



March 2022

ARTIFICIAL INTELLIGENCE

DOD Should Improve Strategies, Inventory Process, and Collaboration Guidance

GAO Highlights

Highlights of [GAO-22-105834](#), a report to congressional committees

Why GAO Did This Study

DOD strategies state that AI will transform the character of warfare, and failure to adopt AI technology could hinder the capability of warfighters to defend our nation. DOD is making organizational changes and investing billions of dollars to incorporate AI technology, such as establishing the Joint AI Center to accelerate the delivery of AI-enabled capabilities across DOD.

House Report 116-442 accompanying the National Defense Authorization Act for Fiscal Year 2021, includes a provision for GAO to assess DOD's resources, capabilities, and plans for AI technology. This report evaluates the extent to which (1) DOD's AI Strategy and associated plans include characteristics of a comprehensive strategy; (2) DOD has identified and reported AI activities across the department; and (3) DOD collaborates on its AI activities. GAO reviewed relevant laws and DOD strategies that outline plans and processes to manage AI across the department, interviewed officials, and conducted a department-wide survey. This is a public version of a sensitive report that GAO issued in February 2022. Information that DOD deemed sensitive has been omitted.

What GAO Recommends

GAO is making seven recommendations, including for DOD to issue guidance to include all characteristics of a comprehensive strategy; develop a high-level plan or roadmap for its AI inventory process; and finalize and issue guidance and agreements that define roles and responsibilities for AI collaboration. DOD concurred with all seven of these recommendations.

View [GAO-22-105834](#). For more information, contact Brian M. Mazanec at (202) 512-5130 or mazanecb@gao.gov.

March 2022

ARTIFICIAL INTELLIGENCE

DOD Should Improve Strategies, Inventory Process, and Collaboration Guidance

What GAO Found

The 2018 *Department of Defense (DOD) Artificial Intelligence (AI) Strategy* defines AI as the ability of machines to perform tasks that normally require human intelligence. The strategy and associated plans include some, but not all, characteristics of a comprehensive strategy. For example, DOD's nine AI-related strategies and plans do not include full descriptions of resources and investments and risk associated with adoption of AI-enabled technologies (See fig.). Issuing guidance to include all characteristics of a comprehensive strategy in future AI-related strategies could help DOD be better positioned to help managers ensure accountability and responsible use of AI.

Assessment of DOD Artificial Intelligence-Related Strategies and Plans



Source: GAO analysis of Department of Defense (DOD) information. | GAO-22-105834

DOD has begun to identify and report on its AI activities, but limitations exist in its AI baseline inventory, such as the exclusion of classified activities. DOD officials said these limitations will be addressed in subsequent phases of the AI inventory identification process. However, DOD has not yet developed a high-level plan or roadmap that captures all requirements and milestones. Such a plan would provide DOD with a high-level, end-to-end view of all the features necessary to accomplish the program's goal to provide a complete and accurate inventory of AI activities to Congress and to DOD decision makers.

DOD organizations collaborate on AI activities, but can more fully incorporate leading collaboration practices. DOD uses a variety of formal and informal collaborative mechanisms that GAO's prior work has identified, such as interagency groups. DOD has partially incorporated leading collaboration practices, such as identifying leadership. However, DOD officials told us they are in the process of developing guidance and agreements that clearly define the roles and responsibilities of DOD components that participate in AI activities. By finalizing and issuing such guidance, DOD could help ensure all participants agree upon responsibilities and decision making on AI efforts across the department.

Contents

Letter		1
	Background	6
	DOD's AI Strategy and Plans Include Some, but Not All, Characteristics of a Comprehensive Strategy	20
	DOD Has Reported Some AI Activities, but Lacks a High-level Plan or Roadmap to Address Limitations	29
	DOD Collaborates on AI Activities, but Can More Fully Incorporate Leading Practices	36
	Conclusions	50
	Recommendations for Executive Action	51
	Agency Comments and Our Evaluation	52
Appendix I	Objectives, Scope, and Methodology	55
Appendix II	Survey about DOD Collaboration on AI Activities	64
Appendix III	DOD Officials' Reported Perceptions of Extent of Collaboration on AI Activities	71
Appendix IV	Joint Common Foundation Development	76
Appendix V	Comments from the Department of Defense	79
Appendix VI	GAO Contact and Staff Acknowledgments	82
Related GAO Products		83

Tables

Table 1: Department of Defense (DOD) Artificial Intelligence (AI)- Related Plans and Strategies	18
--	----

Table 2: Department of Defense (DOD) Military Services Artificial Intelligence (AI)-Related Plans and Strategies	19
Table 3: Extent to Which the 2018 <i>DOD AI Strategy</i> and 2019 <i>Summary of the DOD AI Strategy</i> Include the Key Elements of a Comprehensive Strategy and Select Internal Controls	21
Table 4: Examples of Reasons Organizations Did Not Include Certain Characteristics of a Comprehensive Strategy in Artificial Intelligence (AI)-Related Strategies	26
Table 5: Select Mechanisms for Interagency Collaboration, Their Definitions, and Reported Usage, October 2021	38
Table 6: GAO Analysis of the Extent to Which DOD Incorporated Leading Collaboration Practices and Key Considerations	41
Table 7: Organizations Included in GAO's Web-Based Survey	69
Table 8: Number and Average of Artificial Intelligence-Related Collaborative Connections by Organization Type, Reported as a Point in Time from June through October 2021	71

Figures

Figure 1: Overview of Artificial Intelligence (AI) Types and Technologies	8
Figure 2: Timeline of Key Developments for DOD's Pursuit of Artificial Intelligence (AI), April 2017 through February 2022	11
Figure 3: Timeline of JAIC Development from 2018 through 2021	13
Figure 4: DOD AI Governance Model with JAIC Support, as of November 2021	14
Figure 5: DOD Artificial Intelligence-Related Strategies and Plans	16
Figure 6: Extent to Which Nine DOD Artificial Intelligence (AI)-Related Strategies Include the Key Elements of a Comprehensive Strategy and Select Internal Controls	24
Figure 7: Joint Artificial Intelligence (AI) Center's (JAIC) AI Activities Inventory Process	34
Figure 8: DOD's Joint Common Foundation Concept	39
Figure 9: Comments from Survey Respondents	46
Figure 10: Breakdown of Perceived Extent of Artificial Intelligence Collaboration by Organization Type, Reported as a Point in Time, from June through October 2021	73
Figure 11: Timeline of Joint Common Foundation Development, as of August 2021	76

Abbreviations

AI	Artificial Intelligence
CIO	Chief Information Officer
DOD	Department of Defense
JAIC	Joint Artificial Intelligence Center
ODNI	Office of the Director of National Intelligence

This is a work of the U.S. government and is not subject to copyright protection in the United States. The published product may be reproduced and distributed in its entirety without further permission from GAO. However, because this work may contain copyrighted images or other material, permission from the copyright holder may be necessary if you wish to reproduce this material separately.



March 30, 2022

Congressional Committees

National Security Commission on AI

"AI technologies are the most powerful tools in generations...The ability of a machine to perceive, evaluate, and act more quickly and accurately than a human represents a competitive advantage in any field—civilian or military. AI technologies will be a source of enormous power for the companies and countries that harness them."

Source: National Security Commission on Artificial Intelligence, *Final Report* (Mar. 1, 2021). | GAO-22-105834

Artificial Intelligence (AI) will transform the character of warfare, according to the Department of Defense's (DOD) 2018 *National Defense Strategy*.¹ Failure to adopt AI technology into legacy systems could hinder the capability of warfighters to defend our nation, erode cohesion among allies and partners, and reduce access to markets that may contribute to a decline in our nation's prosperity and standard of living, according to the 2018 *DOD AI Strategy*.² Additionally, the 2018 *DOD AI Strategy* noted that adversaries and strategic competitors such as China and Russia are making significant investments in AI for national security purposes.

DOD has made organizational changes and is investing billions of dollars to incorporate AI technology into its operations. For example:

- DOD established the Joint Artificial Intelligence Center (JAIC) in 2018 to accelerate the delivery of AI-enabled capabilities across DOD.
- JAIC's budget increased from \$89 million in fiscal year 2019 to \$242.5 million in fiscal year 2020, to \$278.2 million for fiscal year 2021.
- DOD realigned the Director of the JAIC to report directly to the Deputy Secretary of Defense in response to a fiscal year 2021 statutory

¹Department of Defense, *Summary of the 2018 National Defense Strategy of the United States of America* (2018). (Referred to as the 2018 *National Defense Strategy*). According to the National Security Commission on AI, AI is a constellation of technologies rather than a single piece of hardware or software and requires talent, data, hardware, algorithms, applications, and integration. National Security Commission on Artificial Intelligence, *Final Report* (Mar. 1, 2021).

²Department of Defense, *Summary of the 2018 Department of Defense Artificial Intelligence Strategy: Harnessing AI to Advance Our Security and Prosperity* (2018). (Hereafter referred to as the 2018 *DOD AI Strategy*).

provision and provided acquisition authority of up to a total of \$75 million through fiscal year 2025.³

- DOD requested \$14.7 billion for science and technology programs for fiscal year 2022, including \$874 million for the development of AI, compared with \$841 million for fiscal year 2021, reflecting the rapidly growing importance of AI in DOD's operations. However, the fiscal years 2021 and 2022 requests do not reflect the total of DOD's AI investments.⁴
- DOD announced initial operating capability of the Chief Digital and AI Officer in February 2022 to serve as the department's senior official responsible for strengthening and integrating data, AI, and digital solutions within the department.⁵

The House Armed Services Committee report accompanying a bill for the National Defense Authorization Act for Fiscal Year 2021 includes a provision that we assess DOD's resources, capabilities, and plans for AI

³The William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, Pub. L. No. 116–283 § 232 and § 808 (2021). The act provides that during 2 years beginning on the date of the enactment, the Director of the JAIC shall report directly to the Deputy Secretary of Defense without intervening authority. Additionally, the Secretary of Defense shall delegate to the Director of the JAIC the acquisition authority to exercise the functions of a head of an agency (as defined in section 2302 of title 10, United States Code) with respect to appropriate acquisition activities of the Center. In exercising the acquisition authority granted in subsection (a), the Director may not obligate or expend more than \$75 million out of the funds made available in fiscal years 2021–2025 to enter into new contracts to support appropriate acquisition activities.

⁴According to a JAIC official, DOD's fiscal years 2021 and 2022 AI budget requests include the JAIC's operating budget and some other investments to procure or to develop AI technologies; however, the requests do not reflect the total of DOD's AI investments. DOD's effort to identify AI activities and associated investments is ongoing and described later in this report.

⁵On Dec. 8, 2021, the Deputy Secretary of Defense issued a memorandum that directs the establishment of the Chief Digital and AI Officer. The memorandum states that the Office of the Chief Digital and AI Officer will serve as the successor organization to the JAIC in reporting directly to the Deputy Secretary of Defense. Deputy Secretary of Defense Memorandum, *Establishment of the Chief Digital and Artificial Intelligence Officer* (Dec. 8, 2021). On Feb. 1, 2022, the Deputy Secretary of Defense issued two memoranda announcing the initial operating capability and clarifying the roles of the Chief Digital and AI Officer. Deputy Secretary of Defense Memorandum, *Initial Operating Capability of the Chief Digital and Artificial Intelligence Officer* (Feb. 1, 2022) and Deputy Secretary of Defense Memorandum, *Role Clarity for the Chief Digital and Artificial Intelligence Officer* (Feb. 1, 2022). According to a senior JAIC official, as of March 2022, DOD's intention is to formally stand down the JAIC by the end of fiscal year 2022.

technology.⁶ Our report evaluates the extent to which (1) the 2018 *DOD AI Strategy* and associated plans include characteristics of a comprehensive strategy; (2) DOD has identified and reported AI activities across the department; and (3) DOD collaborates on its AI activities.⁷

This report is a public version of a sensitive report that we issued in February 2022.⁸ DOD deemed some of the information in our February 2022 report to be sensitive, which must be protected from public disclosure. Therefore, this report omits sensitive detailed information pertaining to our objective on the extent DOD has identified and reported on AI activities across the department. Specifically, we omit information on the methodology DOD used to create its inventory of AI activities and its plans for the next phases of the inventory process. Although the information provided in this report is more limited, the report addresses the same objectives as the sensitive report and uses the same methodology.

To address these objectives, we reviewed relevant laws, regulations, executive orders, and DOD and military service strategies that outline plans and processes to manage AI across the department. We also interviewed and collected documentation from officials in the JAIC, military services, and relevant defense agencies, and DOD organizations with AI oversight responsibilities, as well as other federal organizations with AI oversight responsibilities. We included information from 2017, when the Algorithmic Warfare Cross-Functional Team was established, to 2021.⁹

⁶H.R. Rep. No. 116-442 at 257 (2020). This report also includes a provision that we review steps DOD has taken to examine the effects, risks, and efficiencies of AI on the nuclear mission. H.R. Rep. No. 116-42 at 246-47 (2020). We will address this provision separately.

⁷Characteristics of a comprehensive strategy encompass the seven key elements of a comprehensive strategy we have identified in prior work and three selected internal control principles that relate to ethics, workforce, and risk.

⁸GAO, *Artificial Intelligence: DOD Should Improve Strategies, Inventory Process, and Collaboration Guidance*, GAO-22-104516SU (Washington, D.C.: Feb. 16, 2022).

⁹The Algorithmic Warfare Cross-Functional Team was established by the Deputy Secretary of Defense in a memorandum signed on April 26, 2017. See Deputy Secretary of Defense Memorandum, *Establishment of an Algorithmic Warfare Cross-Functional Team (Project Maven)* (Apr. 26, 2017).

For objective one, we assessed the 2018 *DOD AI Strategy* and associated implementation plans, comparing them to key elements of a comprehensive strategy identified in our prior work and relevant principles on management responsibilities and risk management outlined in *Standards for Internal Control in the Federal Government*.¹⁰ We also reviewed the National Defense Authorization Act for Fiscal Year 2017, which required DOD to develop the *National Defense Strategy* and update it at least once every 4 years and, during the years without an update, to assess the implementation of the strategy and whether any revision is required.¹¹ Additionally, we discussed plans to update strategies with relevant officials, and compared those plans with federal internal controls that state that management should define objectives to include what is to be achieved, who is to achieve it, how it will be achieved, and the time frames for achievement.¹²

For objective two, we reviewed existing DOD reporting requirements and processes to track and report AI investments and activities. We also reviewed the JAIC's April 2021 report to Congress that provided a baseline inventory of AI activities and discussed with JAIC officials planned actions for the next phases of their effort to address certain areas not captured in the initial baseline. We assessed the baseline inventory against *Standards for Internal Control in the Federal Government*, which states that management should identify information requirements in an

¹⁰GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: September 2014) and GAO, *Defense Logistics: A Completed Comprehensive Strategy is Needed to Guide DOD's In-Transit Visibility Efforts*, [GAO-13-201](#) (Washington, D.C.: Feb. 28, 2013), which used criteria derived from GAO, *Managing for Results: Critical Issues for Improving Federal Agencies' Strategic Plans*, [GAO/GGD-97-180](#) (Washington, D.C.: Sept. 16, 1997). We note in the 1997 report that the Government Performance Results Act of 1993 identifies key elements to be included in strategic plans.

¹¹Pub. L. No. 114-328, § 941(a) (2016) (codified at 10 U.S.C. § 113(g)).

¹²Associated plans we assessed include: DOD, Office of the DOD Chief Information Officer, *Artificial Intelligence Governance Plan Version 1.0* (May 2020); DOD, *DOD Digital Modernization Strategy: DOD Information Resource Management Strategic Plan FY19-23* (July 12, 2019); DOD, *DOD Data Strategy* (2020); DOD Joint AI Center and DOD Chief Information Officer, *2020 Department of Defense Artificial Intelligence Education Strategy* (Sept. 2020); Department of the Air Force, *The United States Air Force Artificial Intelligence Annex to The Department of Defense Artificial Intelligence Strategy* (2019); United States Marine Corps, (U) *USMC Annex to the DOD AI Strategy* (Mar. 15, 2019) (U//FOUO); Department of the Army, *The 2020 Army AI Strategy* (2020); U.S. Navy, (U) *The Navy's Annex to the DOD AI Strategy* (2019) (SECRET); and U.S. Navy, *Transforming Naval Operations: USN AI Strategic Vectors* (July 2020).

iterative and ongoing process, using and communicating the resulting quality information to achieve an entity's objective.¹³ Additionally, we reviewed the JAIC's plans for the inventory's next phases against our *Agile Assessment Guide*, which states that an integrated master schedule or similar artifact that captures both government and contractor activities, including Agile software development efforts, should capture all the planned features needed to accomplish the program goals at an appropriate level of detail.¹⁴

For objective three, we surveyed representatives of 39 organizations, asking them about the presence, extent, and characteristics of their organizations' collaboration (or coordination) with these organizations.¹⁵ We received completed unclassified responses from 54 individuals (an 89 percent response rate). We assessed DOD's collaboration efforts against leading practices for interagency collaboration identified in our prior work and the extent to which DOD uses key mechanisms to facilitate collaboration.¹⁶ See appendix I for additional details on our objectives, scope, and methodology.

The performance audit upon which this report is based was conducted from September 2020 to February 2022 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

We subsequently worked from February 2022 to March 2022 to prepare this version for public release. This public version was also prepared in accordance with those standards.

¹³[GAO-14-704G](#).

¹⁴GAO, *Agile Assessment Guide: Best Practices for Agile Adoption and Implementation*, [GAO-20-590G](#) (Washington, D.C.: Sept. 28, 2020).

¹⁵We surveyed 61 individuals from 39 unique organizations and asked them about their organizations' collaborations with the other organizations. See appendix I for additional details on our survey methodology.

¹⁶GAO, *Managing for Results: Key Considerations for Implementing Interagency Collaborative Mechanisms*, [GAO-12-1022](#) (Washington, D.C.: Sept. 27, 2012).

Background

Definitions of AI

Section 238 of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 directed the Secretary of Defense to delineate a definition of the term “artificial intelligence” for use within the department.¹⁷ The 2018 *DOD AI Strategy* states that AI refers to the ability of machines to perform tasks that normally require human intelligence—for example, recognizing patterns, learning from experiences, drawing conclusions, making predictions, or taking action—whether digitally or as the smart software behind autonomous physical systems. In June 2020, the DOD Inspector General issued a report that recommended, among other things, that the JAIC Director establish an AI governance framework that includes a standard definition of AI that is updated at least annually.¹⁸ In response to the recommendation, the DOD CIO identified a March 2020 memorandum signed by the JAIC Director, which stated that the DOD AI Executive Steering Group approved the AI definition from the 2018 *DOD AI Strategy* as the enterprise AI definition for DOD.¹⁹

More recently, Section 5002 of the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, defined AI as a machine-based system that can, for a given set of human-defined objectives, make

¹⁷Pub. L. No. 115-232, § 238 (2018).

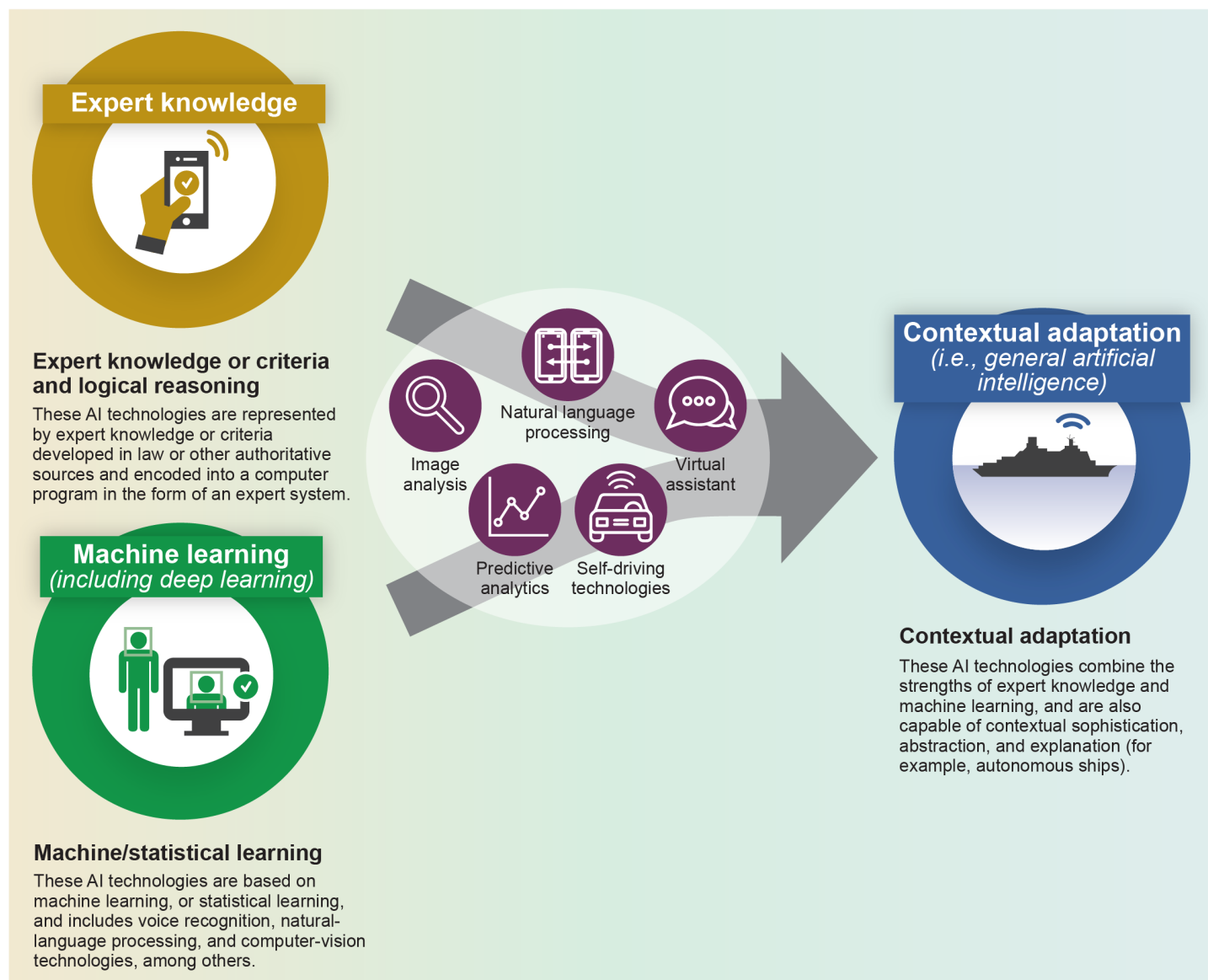
¹⁸DOD Inspector General, (U) *Audit of Governance and Protection of Department of Defense Artificial Intelligence Data and Technology* (June 29, 2020) (U//FOUO). The DOD Inspector General’s June 2020 recommendations to the JAIC included, among others, that when developing its AI governance framework and standards, JAIC should: include a standard definition of AI and regularly, at least annually, consider updating the definition; develop a process to accurately account for AI projects; and develop capabilities for sharing data. In July 2021, officials told us they closed or resolved these AI governance-related recommendations.

¹⁹DOD Chief Information Officer Memorandum, *Department of Defense Artificial Intelligence Executive Steering Group Decisions* (Mar. 4, 2020). Distribution of this memorandum included the Secretaries of the Military Departments, Chairman of the Joint Chiefs of Staff, various Undersecretaries of Defense, and others. The definition of AI from the 2018 *DOD AI Strategy* is similar to other U.S. government definitions of AI. For example, the National Institute of Standards and Technology defines AI as follows: AI refers to computer systems able to perform tasks that normally require human intelligence, such as image classification and speech recognition. Machine learning refers to the components of AI systems that learn from data to perform such tasks. National Institute of Standards and Technology, *Draft National Institute of Standards and Technology Interagency or Internal Report 8269: A Taxonomy and Terminology of Adversarial Machine Learning* (Oct. 2019).

predictions, recommendations or decisions influencing real or virtual environments. AI systems use machine and human-based inputs to—(A) perceive real and virtual environments; (B) abstract such perceptions into models through analysis in an automated manner; and (C) use model inference to formulate options for information or action.²⁰ As of September 2021, DOD continues to use the definition contained in the 2018 *DOD AI Strategy*. Figure 1 illustrates different types of AI and provides descriptions of how they are applied.

²⁰Pub. L. No. 116-283, § 5002 (2021). This definition of AI is part of the National Artificial Intelligence Initiative Act of 2020, which was enacted as Division E of the National Defense Authorization Act for Fiscal Year 2021. The act directed the President to establish the National AI Initiative to ensure continued U.S. leadership in AI research and development; lead the world in the development and use of trustworthy AI systems in the public and private sectors; prepare the present and future U.S. workforce for the integration of AI systems across all sectors of the economy and society; and coordinate ongoing AI research, development, and demonstration activities among the civilian agencies, the Department of Defense, and the Intelligence Community to ensure that each informs the work of the others. Pub. L. No. 116-283, §§ 5101-06 (2021).

Figure 1: Overview of Artificial Intelligence (AI) Types and Technologies



Source: GAO analysis of Department of Defense (DOD) information; Medium.com/Brian Johnson. | GAO-22-105834

DOD's AI History including Roles and Responsibilities

Before the 2018 National Defense Strategy, which prioritized AI as one of the technologies that will transform future warfare, DOD had a long history of working with AI and investing in its research and development. For example, since the late 1950s the Defense Advanced Research

Projects Agency has engaged in research aimed at applying AI principles to defense challenges. Additionally, the Navy established its Center for Applied Research in AI in 1981.²¹ DOD has integrated AI capabilities into various efforts within the department, such as the Algorithmic Warfare Cross-Functional Team (known as Project Maven). According to a Deputy Secretary of Defense memorandum establishing Project Maven, the objective is to turn the enormous volume of data available to DOD into actionable intelligence and insights.²²

Algorithmic Warfare Cross-Functional Team. In 2017, DOD established the Algorithmic Warfare Cross-Functional Team, or Project Maven, and tasked the Office of the Undersecretary of Defense for Intelligence with oversight (the Under Secretary of Defense for Intelligence was later renamed the Under Secretary of Defense for Intelligence and Security).²³ According to Office of the Under Secretary of Defense for Intelligence and Security officials, Project Maven is designed to develop AI projects to and facilitate their placement into permanent DOD programs.²⁴ The Office of the Under Secretary of Defense for Intelligence and Security's Project Maven office establishes policy and provides guidance for all algorithm-based technology initiatives affecting

²¹The Navy Center for Applied Research in Artificial Intelligence is a branch within the Information Technology Division of the U.S. Naval Research Laboratory. The Center conducts basic and applied research on AI to address the application of AI technology and techniques to critical Navy and national problems.

²²Deputy Secretary of Defense Memorandum, *Establishment of an Algorithmic Warfare Cross-Functional Team (Project Maven)* (Apr. 26, 2017).

²³Deputy Secretary of Defense Memorandum, *Establishment of an Algorithmic Warfare Cross-Functional Team (Project Maven)* (Apr. 26, 2017). We previously reported that cross-functional teams rely on individuals with different types of expertise to work toward a common, well-defined goal, and are thought to deliver better and faster solutions to complex and fast-moving problems. GAO, *Defense Management: DOD Should Set Deadlines on Stalled Collaboration Efforts and Clarify Cross-Functional Team Funding Responsibilities*, [GAO-19-598](#) (Washington, D.C.: Aug. 20, 2019).

²⁴In January 2022, the DOD Inspector General issued a report evaluating whether the Algorithmic Warfare Cross-Functional Team monitored Project Maven contracts in accordance with federal laws and DOD policy. The DOD Inspector General made two recommendations including that the Chief of the Algorithmic Warfare Cross-Functional Team formalize Project Maven's processes and procedures for monitoring and managing AI development contracts. According to the DOD Inspector General's report, in October 2021, to address the anticipated recommendations, DOD provided a description of roles and responsibilities, standard operating procedures, and a Project Maven acquisition guide. DOD Inspector General, *Evaluation of Contract Monitoring and Management for Project Maven* (Jan. 6, 2022).

intelligence mission areas within the Defense Intelligence Enterprise.²⁵ This includes overseeing implementation of a DOD data labeling effort for full-motion video and overhead imagery. Additionally, in January 2021, an Office of the Under Secretary of Defense for Intelligence and Security official said geospatial-intelligence technology initiatives will transfer to the National Geospatial-Intelligence Agency by fiscal year 2023, and non-geospatial intelligence technology initiatives would remain with the Office of the Under Secretary of Defense for Intelligence and Security through fiscal year 2025. See figure 2 for key developments and history of AI integration.

²⁵Deputy Secretary of Defense Memorandum, *Establishment of an Algorithmic Warfare Cross-Functional Team (Project Maven)* (Apr. 26, 2017).

Figure 2: Timeline of Key Developments for DOD's Pursuit of Artificial Intelligence (AI), April 2017 through February 2022



Source: GAO analysis of Department of Defense (DOD) information. | GAO-22-105834

^aThe John S. McCain National Defense Authorization Act for Fiscal Year 2019, Pub. L. No. 115-232 § 238 (2018)

^bThe William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, Pub. L. No. 116-283 § 232 (2021).

JAIC roles and responsibilities. In June 2018, DOD established the JAIC to accelerate AI development and integration, with the goal of the JAIC becoming fully operational by October 1, 2019. The JAIC's first director was confirmed by the Senate in December 2018. The JAIC's roles and responsibilities are derived from the John S. McCain National Defense Authorization Act for Fiscal Year 2019, and prescribed in the 2018 *DOD AI Strategy*, and Deputy Secretary of Defense memoranda. The JAIC collaborates with key offices across the department, including the Office of the Under Secretary of Defense for Research and Engineering, the Office of the Under Secretary of Defense for Acquisition and Sustainment, the Director of Operational Test and Evaluation, and the DOD CIO and Chief Data Officer.²⁶ Within the Office of the Under Secretary of Defense for Research and Engineering, the Defense Advanced Research Projects Agency supports AI research and the Defense Innovation Unit conducts projects to transition commercial prototypes for specific applications that support the JAIC's efforts.

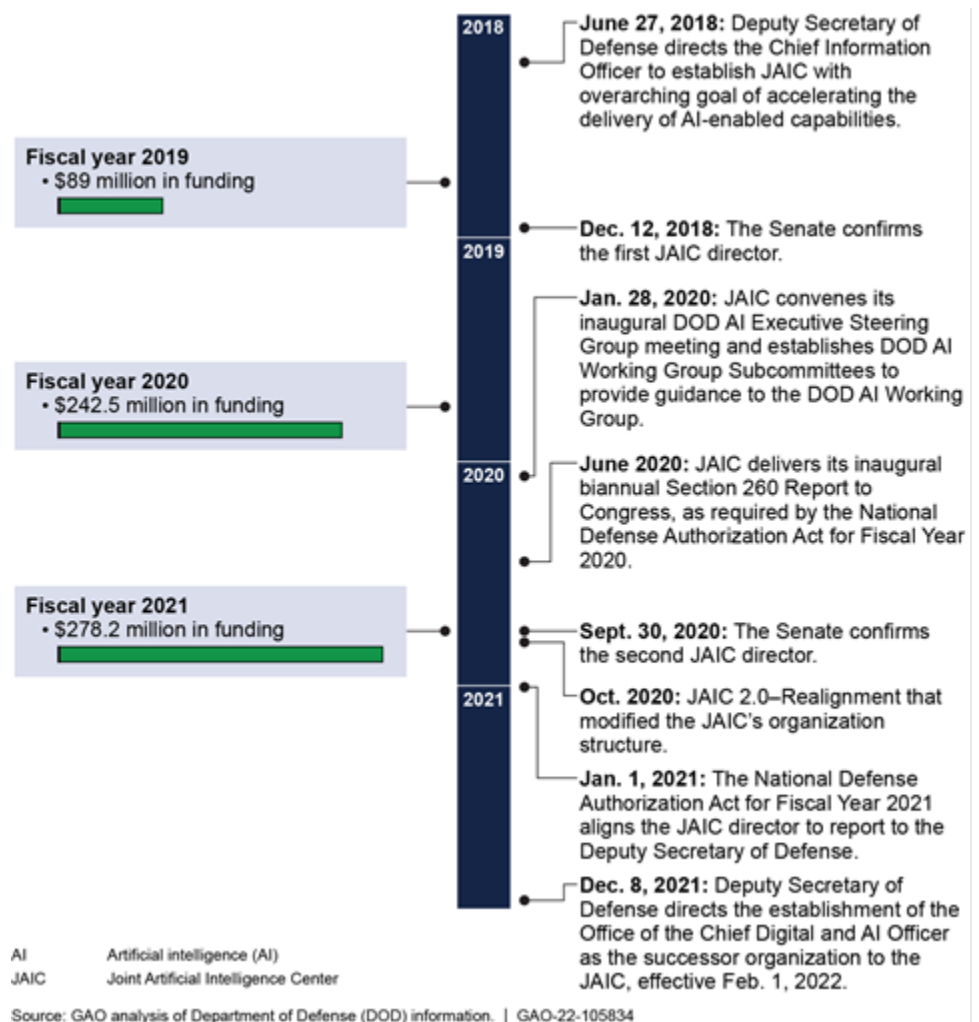
The JAIC also addresses broad AI challenges through Mission Initiatives using a cross-functional team approach.²⁷ According to the Director of the JAIC, efforts are moving from the initial phase of adopting AI to a second phase of AI integration, and then there will be a third phase of scaling of AI capabilities throughout the department.

As shown in figure 3, the JAIC has grown since its inception in 2018 and has shifted from executing and implementing AI solutions of its own to providing technical services, acquisition support, expertise, and best practices to other DOD organizations.

²⁶National Security Commission on Artificial Intelligence, *Final Report* (Mar. 1, 2021).

²⁷In February 2022, we reported on some of the JAIC's initiatives to address DOD's broad AI challenges. GAO, *Artificial Intelligence: Status of Developing and Acquiring Capabilities for Weapons Systems*, [GAO-22-104765](#) (Washington, D.C.: Feb. 17, 2022).

Figure 3: Timeline of JAIC Development from 2018 through 2021

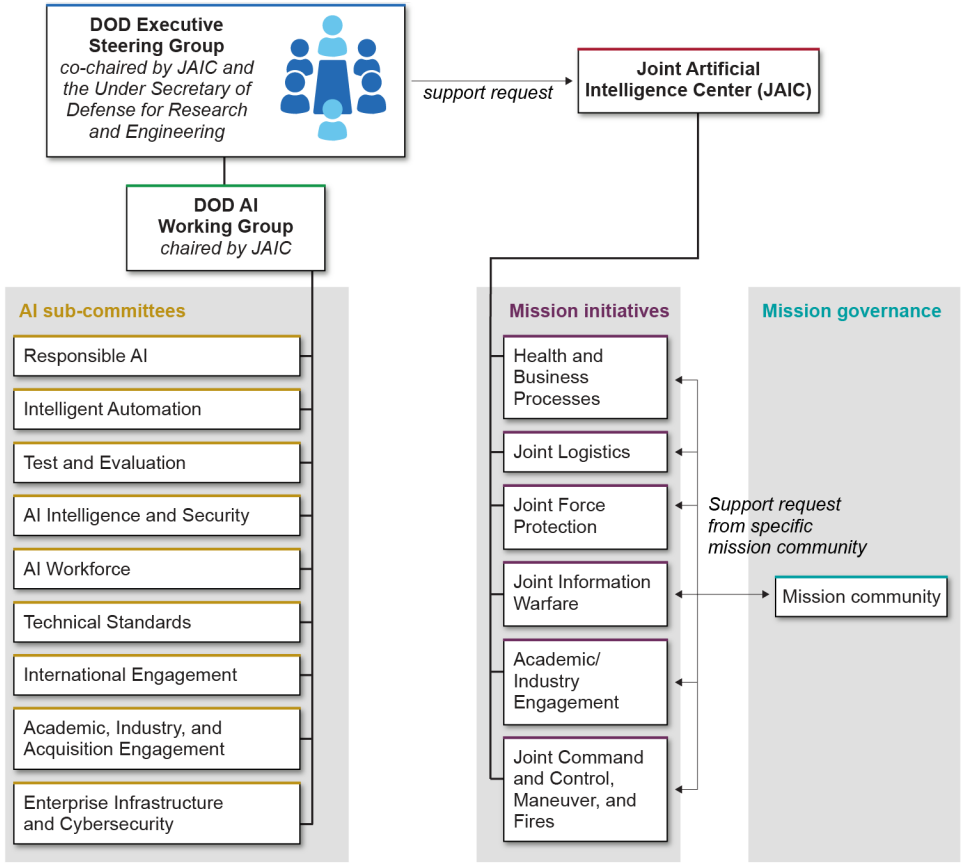


Section 238 of the John S. McCain National Defense Act for Fiscal Year 2019 mandated that the duties of the senior official designated by the Secretary of Defense (Director, JAIC) include regularly convening appropriate officials across the department to integrate the functional activities related to AI and machine learning.²⁸ The JAIC, in coordination with the DOD CIO, established a governance framework as a key

²⁸Pub. L. No. 115-232, § 238 (2018).

collaboration mechanism, consisting of the DOD AI Executive Steering Group, AI Working Group, and nine subcommittees as show in figure 4.

Figure 4: DOD AI Governance Model with JAIC Support, as of November 2021



Source: GAO analysis of Department of Defense (DOD) information. | GAO-22-105834

Mission initiatives. According to the JAIC’s June 2021 biannual report to Congress, the JAIC has six mission initiatives, which have been scoped and selected based on the joint requirements provided to the JAIC by its partners.²⁹ For example, the Joint Logistics Mission Initiative team seeks to enable the development of AI-based solutions for logistics across the DOD by improving access to integrated development tools and vehicle data and by conducting AI projects to find and overcome barriers. One of the Joint Logistics Mission Initiative team’s lines of effort is focused on

²⁹Joint Artificial Intelligence Center, (U) *Biannual Report to Congress of the Joint Artificial Intelligence Center*, (June 2021) (CUI).

predictive logistics for aircraft entering major maintenance cycles. Aircraft entering these cycles can sometimes require more extensive maintenance resulting in an unscheduled longer-than-normal maintenance period which reduces maintenance efficiency and aircraft availability. The Joint Logistics Mission Initiative team is using historic maintenance data to train AI models to predict these longer than normal maintenance periods. The initial logistics model was demonstrated on February 11, 2021.

Chief Digital and AI Officer. On December 8, 2021, the Deputy Secretary of Defense issued a memorandum directing the establishment of the Chief Digital and AI Officer, effective in February 2022, but the implementation plan for this effort has not been published.³⁰ The memorandum outlines initial reporting relationships with the JAIC, the Defense Digital Service, and the Chief Data Officer. For example, the Office of the Chief Digital and AI Officer will be the successor organization to the JAIC in reporting directly to the Deputy Secretary of Defense. As of December 2021, JAIC officials characterized the memorandum's directed changes as related to reporting structure. On February 1, 2022, the Deputy Secretary of Defense issued two memoranda announcing the initial operating capability and clarifying the roles of the Chief Digital and AI Officer.³¹ According to a senior JAIC official, as of March 2022, DOD's intention is to formally stand down the JAIC by the end of fiscal year 2022.

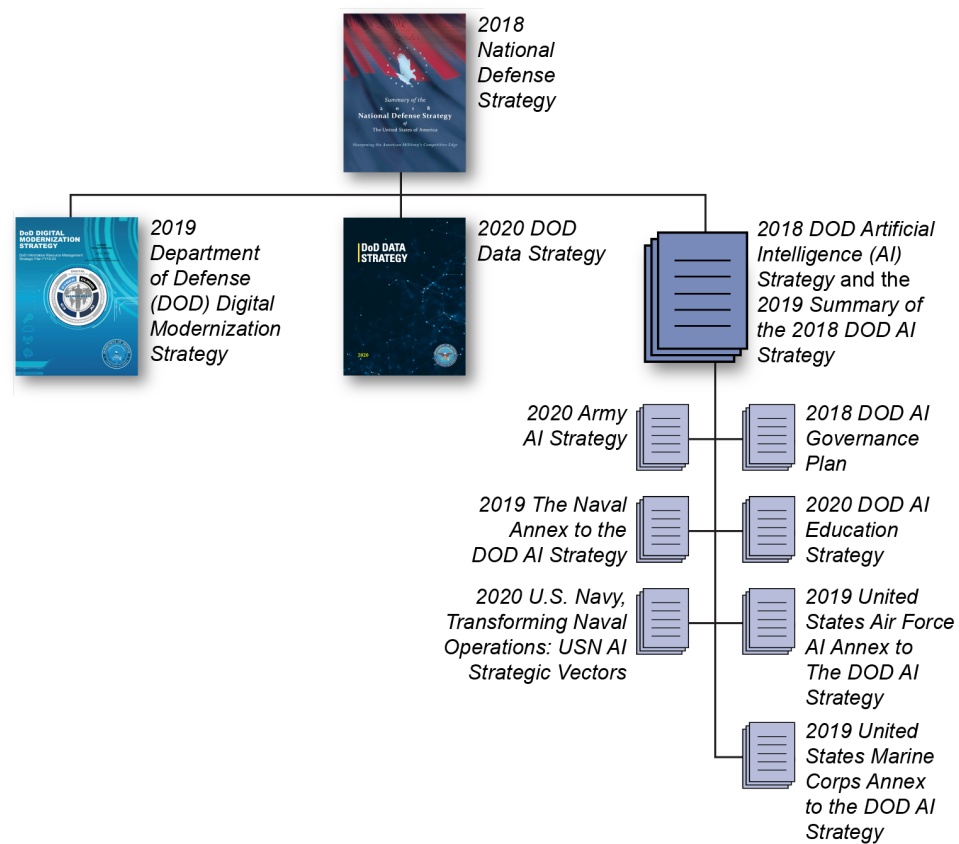
³⁰Deputy Secretary of Defense Memorandum, *Establishment of the Chief Digital and Artificial Intelligence Officer* (Dec. 8, 2021).

³¹Deputy Secretary of Defense Memorandum, *Initial Operating Capability of the Chief Digital and Artificial Intelligence Officer* (Feb. 1, 2022) and Deputy Secretary of Defense Memorandum, *Role Clarity for the Chief Digital and Artificial Intelligence Officer* (Feb. 1, 2022).

DOD and the Military Services' AI-Related Strategies and Plans

DOD and the military services have issued a number of AI-related strategies and plans. (See fig. 5.)

Figure 5: DOD Artificial Intelligence-Related Strategies and Plans



Source: GAO analysis of Department of Defense (DOD) information. | GAO-22-105834

2018 DOD AI Strategy. Section 238 of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 directed the development of a detailed strategic plan to develop, mature, adopt, and transition AI technologies into operational use.³² DOD issued the 2018 *DOD AI Strategy*, which directs DOD to accelerate the adoption of AI and emphasizes that a strong, technologically advanced department is essential for protecting the security of the nation.³³ The 2018 *DOD AI Strategy* presents a strategic approach to guide DOD's efforts to accelerate AI adoption, which includes initiatives such as scaling AI's impact across DOD through a common foundation that enables decentralized development and experimentation, cultivating a leading AI workforce, and leading in military ethics and AI safety. According to JAIC officials, an updated 2018 *DOD AI Strategy* is expected to be issued in the summer of 2022 following the release of a new national defense strategy.

DOD AI-related strategies and plans. In addition to the 2018 *DOD AI Strategy*, DOD has issued the AI-related plans and strategies shown in table 1.

³²Pub. L. No. 115-232, § 238 (2018).

³³The 2018 *DOD AI Strategy* is an annex to the 2018 *National Defense Strategy*, which underpins DOD's planned budgets for fiscal years 2019 through 2023, including accelerating modernization programs such as AI-related applications. The summary of the National Defense Strategy states that, "The Department will invest broadly in military application of autonomy, artificial intelligence, and machine learning, including rapid application of commercial breakthroughs, to gain competitive military advantages."

Table 1: Department of Defense (DOD) Artificial Intelligence (AI)-Related Strategies and Plans

Title of AI-related strategy or plan	Description of AI-related strategy or plan
2018 <i>DOD AI Governance Plan</i>	According to Joint Artificial Intelligence Center (JAIC) officials, the 2018 <i>DOD AI Governance Plan</i> provides a pathway to implement the 2018 <i>DOD AI Strategy</i> . ^a Additionally, it outlines DOD AI governance structures to establish and advance policies. This includes initiatives to identify and integrate AI technologies, tools, and systems across DOD in support of the 2018 <i>National Defense Strategy</i> and the 2019 <i>DOD Digital Modernization Strategy</i> . According to JAIC officials, there are no plans to update the 2018 <i>DOD AI Governance Plan</i> but they plan to issue a memorandum to reflect the reporting relationship of the JAIC Director to the Deputy Secretary of Defense, as required by the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021. ^b
2019 <i>DOD Digital Modernization Strategy</i>	This strategy provides a roadmap to support implementation of the 2018 <i>National Defense Strategy</i> lines of effort through information technology (IT) priorities, including AI. ^c It presents the DOD CIO's vision for achieving the department's goals and creating more secure, coordinated, seamless, transparent, and cost-effective IT architecture. According to a DOD CIO official, the 2019 <i>Digital Modernization Strategy</i> is required to be updated every 5 years.
2020 <i>DOD Data Strategy</i>	This strategy supports both the 2018 <i>National Defense Strategy</i> and the 2019 <i>Digital Modernization Strategy</i> . ^d It provides the overarching vision, guiding principles, essential capabilities, goals, and objectives necessary to aid the department as it becomes more data centric. Additionally, it discusses the importance of data as DOD integrates AI into joint warfighting. According to officials from the Chief Data Office, there are no plans to update the 2020 <i>DOD Data Strategy</i> at this time.
2020 <i>DOD AI Education Strategy</i>	Section 256 of the National Defense Authorization Act for Fiscal Year 2020 required the Secretary of Defense to develop a strategy for educating military service members in relevant occupational fields on matters relating to AI. ^e The 2020 <i>DOD AI Education Strategy</i> includes a curriculum designed to give military service members in relevant occupational fields a basic knowledge of AI. ^e According to JAIC officials, they have no plans to update the 2020 <i>DOD AI Education Strategy</i> at this time.

Source: GAO analysis of Department of Defense (DOD) information. | GAO-22-105834

^aDepartment of Defense, Office of the DOD Chief Information Officer, *Artificial Intelligence Governance Plan Version 1.0* (May 2020).

^bWilliam M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, Pub. L. No. 116-283, § 5002 (2021).

^cDepartment of Defense, *DOD Digital Modernization Strategy: DOD Information Resource Management Strategic Plan FY19–23* (July 12, 2019).

^dDepartment of Defense, *DOD Data Strategy* (2020).

^eDepartment of Defense Joint AI Center and DOD Chief Information Officer, *2020 Department of Defense Artificial Intelligence Education Strategy* (Sept. 2020).

³⁴Pub. L. No. 116-92, § 256 (2019).

Military services AI-related strategies. In 2018, the Deputy Secretary of Defense directed the military departments to develop annexes to the 2018 *DOD AI Strategy*.³⁵ In response, the military services and other organizations issued additional AI-related strategy documentation, and more strategies are under development.³⁶ See table 2 for military service AI-related strategies.

Table 2: Department of Defense (DOD) Military Services Artificial Intelligence (AI)-Related Strategies and Plans

Title of military service AI-related strategy	Status of military service AI-related strategy
2019 <i>United States Air Force Artificial Intelligence (AI) Annex to The Department of Defense Artificial Intelligence Strategy</i> ^a	According to an Air Force official, this annex needs a revision to incorporate U.S. Space Force, and they are in the early stages of drafting an AI strategy for the Department of the Air Force.
2019 <i>United States Marine Corps Annex to the DOD AI Strategy</i> ^b	Marine Corps officials said that they are creating an AI Roadmap to unify their service-wide approach to integration of AI and machine learning projects, and the Roadmap will inform and update the 2019 <i>USMC Annex to the 2018 DOD AI Strategy</i> .
2020 <i>Army AI Strategy</i> ^c	An Army official said no revisions to their AI strategy are planned or underway.
2019 <i>The Naval Annex to the DOD AI Strategy</i> ^d 2020 <i>Transforming Naval Operations: USN AI Strategic Vectors</i> ^e	A Navy official said there are no plans to update <i>The Naval Annex to the 2018 DOD AI Strategy</i> . However, the Navy official said <i>Transforming Naval Operations: USN AI Strategic Vectors</i> is regularly updated.
Space Force AI Strategy	According to Space Force officials, Space Force does not have its own AI strategy and has not determined whether they will develop their own strategy. A Space Force official stated that Space Force has incorporated the 2018 <i>DOD AI Strategy</i> into actions versus developing a reinforcing document.

Source: GAO analysis of Department of Defense (DOD) information. | GAO-22-105834

^aDepartment of the Air Force, *The United States Air Force Artificial Intelligence (AI) Annex to The Department of Defense Artificial Intelligence Strategy* (2019).

^bUnited States Marine Corps, (U) *USMC Annex to the DOD AI Strategy* (Mar. 15, 2019) (U//FOUO).

^cDepartment of the Army, *The 2020 Army AI Strategy* (2020).

^dU.S. Navy, (U) *The Naval Annex to the DOD AI Strategy* (2019) (SECRET).

^eU.S. Navy, *Transforming Naval Operations: USN AI Strategic Vectors* (July 2020).

³⁵2018 *DOD AI Strategy* and Deputy Secretary of Defense Memorandum, *Joint Artificial Intelligence Center Implementation* (Sept. 11, 2018).

³⁶For example, in May 2021 the Deputy Secretary of Defense issued a memorandum that calls for the development of a responsible AI strategy and implementation pathway that will include components such as proposed actions, with corresponding metrics and timelines, while leveraging existing efforts, processes, policies, and structures for responsible AI integration across the department. Deputy Secretary of Defense Memorandum, *Implementing Responsible Artificial Intelligence in the Department of Defense* (May 26, 2021).

GAO AI Accountability Framework

In June 2021, we published an AI accountability framework to help managers ensure accountability and responsible use of AI in government programs and processes.³⁷ Our objective was to identify key practices to help ensure accountability and responsible AI use by federal agencies and other entities involved in the design, development, deployment, and continuous monitoring of AI systems.³⁸ The AI accountability framework is organized around four complementary principles, which address governance, data, performance, and monitoring. For each principle, the framework describes key practices for federal agencies and other entities that are considering, selecting, and implementing AI systems. Each practice includes a set of questions for entities, auditors, and third-party assessors to consider, as well as procedures for auditors and third-party assessors. In particular, the key practices for governance at the organizational level in the AI accountability framework—which include clear goals, roles and responsibilities, values, workforce, stakeholder involvement, and risk management—align with some characteristics of a comprehensive strategy and internal control principles.³⁹

DOD's AI Strategy and Plans Include Some, but Not All, Characteristics of a Comprehensive Strategy

Our assessment shows that the 2018 *DOD AI Strategy* and most associated AI-related plans and strategies include some characteristics of a comprehensive strategy. These characteristics are problem definition, scope, and methodology; activities, milestones, and performance measures; resources and investments; organizational roles,

³⁷GAO, *Artificial Intelligence: An Accountability Framework for Federal Agencies and Other Entities*, [GAO-21-519SP](#) (Washington, D.C.: June 30, 2021).

³⁸To develop the AI accountability framework, we convened a Comptroller General Forum, in September of 2020, of experts in industry, government, nonprofits, and academia to discuss factors affecting oversight of AI, including AI governance, sources of evidence, methods to assess implementation of AI systems, and identifying and mitigating potential bias and inequities. In addition to perspectives from the Comptroller General Forum and subject matter expert interviews, we also conducted an extensive literature review and obtained independent validation of key practices from program officials and subject matter experts.

³⁹We did not use the GAO AI accountability framework to assess DOD's AI strategies because the strategies assessed in this report were published before it was issued. However, the criteria we used aligns with the AI accountability framework.

responsibilities, and coordination; key external factors; and risk.⁴⁰ In addition, the strategies and plans do not fully include some of these characteristics, particularly performance measures, resources and investments, and risk. We previously reported on the importance of including such characteristics in strategy documents.⁴¹

2018 DOD AI Strategy. We found that the 2018 *DOD AI Strategy* fully includes some, but not all, key elements of a comprehensive strategy and select internal control principles. Specifically, we found that the 2018 *DOD AI Strategy* and the 2019 *Summary of the DOD AI Strategy* fully include four characteristics of a comprehensive strategy and partially include six characteristics of a comprehensive strategy.⁴² (See table 3.)

Table 3: Extent to Which the 2018 *DOD AI Strategy* and 2019 *Summary of the DOD AI Strategy* Include the Key Elements of a Comprehensive Strategy and Select Internal Controls

Element/principle	Description	Element included in strategy	Element inclusion assessment
Mission statement	A comprehensive statement that summarizes the main purpose of the strategy.	●	The strategy discusses its main purpose.
Problem definition, scope, and methodology	Presents the issues to be addressed by the strategy, the scope the strategy covers, and the process by which it was developed.	◐	The introduction presents the AI problem statement and gives an overview of scope. There is no discussion of the process by which the strategy was developed.
Goals and objectives	The goals to be achieved by the strategy. The strategy includes overarching goals and objectives that address the overall results desired from implementation of the strategy.	●	The strategy includes overarching goals and objectives that address the overall results desired from its implementation.

⁴⁰Characteristics of a comprehensive strategy refers to the seven key elements of a comprehensive strategy and three select internal control principles.

⁴¹GAO-13-201. For example, we found that it is important to identify needed resources and investments—which may include skills and technology, and human capital, information, and other resources required to meet a strategy's goals and objectives. Additionally, we found that it is important to identify key external factors that might affect a comprehensive strategy so that a mitigation plan can be developed.

⁴²In 2019, DOD issued an unclassified summary of the 2018 *DOD AI Strategy*, which is a classified Secret document. We assessed the 2018 *DOD AI Strategy* and its unclassified summary as one document.

Element/principle	Description	Element included in strategy	Element inclusion assessment
Activities, milestones, and performance measures	The identification of steps to achieve those results, as well as milestones and performance measures to gauge results.	●	The strategy discusses activities to be conducted to achieve strategy goals. Milestones and performance measures are included for some, but not all activities.
Resources and investments	Costs to execute the plan and the sources and types of resources and investments, including skills and technology and the human, capital, information, and other resources required to meet the goals/objectives.	●	The strategy discusses resources in general but does not identify the types of resources or investments needed to execute the strategy (e.g., human capital, information technology, contracts, etc.).
Organizational roles, responsibilities, and coordination	A description of roles and responsibilities for managing and overseeing the implementation of the strategy and the establishment of mechanisms for multiple stakeholders to coordinate their efforts throughout implementation and make necessary adjustments to the strategy based on performance.	●	The strategy's summary describes the Joint Artificial Intelligence Center's roles and responsibilities, but not in context of implementing the strategy. Additionally, the strategy indicates that DOD will establish organizations within the department to enable coordination and integration of AI.
Key external factors that could affect the achievement of goals	Key factors external to the organization and beyond its control that could significantly affect the achievement of the long-term goals contained in the strategy. These external factors can include economic, demographic, social, technological, or environmental factors, as well as conditions or events that would affect DOD's ability to achieve the desired results.	●	The summary discusses how adversaries' advancements in AI for military purposes hinder the U.S. goal to transform all functions of the department, which is an external factor. The strategy does not include other external factors that would be relevant, such as technological challenges.
Ethical values	The oversight body and management should demonstrate a commitment to integrity and ethical values.	●	The strategy includes leadership in military ethics and AI safety as a strategic area.
Workforce	Management should demonstrate a commitment to recruit, develop, and retain competent individuals.	●	The strategy includes workforce as a strategic area.

Element/principle	Description	Element included in strategy	Element inclusion assessment
Risk	Management should identify, analyze, and respond to risks related to achieving the defined objectives.	◐	While the strategy lists AI-related risks, risk mitigation and risk response are not included.

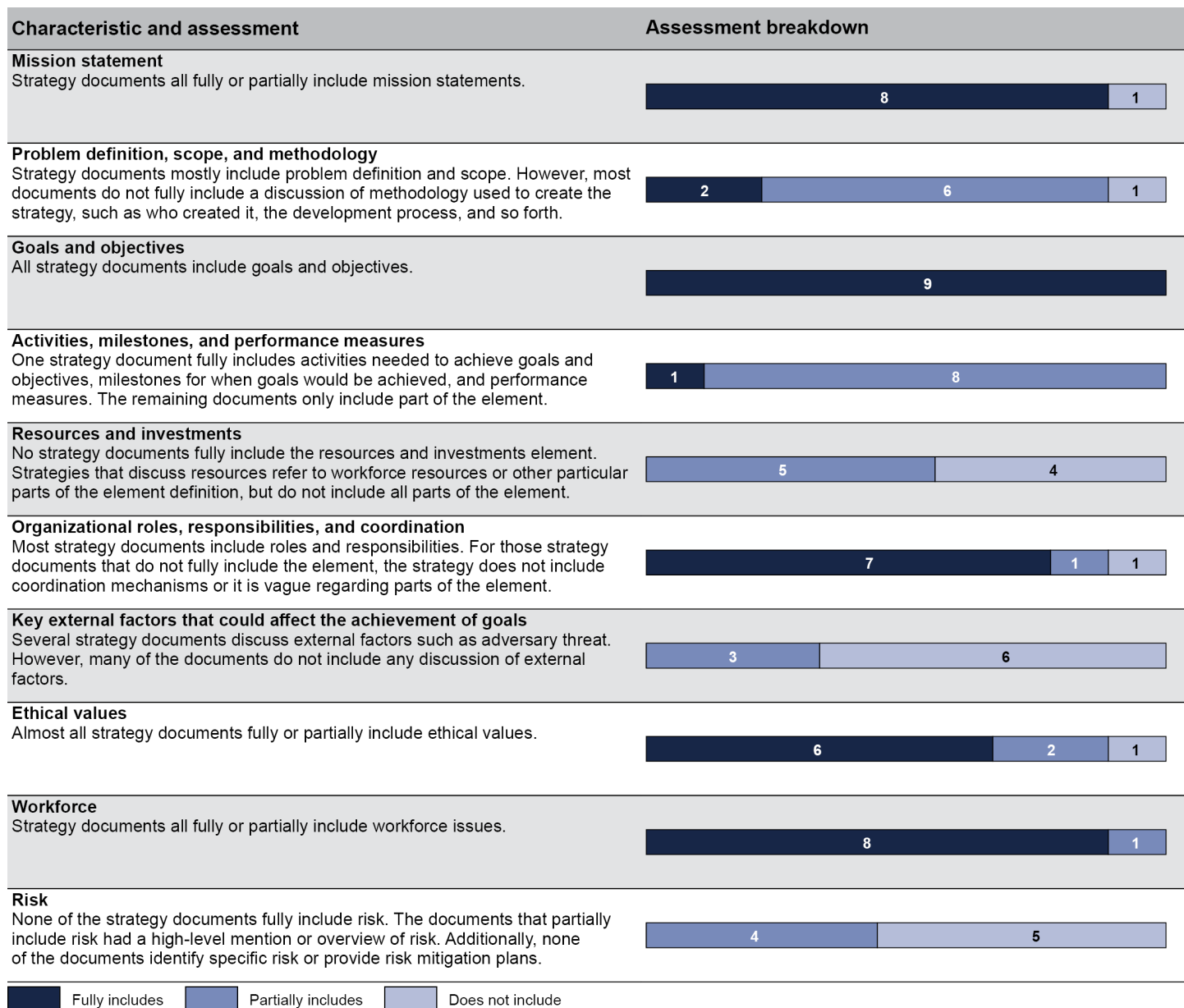
Key: ● = fully included element; ◐ = partially included element; ○ = does not include element

Source: GAO analysis of Department of Defense (DOD) information. | GAO-22-105834

Associated AI strategies and plans. We also found that the body of associated AI strategies and plans include some, but not all, key elements of a comprehensive strategy and select internal control principles.⁴³ (See fig. 6.)

⁴³The body of associated AI-related strategies and plans we assessed include: 2018 *DOD AI Governance Plan*; 2019 *DOD Digital Modernization Strategy*; 2020 *DOD Data Strategy*; 2020 *DOD AI Education Strategy*; and military service AI-related strategies including the 2019 *United States Air Force AI Annex to The DOD AI Strategy*; 2019 *USMC Annex to the DOD AI Strategy*; 2020 *Army AI Strategy*; 2019 *Naval Annex to the DOD AI Strategy*; and 2020 *Transforming Naval Operations: USN AI Strategic Vectors*.

Figure 6: Extent to Which Nine DOD Artificial Intelligence (AI)-Related Strategies Include the Key Elements of a Comprehensive Strategy and Select Internal Controls



Source: GAO analysis of Department of Defense (DOD) information. | GAO-22-105834

DOD's body of AI-related strategies also include some characteristics of a comprehensive strategy, but lack other characteristics. Characteristics that are mostly included are mission statement, goals and objectives,

commitment to integrity and ethical values, and commitment to recruit, develop, and retain competent individuals. However, overall the body of AI-related strategies partially include or do not include the following characteristics: problem definition, scope, and methodology; activities, milestones, and performance measures; resources and investments; organizational roles, responsibilities, and coordination; key external factors; and risk.

The JAIC officials we interviewed identified several potential reasons why certain characteristics were not fully included in their strategies, such as the *2018 DOD AI Strategy*, *2018 DOD AI Governance Plan*, and the *2020 DOD AI Education Strategy*.⁴⁴ For example:

- A JAIC official stated that resources had not been determined when the *2018 DOD AI Strategy* was issued. Additionally, the JAIC official said they could not speak to why risks in AI were not included in the *2018 DOD AI Strategy*.
- JAIC officials said that they have begun to draft an updated *DOD AI Strategy*, which is expected to be issued as an annex to the new *National Defense Strategy*.⁴⁵ According to the Director of the JAIC, the updated DOD AI Strategy is needed as the JAIC shifts its focus from adoption of AI capabilities to integration. The Director of the JAIC said the updated strategy will drive that integration and reflect how AI governance has matured since the original strategy was issued.

Other DOD organizations with AI-related strategies. Additionally, officials from other DOD organizations with AI-related strategies provided various reasons why all characteristics of a comprehensive strategy were not fully included in their strategies. See table 4 for examples of reasons why certain characteristics may not have been included in a strategy.

⁴⁴The DOD Chief Information Officer developed the *2018 DOD AI Strategy* and *2018 DOD AI Governance Plan*, but ownership transferred to the JAIC. The *2018 DOD AI Strategy* was issued prior to establishment of the JAIC and officials explained they could therefore not definitively say why all characteristics of a comprehensive strategy were not included. The JAIC issued the *2020 AI Education Strategy*.

⁴⁵On March 28, 2022, DOD announced that it transmitted the classified 2022 *National Defense Strategy* to Congress.

Table 4: Examples of Reasons Organizations Did Not Include Certain Characteristics of a Comprehensive Strategy in Artificial Intelligence (AI)-Related Strategies

Characteristic	Examples
Methodology	Air Force. An Air Force official said the 2019 <i>United States Air Force AI Annex to The DOD AI Strategy</i> followed the general structure of the 2018 <i>DOD AI Strategy</i>, which did not have a methodology section, so the annex does not either. DOD Chief Data Officer. According to a Chief Data Officer official, the 2020 <i>DOD Data Strategy</i> did not include methodology because it did not have a simple, structured development path that is easy to summarize.
Performance measures	Army. According to an Army official, the 2020 <i>Army AI Strategy</i> may not have included characteristics such as performance measures because it is not a characteristic typically found in an Army strategy document. The official said that such details are typically found in an execute order. Marine Corps. According to Marine Corps officials, AI-related efforts were not mature enough to assess integration of characteristics such as milestones and performance measures in the 2019 <i>USMC Annex to the DOD AI Strategy</i>. The officials stated that as AI is implemented, the Marine Corps will have a stronger understanding of appropriate milestone objectives.
Resources	DOD CIO. A DOD CIO official said characteristics not included in the 2019 <i>DOD Digital Modernization Strategy</i> may have been addressed elsewhere, such as governance bodies chaired by DOD CIO senior leaders that guide and prioritize resourcing, mitigate the impact of external factors, and measure progress. DOD Chief Data Officer. Officials from the Chief Data Office said that the office is beginning to issue the data calls, edit reporting requirements, and update policies to better monitor and manage data resources and investments.
Key external factors	Army. According to an Army official, the 2020 <i>Army AI Strategy</i> may not have included characteristics such as key external factors because it is not a characteristic typically found in an Army strategy document. Air Force. An official from the U.S. Air Force said they were not able to determine key external factors at the time the annex was issued because their AI efforts were in a nascent stage.
Risk	Navy. A Navy official said risk was not included in either the Navy's annex to the <i>DOD AI Strategy</i> or the <i>Transforming Naval Operations: USN AI Strategic Vectors</i> document because there were not enough fielded AI capabilities to have the data needed to determine risk. According to the official, the Navy intends to incorporate risk management measures and policies as AI application increases and experiential data becomes available. DOD CIO. A DOD CIO official noted that at the time of drafting the 2019 <i>DOD Digital Modernization Strategy</i>, many of the initiatives were in their infancy and therefore lacked specific detail for several characteristics, including risk.
General comments	Navy. A Navy official said that some actions listed in the Navy's annex to the <i>DOD AI Strategy</i> were proposals that were never executed, or nascent tasks that did not move forward. The official said that more information is reflected in the regularly updated strategic blueprint <i>Transforming Naval Operations: USN AI Strategic Vectors</i> document. Marine Corps. Marine Corps officials said that several characteristics not included in their annex will be incorporated in an updated document.

Source: GAO analysis of Department of Defense (DOD) information. | GAO-22-105834

We previously reported that a comprehensive strategy provides the foundation upon which an agency builds its plan for defining what the agency intends to accomplish and provides a roadmap for how it will

achieve desired results and meet its goals and objectives.⁴⁶ To achieve this purpose, a comprehensive strategy should include a mission statement; a problem definition, scope, and methodology; goals and objectives; activities, milestones, and performance measures; resources and investments; information about organizational roles, responsibilities, and coordination; and a description of key external factors that could affect the achievement of goals. Additionally, federal internal control standards that apply to the DOD's AI body of strategies include that the oversight body and management should: demonstrate a commitment to integrity and ethical values; demonstrate a commitment to recruit, develop, and retain competent individuals; and identify, analyze, and respond to risks related to achieving the defined objectives.⁴⁷

However, DOD did not issue guidance to the JAIC, military services, and DOD organizations to include in AI strategies and associated plans the key elements of a comprehensive strategy and select internal control principles, including methodology, performance measures, resources and investments, external factors, and risk. For example, the 2018 *DOD AI Strategy* includes guidance for the annexes to discuss objectives listed in the strategy but does not include guidance related to these characteristics in particular. Additionally, the September 2018 Deputy Secretary of Defense memorandum requiring annexes directs the military departments, functional combatant commands and others to develop and submit annexes, but does not specify what should be included in the annexes.⁴⁸ According to a Navy official, the September 2018 Deputy Secretary of Defense memorandum was the only guidance provided to military services. Additionally, after speaking with relevant parties at the JAIC and the military services—to include reviewing the classified 2018 *DOD AI Strategy*—a DOD CIO official confirmed that they are not aware of any other instructions or guidance to the military services regarding AI annexes.

Additionally, as shown in table 2 above, military service appendixes to the 2018 *DOD AI Strategy* have various review and update plans. Specifically, DOD has not established documented procedures, including timelines, for the periodic review of its strategy and the associated military

⁴⁶[GAO-13-201](#).

⁴⁷[GAO-14-704G](#).

⁴⁸Deputy Secretary of Defense Memorandum, *Joint Artificial Intelligence Implementation* (Sept. 11, 2018).

service annexes even though the JAIC is beginning to update the 2018 *DOD AI Strategy*, which is an annex to the 2018 *National Defense Strategy* with expected issuance in 2022. The law that mandated the 2018 *DOD AI Strategy* and the Deputy Secretary of Defense memorandum requiring associated military department annexes does not require periodic reviews.⁴⁹ However, the National Defense Authorization Act for Fiscal Year 2017 required DOD to develop the *National Defense Strategy* and update it at least once every 4 years and, during the years without an update, to assess the implementation of the strategy and whether any revision is necessary.⁵⁰ Additionally, federal internal controls state that management should define objectives to include what is to be achieved, who is to achieve it, how it will be achieved, and the time frames for achievement.⁵¹

Overall, DOD would be better positioned to help managers ensure accountability and responsible use of AI in government programs and processes by ensuring future AI strategies and plans include key elements of a comprehensive strategy and select internal controls such as methodology, performance measures, resources and investments, key external factors, and risk. Furthermore, the military services and components would benefit from procedures promulgated by DOD regarding the periodic review and update of its annexes and associated requirements such as addressing the key characteristics of effective strategies.⁵² Additionally, DOD could use the GAO AI accountability framework to incorporate such characteristics in its strategies and plans moving forward, as the key principles for governance presented there align with some characteristics of a comprehensive strategy.⁵³ For example:

- DOD would be better able to track progress in achieving goals and objectives through using of performance measures and strategy users

⁴⁹Pub. L. No. 115-232, § 238 (2018) and Deputy Secretary of Defense Memorandum, *Joint Artificial Intelligence Implementation* (Sept. 11, 2018).

⁵⁰Pub. L. No. 114-328, § 941(a) (2016) (codified at 10 U.S.C. § 113(g)).

⁵¹[GAO-14-704G](#).

⁵²[GAO-21-519SP](#).

⁵³[GAO-21-519SP](#). Our AI accountability framework provides key governance practices to help management, and those charged with oversight of AI, to establish governance structures and processes to manage risk, demonstrate the importance of integrity and ethical values, and ensure compliance with relevant laws, regulations, and guidance.

would have a better understanding of how a strategy was created through inclusion of a methodology.

- DOD would be better positioned to understand investments being made in AI across the department, and understand all types of resources needed to achieve a strategy's goals and objectives.
- DOD would also have a more realistic understanding of the influence posed by external factors and would be better positioned to address the factors.
- DOD would be better positioned to understand and mitigate risks that could threaten success of the strategy's goals and objectives by including in AI strategies how to identify, analyze, and respond to risk.

DOD Has Reported Some AI Activities, but Lacks a High-level Plan or Roadmap to Address Limitations

DOD Created a Baseline Inventory of AI Activities in 2021, but It Is Not Comprehensive

DOD's April 2021 AI baseline inventory. In January 2021, in response to a Congressional mandate, the JAIC began to develop a new process for identifying AI-related activities that improved upon the methodology previously used to create lists of AI activities.⁵⁴ In April 2021, JAIC officials provided to Congress an AI baseline inventory and report that included the methodology, key findings, and limitations for this initial

⁵⁴The Joint Explanatory Statement accompanying the Consolidated Appropriations Act, 2021, Pub. L. No. 116-260 (2020) available at 166 Cong. Rec. H8251 (Dec. 21, 2020) stated that: The statement supports the AI activities of the DOD which are intended to improve the affordability and effectiveness of military operations. However, the statement reflects a concern about a lack of coordination among the myriad of AI programs within the department and the military services. Therefore, the Director of the JAIC is directed to provide the congressional defense committees, not later than 120 days after the enactment of the Act, an inventory of all AI activities to include each program's appropriation, project, and line number; the current and future years defense program funding; the identification of academic or industry mission partners, if applicable; and any planned transition partners.

inventory.⁵⁵ According to the April 2021 AI baseline inventory report, the JAIC improved upon prior efforts to identify DOD AI activities and leveraged existing AI-related investment information that DOD CIO requires organizations to report in support of DOD's AI-related information technology and cyberspace budget submission.⁵⁶

The April 2021 AI baseline inventory addressed some of the challenges identified through prior efforts to report DOD AI activities. For example, according to the JAIC's April 2021 AI baseline inventory report, AI is a difficult investment category to track because it is a capability that is embedded in other systems, not a new type of system that is distinct and largely separate from other systems. Further, officials from DOD organizations and the military services told us they were determining how to define and identify specific AI activities. For example, as a part of our review, we surveyed 39 organizations across DOD on how they define, identify, track, and report AI activities, and we found there is not a consistent definition of AI or method for identifying, tracking, and reporting AI activities.

To help address these challenges, the JAIC used three definitions to categorize AI activities in the April 2021 AI baseline inventory based on a recommendation from the National Security Commission on AI: core AI,

⁵⁵Joint Artificial Intelligence Center, (U) *Overview of AI Inventory Methodology and Future Activities and Annual Artificial Intelligence Inventory Baseline Assessment-Fiscal Year (FY) 2021* (Apr. 2021) (CUI) (Hereafter referred to as the April 2021 AI baseline inventory report).

⁵⁶Department of Defense Chief Information Officer, (U) *DOD CIO Fiscal Year (FY) 2022-2026 Capability Programming Guidance (CPG)* (Washington, D.C.: Dec. 20, 2019) (SECRET//NOFORN). This guidance was updated in Jan. 2021 and required organizations to report AI projects and infrastructure-related resource information through DOD's Defense Information Technology Investment Portal and the Selective Native Programming–Information Technology systems. Department of Defense 7000.14-R *Financial Management Regulation (FMR) Volume 2B, Chapter 18, Information Technology (Including Cyberspace Operations)* states that: The DOD Information Technology Investment Portal provides a centralized location for information technology investment portfolio data and aligns information technology systems information in the Defense Information Technology Portfolio Registry with budget information in the Select and Native Programming-Information Technology system, which is a database application used to collect and assemble information required in support of the information technology budget request submitted to Congress. DOD also uses the system to report its information technology budget data on the Information Technology Dashboard.

AI enabled, and AI enabling.⁵⁷ Specific definitions and examples of AI activities for each of these categories were omitted because the information is sensitive. We also omitted specific details for the methodology the JAIC used to develop the April 2021 AI baseline inventory because the information is sensitive.

The April 2021 AI baseline inventory contained 685 project and line item accounts that include AI-related activities.⁵⁸ The 685 AI activities identified included 135 AI activities reported in the fiscal year 2021 President’s Information Technology Budget submission, according to the JAIC’s report.⁵⁹ The report also stated that the process used to create the baseline inventory provided the foundation for a repeatable methodology to inventory AI projects more effectively and efficiently than previous JAIC and DOD CIO efforts. Further, the report stated that the new methodology provided insight and value to each of the military services and DOD organizations in their strategic planning for their respective AI portfolios.

DOD’s April 2021 AI baseline inventory is not comprehensive.

However, JAIC officials also reported to Congress that the April 2021 AI baseline inventory is not comprehensive and has limitations. Specifically, JAIC officials said the April 2021 AI baseline inventory does not include operations and maintenance-related AI activities—such the JAIC’s overall operating budget—or any classified AI activities. These categories were

⁵⁷National Security Commission on AI, *Final Report* (Mar. 1, 2021). The National Security Commission on AI was established by Section 1051 of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 to review advances in AI, related machine learning developments, and associated technologies. The statute directed the Commission’s review to consider the methods and means necessary to maintain a technological advantage in artificial intelligence, machine learning, and associated technologies that are materially related to the national security and defense needs of the United States. Pub. L. No. 115-232, § 1051 (2018). On Mar. 1, 2021, the Commission issued its final report that included recommendations, analysis and blueprints for how DOD and the Intelligence Community must become “AI-ready” by 2025.

⁵⁸Joint Artificial Intelligence Center, (U) *Overview of AI Inventory Methodology and Future Activities and Annual Artificial Intelligence Inventory Baseline Assessment—Fiscal Year (FY) 2021* (Apr. 2021) (CUI).

⁵⁹While requiring DOD organizations to report AI projects and infrastructure-related resource information, DOD’s budget reporting requirement for Information Technology and Cyberspace Operations exempts organizations from having to report investments for programs, projects, and activities embedded in non-Command and Control and Communications programs, weapon systems, or in military service force structure because they are not readily identifiable in the budget. DOD 7000.14-R Financial Management Regulation (FMR) Volume 2B, Chapter 18: “Information Technology (Including Cyberspace Operations)” (revised Sept. 2015).

excluded because the budget justification documents for those activities had not been fully converted into a machine-readable dataset. The number of activities not included could not be estimated.

Further, JAIC officials reported that for the April 2021 AI baseline inventory they were unable to include funding-related summary data on the overall DOD AI budget or identify relationships between related projects or projects that are addressing similar problems because AI is not identified as its own line item in the budget documentation. The April 2021 baseline inventory report also stated that the JAIC intends to build on the baseline inventory effort to establish a repeatable process that will enable DOD to provide an accurate estimate of overall AI-related spending each year and address these gaps and limitations in the second phase of their effort.⁶⁰

DOD Is Building an AI Inventory Portfolio Analytics Tool to Address Limitations, but Does Not Have a Detailed Plan or Timelines

The JAIC's April 2021 AI baseline inventory report to Congress stated that in the second phase of its AI inventory process they plan to address three limitations in the baseline inventory: (1) operations and maintenance activities, (2) DOD classified activities, and (3) AI-related funding information. Specifically, the JAIC plans to continue adding and updating relevant datasets, improve web-enabled database tool capabilities and the user-interface, and continue close coordination with Office of the Under Secretary of Defense (Comptroller) and other DOD organizations.⁶¹ The JAIC reported that the web-enabled database tool—the DOD AI Inventory Portfolio Analytics Tool—is expected to improve DOD's ability to synchronize and deconflict its AI portfolio. The JAIC's Director told us that the AI inventory could also serve as a reference catalogue for the Joint Common Foundation, an enterprise cloud development environment equipped with practices and repositories for AI development, as discussed in the next section.⁶²

⁶⁰JAIC reported the second phase will also better capture contracting information with industry and academia, and planned transition partners.

⁶¹Joint Artificial Intelligence Center, (U) *Overview of AI Inventory Methodology and Future Activities and Annual Artificial Intelligence Inventory Baseline Assessment - Fiscal Year (FY) 2021* (Apr. 2021) (CUI).

⁶²As defined by the National Institute of Standards and Technology, cloud services enable on-demand access to resources (e.g., networks, servers, storage applications, and services) that can be rapidly provisioned. Purchasing information technology services through a cloud service provider is a means for federal agencies to buy services more quickly and possibly at a lower cost than building, operating, and maintaining these cloud computing resources themselves.

However, the JAIC official leading the inventory project team said they have identified challenges in addressing the limitations of the April 2021 baseline inventory that could lead to incomplete information being submitted to Congress for the second phase of their process. We have omitted details about how the JAIC plans to address the limitations because the information is sensitive.

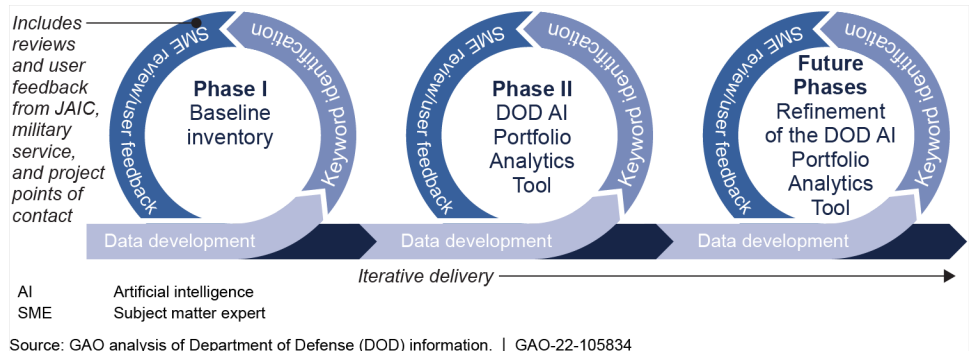
The JAIC defines the AI Inventory Portfolio Analytics Tool as a tool designed to catalog AI budget data with a web form capability to assist in the collection of data from and coordination with various DOD organizations. Specifically:

- JAIC will leverage a multi-purpose data analytics system, called Advancing Analytics (Advana), which is managed by the Office of the Under Secretary of Defense (Comptroller) and is used to analyze data across the department.⁶³
- During development of the first iteration of the AI Inventory Portfolio Analytics Tool, Advana’s contractor team will apply their product management lifecycle that is their recommended methodology to govern the development of all Advana products, and which incorporates Agile development.
- The Agile approach stresses the iterative delivery of software in short, incremental segments, which allows for greater flexibility and the ability to adapt to meet changing customer needs and requirements.⁶⁴ Figure 7 illustrates the JAIC’s evolving inventory process.

⁶³Deputy Secretary of Defense Memorandum, *Creating Data Advantage* (May 5, 2021). This memorandum provides that common access to authoritative data is essential for providing a “single source of truth” for objective and informed decision-making. The Advancing Analytics (Advana) platform is the single enterprise authoritative data management and analytics platform for the Secretary of Defense, Deputy Secretary of Defense, and Principal Staff Assistants, with inputs from all DOD Components. The use of other data management and analytics platforms must be approved by the DOD Chief Data Officer and appropriate Component Chief Data Officer to ensure adherence to an open data standard architecture. A JAIC official told us in October 2021 that the platform was used by at least 20,000 staff across 42 DOD organizations.

⁶⁴Agile emphasizes early and continuous software delivery, as well as using collaborative teams, fast feedback cycles, and measuring progress with working software. GAO, *Agile Assessment Guide: Best Practices for Agile Adoption and Implementation*, [GAO-20-590G](#) (Washington, D.C.: Sept. 2020).

Figure 7: Joint Artificial Intelligence (AI) Center's (JAIC) AI Activities Inventory Process



The JAIC's April 2021 report to Congress stated that the JAIC plans to update and refine the AI Inventory Portfolio Analytics Tool using Agile methods over the next 2 to 3 years. The JAIC official also said that, in addition to addressing the limitations of the April 2021 baseline AI inventory, the JAIC plans to meet the remaining inventory-related congressional requirements by August 2022, including to better capture spending on individual contracts for AI-related activities with industry and academia, and other planned transition partners. The JAIC will provide access to the AI Inventory Portfolio Analytics Tool to DOD components to support the analysis of and management of their AI portfolios.

The JAIC has a customer agreement with the Advana contractor team and has set milestones and estimated delivery dates to reach core functionality of the AI Inventory Portfolio Analytics Tool in December 2021 and complete the second phase of the inventory process. The Advana contractor team also established business requirements in September 2021 for delivery of the second-phase AI Inventory Portfolio Analytics Tool.

In October 2021, the Advana contractor team issued its AI Inventory Portfolio Analytics Tool product roadmap that provides some additional milestones and estimated delivery dates. However, the roadmap did not capture all the high-level requirements or milestones for addressing deficiencies in its baseline inventory to provide a complete list of AI activities that supports the preparation of the department's AI portfolio inventory and budget data. Specifically, the JAIC's plans for its AI inventory process, such as establishing core functionality and future phases of the DOD AI Inventory Portfolio Analytics Tool, are incomplete and they have not captured a schedule for the whole program. For

example, the roadmap does not provide an indication of the duration of the tasks, only the estimated date of delivery and does not go beyond completion of the second phase in December 2021.

The *Standards for Internal Control in the Federal Government* states that management should identify information requirements in an iterative and ongoing process, using and communicating the resulting quality information to achieve an entity's objective.⁶⁵ The guidance also stipulates that quality information includes data that are appropriate, current, complete, accurate, accessible, and provided on a timely basis, and that management should have accurate and complete information for decision-making. Additionally, our *Agile Assessment Guide* states that while Agile emphasizes that only near-term work is planned in detail (e.g., the next iteration), programs need to define their overall goal in a vision and plan the work, at a high-level, needed to satisfy the vision.⁶⁶ The detailed plan is subject to change, but the vision provides a strategic view of the program goals to be accomplished. An integrated master schedule or similar artifact that captures both government and contractor activities, including Agile software development efforts, should capture all the planned features needed to accomplish the program goals at an appropriate level of detail.⁶⁷

Accurate and complete information on the overall DOD AI-related activities and spending amounts each year is an important aspect of evaluating DOD's efforts and prioritizing resources and to synchronize and deconflict its AI portfolio. To do this more effectively, DOD would benefit from a high-level plan or roadmap—aligned with the best practices of an integrated master schedule for the whole program development and refinement of the DOD AI Inventory Portfolio Analytics Tool—that captures all requirements, activities, and milestones to fully develop its inventory. Such a plan would provide DOD with a high-level, end-to-end view of all the features necessary to accomplish the program's goals to

⁶⁵[GAO-14-704G](#).

⁶⁶[GAO-20-590G](#).

⁶⁷An integrated master schedule is a program schedule that includes the entire required scope of effort, including the effort necessary from all government, contractor, and other key parties for a program's successful execution from start to finish. It should consist of logically related activities whose forecasted dates are automatically recalculated when activities change. The integrated master schedule includes summary, intermediate, and detail-level schedules. *GAO Schedule Assessment Guide: Best Practices for Project Schedules*, [GAO-16-89G](#) (Washington, D.C.: Dec. 22, 2015).

provide a complete and accurate inventory of AI activities to Congress and DOD decision makers.

DOD Collaborates on AI Activities, but Can More Fully Incorporate Leading Practices

DOD officials reported collaborating on AI activities using informal and formal collaboration mechanisms, and that DOD intends to use the Joint Common Foundation as a mechanism to improve collaboration. DOD has not fully incorporated leading collaboration practices in its AI activities.

DOD Uses Informal and Formal Collaboration Mechanisms to Coordinate AI Activities

We surveyed 39 organizations with a role in the oversight and management of DOD's AI activities about their collaboration activities.⁶⁸ Our survey results showed that the mechanisms an organization reported using to collaborate with other organizations are associated with the quantity of the reported collaboration.⁶⁹ Officials we surveyed reported collaborating most frequently through informal discussions, but also reported using formal mechanisms to collaborate, such as interagency groups.

Informal collaborative mechanisms. We found that most organizations reported collaborating informally on a variety of AI activities.⁷⁰ According to DOD officials from multiple organizations, their collaboration with other AI organizations is generally relationship-dependent and conducted through informal discussions. For example, one DOD official said that informal networking with officials from other organizations is the most effective way to collaborate. According to another survey respondent, informal discussions provide an opportunity to assess progress, share lessons learned, and identify opportunities to leverage work already

⁶⁸See Appendix II for a complete list of the organizations we surveyed. We took multiple steps to identify a respondent(s) who could speak to their organization's AI collaboration efforts as a whole with the JAIC, with other organizations across DOD, or with the Office of the Director of National Intelligence. See Appendix I for the full methodology of how we selected respondent(s) from each organization.

⁶⁹See Appendix III for our analysis of DOD officials' reported perceptions of extent of collaboration on AI activities.

⁷⁰In the survey, we asked respondents to specify which formal mechanisms they use to collaborate with other organizations, such as memoranda of understanding or memoranda of agreement, interagency agreements, working groups or other types of collaboration. Some organizations responded that they had other interactions in addition to GAO-identified mechanisms and indicated that they were informal arrangements.

performed. In contrast, other respondents described challenges related to informal collaboration. For example, one respondent said individual personalities challenge their informal collaboration. Overall, 94 percent of survey respondents said they use informal discussions to collaborate with at least one of their partner organizations and 79 percent reported they used information sharing.

Formal collaborative mechanisms. Survey respondents also reported using a variety of formal mechanisms to collaborate on AI activities that our prior work has identified, such as interagency working groups, conferences, and memoranda of understanding.⁷¹ For example, respondents reported using interagency agreements in 23 percent of their connections to collaborate with their partner organizations. See table 5 for definitions of the selected mechanisms the federal government uses to facilitate interagency collaboration that we reported on in 2012 and the frequency survey respondents reported using each mechanism.⁷²

⁷¹As we reported in September 2012, experts defined an interagency mechanism for collaboration as any arrangement that can facilitate collaboration between agencies. The types of mechanisms listed in [GAO-12-1022](#) are examples of frequently used collaborative mechanisms. GAO, *Managing for Results: Key Considerations for Implementing Interagency Collaborative Mechanisms*, [GAO-12-1022](#) (Washington, D.C.: Sept. 27, 2012).

⁷²[GAO-12-1022](#).

Table 5: Select Mechanisms for Interagency Collaboration, Their Definitions, and Reported Usage, October 2021

Collaborative mechanism	Definition	Percentage of times respondents reported they used a collaborative mechanism out of total
Interagency groups	Groups led by agencies that are sometimes referred to as task forces, working groups, councils, or committees.	64
Conferences	A meeting that brings together representatives of different agencies or departments for the discussion of common problems, the exchange of information, or the development of agreements on issues of mutual interest.	44
Strategy development	A document or initiative that is national in scope and provides a broad framework for addressing issues that cut across federal agencies and often across other levels of government and sectors.	42
Shared data systems or technologies	Tools that facilitate collaboration, such as shared databases and web portals.	36
Specific positions to facilitate coordination (e.g. liaisons)	An employee of one organization assigned to work primarily or exclusively with another agency.	33
Co-location	One office maintaining responsibility for collaborating with federal agencies or departments that are located in the same geographic region. Also, in some cases, the location of more than one program office from different federal agencies into a facility with the intention of personnel from the agencies collaborating with one another.	23
Memorandum of understanding, memorandum of agreements, interagency agreements	A written agreement between more than one federal agency or department.	23

Source: GAO 12-1022 and GAO Survey about Department of Defense Collaboration on Artificial Intelligence Activities | GAO-22-105834.

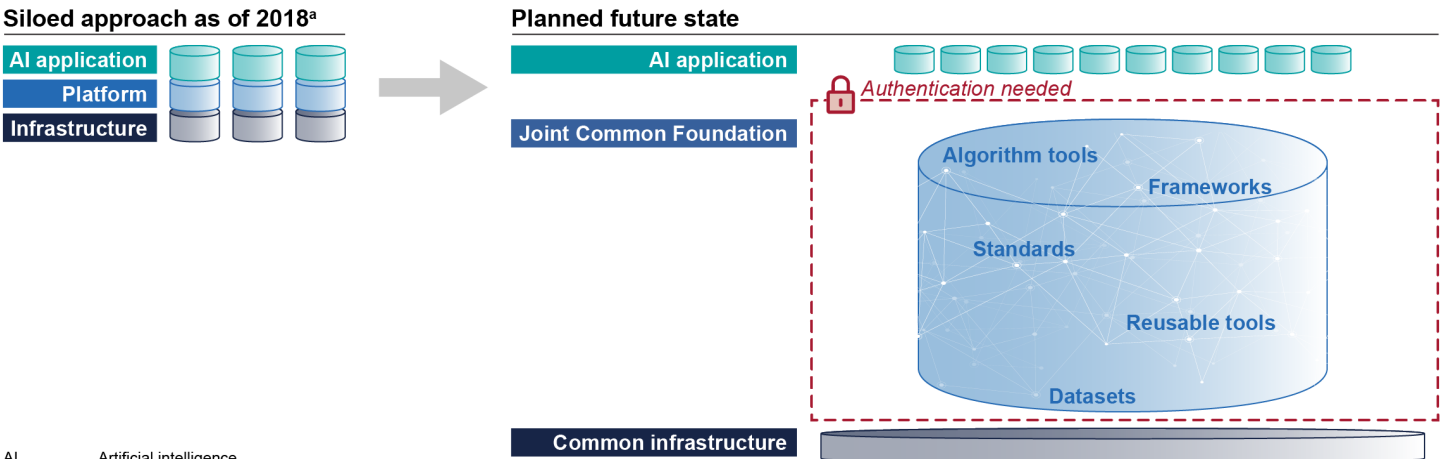
Note: The mechanisms reported are not mutually exclusive and more than one mechanism could have been reported for each collaboration instance.

According to our survey respondents, the most frequently used formal collaborative mechanism to collaborate with other organizations and the JAIC was interagency groups (64 percent). Survey respondents reported using mechanisms such as memoranda of understanding, memorandum of agreements, interagency agreements, co-location, and specific positions to facilitate coordination (e.g., liaisons) least frequently (See table 5.). Most frequently, survey respondents reported using multiple collaborative mechanisms; in numerous cases, using three or four different mechanisms. On average, the Defense Intelligence Enterprise organizations respondents we surveyed reported the highest average number of formal collaboration mechanisms used to collaborate with another organization.

DOD Intends to Use the Joint Common Foundation as a Mechanism to Improve Collaboration

According to DOD officials, DOD intends to improve collaboration by establishing the Joint Common Foundation as a collaborative mechanism.⁷³ In 2019, the JAIC began developing the Joint Common Foundation to create a department-wide data-sharing platform in lieu of each organization maintaining their data in separate systems as shown in figure 8.⁷⁴

Figure 8: DOD’s Joint Common Foundation Concept



AI Artificial intelligence

Source: GAO analysis of Department of Defense (DOD) information. | GAO-22-105834

^aThe 2018 DOD Artificial Intelligence (AI) Strategy calls for Joint Artificial Intelligence Center to establish a common foundation for scaling AI's impact across DOD, leading strategic data acquisition and introducing unified data stores, reusable tools, frameworks and standards, and cloud and edge services. Absent a common foundation, DOD's AI development operated where every program had to build platform and infrastructure from scratch.

Through the Joint Common Foundation, the JAIC aims to eliminate duplicative efforts and reduce the challenges to initial AI adoption by providing a secure space where DOD organizations can share data and algorithms needed to build, test, and field AI applications. In other words, a DOD official told us that the Joint Common Foundation acts as an “AI sandbox,” where one organization can use data from another organization’s AI application to develop its own data and potentially

⁷³Department of Defense, *DOD Artificial Intelligence Strategy* (2018).
⁷⁴We reported on additional details and DOD’s plans for the Joint Common Foundation in [GAO-22-104765](#).

collaborate on AI projects.⁷⁵ According to DOD documentation, the Joint Common Foundation will bring disparate AI applications under a single platform and scale AI across the department.

Of the 39 organizations we surveyed, 12 organizations reported the Joint Common Foundation as one of their most important collaboration activities with the JAIC. According to a senior JAIC official, the JAIC is developing a communication plan including a rollout strategy for the expected increase of Joint Common Foundation users. In the meantime, the JAIC fosters awareness about the Joint Common Foundation by word of mouth (e.g., DOD JAIC AI Symposium), as described in Appendix IV.

DOD Has Not Fully Incorporated Leading Collaboration Practices

We found that DOD has not fully incorporated leading practices for collaboration in working groups, such as the JAIC subcommittees; collaborative technologies, such as the Joint Common Foundation; and other collaborative mechanisms.⁷⁶ While collaborative mechanisms may differ in complexity and scope (see table 5 above), the mechanisms all benefit from the incorporation of leading collaboration practices, based on our prior work. The mechanisms fall into the categories of outcomes and accountability; bridging organizational cultures; leadership; clarity of roles and responsibilities; including relevant participants; identifying and leveraging resources; and written guidance and agreements (See table 6.). Table 6 includes examples that informed our assessment of DOD's incorporation of the leading collaboration practices.

⁷⁵For example, according to a senior JAIC official, the DOD AI Inventory Portfolio Analytics Tool could be used in a variety of ways such as a catalog or customer list for the Joint Common Foundation in the future.

⁷⁶[GAO-12-1022](#). We have previously reported that interagency mechanisms or strategies to coordinate programs that address crosscutting issues may reduce potentially duplicative, overlapping, and fragmented efforts. In addition, while collaborative mechanisms may differ in complexity and scope, they all benefit from certain leading practices, which raise issues to consider when implementing these mechanisms, according our analysis.

Table 6: GAO Analysis of the Extent to Which DOD Incorporated Leading Collaboration Practices and Key Considerations

Leading practice	Key considerations	Extent incorporated	GAO analysis
Defining outcomes and monitoring accountability	Is there a way to track and monitor progress toward short-term and long-term outcomes?	●	Joint Artificial Intelligence Center (JAIC) officials told us they are working on an internal measurement to track outcomes. However, the 2018 Department of Defense (DOD) AI Strategy and other associated plans do not fully include performance measures and milestones to achieve the outcomes defined in the strategies and plans. ^a
Bridging organizational cultures	What are the commonalities between the participating agencies' missions and cultures, and what are some potential challenges? Have participating agencies developed ways for operating across agency boundaries? Have participating agencies agreed on common terminology and definitions?	●	The JAIC is developing the Joint Common Foundation in response to DOD's need for a cohesive development environment, which will include classified capabilities. However, DOD has not fully agreed on common terminology or developed a common understanding of AI to operate across component boundaries.
Identifying and sustaining leadership	How will leadership be sustained over the long term? If leadership is shared, have roles and responsibilities been clearly identified and agreed upon?	●	The Director of the JAIC reports to the Deputy Secretary of Defense. However, DOD has not fully defined leadership roles and responsibilities within DOD's AI governance structure.
Clarifying roles and responsibilities	Have participating agencies clarified roles and responsibilities?	●	DOD developed an AI governance structure to define department-wide AI roles and responsibilities consisting of the DOD AI Executive Steering Group, AI Working Group, and nine subcommittees. However, DOD has not fully defined roles and responsibilities for the JAIC within the AI governance structure.
Including relevant participants	Have all relevant participants been included? Do participants have appropriate knowledge, skills, and abilities to contribute?	●	DOD identified organizations involved in developing, transitioning, and using AI. However, DOD has not identified which organizations must collaborate with the JAIC and other organizations (or which organizations will be required to use the Joint Common Foundation).

Leading practice	Key considerations	Extent incorporated	GAO analysis
Identifying and leveraging resources	How will the collaborative mechanism be funded and staffed?	●	DOD has identified and increased funding for the JAIC, since its 2018 inception. However, responses to our survey indicated that additional subject matter experts, resources, and technical expertise might frequently be needed to further collaborate. As previously discussed, DOD's efforts to establish a process to identify AI activities and associated investments (i.e. resources) are ongoing and could benefit from a road-map to better guide its efforts.
Developing and updating written guidance and agreements	If appropriate, have the participating agencies documented their agreement regarding how they will collaborate? Have participating agencies developed ways to continually update or monitor written agreements?	●	In a 2018 memorandum, the Deputy Secretary of Defense directed the CIO to establish the JAIC. This memorandum highly encouraged the military services and other DOD organizations to collaborate with the JAIC for new AI initiatives, and required components to initially coordinate on each initiative that totals more than \$15 million annually. However, DOD is in the process of developing guidance and written agreements that will provide more details regarding expectations and requirements for AI collaboration.

Key: ● = fully included aspects of this leading practice; ● = partially included aspects of this leading practice;
○ = does not include aspects of this leading practice

Source: GAO 12-1022, GAO analysis of DOD documentation, and GAO Survey about Department of Defense Collaboration on Artificial Intelligence Activities. | GAO-105834

^aDeputy Secretary of Defense Memorandum, Establishment of the Joint Artificial Intelligence Center (June 27, 2018).

According to our analysis, DOD's collaboration on AI activities partially incorporates the leading practices for collaboration, but we identified collaboration challenges in three key areas:

Defining outcomes and monitoring accountability. DOD does not have performance measures and milestones to achieve the outcomes for AI collaboration activities or to monitor progress toward short-term and long-term outcomes. For example, a survey respondent said that efforts are hindered by uncertain expectations of AI-driven capabilities and more near-term focus than normal for basic research efforts. Another survey respondent commented that for some of their collaborations there are currently no identified milestones; however, periodic discussions for future planning are taking place. The JAIC is developing internal and external key performance indicators that will assess how effectively it is achieving its mission to transform the department through AI and expects to report

quantitative measures on its metrics by December 2021. Additionally, DOD does not have a mechanism to track and monitor progress and milestones for the Joint Common Foundation. According to DOD officials, DOD planned to finalize a roadmap or high-level plan with milestones for the Joint Common Foundation by August 2021, but has experienced multiple delays, and as of November 2021 the roadmap was not finalized.

Bridging organizational culture. DOD previously established an enterprise definition of AI in the 2018 *DOD AI Strategy*, but it is not consistently used across the department to align DOD-wide AI activities and bridge organizational culture. According to our survey, 50 percent of respondents said they use the *National Artificial Intelligence Initiative Act of 2020* definition of AI, while 24 percent said they use the DOD AI Strategy's definition, 13 percent said they use another strategy or guidance document for their definition, and 9 percent used an organization-specific definition.⁷⁷ Further, DOD is in the process of determining how to define and identify specific AI activities as part of its AI inventory effort. According to DOD officials, the JAIC is developing an AI ontology foundry (i.e. a uniform vocabulary) in coordination with Chief Data Officer and the Intelligence Community. The JAIC plans to house this vocabulary in the Joint Common Foundation to further bridge DOD's organization culture by enabling collaboration, sharing, and the reuse of knowledge models to avoid fragmentation over how DOD labels data.

Our analysis showed some DOD officials were unaware of these AI-related efforts or reported challenges with DOD-wide or Intelligence Community collaboration because some organizations have not prioritized participation in the interagency groups such as the JAIC. For example, one organization respondent reported that the scope of AI efforts does not seem to be clearly understood. According to an Office of the Under Secretary for Defense for Intelligence and Security survey respondent, JAIC-led subcommittees are in the process of being

⁷⁷Pub. L. No. 116-283, § 5002 (2021). The National Defense Authorization Act for Fiscal Year 2021's definition of AI is part of the National Artificial Intelligence Initiative Act of 2020 which was enacted as Division E of the National Defense Authorization Act for Fiscal Year 2021. The act directed the President to establish the National AI Initiative to ensure continued U.S. leadership in AI research and development; lead the world in the development and use of trustworthy AI systems in the public and private sectors; prepare the present and future U.S. workforce for the integration of AI systems across all sectors of the economy and society; and coordinate ongoing AI research, development, and demonstration activities among the civilian agencies, the Department of Defense, and the Intelligence Community to ensure that each informs the work of the others. Pub. L. No. 116-283, §§ 5101-06 (2021).

developed and tend to discuss basic issues. Accordingly, the respondent stated, the subcommittees are not well attended by the services, defense agencies and other components because they are in the process of being organized and as a result challenge the ability of others to collaborate with the JAIC. Additionally, each of the four responding Defense Intelligence Enterprise organizations respondents stated that classification challenges or data sharing policies hindered their collaboration with the JAIC and across DOD.⁷⁸

Guidance and agreements to clarify roles and responsibilities and identify leadership and participants. DOD developed an AI governance structure to define department-wide AI roles and responsibilities and to establish and advance policies. However, according to one senior JAIC official, the DOD AI governance structure may not be the most effective tool for AI integration and collaboration because it does not ensure collaboration with the JAIC as a separate entity. For example, while the Director of the JAIC co-chairs the Executive Steering Group, the Executive Steering Group is not a direct function of the JAIC, as shown in figure 4 above. DOD is updating the DOD AI Executive Steering Group's charter to serve as a vetting body for senior officials, but has not issued it as of September 2021, according to JAIC officials.

DOD has not defined or set expectations for those responsible for collaborating with the JAIC or the broader DOD data ecosystem (e.g., people, technology, and culture). For example, respondents representing 20 organizations stated that they believe collaboration is challenged by a lack of clearly defined roles and responsibilities. Having clearly defined roles and responsibilities is consistent with one of our leading collaboration practices.⁷⁹ JAIC officials stated that they have several component-specific agreements and memorandums of understanding in place, and they are prepared to engage in more agreements in the future to improve collaboration. DOD officials also told us they are working to formalize their collaborative relationships with the Intelligence Community

⁷⁸At an unclassified level, collaboration between the Defense Intelligence Enterprise organizations we surveyed and the JAIC is generally related to the Responsible AI subcommittee and sharing lessons learned.

⁷⁹[GAO-12-1022](#).

but will require further policies and agreements to support such collaboration with the JAIC.⁸⁰

Figure 9 below contains examples of comments from survey respondents on select leading collaboration practices.

⁸⁰Compared to the military services, the Intelligence Community's collaboration with JAIC and within the DOD's AI governance structure is a recent addition. For example, according to our survey responses, the National Geospatial-Intelligence Agency requested to become a member of DOD's AI Executive Steering Group as of Aug. 2021.

Figure 9: Comments from Survey Respondents

Reflections from Survey Respondents on Bridging Organization Culture	Reflections from Survey Respondents on Clarifying Roles and Responsibilities	Reflections from Survey Respondents on Developing and Updating Written Guidance and Agreements
"The Joint Artificial Intelligence Center (JAIC) must improve its understanding of the Department of Defense's (DOD) broad data ecosystem and better support the federated development of AI." —Office of the Secretary of Defense Senior Official "Lack of experience and terminology understanding delays discussions. [There is a] need for resourcing and elimination of siloed efforts." —Office of the Secretary of Defense Official "Many of [DOD's] working groups are similar or competing with those that exist across not only the data but also software development space. [The JAIC] should join rather than start new." —Office of the Secretary of Defense Senior Official "On matters where the topics are more conceptual ... it is more difficult to find common ground [with the JAIC]. Sometimes, out of expediency to meet Department timelines, the JAIC will advance untried policy without sufficient time for staffing and review, and this inevitably causes friction. Rushing to meet deadlines may result in policy that suffocates innovation, negatively impacts employment options, or biases users/vendors before the AI has had time to mature." —Office of the Secretary of Defense Senior Official	"Greater definition on the relationship (coordination lanes) and flow of intellectual and technological capital between JAIC and the services would be welcome." —Military Service Official "Transition-related efforts are largely hindered by a lack of documented expectations of what AI-enabled capabilities are needed." —Military Service Official "We have opportunities to collaborate with JAIC..., but no substantial engagement has occurred." —Defense Intelligence Enterprise Official "Groups generally operate without a formalized charter; they do not always represent the full spectrum of the department." —Joint Staff Official	"No presence of written agreements hinders significant interaction [with the Defense Advanced Research Projects Agency and the JAIC (via the artificial intelligence subcommittees)]." —Defense Agency Official "Our written agreement with [the National Security Agency] is immensely helpful in opening doors for us policy-wise with this partner. The individual personalities could not make things work as they do without the written agreement in place." —Military Service Official "DOD and the [Intelligence Community] are developing community-wide standards and procedures for data management, common data fabrics, AI test and evaluation procedures, responsible AI policies, and other key enablers that need to be in place prior to robust development and fielding of individual AI capabilities." —Defense Intelligence Enterprise Official

Source: GAO survey about Department of Defense (DOD) collaboration on artificial intelligence (AI) activities. | GAO-22-105834

DOD has taken some steps recently to incorporate leading practices for interagency collaboration into its guidance, such as developing additional data sharing guidance and updating prior guidance, according to our analysis. For example:

- In May 2021, the Deputy Secretary of Defense issued a memorandum outlining five "data decrees," which cover the creation, publication, protection, management, and use of data and directs the creation of

the DOD Data Council for organizations to coordinate their data activities.⁸¹

- In May 2021, the Secretary of Defense signed the Joint All-Domain Command and Control Strategy to provide guidance on shaping future Joint Force command and control capabilities that leverage AI and machine learning.⁸²
- In June 2021, the Vice Chairman of the Joint Chiefs of Staff signed four new strategic directives that mandate all U.S. military services to make data accessible for all their weapons and platforms in response to the memorandum's requirement to use a central repository to support decision-making.⁸³
- In June 2021, the Deputy Secretary of Defense issued a memorandum establishing the AI and Data Acceleration initiative to rapidly advance AI implementation efforts through a series of implementation experiments or exercises.⁸⁴ As a part of this new initiative, the JAIC will send out "flyaway" teams of data and AI

⁸¹Deputy Secretary of Defense Memorandum, *Creating Data Advantage* (May 5, 2021).

⁸²DOD's March 2022 unclassified summary of the Joint All-Domain Command and Control Strategy states that advanced Joint All-Domain Command and Control technologies will leverage AI and machine learning to help accelerate the commander's decision cycle. Automatic machine-to-machine transactions will extract, consolidate and process massive amounts of data and information directly from the sensing infrastructure. DOD, *Summary of the Joint All-Domain Command and Control (JADC2) Strategy* (March 2022). Additionally, in March 2022, the Deputy Secretary of Defense signed the Department of Defense Joint All-Domain Command and Control (JADC2) Implementation Plan.

⁸³Vice Chairman of the Joint Chiefs of Staff, JSD 001-21, (U) *Joint Requirements Oversight Council Strategic Directive ISO Logistics Functional Capability Board (LOG FCB) Multi-Capable Distribution Platforms Capability Portfolio Management Review* (June 21, 2021) (SECRET//NOFORN); Vice Chairman of the Joint Chiefs of Staff, JSD 002-21, (U) *JROC Strategic Directive for Joint Fires* (June 21, 2021) (SECRET//NOFORN); Vice Chairman of the Joint Chiefs of Staff, JSD 003-21, (U) *JROC Strategic Directive for Information Advantage: Title 10/50 Interdependency* (June 21, 2021) (SECRET//NOFORN); Vice Chairman of the Joint Chiefs of Staff, JSD 004-21, (U) *Joint Concept for Command and Control Strategic Directive* (June 21, 2021) (SECRET).

⁸⁴Deputy Secretary of Defense, *Accelerating Data and Artificial Intelligence for the Warfighter* (June 21, 2021).

experts to help combatant commands quickly shift AI from labs to real-world warfighting.⁸⁵

- In September 2021, the Deputy Secretary of Defense issued a memorandum giving the Director of the JAIC authority to discover, access, share, and appropriately reuse DOD data and models of defense components and elements and to build and maintain AI capabilities for the department.⁸⁶
- In December 2021, the Deputy Secretary of Defense issued a memorandum that directs the establishment of the Chief Digital and AI Officer to serve as the department's senior official responsible for strengthening and integrating data, AI, and digital solutions in the department. Further, the memorandum states that the Office of the Chief Digital and AI Officer will serve as the successor organization to the JAIC in reporting directly to the Deputy Secretary of Defense.⁸⁷
- In February 2022, the Deputy Secretary of Defense issued two memoranda announcing the initial operating capability and clarifying the roles of the Chief Digital and AI Officer.⁸⁸

Additionally, DOD officials told us they are in the process of developing guidance and agreements that will define the roles and responsibilities of the military services and organizations as participants in AI collaboration. As of October 2021, DOD officials said that they have not issued such guidance but expect to complete drafting a DOD AI Directive within 90 days. However, they have not established time frames for issuing the final DOD AI directive or other additional guidance and agreements. Further, DOD officials did not provide details about what will be included in the additional guidance. Therefore, we are unable to determine to what extent

⁸⁵These teams, known as Operational Data Teams, will be forward-deployed to each combatant command and will help scale existing platforms and assist warfighters in making their data visible, accessible, understandable, linked, trustworthy, interoperable, and secure.

⁸⁶Deputy Secretary of Defense, *Joint Artificial Intelligence Center Data Access for Artificial Intelligence Development and Coordination of Activities* (Sept. 22, 2021).

⁸⁷Deputy Secretary of Defense, *Establishment of the Chief Digital and Artificial Intelligence Officer* (Dec. 8, 2021).

⁸⁸Deputy Secretary of Defense Memorandum, *Initial Operating Capability of the Chief Digital and Artificial Intelligence Officer* (Feb. 1, 2022) and Deputy Secretary of Defense Memorandum, *Role Clarity for the Chief Digital and Artificial Intelligence Officer* (Feb. 1, 2022).

the additional guidance may address the opportunities we have identified for DOD to improve its AI collaboration practices.

However, as described above, some DOD and JAIC officials we surveyed reported that AI is not fully integrated across the department and increased collaboration is key to achieving the department's desired outcomes. As previously discussed, incorporating leading practices for collaboration can improve agency's efforts to achieve its desired outcomes.⁸⁹ Further, we have previously reported that interagency mechanisms or strategies to coordinate programs that would better manage or reduce potential fragmentation and address crosscutting issues may reduce unwarranted duplication and overlap.⁹⁰

In line with these leading practices on collaboration, DOD's efforts would specifically benefit from:

- defining outcomes and monitoring accountability for AI-related activities, such as issuing key performance indicators and a roadmap or high-level plan for the Joint Common Foundation as a mechanism to track and monitor progress and milestones against its requirements;
- establishing a timeline and guidance for establishing common terminology for AI related activities to further bridge organizational culture and better aligning DOD-wide AI activities, such as improving processes for sharing classified data; and

⁸⁹GAO-12-1022. We broadly defined collaboration as any joint activity that is intended to produce more value than could be produced when the agencies act alone. This work found that agencies that define outcomes, use common terminology, clarify roles and responsibilities, develop written guidance and agreements, and routinely monitor and update them, can strengthen their commitment to working collaboratively. As previously discussed, these key features include (1) outcomes and accountability; (2) bridging organizational cultures; (3) leadership; (4) clarity of roles and responsibilities; (5) participants; (6) resources; and (7) written guidance and agreements.

⁹⁰GAO-12-1022. See also GAO, *Fragmentation, Overlap, and Duplication: An Evaluation and Management Guide* GAO-15-49SP (Washington, D.C.: Apr. 14, 2015). We define duplication as instances when two or more agencies or programs are engaged in the same activities or provide the same services to the same beneficiaries; overlap as instances when multiple agencies or programs have similar goals, engage in similar activities or strategies to achieve them, or target similar beneficiaries; and fragmentation as instances when more than one federal agency, or organization within an agency, is involved in the same broad area of national need, and opportunities exist to improve service delivery.

-
- finalizing guidance and agreements that clearly define roles and responsibilities for leadership and relevant participants to ensure they are aware of and agree upon: (1) who will have what responsibilities; (2) how they will organize their joint and individual data sharing efforts; and (3) how they will make decisions regarding collaboration AI technology across the department.

Unless DOD addresses these shortcomings in collaboration across the AI landscape, DOD risks having a fragmented approach that may lead to unnecessary duplication and overlap. Further, DOD will not be well positioned to meet its desired objectives for AI across the department.

Conclusions

DOD's 2018 *AI Strategy* noted that adversaries and strategic competitors such as China and Russia are making significant investments in AI for national security purposes.⁹¹ Since 2018, DOD has made organizational changes and is investing billions of dollars to incorporate AI technology into its operations. For example, DOD has developed an overarching AI strategy and other AI-related strategy documents. However, these strategies do not include all key elements of a comprehensive strategy, which could impede the department's ability to meet its AI-related goals and objectives. As DOD further develops and updates AI-associated guidance, it will also be beneficial to consider the key governance practices outlined in GAO's AI accountability framework.⁹² Further, Congress and DOD decision makers do not have complete information about the number of AI activities and investments that comprise DOD's AI portfolio. As DOD works to develop its AI inventory process, they would benefit from a high-level plan or roadmap that provides requirements, activities, and milestones for the entire process. This plan would help DOD to deliver a complete and accurate inventory to Congress and DOD decision makers. Finally, the military services and other key DOD organizations are building collaborative relationships and a shared data network to better leverage expertise. However, taking steps to further incorporate leading collaboration practices would help DOD avoid unnecessary fragmentation, duplication, and overlap in the future as DOD organizations adopt and integrate AI technologies. Further, DOD has an opportunity to fully implement these leading collaboration practices as it establishes the Office of the Chief Digital and AI Officer in 2022.

⁹¹Department of Defense, *DOD AI Strategy* (2018).

⁹²[GAO-21-519SP](#).

Recommendations for Executive Action

We are making the following seven recommendations to DOD:

The Secretary of Defense should ensure that the Deputy Secretary of Defense issues guidance to the Chief Digital and AI Officer (once established) and the JAIC, military services, and relevant DOD organizations to include all characteristics of a comprehensive strategy in future AI strategies and associated plans and to consider the key governance practices outlined in the GAO AI accountability framework. (Recommendation 1)

The Secretary of Defense should ensure that the Deputy Secretary of Defense, in consultation with the Chief Digital and AI Officer (once established), the JAIC, and military departments, establish documented procedures, including timelines, for the periodic review of the *DOD AI Strategy* and associated military service annexes to assess the implementation of the strategy and whether any revision is necessary. (Recommendation 2)

The Secretary of Defense should ensure that the Chief Digital and AI Officer (once established) and the Director of the JAIC in collaboration with the Office of the Under Secretary of Defense Comptroller and other entities, as appropriate, develop a high-level plan or roadmap—aligned with the best practices of an integrated master schedule—that captures all requirements, activities, and milestones that supports the preparation of the department’s AI portfolio inventory and budget data. (Recommendation 3)

The Secretary of Defense should ensure that the Deputy Secretary of Defense issues guidance that defines outcomes and monitors accountability for AI-related activities and includes AI key performance indicators. (Recommendation 4)

The Secretary of Defense should ensure that the Chief Digital and AI Officer (once established) and the Director of the JAIC issue a roadmap or a high-level plan that captures all requirements and milestones for developing and onboarding users to the Joint Common Foundation. (Recommendation 5)

The Secretary of Defense should ensure that the Deputy Secretary of Defense develops a timeline and guidance that directs Chief Digital and AI Officer (once established), and the JAIC, military services, and other relevant entities to establish common terminology for AI related activities. (Recommendation 6)

The Secretary of Defense should ensure that the Deputy Secretary of Defense, in coordination with the Chief Digital and AI Officer (once established) and the JAIC, finalize and issue guidance and agreements that define the roles and responsibilities of the military services and other DOD organizations for leadership and relevant participants collaborating on AI activities. (Recommendation 7)

Agency Comments and Our Evaluation

We provided a draft of the sensitive report to DOD, ODNI, and the National Institute for Standards and Technology for review and comment. In its written comments on the sensitive report, reproduced in appendix V, DOD concurred with all seven of our recommendations and identified actions it was taking or planned to take in response. DOD also provided technical comments, which we incorporated as appropriate. ODNI and the National Institute for Standards and Technology chose not to provide comments.

In concurring with our first and second recommendations, DOD stated that it plans to incorporate characteristics of the GAO AI accountability framework in its strategies and plans moving forward. In concurring with our sixth recommendation, DOD stated that upon completion of the 2022 DOD AI Strategy, the department plans to adopt a common enterprise definition for AI to ensure use of common terminology. Additionally, DOD stated that it will develop plans to implement our third, fourth, fifth, and seventh recommendations after the Chief Digital and AI Officer is at full operational capability.

We are encouraged that DOD is planning to take these actions to address all seven of our recommendations. We believe that once DOD implements our recommendations, the department will be better positioned to provide Congress and decision makers information to improve collaboration, to manage or reduce potential fragmentation, and to address crosscutting issues related to DOD's AI activities. DOD's planned actions to address our recommendations are also important given strategic competitors', such as China, significant AI national security investments and activities.

We are sending copies of this report to the appropriate congressional committees, the Secretary of Defense, the Deputy Secretary of Defense, the Director of National Intelligence, the Director of the Joint Artificial Intelligence Center, Secretaries of the Air Force, Army, and Navy, and combatant command commanders. In addition, the report is available at no charge on the GAO website at <https://www.gao.gov>.

If you or members of your staff have any questions regarding this report, please contact me at (202) 512-5130 or mazanecb@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Key contributors to this report are listed in appendix VI.

A handwritten signature in black ink, appearing to read 'B. Mazanec', with a long horizontal flourish extending to the right.

Brian M. Mazanec
Director, Defense Capabilities and Management

List of Committees

The Honorable Jack Reed
Chairman
The Honorable James M. Inhofe
Ranking Member
Committee on Armed Services
United States Senate

The Honorable Jon Tester
Chairman
The Honorable Richard C. Shelby
Ranking Member
Subcommittee on Defense
Committee on Appropriations
United States Senate

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

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

Appendix I: Objectives, Scope, and Methodology

In a report accompanying a bill for the National Defense Authorization Act for Fiscal Year 2021, the House Armed Services Committee includes a provision that we assess the Department of Defense's (DOD) resources, capabilities, and plans for artificial intelligence (AI) technology.¹ This report evaluates (1) the extent to which the 2018 *DOD AI Strategy* and associated plans include characteristics of a comprehensive strategy; (2) the extent to which DOD has identified and reported AI investments and activities across the department; and (3) the extent to which DOD collaborates across the department to coordinate its AI activities.²

This report is a public version of a sensitive report that we issued in February 2022.³ DOD deemed some of the information in our February 2022 report to be sensitive, which must be protected from public disclosure. Therefore, this report omits sensitive detailed information pertaining to our objective on the extent DOD has identified and reported on AI activities across the department. Specifically, we omit information on the methodology DOD used to create its inventory of AI activities and its plans for the next phases of the inventory process. Although the information provided in this report is more limited, the report addresses the same objectives as the sensitive report and uses the same methodology.

To address these objectives, we reviewed relevant laws, regulations, executive orders, and DOD and military service strategies that outline plans and processes to manage AI across the department. We also interviewed and collected documentation from officials in the JAIC, military services, and relevant defense agencies, and DOD organizations with AI oversight responsibilities, as well as other federal organizations with AI oversight responsibilities. We included information from 2017,

¹H.R. Rep. No. 116-442 at 257 (2020).

²Characteristics of a comprehensive strategy encompass the seven key elements of a comprehensive strategy and three select internal control principles.

³GAO, *Artificial Intelligence: DOD Should Improve Strategies, Inventory Process, and Collaboration Guidance*, GAO-104516SU (Washington, D.C.: Feb. 16, 2022).

when the Algorithmic Warfare Cross-Functional Team was established, to 2021.⁴

To determine the extent to which the 2018 *DOD AI Strategy* and associated plans include characteristics of a comprehensive strategy, we reviewed, assessed, and compared them to elements of a comprehensive strategy and relevant *Standards for Internal Control in the Federal Government* principles on management responsibilities and risk management.⁵ Specifically, we have reported that a comprehensive strategy should include seven elements: a mission statement; a problem definition, scope, and methodology; goals and objectives; activities, milestones, and performance measures; resources and investments; information about organizational roles, responsibilities, and coordination; and a description of key external factors that could affect the achievement of goals.⁶ Additionally, we determined that certain internal control principles apply to the DOD's AI body of strategies including the principles stating that the oversight body and management should demonstrate a commitment to integrity and ethical values; management should demonstrate a commitment to recruit, develop, and retain competent individuals; and management should identify, analyze, and respond to risks related to achieving the defined objectives.⁷ The criteria we used aligns with our *AI Accountability Framework for Federal Agencies and Other Entities*.⁸ To conduct the content analysis on the 2018 *DOD AI*

⁴The Algorithmic Warfare Cross-Functional Team was established by the Deputy Secretary of Defense in a memorandum signed on Apr. 26, 2017. See Deputy Secretary of Defense Memorandum, *Establishment of an Algorithmic Warfare Cross-Functional Team (Project Maven)* (Apr. 26, 2017).

⁵Associated plans we assessed include: DOD, Office of the DOD Chief Information Officer, *Artificial Intelligence Governance Plan Version 1.0* (May 2020); DOD, *DOD Digital Modernization Strategy: DOD Information Resource Management Strategic Plan FY19-23* (July 12, 2019); DOD, *DOD Data Strategy* (2020); DOD Joint AI Center and DOD Chief Information Officer, *2020 Department of Defense Artificial Intelligence Education Strategy* (September 2020); Department of the Air Force, *The United States Air Force Artificial Intelligence Annex to The Department of Defense Artificial Intelligence Strategy* (2019); United States Marine Corps, (U) *USMC Annex to the DOD AI Strategy* (Mar. 15, 2019) (U//FOUO); Department of the Army, *The 2020 Army AI Strategy* (2020); U.S. Navy, (U) *The Navy's Annex to the DOD AI Strategy* (SECRET); and U.S. Navy, *Transforming Naval Operations: USN AI Strategic Vectors*.

⁶GAO, *Defense Logistics: A Completed Comprehensive Strategy is Needed to Guide DOD's In-Transit Visibility Efforts*, [GAO-13-201](#) (Washington, D.C.: Feb. 28, 2013).

⁷[GAO-14-704G](#).

⁸[GAO-21-519SP](#).

Strategy and associated plans, we assessed each document against the set of criteria to determine the extent to which the body of work contains characteristics needed for an effective strategy. Two analysts assessed each document on a scale of fully includes, partially includes, or does not include for each characteristic, and a third analyst adjudicated the results blindly, without knowing the identity of the two assessing analysts. The three analysts discussed any assessment discrepancies to reach consensus. From the assessment results, we identified gaps between DOD's documentation and elements of a comprehensive strategy and internal control principles.

To address objective one and determine timelines for periodically reviewing the 2018 *DOD AI Strategy* and associated military service annexes, we also reviewed the National Defense Authorization Act for Fiscal Year 2017, which required the Secretary of Defense to provide the National Defense Strategy and update it at least once every 4 years and, during the years without an update, to assess the implementation of the strategy and whether any revision is required.⁹ Additionally, we discussed plans to update strategies with document owners, and compared those plans with federal internal controls that state management should define objectives to include what is to be achieved, who is to achieve it, how it will be achieved, and the time frames for achievement. From this comparison, we identified gaps between when the 2018 *DOD AI Strategy* was updated and plans to update it in the future.

To address objective two, we reviewed existing DOD reporting requirements and processes to track and report AI investments and activities. We also interviewed JAIC officials to determine the actions planned or taken by the JAIC to implement and communicate a department-wide process for identifying and establishing an inventory of AI activities. Specifically, we reviewed the JAIC's April 2021 report to Congress that provided a baseline inventory of AI activities and discussed with JAIC officials planned actions for the next phases of their effort to address certain areas not captured in the initial baseline.

We assessed the JAIC's baseline inventory of AI activities against *Standards for Internal Control in the Federal Government*, which state that management should identify information requirements in an iterative and ongoing process, using and communicating the resulting quality

⁹Pub. L. No. 114-328, § 941(a) (2016) (codified at 10 U.S.C. § 113(g)).

information to achieve an entity's objective.¹⁰ The guidance also stipulates that quality information includes data that are appropriate, current, complete, accurate, accessible, and provided on a timely basis, and that management should have accurate and complete information for decision-making. Additionally, we reviewed the JAIC's plans for the second phase of its inventory process against our *Agile Assessment Guide*, which states that while Agile emphasizes that only near-term work is planned in detail (e.g., the next iteration), programs need to define their overall goal in a vision and plan the releases needed to satisfy the vision.¹¹ The detailed plan is subject to change, but the vision provides a high-level view and strategic view of the program's goals. An integrated master schedule or similar artifact that captures both government and contractor activities, including Agile software development efforts, should capture all the planned features needed to accomplish the program goals at an appropriate level of detail.

Additionally, we identified the processes used by the military services and other DOD components to track and report their AI activities and coordinate with the JAIC's inventory effort. In addition to interviewing officials from each of the military services and other relevant DOD components, we included in a department-wide survey question requesting information on how AI activities are identified and tracked within the organizations. Details for how we developed and administered this survey are described below.

To address objective three, we administered a department-wide unclassified survey to determine the collaborative relationships between key organizations on AI-related activities across DOD. To learn about AI collaboration (or coordination), the survey identified the different methods that organizations use to collaborate across the department as well as factors that help and hinder successful collaboration.¹² In addition, we asked questions about the extent of collaboration, the coordination mechanisms used to facilitate collaboration, and factors that helped and hindered collaboration. Specifically, we surveyed 39 unique organizations asking each of the organizations about their collaboration with one

¹⁰[GAO-14-704G](#).

¹¹[GAO-20-590G](#).

¹²Our survey analysis includes unclassified information provided by respondents about AI-related collaboration activities.

another as well as with the JAIC.¹³ We identified the 40 organizations based on prior interviews with officials representing the JAIC, the military services, other DOD organizations and components, and the Office of the Director of National Intelligence.¹⁴ We then reviewed and confirmed the universe of organizations participating in AI collaboration with JAIC officials. Additionally, we notified each respondent before administering the survey to confirm they could speak to their organization's AI collaboration efforts as a whole with the JAIC, with other organizations across DOD, or with the Office of the Director of National Intelligence.

To minimize errors that might occur from respondents interpreting our questions differently than we intended, we developed the survey with the assistance of several of our survey specialists, including an independent review by an additional survey specialist on the draft instrument.

Furthermore, we pretested the survey with four DOD entities including: the JAIC Missions Directorate, Air Force, Office of the Under Secretary of Defense Comptroller, and Joint Staff J-6. We conducted pretests to check that (1) the questions were clear and unambiguous, (2) terminology was used correctly, (3) the questionnaire did not place an undue burden on agency officials, (4) the information could feasibly be obtained, (5) the survey was comprehensive and unbiased, and (6) that we had identified the key respondents with knowledge about AI and associated collaboration. We conducted these four pretests over the telephone. We made changes to the content and format of the survey after each of the first three pretests, based on the feedback received. We noted any potential problems identified by the reviewers and through the pretests and modified the questionnaire based on the feedback received. For example, we identified that the military services often have multiple units or sub-organizations involved in AI activities; therefore, a single respondent would likely be unable to respond on behalf of the entire organization. As a result, we administered multiple surveys to six organizations—six surveys to the Army, four to the Air Force, two to the Navy, two to the Office of the Chief Information Officer, one to each Joint Staff Directorate for a total of eight, and five to the JAIC. We administered one survey to the other organizations for 61 total surveys administered.

¹³DOD Office of General Counsel did not identify a point of contact to receive the survey. Therefore, we continued to survey each of the 39 other organizations about their collaboration with other organizations, including the Office of General Counsel.

¹⁴A list of these organizations can be found in appendix II.

See Appendix II for a list of organizations we surveyed and for select survey questions.

We conducted the survey between June 2021 and October 2021. We developed and administered a Web-based questionnaire accessible through a secure server. When we completed the final survey questions and format, we sent an e-mail announcement of the survey to each identified organization. To maximize our response rate, we sent initial notification emails, as well as reminder emails to encourage recipients to complete the survey and followed up with nonrespondents with phone calls. In total, we received 54 of the 61 administered surveys for an 89 percent response rate.

Since this was a Web-based survey, respondents entered their answers directly into the electronic questionnaire, eliminating the need to key data into a database, minimizing error.¹⁵ Further, because this was not a sample survey, it has no sampling errors. However, the practical difficulties of conducting any survey may introduce errors, commonly referred to as nonsampling errors. For example, difficulties in interpreting a particular question, sources of information available to respondents, or entering data into a database or analyzing them can introduce unwanted variability into the survey results. We took steps in developing the questionnaire, collecting the data, and analyzing them to minimize such nonsampling errors.

We performed a content analysis of open-ended responses by reviewing responses to the open-ended questions for themes or issues relevant to our objectives. For all open-ended survey questions, one analyst evaluated the open-ended question responses and coded the information into categories. A different analyst checked the coded information for accuracy. The analysts then discussed and resolved any initial disagreements in the coding to arrive at the final categories.

We also assessed the extent to which the JAIC's guidance and processes for collaborating with the military services and other organizations on AI activities include leading practices for interagency collaboration.¹⁶ Specifically, one analyst independently reviewed and assessed DOD's AI

¹⁵Six respondents submitted their survey late and were unable to use the web-based questionnaire. As a result, we manually entered and coded their responses.

¹⁶GAO, *Managing for Results: Key Considerations for Implementing Interagency Collaborative Mechanisms*, [GAO-12-1022](#) (Washington, D.C.: Sept. 27, 2012).

collaboration against seven leading practices for interagency collaboration to determine the extent to which DOD's actions incorporated these leading practices. This analyst assessed DOD's AI collaboration on a scale of fully incorporates, partially incorporates, or does not incorporate for each leading practice, and a second analyst checked the scoring for accuracy. The analysts discussed any assessment discrepancies to reach consensus.

We assessed DOD's plans to develop additional AI-related collaboration guidance and agreements against *Standards for Internal Control in the Federal Government*, which states that management should define objectives to include what is to be achieved, who is to achieve it, how it will be achieved, and the time frames for achievement.¹⁷

To address all our objectives, we interviewed officials and, where appropriate, obtained documentation and survey responses from the following organizations:

- Department of Defense
 - Military Services and National Guard:
 - Army
 - Air Force
 - Navy
 - Marine Corps
 - National Guard
 - Space Force
 - Combatant Commands:
 - U.S. Africa Command
 - U.S. Central Command
 - U.S. Cyber Command
 - U.S. European Command
 - U.S. Indo-Pacific Command
 - U.S. Northern Command

¹⁷[GAO-14-704G](#).

- U.S. Southern Command
- U.S. Space Command
- U.S. Special Operations Command
- U.S. Strategic Command
- U.S. Transportation Command
- Defense Advanced Research Projects Agency
- Defense Intelligence Agency
- Defense Logistics Agency
- Defense Threat Reduction Agency
- Joint Chiefs of Staff
- Missile Defense Agency
- National Geospatial-Intelligence Agency
- National Reconnaissance Office
- National Security Agency
- Office of the Chief Information Officer, include the Chief Data Officer
- Office of the Director of Cost Assessment and Program Evaluation
- Office of the Directors of Operational Test and Evaluation
- Office of the Under Secretary of Defense Comptroller
- Office of the Under Secretary of Defense for Acquisition and Sustainment
- Office of the Under Secretary of Defense for Intelligence and Security
- Office of the Under Secretary of Defense for Personnel and Readiness
- Office of the Under Secretary of Defense for Policy
- Office of the Under Secretary of Defense for Research and Engineering
- Space Development Agency
- Office of the Director of National Intelligence

The performance audit upon which this report is based was conducted from September 2020 to February 2022 in accordance with generally

accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

We subsequently worked from February 2022 to March 2022 to prepare this version for public release. This public version was also prepared in accordance with those standards.

Appendix II: Survey about DOD Collaboration on AI Activities

This appendix describes an abbreviated version of the survey questions and the respondents.

Abbreviated Survey and Survey Respondents

GAO administered a web-based survey to various DOD organizations and the Director of National Intelligence. We received 54 responses out of 61 for an 89 percent response rate. The survey included questions to help us identify the extent to which collaboration exists, different methods that organizations use to collaborate across DOD, and factors that help and hinder successful collaboration. For the purpose of this survey, we broadly defined collaboration as any joint activity that is intended to produce more public value than could be produced when the organizations act alone. For example, this could include coordinating with another organization to establish compatible policies and procedures or identify and address needs by leveraging outside resources.

Reprinted below are the survey questions that informed the information presented in this report. Table 7 contains the list of organizations we surveyed.

1. GAO recognizes that across the DOD there is no consensus or agreement on a single definition of AI. The Fiscal Year 2021 National Defense Authorization Act defines Artificial Intelligence (AI) as
 - a machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations or decisions influencing real or virtual environments. AI systems use machine and human-based inputs to—
 - (A) perceive real and virtual environments;
 - (B) abstract such perceptions into models through analysis in an automated manner; and
 - (C) use model inference.

Is this the definition of AI that your organization uses?

- ☐ Yes (Skip to question 4)
- ☐ No (Continue with next question a)

For the purpose of this survey, please provide the definition of AI your organization uses or where the definition of AI comes from (e.g. *DOD AI Strategy*) that you will use to answer the following questions.

2. Please describe how your organization identifies, tracks, and reports AI activities (e.g., data calls or keyword search methodologies).
3. Please describe any planned actions your organization has to collaborate AI activities with the Joint Artificial Intelligence Center (JAIC) Executive Steering Group, Working Group, or subcommittees, and any associated milestones. If none, please go to question 5.
4. Below we list various elements of the JAIC and for those that you collaborate with we ask you a short series of questions about that collaboration.

Does your organization collaborate with this part of the JAIC on AI activities?

☐ Yes (Continue with next question)

☐ No (Skip to next organization)

When answering questions ii through vi, consider in general the entire array of collaboration activities you have with this part of the JAIC.

Overall, to what extent does your organization collaborate with this part of the JAIC on AI activities?

☐ Great extent

☐ Moderate extent

☐ Some extent

☐ Little extent

☐ No extent

What are the most important AI activities that your organization collaborates on with this part of the JAIC? (Please describe in some detail at least three of your most important AI activities, if possible)

Which mechanisms does your organization use to collaborate with this part of the JAIC?

**Appendix II: Survey about DOD Collaboration
on AI Activities**

Collaboration Mechanism	Yes	No
MOUs, MOAs, Interagency Agreements	☐	☐
Interagency groups (e.g., working groups, issue groups, communities of practice, task force, cross functional teams)	☐	☐
Conferences	☐	☐
Strategy development	☐	☐
Co-location (e.g., working in the same facility or in some cases, located in the same geographic region)	☐	☐
Specific positions to facilitate coordination (e.g. liaisons)	☐	☐
Shared data systems, technology (e.g., shared databases and web portals)	☐	☐
Information sharing	☐	☐
Informal discussions	☐	☐
Other (please describe):		

Overall, how effective is the collaboration on AI activities between your organization and this part of the JAIC?

- ☐ Very effective
- ☐ Moderately effective
- ☐ Somewhat effective
- ☐ Little effective
- ☐ Not effective

What factors, if any, help and/or hinder your organization's collaboration on AI activities with this part of the JAIC? Please consider the following: agency policies and procedures, available resources, leadership, personalities, presence of written agreements, and accountability measures.

5. In this section, we list organizations that we have identified as having a role in the oversight and integration of DOD's AI activities and for those that you collaborate with we ask you a short series of questions on collaboration you have with about that collaboration.

[Questions i – v repeated for all organizations in Table X]

Does your organization collaborate with this organization on AI activities?

☐ Yes (Continue with next question)

☐ No (Skip to next organization)

When answering questions ii through vi, consider in general the entire array of collaboration activities you have with this organization.

Overall, to what extent does your organization collaborate with this organization on AI activities?

☐ Great extent

☐ Moderate extent

☐ Some extent

☐ Little extent

☐ No extent

What are the most important AI activities that your organization collaborates with this organization on? (Please describe in some detail at least three of your most important AI activities, indicating the particular units and/or sub-organizations you work with on these activities, if possible.)

Which mechanisms does your organization use to collaborate with this organization on AI activities?

**Appendix II: Survey about DOD Collaboration
on AI Activities**

Collaboration Mechanism	Yes	No
MOUs, MOAs, Interagency Agreements	☐	☐
Interagency groups (e.g., working groups, issue groups, communities of practice, task force, cross functional teams)	☐	☐
Conferences	☐	☐
Strategy development	☐	☐
Co-location (e.g., working in the same facility or in some cases, located in the same geographic region)	☐	☐
Specific positions to facilitate coordination (e.g. liaisons)	☐	☐
Shared data systems, technology (e.g., shared databases and web portals)	☐	☐
Information sharing	☐	☐
Informal discussions	☐	☐
Other (please describe):		

Overall, how effective is the collaboration on AI activities between your organization and this organization?

- ☐ Very effective
- ☐ Moderately effective
- ☐ Somewhat effective
- ☐ Little effective
- ☐ Not effective

What factors, if any, help and/or hinder your organization's collaboration on AI activities with this organization? Please consider the following: agency policies and procedures, available resources, leadership, personalities, presence of written agreements, and accountability measures.

6. Please describe any planned actions to collaborate and associated milestones with any of the above organizations.

Appendix II: Survey about DOD Collaboration
on AI Activities

Table 7: Organizations Included in GAO’s Web-Based Survey

Organization Type	Organization Name
Military Services and National Guard	Air Force ^a
	Army ^b
	National Guard
	Navy ^c
	Marine Corps ^d
	Space Force
Offices of the Secretary of Defense	Office of the Chief Information Officer ^e
	Office of the Director of Cost Assessment and Program Evaluation
	Office of the Director of Operational Test and Evaluation
	Office of the General Counsel ^f
	Office of the Under Secretary of Defense (Comptroller)
	Office of the Under Secretary of Defense for Acquisition and Sustainment
	Office of the Under Secretary of Defense for Intelligence and Security
	Office of the Under Secretary of Defense for Personnel and Readiness
	Office of the Under Secretary of Defense for Policy
Joint Chiefs of Staff	Office of the Under Secretary of Defense for Research and Engineering ^g
	Joint Staff Directorates
Combatant Commands	U.S. Africa Command
	U.S. Central Command
	U.S. Cyber Command
	U.S. European Command
	U.S. Indo-Pacific Command
	U.S. Northern Command
	U.S. Southern Command
	U.S. Space Command
	U.S. Special Operations Command
	U.S. Strategic Command
	U.S. Transportation Command
Defense Agencies	Defense Advanced Research Projects Agency
	Defense Information Systems Agency
	Defense Logistics Agency
	Defense Threat Reduction Agency
	Missile Defense Agency
	Space Development Agency
Defense Intelligence Enterprise	Defense Intelligence Agency

**Appendix II: Survey about DOD Collaboration
on AI Activities**

	National Geospatial-Intelligence Agency
	National Security Agency
	National Reconnaissance Office
Office of the Director of National Intelligence	Office of the Director of National Intelligence
Joint Artificial Intelligence Center	Joint Artificial Intelligence Center

Source: GAO Survey about Department of Defense (DOD) Collaboration on Artificial Intelligence (AI) Activities | GAO-22-105834

Note: We categorized the 40 organizations included in our survey questions into broad types of organizations. While we could characterize some organizations into multiple of the organization types listed, we grouped the organizations into types based on DOD organizational structure. For example, various military services components are a part of the Defense Intelligence Enterprise; however, we characterized the military services in the organization type Military Service and National Guard based on their overall DOD organizational relationship.

^aAir Force includes the Air Force Warfighting and Integration Capability/AF A5/7, Air Force AI Cross Functional Team, Air Force Research Lab, Air Force AI Accelerator at MIT.

^bArmy includes the Army AI Task Force, AI Integration Center, Combat Capabilities Development Command (DEVCOM) Army Research Lab, DEVCOM Aviation & Missile Center, DEVCOM Command, Control, Computers, Communications, Cyber, Intelligence, Surveillance and Reconnaissance, Army Cross Functional Teams.

^cNavy includes the Office of Naval Research, Fleet Cyber Command/C10F.

^dMarine Corps includes the Marine Corps AI Task Force, Marine Corps Warfighting Lab.

^eThe Office of the Chief Information Officer includes the Office of the Chief Data Officer.

^fDOD Office of the General Counsel did not provide a point of contact to receive the survey. Therefore, we surveyed each of the 39 other organizations about their collaboration with other organizations, including the Office of General Counsel.

^gFor this survey’s purposes, the Office of the Under Secretary of Defense for Research and Engineering includes Defense Innovation Unit, Defense Science Board, Defense Innovation Board, among other R&E enterprises. This does not include not Defense Advanced Research Projects Agency, Missile Defense Agency, and Space Defense Agency, which are listed separately.

Appendix III: DOD Officials’ Reported Perceptions of Extent of Collaboration on AI Activities

We identified 40 organizations with a role in the oversight and management of DOD’s AI activities.¹ We surveyed 39 of these organizations about whether they collaborate and to what extent.² As shown in table 10 and figure 10, some types of DOD organizations reported more collaborative connections (or engagement) than others. Specifically, a connection refers to if an organization reports that it collaborates with another organization—it does not imply the other organization reported the same collaborative connection.

See table 8 for our analysis of collaborative connections reported between June and October 2021 for each organization type.

Table 8: Number and Average of Artificial Intelligence-Related Collaborative Connections by Organization Type, Reported as a Point in Time from June through October 2021

Type of organization ^a	Number of respondents	Number of times organization type reported a collaborative connection with another organization	Average number of times organization type reported collaborative connection with another organization ^b
Defense intelligence enterprise organizations ^c	4	83	20.8
Office of the Director of National Intelligence	1	19	19.0
Joint Artificial Intelligence Center	5	94	18.8
Office of the Secretary of Defense organizations	9	130	14.4
Joint Chiefs of Staff	7	87	12.4
Military services and National Guard	14	157	11.2
Combatant commands	9	71	7.9

¹See Appendix II for a complete list of the 40 organizations we identified and survey questions. For each of the 61 individuals surveyed, we asked them about the presence, extent, and characteristics of their organizations’ collaborations with the other 39 organizations. Overall, the 54 respondents reported 670 collaboration connections. Our survey analysis includes unclassified information provided by respondents about AI-related collaboration activities.

²We took multiple steps to identify a respondent(s) who could speak to their organization’s AI collaboration efforts as a whole with the JAIC, with other organizations across DOD, or with the Office of the Director of National Intelligence. DOD Office of General Counsel did not provide a point of contact to receive the survey. Therefore, we surveyed 39 organizations about their collaboration. See Appendix I for the full methodology of how we selected respondent(s) from each organization.

Appendix III: DOD Officials' Reported Perceptions of Extent of Collaboration on AI Activities

Type of organization ^a	Number of respondents	Number of times organization type reported a collaborative connection with another organization	Average number of times organization type reported collaborative connection with another organization ^b
Defense agency organizations	5	29	5.8
All organization types	54	670	12.4

Source: GAO Survey about Department of Defense (DOD) Collaboration on Artificial Intelligence (AI) Activities | GAO-22-105834

Note: Survey respondents responded to our unclassified survey from June through October 2021 and the views of each individual respondent are based on the point in time they completed their survey.

^aWe categorized the 39 organizations we surveyed into broad organization types. The representative(s) of each of these were asked questions about their collaboration with 39 DOD and JAIC organizations. While some organizations fit into multiple organization types, we grouped the organizations based on DOD organizational structure. For example, the intelligence elements of the military services are a part of the Defense Intelligence Enterprise; however, we placed the military services in the organization type "Military Services and National Guard" based on their overall DOD organizational structure. See appendix II for the full list of 40 organizations we asked about in our survey and their associated organization type for the purpose of this survey's analysis.

^bThe average number of collaborative connections reported by respondent is calculated by dividing the total number of collaborative connections reported by the number of respondents. We calculated this average to provide a fair representation as some organization types had more respondents than others. For example, the military services and National Guard represented 6 organizations and had 14 respondents, while the Joint Chiefs of Staff is 1 organization with 7 respondents.

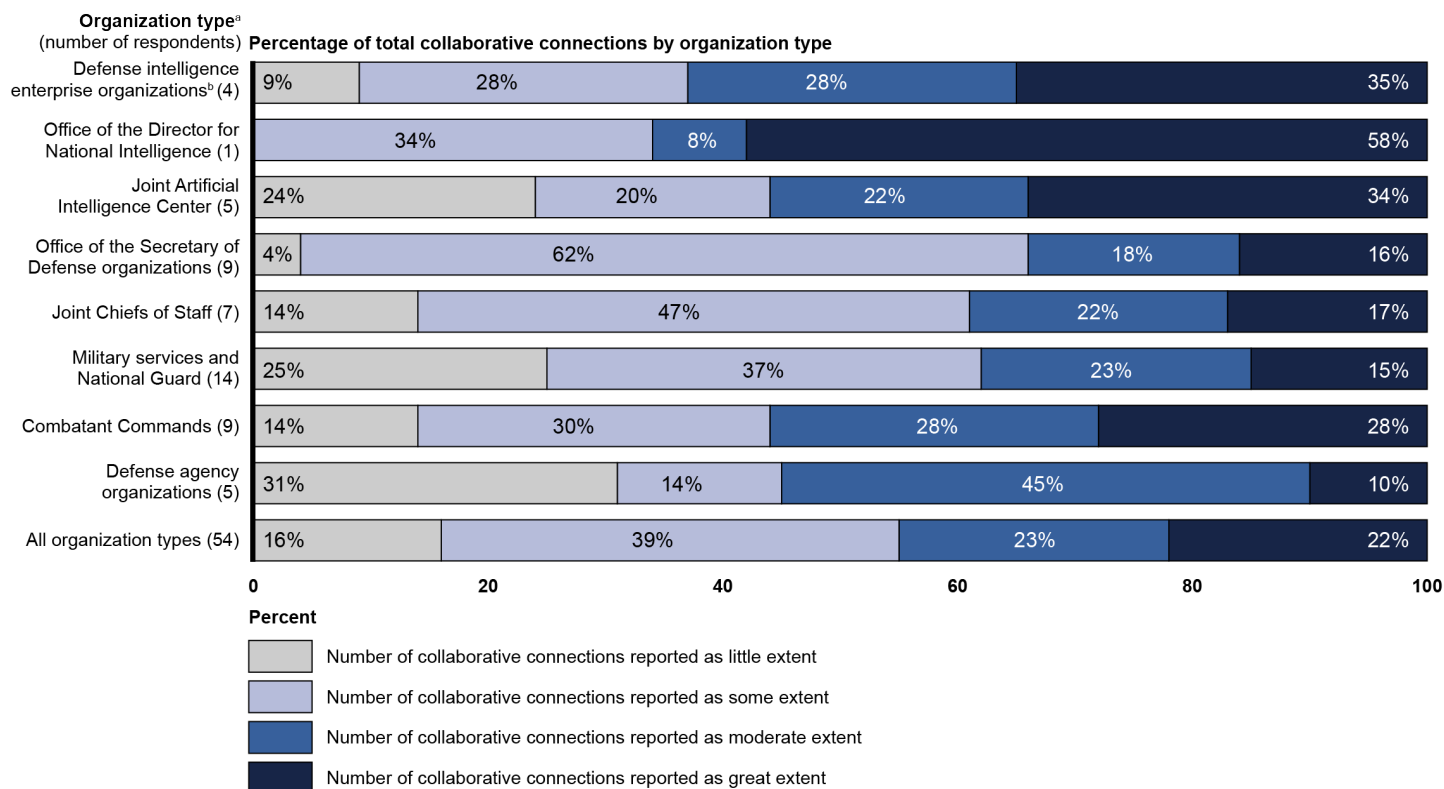
^cDOD defines the Defense Intelligence Enterprise as the organizations, infrastructure, and measures to include policies, processes, procedures, and products of the intelligence, counterintelligence, and security components of the Joint Staff, combatant commands, military departments, and other DOD elements that perform national intelligence, defense intelligence, intelligence-related, counterintelligence, and security functions, as well as those organizations under the authority, direction, and control of the Under Secretary of Defense for Intelligence and Security. However, for the purpose of this survey, we only included the Defense Intelligence Agency, National Geospatial Intelligence Agency, National Reconnaissance Office, and National Security Agency as a part of our Defense Intelligence Enterprise classification.

In addition to asking survey respondents if they have a connection with another organization, we also asked them to rate the extent of their perceived collaboration on a four-point scale.³ Specifically, extent refers to a respondent's perception of how much they collaborate with the other organization that they reported a collaborative connection with. According to our analysis, having a connection does not necessarily mean there is a great extent of collaboration. As shown in figure 10, the perceived extent of collaboration (or how much they collaborate) also varied.

³We asked survey respondents to rate their perceived extent of collaboration with the organization in question on a four point scale—little extent, some extent, moderate extent, and great extent.

Appendix III: DOD Officials' Reported Perceptions of Extent of Collaboration on AI Activities

Figure 10: Breakdown of Perceived Extent of Artificial Intelligence Collaboration by Organization Type, Reported as a Point in Time, from June through October 2021



Source: GAO survey results. | GAO-22-105834

Note: Survey respondents responded to our unclassified survey from June through October 2021, and the views of each individual respondent are based on the point in time they completed their survey.

^aWe categorized the 39 organizations we surveyed into broad organization types. The representative of each of these were asked questions about their collaboration with 39 DOD and JAIC organizations. While some organizations fit into multiple organization types, we grouped the organizations based on DOD organizational structure. For example, the intelligence elements of the military services are a part of the Defense Intelligence Enterprise; however, we placed the military services in the organization type "Military Services and National Guard" based on their overall DOD organizational structure. See appendix II for the full list of 39 organizations surveyed and their associated organization type for the purpose of this survey's analysis.

^bDOD defines the Defense Intelligence Enterprise as the organizations, infrastructure, and measures to include policies, processes, procedures, and products of the intelligence, counterintelligence, and security components of the Joint Staff, combatant commands, military departments, and other DOD elements that perform national intelligence, defense intelligence, intelligence-related, counterintelligence, and security functions, as well as those organizations under the authority, direction, and control of the Under Secretary of Defense for Intelligence and Security. However, for the purpose of this survey, we only included the Defense Intelligence Agency, National Geospatial Intelligence Agency, National Reconnaissance Office, and National Security Agency as a part of our Defense Intelligence Enterprise classification.

Our analysis showed that for the majority of reported connections, the extent, or how much they collaborate varies by organization type. For example:

- The Offices of the Secretary of Defense respondents we surveyed characterized a majority of their collaboration as being to a little or some extent. For example, according to the Office of the Secretary of Defense for Policy respondent, they have collaborated with many of the other organizations on the development of relevant AI policies and on lethal autonomous weapons policies. However, after the policies are developed, as DOD begins to adopt and integrate AI, the extent of their collaboration declines as AI-related issues enter the broader policy discussions to a more limited degree.⁴
- The military services respondents we surveyed characterized a majority of their collaboration as being to some or a moderate extent. This is generally consistent with the military services' reported participation in various JAIC-led groups and initiatives. For example, each military service had at least one respondent who described participating in JAIC-led AI subcommittees or DOD AI Working Group.
- The Defense Intelligence Enterprise respondents we surveyed characterized the majority of their connections as being to a great or moderate extent.⁵ This is generally consistent with the longer and more established AI efforts that various Defense Intelligence Enterprise respondents described in their written responses. For example, multiple respondents described collaboration related to geospatial intelligence-related projects. Specifically, they reported activities related to the Augmenting Intelligence using Machines

⁴The Offices of the Secretary of Defense respondents we surveyed include respondents from the Office of the Chief Information Officer; Offices of the Directors of Cost Assessment and Program Evaluation and Operational Test and Evaluation; the Office of the Under Secretary of Defense (Comptroller); and the Offices of the Under Secretary of Defense for Acquisition and Sustainment, Intelligence and Security, Personnel and Readiness, and Policy.

⁵The Defense Intelligence Enterprise respondents we surveyed include respondents from Defense Intelligence Agency, National Geospatial-Intelligence Agency, National Security Agency, and National Reconnaissance Office.

Strategy, Project Maven, and Machine-Assisted Analytic Rapid-Repository System.⁶

Additionally, as previously discussed, the JAIC was established to accelerate the delivery of AI-enabled capabilities across DOD. Our analysis of the survey responses for JAIC-specific collaboration showed that from the perspective of those surveyed between June and October 2021, opportunities exist to improve the extent of collaboration with the JAIC. Specifically, when the respondents reported collaborating with the JAIC, 49 percent of those reported collaborative connections were perceived as to a little extent or some extent.⁷

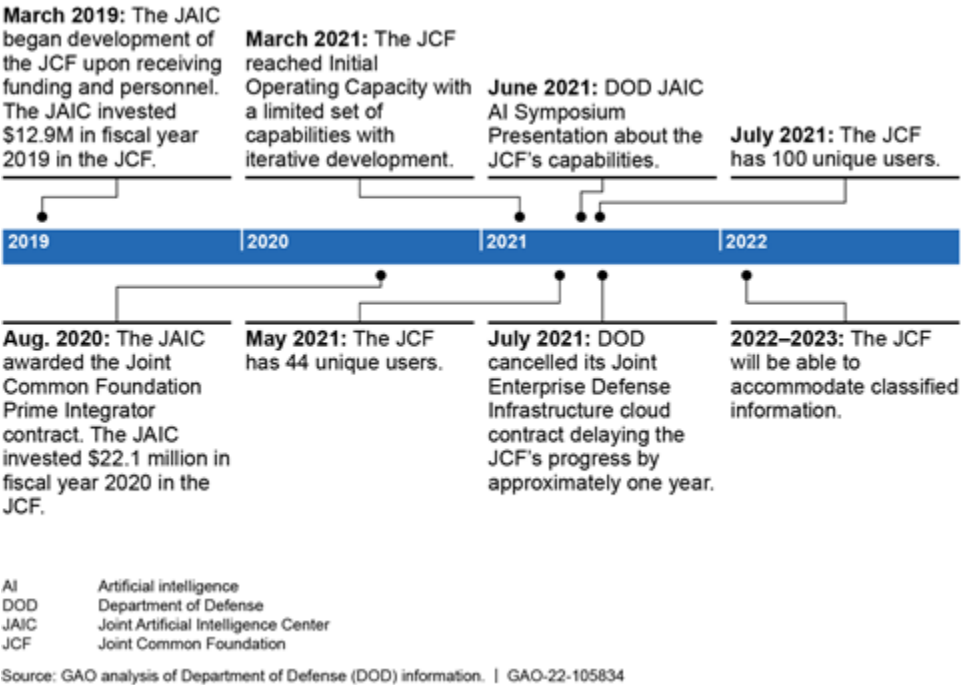
⁶The Office of the Director of National Intelligence's 2019 Augmenting Intelligence using Machines Strategy provides a framework for the incorporation of Augmenting Intelligence using Machines technologies to accelerate mission capability development across the Intelligence Community. DOD launched Project Maven in 2017 with the aim to simplify work for intelligence analysts by recognizing objects in video footage captured by drones and other platforms. As reported in [GAO-21-57](#), the Defense Intelligence Agency intends to replace its legacy system, the Modernized Integrated Database, which captures such intelligence with a new system—the Machine-Assisted Analytic Rapid-Repository System as of 2020.

⁷In total, respondents reported 101 collaborative connections with the JAIC.

Appendix IV: Joint Common Foundation Development

According to DOD officials, DOD intends to improve collaboration by establishing the Joint Common Foundation as a collaborative mechanism. The 2018 *DOD AI Strategy*'s strategic approach includes creating a common foundation of shared data, reusable tools, frameworks and standards, and cloud and edge services, as part of its strategic approach to accelerate AI adoption and deliver AI-enabled capabilities at scale. The JAIC's efforts to develop the Joint Common Foundation are supported by several other development platforms across the department. With some military service-specific platforms already in use, a 2020 Deputy Secretary of Defense Memorandum established data interoperability requirements for the military services and DOD organizations.¹ In 2019, the JAIC began developing the Joint Common Foundation as shown in figure 11.

Figure 11: Timeline of Joint Common Foundation Development, as of August 2021



¹Deputy Secretary of Defense Memorandum, *Actions to Enhance and Accelerate Enterprise Data Management*, (Dec 10, 2020).

As described in figure 11, JAIC officials told us that initial operational capability of the Joint Common Foundation was achieved in March 2021 with unclassified capabilities.² According to DOD documentation, any DOD user with a Common Access Card can join the Joint Common Foundation to leverage these services and start building AI solutions for their respective domains.³ This enables DOD users to execute a wide range of data science and AI tasks, thus lowering or eliminating factors that potentially prevent or impede AI integration, according to JAIC officials. Through the Agile development process, DOD officials quickly identified some gaps and areas for improvement via the onboarding and training processes since reaching initial operating capability in March 2021.

Full operational capability for the Joint Common Foundation is an evolving concept in the Agile development process, according to JAIC officials. According to a JAIC official and DOD documentation, budgetary and contracting issues (e.g., the cancellation of the Joint Enterprise Defense Infrastructure cloud contract), as well as the impacts of COVID-19, have delayed the Joint Common Foundation reaching full operational capability and an estimated date for that milestone has not been determined.⁴ The JAIC, in coordination with the Intelligence Community, plans for the Joint Common Foundation being able to accommodate classified information by 2023.⁵ According to JAIC officials, the final operating capability of the Joint Common Foundation will ensure security and use at various classification levels (e.g., secret and top secret data). As of July 2021, JAIC officials told us they are working on incorporating higher classification levels but did not provide additional details on the

²According to JAIC officials, the JAIC announced initial operational capabilities with Amazon Web Services in March 2021 and capabilities with Microsoft Azure in May 2021. Amazon Web Services and Microsoft Azure are cloud-computing services.

³DOD issues a unique identification credential called a common access card to military personnel, civilian employees, and eligible contractors, according to DOD Manual 5200.08 Volume 3.

⁴The Joint Enterprise Defense Infrastructure contract was a DOD cloud-computing contract, which has been reported as being worth \$10 billion over ten years. According to a July 6, 2021 DOD news release, DOD determined to cancel this contract due to evolving requirements, increased cloud conversancy, and industry advances, and that it no longer meets its needs.

⁵The JAIC, in coordination with the Intelligence Community, is working to build on what the Intelligence Community has accomplished with their infrastructures to be able to use the Joint Common Foundation for Joint Worldwide Intelligence Communication System and top-secret data.

actions being taken. According to DOD officials, DOD planned to finalize a roadmap or high-level plan with milestones for the Joint Common Foundation by August 2021, but has experienced multiple delays, and as of November 2021 the roadmap was not finalized.

According to the Director of the JAIC, the JAIC aims to develop an enterprise fabric to accommodate AI projects and interconnect DOD components by enabling data sharing across components using different platforms. Specifically, components would not be limited to one cloud platform, but can choose among the platforms available to DOD and select the one that aligns with their needs. As the JAIC developed the Joint Common Foundation to enable DOD to test, field, and validate AI capabilities, JAIC officials told us that they are mindful that the Joint Common Foundation will need to seamlessly integrate with the growing ecosystem of DOD AI cloud-neutral software development platforms.⁶

⁶A cloud-neutral capability uses different cloud providers for a federated and vendor-neutral approach. According to a JAIC official, at full operational capability, the Joint Common Foundation is intended to evolve to a cloud-neutral capability using different cloud providers in order to incorporate new technologies.

Appendix V: Comments from the Department of Defense



CHIEF INFORMATION OFFICER

DEPARTMENT OF DEFENSE

6000 DEFENSE PENTAGON
WASHINGTON, D.C. 20301-6000

JAN 28 2022

Mr. Brian Mazanec
Director, Defense Capabilities and Management
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Mr. Mazanec,

This response is provided to the draft report entitled "Artificial Intelligence: DOD Should Improve Strategies, Inventory Process, and Collaboration Guidance" (GAO-22-104516SU). The Department is in general agreement with the overall content of the proposed report and concurs with technical comments (enclosed).

The Department appreciates the opportunity to review the proposed report. My point of contact for this matter is Ms. Rebecca Norfolk, rebecca.b.norfolk.civ@mail.mil.

Sincerely,

A handwritten signature in blue ink, appearing to read "JS", is written over the word "Sincerely,".

John Sherman

Enclosure:
As stated

**GAO PROPOSED REPORT
(GAO-22-104516SU)**

**“Artificial Intelligence: DOD Should Improve Strategies, Inventory Process, and
Collaboration Guidance”**

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

GENERAL DoD COMMENT. Pursuant to Section 238 of the John S. McCain National Defense Authorization Act (NDAA) for FY 2019, as amended and per Deputy Secretary of Defense Memorandum – Subj: Establishment of the Chief Digital and Artificial Intelligence Officer (CDAO) dated December 8, 2021, the Office of the CDAO shall serve as the successor organization to the JAIC, reporting directly to the Deputy Secretary of Defense. As such, the cited Deputy Secretary’s Memorandum sets a CDAO fully operational Capable (FOC) date of June 1, 2022. Upon reaching FOC, the CDAO will establish courses of action to address and achieve the results of the following GAO recommendations accordingly.

RECOMMENDATION 1: The Secretary of Defense should ensure that the Deputy Secretary of Defense issues guidance to the Chief Digital and AI Office (once established) and the JAIC, military services, and relevant DOD organizations to include all characteristics and comprehensive strategy in future AI strategies and associated plans and consider the key governance practices outlines in the GAO AI Accountability Framework.

DoD RESPONSE: Concur. DoD acknowledges the value of the GAO AI Accountability Framework and readily seeks to incorporate such characteristics in its strategies and plans moving forward, as the key principles governance presented there align some characteristics of a comprehensive strategy. Please see technical comment below.

RECOMMENDATION 2: The Secretary of Defense should ensure that the Deputy Secretary of Defense, in consultation the Chief Digital and AI Officer (once established), the JAIC, and military services, establish documented procedures, including timelines, for the periodic review of the DOD AI Strategy and associated service annexes to assess the implementation of the strategy and whether and revision is necessary.

DoD RESPONSE: Concur. DoD supports the recommendation of the Department of the Air Force that Recommendation 2 be directed toward the Military Departments, rather than the Military Services. At this level the Service Secretaries may direct the Military Services to establish Service specific annexes. For example, the Secretary of the Air Force would have the flexibility to develop a Department of the Air Force Annex to the DoD AI Strategy or to direct the Air Force and/or Space Force to develop Service annexes.

RECOMMENDATION 3: The Secretary of Defense should ensure that the Chief Digital and AI Officer (once established) and the Director of the JAIC in collaboration with the Under Secretary of Defense for Comptroller and other entities, as appropriate, develops a high-level plan or roadmap-aligned with the best practices of an integrated master schedule-that captures all requirements, activities, and milestones that support the preparation of the department’s AI portfolio inventory and budget data.

DoD RESPONSE: Concur. The DoD will develop a plan to address this requirement after the CDAO is at full operational capability.

RECOMMENDATION 4: The Secretary of Defense should ensure that the Deputy Secretary of Defense issue guidance that defines outcomes and monitors accountability for AI-related activities and includes AI key performance indicators.

DOD RESPONSE: Concur. The DoD will develop a plan to address the requirements of this recommendation after the CDAO is at full operational capability.

RECOMMENDATION 5: The Secretary of Defense should ensure that the Director of the JAIC and the Chief Digital and AI Officer (once established), issues a roadmap or a high-level plan that captures all requirements and milestones for developing and onboarding users to the Joint Common Foundations.

DOD RESPONSE: Concur. The DoD will develop a plan to address the requirements of this recommendation after the CDAO is at full operational capability.

RECOMMENDATION 6: The Secretary of Defense should ensure that the Deputy Secretary of Defense develops a timeline and guidance that directs the Chief Digital and AI Officer (once established) common terminology for AI related activities

DOD RESPONSE: Concur. Upon completion of the 2022 DoD AI Strategy, the Department will seek to adopt a common enterprise definition of AI to ensure use of common terminology.

RECOMMENDATION 7: The Secretary of Defense should ensure that the Deputy Secretary of Defense in coordination with the Chief Digital and AI Officer (once established) and the JAIC, finalize guidance and agreements that define the roles and responsibilities of the military services and other DOD organizations for leadership and relevant participants collaborating on AI activities.

DOD RESPONSE: Concur. The DoD will set courses of action in place to address the requirements of this recommendation after the CDAO is at full operational capability.

Appendix VI: GAO Contact and Staff Acknowledgments

GAO Contact

Brian M. Mazanec at (202) 512-5130 or mazanecb@gao.gov.

Staff Acknowledgments

In addition to the contact named above, Penney Harwell Caramia, (Assistant Director); Jennifer Andreone (Analyst-in-Charge); Tracy Barnes; Erin Butkowski; Raj Chitikila; David Dornisch; Hannah Hubbard; Joshua Leiling; Jennifer Leotta; Amie Lesser; Sean Manzano; Gabrielle Matuzsan; Clarice Ransom; Andrew Stavisky; Megan Stewart; and Sarah Veale made key contributions to this report.

Related GAO Products

Artificial Intelligence: Status of Developing and Acquiring Capabilities for Weapon Systems. [GAO-22-104765](#). Washington, D.C.: February 17, 2022.

Artificial Intelligence: DOD Should Improve Strategies, Inventory Process, and Collaboration Guidance. [GAO-22-104516SU](#). Washington, D.C.: February 16, 2022.

Artificial Intelligence: An Accountability Framework for Federal Agencies and Other Entities. [GAO-21-519SP](#). Washington, D.C.: June 2, 2021.

Agile Assessment Guide: Best Practices for Agile Adoption and Implementation, [GAO-20-590G](#). Washington, D.C.: September 28, 2020.

Defense Logistics: A Completed Comprehensive Strategy is Needed to Guide DOD's In-Transit Visibility Efforts. [GAO-13-201](#). Washington, D.C.: February 28, 2013.

Managing for Results: Key Considerations for Implementing Interagency Collaborative Mechanisms. [GAO-12-1022](#). Washington, D.C.: September 27, 2012.

Managing for Results: GPRA Modernization Act Implementation Provides Important Opportunities to Address Government Challenges. [GAO-11-617T](#). Washington, D.C.: May 10, 2011.

Results-Oriented Government: Practices That Can Help Enhance and Sustain Collaboration among Federal Agencies. [GAO-06-15](#). Washington, D.C.: October 21, 2005.

GAO's Mission

The Government Accountability Office, the audit, evaluation, and investigative arm of Congress, exists to support Congress in meeting its constitutional responsibilities and to help improve the performance and accountability of the federal government for the American people. GAO examines the use of public funds; evaluates federal programs and policies; and provides analyses, recommendations, and other assistance to help Congress make informed oversight, policy, and funding decisions. GAO's commitment to good government is reflected in its core values of accountability, integrity, and reliability.

Connect with GAO

Connect with GAO on [Facebook](#), [Flickr](#), [Twitter](#), and [YouTube](#).
Subscribe to our [RSS Feeds](#) or [Email Updates](#). Listen to our [Podcasts](#).
Visit GAO on the web at <https://www.gao.gov>.

To Report Fraud, Waste, and Abuse in Federal Programs

Contact FraudNet:
Website: <https://www.gao.gov/about/what-gao-does/fraudnet>
Automated answering system: (800) 424-5454 or (202) 512-7700

Congressional Relations

A. Nicole Clowers, Managing Director, ClowersA@gao.gov, (202) 512-4400, U.S. Government Accountability Office, 441 G Street NW, Room 7125, Washington, DC 20548

Public Affairs

Chuck Young, Managing Director, youngc1@gao.gov, (202) 512-4800
U.S. Government Accountability Office, 441 G Street NW, Room 7149
Washington, DC 20548

Strategic Planning and External Liaison

Stephen J. Sanford, Managing Director, spel@gao.gov, (202) 512-4707
U.S. Government Accountability Office, 441 G Street NW, Room 7814,
Washington, DC 20548



Please Print on Recycled Paper.