in their responses to CAPE's findings and recommendations. Specifically:

- The **Army** prepared written responses in which it noted agreement or disagreement with each finding and recommendation. When in agreement, the Army explained the next steps planned. For example, the Army outlined both the next steps and the entities that would be involved in resolving deficiencies with required cost and software data reports. When in disagreement, the Army provided a detailed rationale. For example, the Army disagreed that data deficiencies CAPE referenced were related to the Army's operations and support database but instead attributed the deficiencies to source data collection and quality.
- According to a **Navy** official, the Navy made or is in the process of adjusting its sustainment review process in response to the findings. For example, the official indicated that to address CAPE's finding and recommendation to improve the quality of data used in developing

³⁶Director, CAPE Memorandum, *Implementation of Cost Estimating, Document Collection, and Data Reporting for Fiscal Year 2023 Sustainment Reviews* (Nov. 9, 2022).

³⁷This recommendation was related to determining if additional policy and guidance for the military departments is needed about cost growth metrics and calculations. CAPE found that the Air Force used a different methodology as compared to the Navy and Army when calculating O&S cost growth.

cost estimates, program offices have interacted more with the team that maintains the Navy's database for operating support costs. Also, to address CAPE's finding and recommendation that the Navy does not have an independent cost organization that can prepare independent cost estimates, the Navy official indicated that the Navy plans to complete transitioning its existing Naval Cost Division into an independent organization by March 2024.

- **Air Force** officials told us that based on the findings and recommendations with which they agreed, they made adjustments to their sustainment review process. For example, Air Force officials indicated that they have implemented CAPE's recommendation about having a feedback mechanism to incorporate findings from the sustainment review's independent cost estimate process.

According to CAPE officials, they are considering moving away from reviewing the military departments' materials and from reporting department-wide findings after the departments' sustainment reviews have been submitted to the congressional defense committees. Instead, CAPE officials would document individual assessments of select weapon system's independent cost estimates and provide related findings and recommendations following the individual weapon system's sustainment review. We will monitor CAPE's actions as part of our ongoing review of DOD's annual sustainment reviews and the supporting independent cost estimates.

Military Departments Vary in Their Presentation of Estimates Used for Determining Cost Growth in Submissions to Congress

The military departments' sustainment review submissions to the congressional defense committees presented fiscal year 2022 independent cost estimate information in differing ways in three areas—sunk costs, time frames for the estimates, and cost categories and the effects of inflation.

Sunk costs. According to DOD's Cost Estimating Guide, sunk costs are costs that the program has already incurred and cannot be readily recovered by the program.³⁸ However, the military departments varied in

³⁸CAPE, *DOD Cost Estimating Guide*, Version 2.0 (January 2022).

how they reported these costs in the estimates in their sustainment review submissions to the congressional defense committees.

- The *Army* reported a total O&S amount for the independent cost estimates for all 11 systems. According to Army officials, these estimates included, at a minimum, the sunk costs for the 5 years preceding fiscal year 2022 to facilitate cost growth comparisons with previous estimates.³⁹
- The *Navy* varied in reporting sunk costs across the independent cost estimates for the eight weapon systems. It reported sunk costs for two of the systems. According to a Navy official, the Navy required sunk costs to be evaluated in the O&S cost comparison to determine O&S cost growth.
- The *Air Force* did not report sunk costs in any of the independent cost estimates. According to Air Force officials, section 4323 calls for an independent cost estimate for the remainder of the life cycle of the program; therefore, sunk costs, which are not accrued during the remainder of the life cycle of the program, were not included when determining O&S cost growth.

Time frames for independent cost estimates. The military departments varied in what time frames the independent cost estimate(s) covered in their sustainment review submissions to the congressional defense committees—the full life of the system (i.e., sunk and future costs) versus the remaining life cycle (i.e., only future costs)—and whether they included this information.⁴⁰

- The *Army* did not label what time frame the independent cost estimates for all 11 systems covered in its submission. However, according to the Army's separate independent cost estimate

³⁹In reviewing the Army's fiscal year 2022 sustainment review, CAPE found that the Army documented its independent cost estimate at the total O&S level in its submission to the congressional defense committees but provided a breakout of the independent cost estimate by a weapon system's life-cycle phase and by the O&S cost categories in other documentation that was not part of the submission. CAPE stated that detailed independent cost estimate documentation provides valuable context for the sustainment review and recommended the Army provide this level of detail in all sustainment review documentation, including the submission to the committees. According to Army officials, the Army plans to implement this recommendation in future sustainment reviews.

⁴⁰Section 4323 of title 10, U.S. Code, states that the sustainment review must assess execution of the life-cycle sustainment plan of the system and include, among other elements, an independent cost estimate for the remainder of the life cycle of the program. 10 U.S.C. § 4323(b)(1).

documentation for each system, the Army presented independent cost estimates for O&S costs that were to include sunk and future costs.

- The *Navy* displayed the results of the independent cost estimates in two different ways for seven of their eight systems in its submission. Specifically, the Navy projected costs for each system's remaining life cycle from fiscal year 2022 onward. Additionally, the Navy presented independent cost estimates for O&S costs that, according to a Navy official, were to include sunk and future costs. For the remaining system, the Navy presented one independent cost estimate that projected its remaining life-cycle cost from fiscal year 2022 onward.
- The *Air Force* did not label what time frame the reported cost estimates for all six systems covered in its submission. However, according to the Air Force's separate independent cost estimate documentation for each system, the Air Force projected the remaining life-cycle costs from fiscal year 2022 onward for all independent cost estimates.

Cost categories and the effects of inflation. The military departments varied in the level of detail included for their cost estimates reported in their sustainment review submissions to the congressional defense committees.

- The *Army* presented total O&S cost estimates in base year dollars for the 11 systems in its submission. According to CAPE's *Inflation and Escalation Best Practices for Cost Analysis: Analyst Handbook*, base year dollars is an ambiguous term no longer recommended for use.⁴¹ Additionally, costs labeled as "base year dollars" may refer to costs normalized to a base year relative to an escalation index—known as constant price—versus an inflation index—known as constant year dollars.⁴² In the Army's separate independent cost estimate

⁴¹CAPE, *Inflation and Escalation Best Practices for Cost Analysis: Analyst Handbook* (December 2021).

⁴²In reviewing the Army's fiscal years 2021 and 2022 sustainment reviews, CAPE found the Army applied improper price indices in its calculation of outputs, resulting in the understatement of constant year dollar costs for civilian and military personnel and fuel costs. According to Army officials, the Army disagreed with CAPE's finding and stated that the specific indices it used provided a higher level of transparency and did not artificially inflate the results.

documentation for each system, the Army included cost information broken out into the five O&S cost categories.⁴³

- The *Navy* presented cost estimates in multiple cost unit formats for the eight systems in its submission. For the independent cost estimates that projected the remaining life-cycle costs from fiscal year 2022 onward, the Navy included constant and then-year cost data for seven systems and base and then-year data for the remaining system.⁴⁴ For the independent cost estimates in the sustainment reviews that the Navy used to make the O&S cost growth determinations, the Navy presented five systems' itemized cost estimates in constant year dollars for each of the five O&S cost categories.⁴⁵ For another system, the Navy presented its itemized cost estimates in base year dollars for each of the five O&S cost categories. For the remaining system, the Navy presented total O&S cost estimates—but not broken out into the five O&S cost categories—in constant year dollars.
- The *Air Force* consistently presented both constant and then-year dollars as well as estimates for the five O&S cost categories in its independent cost estimates for the six systems in its submission. For one system, the Air Force also presented the total O&S cost estimates in base year dollars and used those amounts to make the O&S cost determination.

As we previously reported, the USD(A&S) issued sustainment review guidance, in June 2021, to provide guidance on implementing section 4323 and to support the military departments' efforts in conducting the annual sustainment reviews.⁴⁶ Specifically, this guidance includes, among other things, instructions on determining critical O&S cost growth by using the independent cost estimate prepared for each sustainment review. Further, it points to the guidance in DOD Instruction 5000.73, *Cost*

⁴³In reviewing the Army's fiscal year 2022 sustainment reviews, CAPE stated that detailed independent cost estimate documentation provides valuable context for the sustainment review submission. CAPE recommended, among other things, that the Army document the independent cost estimate by the five O&S cost categories in all sustainment review documentation. The Army agreed to implement this recommendation moving forward.

⁴⁴According to GAO's *Cost Estimating and Assessment Guide*, constant year dollars are expressed in the value of a specific year and do not include inflation. Then-year information refers to cost estimates that include the effects of inflation and time-phasing. See [GAO-20-195G](#).

⁴⁵The Navy did not make an O&S cost growth determination for one system.

⁴⁶Under Secretary of Defense for Acquisition and Sustainment Memorandum, *Implementation of Sustainment Reviews* (June 2, 2021).

Analysis Guidance and Procedures, and CAPE's fiscal year 2021 sustainment review memorandum for additional details on the sustainment review independent cost estimate.⁴⁷ However, as DOD officials acknowledged, this guidance does not provide the necessary clarity to ensure the consistent presentation of the cost estimate information. For example, military department officials stated that there was no official guidance about including sunk costs or the effects of inflation in the critical O&S cost determination.

In addition, GAO's *Cost Estimating and Assessment Guide* highlights the need to normalize cost data, which is a process to remove the effects of external influences, such as inflation.⁴⁸ The objective of data normalization is to improve data consistency so that comparisons and projections are more valid. Further, GAO's *Cost Estimating and Assessment Guide* points out as a best practice that presenting the cost estimate in a consistent format facilitates management's understanding of the completeness and the quality of the cost estimate.

As a result of the lack of clear guidance from USD(A&S) on the consistent presentation of the cost estimate information, the military departments are presenting varied independent cost estimates, effecting their presentations of critical O&S cost growth.⁴⁹ Without the development and implementation of clear guidance, DOD stakeholders and Congress will not have consistent and complete information for effective decision-making and oversight.

Conclusions

DOD has made progress in implementing its sustainment reviews and assessing O&S cost growth for its weapon systems during fiscal years 2021 and 2022. The department can continue to build on this progress by developing and implementing guidance that ensures the consistent

⁴⁷See DOD Instruction 5000.73; Director, CAPE Memorandum, *Implementation of Cost Estimating, Document Collection, and Data Reporting for Sustainment Reviews* (June 14, 2021).

⁴⁸[GAO-20-195G](#).

⁴⁹According to DOD Directive 5135.02, the USD(A&S) is responsible for, among other things, (1) establishing policies on and supervising all elements of sustainment and (2) directing the secretaries of the military departments, among others, in the exercise of sustainment functions. DOD Directive 5135.02, *Under Secretary of Defense for Acquisition and Sustainment (USD(A&S))* (July 15, 2020).

presentation of O&S cost estimate information across the military departments. Doing so would improve DOD's ability to provide consistent and clear information throughout the department and to congressional stakeholders, thereby enhancing oversight of weapon systems' O&S costs and decision-making to address growth in those costs.

Recommendation for Executive Action

The Secretary of Defense should ensure the Under Secretary of Defense for Acquisition and Sustainment, in coordination with CAPE and the military departments, develops and implements clarifying guidance about what independent cost estimate information to include in the sustainment review submissions to the congressional defense committees to ensure the military departments are consistently presenting sunk costs, the time frames for the independent cost estimates, the cost categories, and the effects of inflation in their critical O&S cost growth information. (Recommendation 1)

Agency Comments and Our Evaluation

We provided a draft of this report to DOD for review and comment. DOD submitted written comments on the sensitive report (reprinted in appendix II) concurring with the spirit of the recommendation. DOD requested that we clarify the recommendation to ensure it was focused on the consistent presentation of information in the military departments' submissions to Congress. We agreed with their proposed clarification and revised the text of the recommendation to clarify its intent. DOD also separately provided technical comments that we incorporated as appropriate.

We are sending copies of this report to the appropriate congressional committees, the Secretary of Defense; the Under Secretary of Defense for Acquisition and Sustainment; the Director of Cost Assessment and Program Evaluation, and the Secretaries of the Army, Navy, and Air Force. In addition, the report is available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-9627 or maurerd@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix III.

Letter

A handwritten signature in black ink that reads "Diana Maurer". The signature is written in a cursive style with a large, sweeping initial 'D'.

Diana Maurer
Director, Defense Capabilities and Management

List of Committees

The Honorable Jack Reed
Chairman
The Honorable Roger Wicker
Ranking Member
Committee on Armed Services
United States Senate

The Honorable Jon Tester
Chair
The Honorable Susan Collins
Ranking Member
Subcommittee on Defense
Committee on Appropriations
United States Senate

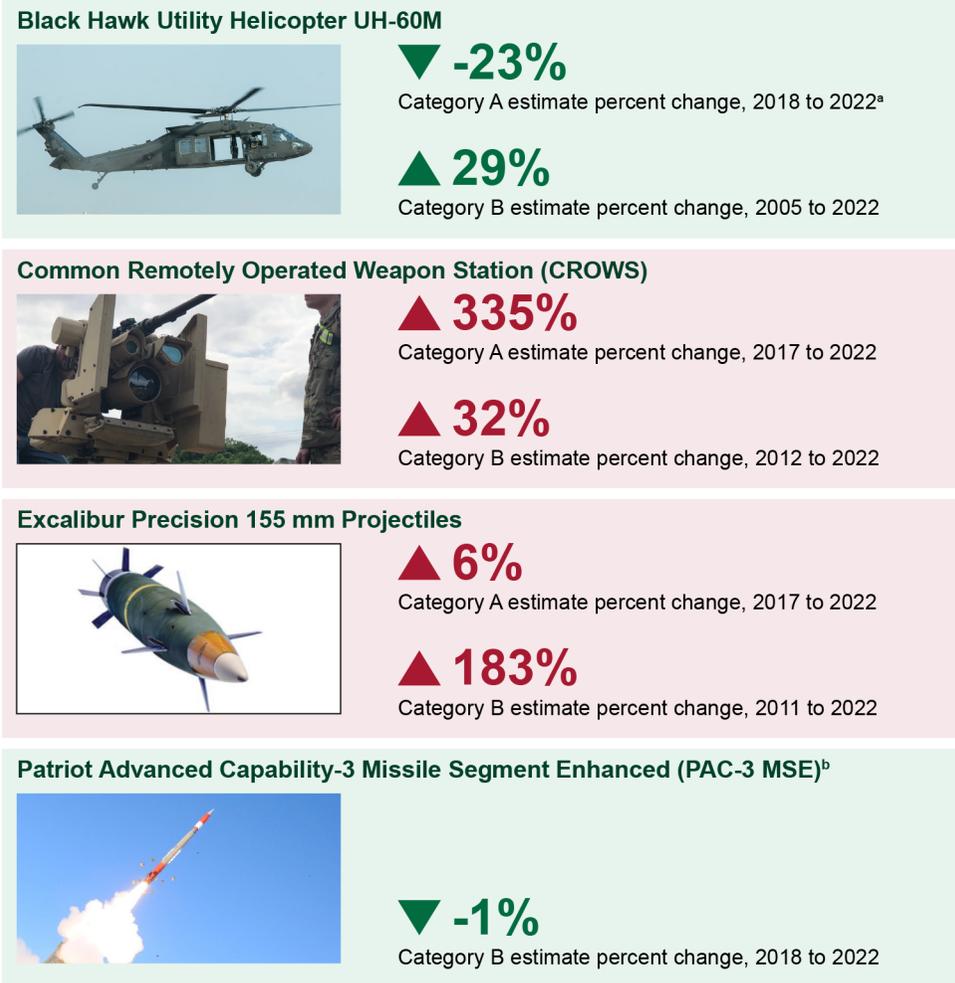
The Honorable Mike Rogers
Chairman
The Honorable Adam Smith
Ranking Member
Committee on Armed Services
House of Representatives

The Honorable Ken Calvert
Chair
The Honorable Betty McCollum
Ranking Member
Subcommittee on Defense
Committee on Appropriations
House of Representatives

Appendix I: Operating and Support (O&S) Cost Changes of Weapon Systems Reviewed in Fiscal Year 2022

For the fiscal year 2022 sustainment reviews, the Department of Defense (DOD) identified O&S cost changes for 16 systems, and critical cost growth for seven systems. See figures 9–13 for details related to each weapon system for which the military departments identified O&S cost changes. We omitted specific details about the dollar amount cost changes because DOD deemed the information sensitive.

Figure 9: Army Weapon Systems with Operating and Support (O&S) Cost Changes Identified in Fiscal Year 2022 Sustainment Reviews



Experienced critical operating and support cost growth

Source: GAO analysis of Department of Defense data; U.S. Army/Capt. S. James, Army National Guard/Pfc. I. Matthews, U.S. Army, and 94th Airlift Wing (photos). | GAO-24-107378

Note: Category A is critical O&S cost growth when there is at least 25 percent more growth than the estimate documented in the most recent independent cost estimate for the system. Category B is critical O&S cost growth when there is at least 50 percent more growth than the estimate documented in the original baseline cost estimate for the system.

^aAccording to Army officials, there are several factors for the Black Hawk UH-60M's Category A cost decline, including annual lower operational tempo and personnel costs.

^bAccording to an Army official, the PAC-3 MSE did not have a Category A comparison because no previous cost estimate for this system existed. According to an Army official, the PAC-3 MSE's Category B cost decline is due to adjustments to procurements and a change in the inflation rate.

Figure 10: Army Weapon Systems with Operating and Support (O&S) Cost Changes Identified in Fiscal Year 2022 Sustainment Reviews (Continued)

Tactical Mission Command-Maneuver Control System (TMC-MCS)



▼ **-30%**

Category A estimate percent change, 2017 to 2022^a

▲ **464%**

Category B estimate percent change, 2008 to 2022

Warfighter Information Network-Tactical (WIN-T) Increment 1^b



▲ **32%**

Category A estimate percent change, 2007 to 2022

Experienced critical operating and support cost growth

Source: GAO analysis of Department of Defense data; U.S. Army Acquisition Support Center, U.S. Army (photos). | GAO-24-107378

Note: Category A is critical O&S cost growth when there is at least 25 percent more growth than the estimate documented in the most recent independent cost estimate for the system. Category B is critical O&S cost growth when there is at least 50 percent more growth than the estimate documented in the original baseline cost estimate for the system.

^aAccording to Army officials, the TMC-MCS's Category A cost decline was due to funding that was no longer needed but had been included in the 2017 independent cost estimate for a technical refresh of the system.

^bAccording to the Army's submission, the WIN-T did not have a Category B comparison because no original baseline cost estimate for this system existed.

Figure 11: Navy Weapon Systems with Operating and Support (O&S) Cost Changes Identified in Fiscal Year 2022 Sustainment Reviews

Cooperative Engagement Capability (CEC)^a



▲ 11%

Category A estimate percent change, 2018 to 2022

EA-18G Growler



▲ 19%

Category A estimate percent change, 2017 to 2022

▲ 219%

Category B estimate percent change, 2003 to 2022

F/A-18E/F Super Hornet



▲ 179%

Category A estimate percent change, 2012 to 2022

▲ 47%

Category B estimate percent change, 1996 to 2022

KC-130J Super Hercules^b



▼ -15%

Category A estimate percent change, 2010 to 2022

Experienced critical operating and support cost growth

Source: GAO analysis of Department of Defense data; U.S. Navy/Mass Communication Specialist 3rd Class K. Leitner, U.S. Navy, U.S. Navy/Chief Mass Communication Specialist S. Renfro, and U.S. Marine Corps/Lance Cpl. L. Walker (photos). | GAO-24-107378

Note: Category A is critical O&S cost growth when there is at least 25 percent more growth than the estimate documented in the most recent independent cost estimate for the system. Category B is critical O&S cost growth when there is at least 50 percent more growth than the estimate documented in the original baseline cost estimate for the system.

^aAccording to the Navy's submission, the CEC did not have a Category B comparison because the original baseline cost estimate for this system did not include O&S cost estimates.

^bAccording to the Navy's submission, the KC-130J Super Hercules did not have a Category B comparison because no original baseline cost estimate for this system existed. Also, the Category A cost decline is attributed to a reduction in operational tempo.

Figure 12: Navy Weapon Systems with Operating and Support (O&S) Cost Changes Identified in Fiscal Year 2022 Sustainment Reviews (Continued)

Littoral Combat Ships (LCS)



— 0%

Category A estimate percent change, 2021 to 2022

▼ -20%

Category B estimate percent change, 2011 to 2022^a

Navy Multiband Terminal (NMT)^b



▲ 365%

Category A estimate percent change, 2015 to 2022

▲ 647%

Category B estimate percent change, 2012 to 2022

Tactical Tomahawk (TACTOM)^c



▲ 14%

Category A estimate percent change, 2018 to 2022

Experienced critical operating and support cost growth

Source: GAO analysis of Department of Defense data; U.S. Navy/Chief Mass Communication Specialist K. DeVinney, U.S. Fleet Cyber Command/D. Baumeister, and U.S. Navy/Ens. S. Ianno (photos). | GAO-24-107378

Note: Category A is critical O&S cost growth when there is at least 25 percent more growth than the estimate documented in the most recent independent cost estimate for the system. Category B is critical O&S cost growth when there is at least 50 percent more growth than the estimate documented in the original baseline cost estimate for the system.

^aAccording a Navy official, the LCS's Category B cost decline was due to a decrease in the number of ships to be procured and sustained.

^bAccording to the Navy's submission, these are base year dollar amounts.

^cAccording to the Navy's submission, the TACTOM did not have a Category B comparison because no original baseline cost estimate for this system existed.

Appendix I: Operating and Support (O&S) Cost Changes of Weapon Systems Reviewed in Fiscal Year 2022

Figure 13: Air Force Weapon Systems with Operating and Support (O&S) Cost Changes Identified in Fiscal Year 2022 Sustainment Reviews

HC/MC-130J^a



▲ 17%

Category A estimate percent change, 2013 to 2022

Joint Direct Attack Munition (JDAM)



▲ 4%

Category A estimate percent change, 2001 to 2022

▼ -19%

Category B estimate percent change, 1995 to 2022^b

T-6A Texan II^c



▼ -29%

Category A estimate percent change, 1992 to 2022

Experienced critical operating and support cost growth

Source: GAO analysis of Department of Defense data; U.S. Air Force/Senior Airman C. Miller, U.S. Air Force/Tech. Sgt. P. Labbe, and U.S. Air Force/Airman 1st Class Z. Heal (photos). | GAO-24-107378

Note: Category A is critical O&S cost growth when there is at least 25 percent more growth than the estimate documented in the most recent independent cost estimate for the system. Category B is critical O&S cost growth when there is at least 50 percent more growth than the estimate documented in the original baseline cost estimate for the system.

^aAccording to the Air Force's submission, the HC/MC-130J did not have a Category B comparison because no original baseline cost estimate for this system existed.

^bAccording to the Air Force's submission, the Joint Direct Attack Munition's Category B cost decline is attributed to a decline of the per unit cost as the procurement of these weapons has increased.

^cAccording to the Air Force's submission, the T-6A Texan II did not have a Category B comparison because no original baseline cost estimate for this system existed and these are base year dollar amounts. According to the Air Force's separate independent cost estimate documentation, the Category A cost decline is attributed to lower fuel consumption and utilization rate.

Appendix II: Comments from the Department of Defense



OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
3500 DEFENSE PENTAGON
WASHINGTON, DC 20301-3500

SUSTAINMENT

Ms. Diana Maurer
Director, Defense Capabilities Management
U.S. Government Accountability Office
441 G Street, NW
Washington DC 20548

Dear Ms. Maurer,

This is the Department of Defense (DoD) response to the Government Accountability Office (GAO) Draft Report GAO-24-106897, "WEAPON SYSTEM SUSTAINMENT: DOD Identified Operating and Support Cost Growth, but Needs to Improve the Consistency and Completeness of Information to Congress," dated December 18, 2023.

The Department concurs with the recommendation as revised in the enclosure. On January 26, 2024, the Department submitted consolidated technical comments for GAO consideration. Given the ongoing preliminary sensitivity review, DoD will submit the sensitivity review results after final review and staffing.

Sincerely,

RAMDASS.VICKY | Digitally signed by
SHASHINDERAJ.10 | RAMDASS.VICKY.SHASHINDER
19209780 | AJ.1010200780
Date: 2024.02.06 11:15:21 -0500

Vic S. Ramdass, Ph.D.
Deputy Assistant Secretary of Defense
(Materiel Readiness)

Enclosure:
As stated

ENCLOSURE

**GAO DRAFT REPORT DATED DECEMBER 18, 2023
GAO-24-106897 (GAO CODE 106897)**

**“WEAPON SYSTEM SUSTAINMENT: DOD IDENTIFIED OPERATING AND
SUPPORT COST GROWTH, BUT NEEDS TO IMPROVE THE CONSISTENCY AND
COMPLETENESS OF INFORMATION TO CONGRESS”**

**DEPARTMENT OF DEFENSE COMMENTS
TO THE GAO RECOMMENDATION**

RECOMMENDATION 1: The Secretary of Defense should ensure the Under Secretary of Defense for Acquisition and Sustainment, in coordination with CAPE and the military departments, develops and implements clarifying independent cost estimate guidance for sustainment review submissions to ensure the military departments are consistently presenting sunk costs, the time frame of the independent cost estimate, the cost categories, and the effects of inflation in their critical O&S cost growth information.

DoD RESPONSE: The DoD concurs with the spirit of the GAO recommendation. However, it requests that the recommendation be clarified to indicate that the Under Secretary of Defense for Acquisition and Sustainment (USD(A&S)), in coordination with CAPE and the military departments, will issue clarifying guidance about what information from the sustainment review independent cost estimate is submitted to Congress. The USD(A&S) guidance will clarify how sunk costs, the time frame of the independent cost estimate, the cost categories, and the effects of inflation should be displayed in their critical O&S cost growth information.

Appendix III: GAO Contact and Staff Acknowledgements

GAO Contact

Diana Maurer, 202-512-9627 or maurerd@gao.gov

Staff Acknowledgments

In addition to the contact named above, John Bumgarner (Assistant Director), Nicole Ashby, T. Jackson Autry, Shveta Khanna, Jennifer Leotta, Amie Lesser, Molly Ryan, and Carter Stevens made key contributions to this report.

Related GAO Products

Weapon System Sustainment: The Army and Air Force Conducted Reviews and the Army Identified Operating and Support Cost Growth. [GAO-23-106341](#). Washington, D.C.: March 30, 2023.

Weapon System Sustainment: Navy Ship Usage Has Decreased as Challenges and Costs Have Increased. [GAO-23-106440](#). Washington, D.C.: January 31, 2023.

Weapon System Sustainment: Aircraft Mission Capable Goals Were Generally Not Met and Sustainment Costs Varied by Aircraft. [GAO-23-106217](#). Washington, D.C.: November 10, 2022.

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

Littoral Combat Ship: Actions Needed to Address Significant Operational Challenges and Implement Planned Sustainment Approach. [GAO-22-105387](#). Washington, D.C.: February 24, 2022.

Military Readiness: Department of Defense Domain Readiness Varied from Fiscal Year 2017 through Fiscal Year 2019. [GAO-21-279](#). Washington, D.C.: April 7, 2021.

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Military Depots: The Navy Needs Improved Planning to Address Persistent Aircraft Maintenance Delays While Air Force Maintenance Has Generally Been Timely. [GAO-20-390](#). Washington, D.C.: June 23, 2020.

Weapon System Sustainment: DOD Needs to Better Capture and Report Software Sustainment Costs. [GAO-19-173](#). Washington, D.C.: February 25, 2019.

Weapon System Sustainment: Selected Air Force and Navy Aircraft Generally Have Not Met Availability Goals, and DOD and Navy Guidance Need to Be Clarified. [GAO-18-678](#). Washington, D.C.: September 10, 2018.

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