January 2023

CONTESTED INFORMATION ENVIRONMENT

Actions Needed to Strengthen Education and Training for DOD Leaders

Accessible Version

GAO Highlights

CONTESTED INFORMATION ENVIRONMENT

Actions Needed to Strengthen Education and Training for DOD Leaders

Why GAO Did This Study

According to DOD, our competitors and adversaries are taking advantage of vulnerabilities in the information environment to advance their national objectives and offset the U.S.'s position as the preeminent warfighting force. DOD's military operations in the information environment play a pivotal role in engaging our adversaries.

House Report 117-118 included a provision for GAO to review DOD training that prepares leaders and service members to operate and make decisions in a contested information environment. In this report, GAO (1) describes DOD guidance that supports the department's education and training efforts to prepare leaders to make decisions in a contested information environment and (2) assesses the extent to which DOD provides education and training designed to prepare leaders to make such decisions.

GAO reviewed selected DOD strategies, policies, and course syllabi; analyzed information related to the conduct of military exercises; and interviewed officials with knowledge of the department's education and training efforts.

What GAO Recommends

GAO recommends that DOD (1) develop guidance about what content to incorporate in its education and training related to decision-making in a contested information environment and (2) assess the resources necessary to meet related education and training needs. DOD generally concurred with GAO's recommendations.

What GAO Found

Department of Defense (DOD) guidance for operating in a contested information environment continues to evolve as DOD works to develop and prepare leaders to make effective decisions. The information environment—that is, the aggregate of factors that affect how humans and automated systems derive meaning from, act upon, and are impacted by information—is at risk of adversaries from anywhere attacking and contesting it to undermine DOD operations. In 2017 DOD elevated "information" as a joint function, and in 2019 it identified *Globally Integrated Operations in the Information Environment* as a special area of emphasis for education. As adversaries increasingly aim to distort or compromise information available to leaders, the focus on leader decision-making approaches becomes more important to minimize negative effects on military readiness and the successful execution of military operations (see figure). DOD continues to take steps—such as establishing a doctrinal, operational, and technical framework—to improve its understanding of and effective operation in increasingly contested information environments.

Examples of Adversary Actions That Can Affect DOD Leader Decision-Making in a Contested Information Environment

Adversary makes position, navigation, and timing systems unreliable, making it difficult for DOD ships to correctly determine their location.

Adversary spoofs the radio frequency to prevent units on the ground from communicating and coordinating.

Adversary manipulates the intelligence, surveillance, and reconnaissance systems and changes the location of adversary ships displayed to the leader.

Command and control center

Adversary creates disinformation that is shared by unwitting actors on social media.

To make decisions in a contested information environment, leaders can use decision-making approaches. These decisions can be affected by adversary actions. As a result, educating and training leaders to operate in these environments is critical to DOD achieving its military and national security objectives.

Source: GAO analysis of Department of Defense (DOD) information. | GAO-23-105608

As part of its efforts to prepare for contested information environments, DOD offers education and training for its leaders. However, DOD components are unclear about what information environment aspects to cover in such education and training because guidance does not specify what content to include. DOD officials also reported having limited resources for their education and training efforts and cited simulation, infrastructure, and personnel limitations as further impeding these efforts. Officials stated that these limitations hinder the creation of realistic environments in which leaders can practice decision-making skills. However, DOD has not assessed or comprehensively reviewed component assessments of resources. Until DOD develops guidance and assesses its resources, it will lack assurance that it will be able to educate and train leaders to prepare them to make decisions in a contested information environment.

Contents

Abbreviations

DOD	Department of Defense
OODA	Observe, Orient, Decide, Act

January 26, 2023

Chair
Ranking Member
Committee on Armed Services
United States Senate

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

Our competitors and adversaries are taking advantage of vulnerabilities in the information environment to advance their national objectives and offset the U.S.'s position as the preeminent warfighting force, according to the Department of Defense's (DOD) 2018 *Joint Concept for Operating in the Information Environment*.[1] The information environment—that is, the aggregate of factors that affect how humans and automated systems derive meaning from, act upon, and are impacted by information—is not limited by geographic boundaries and affects all of DOD's operations.[2]

The wide reach and fluid nature of the information environment poses risks that adversaries can contest and attack to undermine U.S. and friendly forces' understanding, decision-making, morale, and will, according to DOD.[3] For example, the widespread availability of wireless communications, expansion of information technology, dependence on the electromagnetic spectrum, and the far-reaching effect of social media to disseminate disinformation and influence decisions has led to the rapid

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[1]Joint Chiefs of Staff, *Joint Concept for Operating in the Information Environment (JCOIE)* (July 25, 2018).

[2]Joint Chiefs of Staff, Joint Pub. 3-04, *Information in Joint Operations* (Sept. 14, 2022).

[3]Joint Pub. 3-04.

evolution of the information environment.[4] These factors pose new and complex challenges for national security.

In such a contested information environment, adversaries can distort or compromise system information. For example, adversaries can jeopardize operational readiness by jamming radio frequency communications, influencing military leaders to make decisions with incomplete or inaccurate information. See text box below for key definitions and concepts.

Key Definitions and Concepts Used in This Report

Operational Environment: The aggregate of conditions, circumstances, and influences that affect the employment of capabilities and bear on the decisions of the commander. The operational environment encompasses physical domains (i.e., air, land, sea, and space), and information (to include cyberspace) and electromagnetic operational environments.

Information Environment: The aggregate of social, cultural, linguistic, psychological, technical, and physical factors that affect how humans and automated systems derive meaning from, act upon, and are impacted by information, including the individuals, organizations, and systems that collect, process, disseminate, or use information.

Contested Information Environment: An operational environment in which U.S. adversaries have the capability and intent to attack U.S. or friendly forces' capabilities that leverage information. Such an attack could include one that contests, influences, disrupts, degrades, manipulates, or destroys friendly information to undermine these forces' understanding, decision-making, morale, and will across all domains, environments, and geographic areas.

Source: GAO analysis of Joint Chiefs of Staff, Joint Pub. 3-0, *Joint Campaigns and Operations* (June 18, 2022); Joint Chiefs of Staff, Joint Pub. 3-04, *Information in Joint Operations* (Sept. 14, 2022); and DOD Instruction 5000.90, *Cybersecurity for Acquisition Decision Authorities and Program Managers* (Dec. 31, 2020). Based on these sources and because DOD has not established a definition of the term "contested information environment," we developed related terminology and concepts where they were absent, which we use throughout this report. | GAO-23-105608

The *2022 National Defense Strategy* states that to achieve DOD's strategic objectives, the department requires a joint force that is lethal, resilient, sustainable, survivable, agile, and responsive.[5] DOD recognizes that our forces must be prepared to contest our adversaries along the entire competition continuum—from cooperation to adversarial

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[4]DOD, *Strategy for Operations in the Information Environment* (June 2016). The electromagnetic spectrum is a maneuver space essential for facilitating control within the operational environment and impacts all portions of that environment and military operations. Military operations and training are executed in an environment complicated by increasingly challenging demands and constraints on the electromagnetic spectrum. Joint Chiefs of Staff, Joint Pub. 3-85, *Joint Electromagnetic Spectrum Operations* (May 22, 2020).

[5]DOD, *Fact Sheet: 2022 National Defense Strategy* (Mar. 28, 2022). The most recent version of the *National Defense Strategy* also issued in March 2022 is classified. As a result, we cite the unclassified fact sheet here.

competition below armed conflict to armed conflict—and that gaining and maintaining an information advantage is critical to U.S. success in this expanded battlefield. According to the Marine Corps' fiscal year 2023 budget submission, maintaining a competitive edge in decision-making is critical given the complexity and evolving nature of the modern battlefield.[6] This battlefield requires a highly educated and trained force that produces better leaders and warfighters by, for example, focusing education and training on critical thinking and practical judgement under pressure and expanding the use of war-gaming and force-on-force training.[7]

House Report 117-118, accompanying a bill for the National Defense Authorization Act for Fiscal Year 2022, included a provision for us to review DOD training that prepares leaders and service members to operate and make decisions in a contested information environment.[8] Our report (1) describes DOD guidance that supports the department's education and training efforts to prepare leaders to make decisions in a contested information environment, and (2) assesses the extent to which DOD provides education and training designed to prepare leaders to make such decisions.

To address these objectives, we reviewed and analyzed key DOD guidance and documentation issued since fiscal year 2018 related to DOD's information environment efforts and education and training to

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[6]DOD, Office of the Under Secretary of Defense (Comptroller)/Chief Financial Officer, Defense Budget Overview, *United States Department of Defense Fiscal Year 2023 Budget Request* (April 2022).

[7]In its broadest sense, education conveys general bodies of knowledge; develops habits of mind applicable to a wide spectrum of endeavors; and fosters diverse perspectives, critical analysis, abstract reasoning, comfort with ambiguity and uncertainty, and innovative thinking, particularly with respect to complex, nonlinear problems. In contrast, training is defined as instruction and applied exercises for acquiring and retaining knowledge, skills, abilities, and attitudes necessary to complete specific tasks. However, education and training are not mutually exclusive, and they are partners in the generation and sustainment of an individual's abilities to perform. Chairman of the Joint Chiefs of Staff Instruction 3500.01J, *Joint Training Policy for the Armed Forces of the United States* (Jan. 13, 2020).

[8]H.R. Rep. No. 117-118, at 266 (2021).

support such efforts.[9] We identified existing definitions of terms, including "information environment," and developed terminology and concepts where they were absent.[10] We also conducted 16 semi-structured interviews with a nongeneralizable sample of officials from selected DOD components who have knowledge of the department's education and training efforts to prepare leaders to make decisions during contested information environment operations.[11] We selected DOD components that (1) provide, educate, and train military service members who comprise the bulk of the joint force and (2) represent various geographic and functional commands. Specifically, we selected the Offices of the Under Secretary of Defense for Personnel and Readiness and Policy, the Joint Staff, five military services, and three unified combatant commands.[12] We included within our scope different grades of commanders—O-5 and above and noncommissioned officers (E-8 and E-9)—which we refer to

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[9]We generally limited our review to guidance issued since fiscal year 2018 because the *Joint Concept for Operating in the Information Environment (JCOIE)*, which aimed to institutionalize and operationalize the military's approach to "information operations," was issued on July 25, 2018 (i.e., fiscal year 2018). According to Joint Pub. 3-04, the joint force is transitioning from information operations to operations in the information environment. We also reviewed other guidance documents most relevant to the topic that pre-date the fiscal year 2018 timeframe but that were based on related, prior work and as identified by officials representing the DOD components in our scope, to include DOD's 2016 *Strategy for Operations in the Information Environment* (June 2016). In addition, because education and training are not mutually exclusive, according to CJCSI 3500.01J, we assessed both education and training against criteria contained in guidance and documentation we reviewed.

[10]For example, because DOD has not established a definition of the term "contested information environment," we developed related concepts for this term, which we use throughout this report.

[11]Hereafter, these selected components are referred to as DOD components. For the purposes of this report, we mainly focus on the extent to which leaders are receiving the education and training experiences needed to fully understand the adversary's effect on their defensive capabilities.

[12]We selected the following five military services—Army, Marine Corps, Navy, Air Force, and Space Force—and the following three unified combatant commands—U.S. European, U.S. Indo-Pacific, and U.S. Special Operations Commands. In speaking with officials from Space Force regarding their education and training efforts, we learned that they are still developing their education and training programs and largely rely on Air Force education and training efforts. As a result, we did not include them in our semi-structured interview efforts.

collectively as leaders.[13] We selected these grades as the leaders group because of the leadership roles that individuals in these grades have, at both the operational and tactical levels of warfare, in overseeing how service members conduct operations in a contested information environment.[14]

We assessed the information we obtained against criteria on joint education and training found in joint guidance, DOD strategy, and in our prior work highlighting the assessment of strategic training to identify actions DOD has taken related to its efforts to prepare leaders to make decisions in a contested information environment.[15] We also determined

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[13]The term "grade" means a step or degree, in a graduated scale of office or military rank that is established as a grade by law or regulation. 10 U.S.C. § 101. **Officer grades** range from O-1 to O-10, with O-1 being the lowest ranking grade and O-10 being the highest ranking grade. For example, in the Army, the Marine Corps, the Air Force, and the Space Force, O-5s and O-6s are known as "lieutenant colonels" and "colonels," respectively; in the Navy, they are known as "commanders" and "captains," respectively. **Enlisted grades** range from E-1 to E-9, with E-1 being the lowest ranking grade and E-9 being the highest ranking grade. At the E-8 level, the Army, Marine Corps, and Air Force have two positions at the same paygrade. E-8s in the Army are known as "master sergeants" or "first sergeants"; in the Marine Corps are known as "master sergeants" or "first sergeants"; and in the Air Force are known as "senior master sergeants" or "first sergeants." In the Navy, E-8s are known as "senior chief petty officers," and in the Space Force, E-8s are known as "senior master sergeants." *See* DOD, "U.S. Military Rank Insignia" (Washington, D.C.), accessed Aug. 17, 2022, https://www.defense.gov/Resources/Insignia/.

[14]According to Joint Pub. 3-0, there are three levels of warfare: (1) strategic; (2) operational; and (3) tactical. The **strategic level of warfare** is the level at which a nation determines national or multinational guidance, develops strategic objectives, then develops and commits national resources to achieve those objectives. The **operational level of warfare** is the level of warfare in which campaigns and operations are planned, conducted, and sustained to achieve operational objectives to support achievement of strategic objectives. The **tactical level of warfare** is the level of warfare at which forces plan and execute battles and engagements to achieve military objectives. For the purposes of this report, we mainly focus on leaders functioning at the operational and tactical levels because (1) the operational level of warfare links the tactical employment of forces to strategic objectives, and (2) the tactical level of warfare includes planning and executing battles, engagements, and activities to achieve military objectives.

[15]See, for example, CJCSI 3500.01J; DOD, *Strategy for Operations in the Information Environment* (June 2016); and GAO, *Human Capital: A Guide for Assessing Strategic Training and Development Efforts in the Federal Government*, GAO-04-546G (Washington, D.C.: Mar. 1, 2004). In our prior work highlighting the assessment of strategic training, we state that training can be defined as making available to employees planned and coordinated educational programs of instruction in professional, technical, or other fields that are or will be related to the employee's job responsibilities. Moreover, training can be accomplished through a variety of approaches, such as classroom training, e-learning, and professional conferences that are educational or instructional in nature. As a result, we also assessed the information we obtained against criteria found in GAO-04-546G.

that the control activities component of the *Standards for Internal Control in the Federal Government* was significant to the provision of education and training objectives, along with the underlying principles that management should (1) design control activities to achieve objectives and respond to risks, and (2) implement control activities through policies.[16] See appendix I for our full scope and methodology, including a list of the organizations we contacted over the course of this review.

We conducted this performance audit from December 2021 to January 2023 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Evolving Security Threats and the Contested Information Environment

The joint force conducts its operations in a complex, volatile security environment characterized by contested norms and persistent disorder, according to Joint Publication 3-0.[17] During a March 2021 congressional hearing,[18] senior DOD officials, including the Acting Assistant Secretary of Defense for Special Operations and Low-Intensity Conflict, stated that adversary use of disinformation, misinformation, and propaganda poses

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[16]GAO, *Standards for Internal Control in the Federal Government*, GAO-14-704G (Washington, D.C.: Sept. 10, 2014).

[17]Joint Chiefs of Staff, Joint Pub. 3-0, *Joint Campaigns and Operations* (June 18, 2022). The joint force is a force composed of elements, assigned or attached, of two or more military departments operating under a single joint force commander. *See* Chairman of the Joint Chiefs of Staff, *DOD Dictionary of Military and Associated Terms* (November 2021).

[18]Mr. Christopher Maier, Acting Assistant Secretary of Defense, Special Operations and Low-Intensity Conflict; Mr. Neill Tipton, Director of Defense Intelligence (Collections and Special Programs); and Mr. James Sullivan, Defense Intelligence Officer for Cyber, Defense Intelligence Agency, U.S. Department of Defense, *Disinformation in the Gray Zone: Opportunities, Limitations, and Challenges*, testimony before the House Subcommittee on Intelligence and Special Operations, 117th Cong., 1st sess., March 16, 2021.
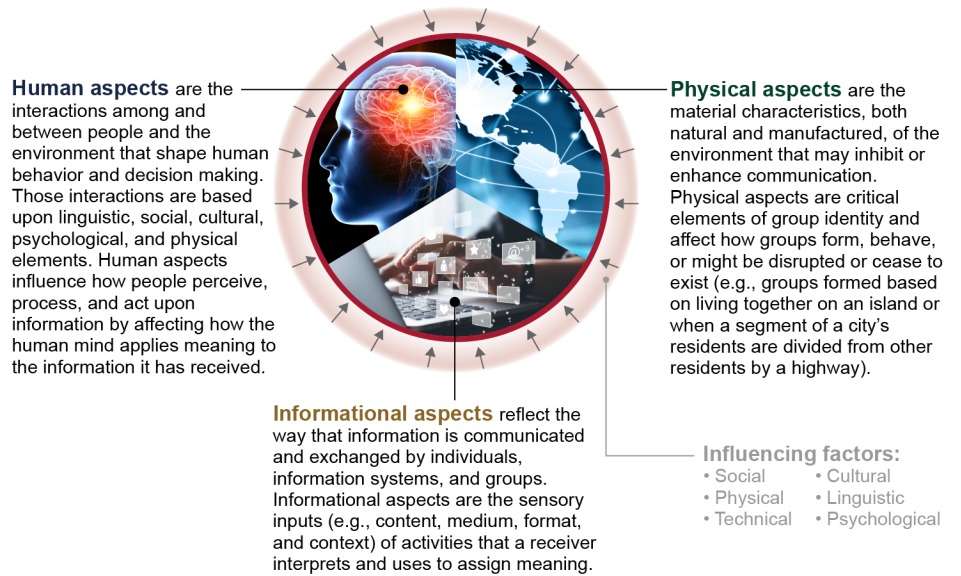
one of today's greatest challenges to the United States, not just to DOD.[19] For example, these officials noted that Russia and China understand that in today's information environment, they have real-time access to a global audience. By flooding the information environment with deliberately manipulated information, these actors can gain leverage to threaten our interests, according to the same officials. We have similarly reported that an adversary can undermine DOD's ability to achieve its overall mission to defend and protect the United States—including its operational and tactical goals—by manipulating information and conducting activities in the information environment.[20] Figure 1 depicts the information environment and generally describes its human, physical, and informational aspects.[21]

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[19]DOD understands "disinformation" to consist of the deliberate dissemination of false information with the intent to deceive (e.g., planting false news stories in the media, false narratives in social media, and tampering with private and/or classified communications before their widespread release). "Disinformation" is also closely related to "misinformation," which can be defined as the unintentional dissemination of false information (e.g., internet trolls who spread unfounded conspiracy theories or web hoaxes through social media, believing them to be true). "Disinformation" and "misinformation" both exploit false information. "Propaganda" is the dissemination of an idea or narrative that is intended to influence, and it may be misleading or true.

[20]Our prior work on the information environment highlighted concern among defense officials about missions and functions—including military operations and command and control decision-making—affected by the information environment. This work has also highlighted the emergence of various technologies, including artificial intelligence and machine learning and quantum computing, among other threats, which could have negative consequences for DOD. For additional details on the complex array of information-related threats to our national security, see GAO, *Information Environment: Opportunities and Threats to DOD's National Security Mission*, GAO-22-104714 (Washington, D.C.: Sept. 21, 2022).

[21]Joint Chiefs of Staff, Joint Pub. 3-04, *Information in Joint Operations* (Sept. 14, 2022).

Figure 1: The Information Environment and Factors That Influence the Processing of Information

Human aspects are the interactions among and between people and the environment that shape human behavior and decision making. Those interactions are based upon linguistic, social, cultural, psychological, and physical elements. Human aspects influence how people perceive, process, and act upon information by affecting how the human mind applies meaning to the information it has received.

Physical aspects are the material characteristics, both natural and manufactured, of the environment that may inhibit or enhance communication. Physical aspects are critical elements of group identity and affect how groups form, behave, or might be disrupted or cease to exist (e.g., groups formed based on living together on an island or when a segment of a city's residents are divided from other residents by a highway).

Informational aspects reflect the way that information is communicated and exchanged by individuals, information systems, and groups. Informational aspects are the sensory inputs (e.g., content, medium, format, and context) of activities that a receiver interprets and uses to assign meaning.

Influencing factors:
- Social   • Cultural
- Physical   • Linguistic
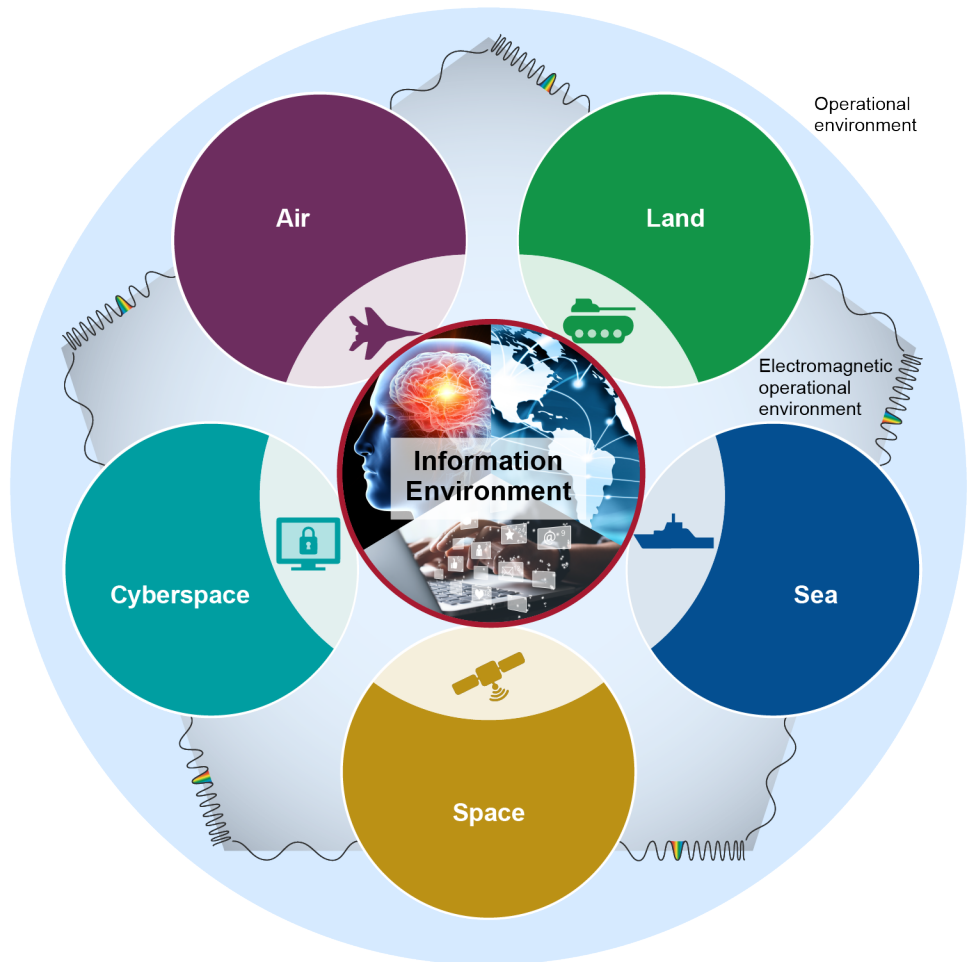- Technical • Psychological

Source: GAO analysis of Department of Defense information; tippapatt/stock.adobe.com, Victoria/stock.adobe.com, and SciePro/stock.adobe.com (photos). | GAO-23-105608

National security threats are transregional, all-domain, and multifunctional. Such threats present themselves in the operational environment, which consists of

- the physical domains of air, land, sea, and space;

- the electromagnetic operational environment; and

- the information environment, which includes cyberspace.

An adversary's manipulation of the information environment to control key physical infrastructure and cyberspace infrastructure can limit our flexibility and freedom of maneuver (i.e., freedom of navigation operations) and erode our influence, according to Joint Publication 3-0. These adversary actions have resulted in contested norms and created alternative views of reality, underscoring the importance of activities in the information environment, according to DOD. Figure 2 illustrates the information environment across domains and environments.

Figure 2: The Information Environment across DOD Domains and Operational Environments

The joint force uses the information environment to improve understanding, decision-making, and communication in all physical domains; cyberspace; and the electromagnetic operational environment.

Source: GAO analysis of Department of Defense (DOD) information; tippapatt/stock.adobe.com, Victoria/stock.adobe.com, and SciePro/stock.adobe.com (photos). | GAO-23-105608

DOD Operations and Decision-Making in a Contested Information Environment

DOD conducts operations in a contested information environment by using offensive and defensive efforts intended to achieve goals and reduce the risk of adversary threats.

- **Offensive actions** in the information environment entail scenarios where the U.S. military acts to affect an external group's information environment, such as their decision-making and behavior. DOD refers to offensive-oriented actions primarily as operations in the information environment, offensive cyberspace operations, electromagnetic spectrum operations, public affairs, civil military operations, military deception, and military information support operations.

- **Defensive actions** entail scenarios where an adversary or actor seeks to degrade or modify DOD's information environment, requiring DOD to respond. These defensive-oriented actions can include preparing leaders to make decisions in an information environment where an adversary is seeking to influence them, for example, through manipulated or destroyed information or systems that have been compromised as part of the adversary's offensive efforts.[22]

As part of DOD's defensive efforts, department components use varying decision-making approaches, to include what is known as the Observe, Orient, Decide, Act (OODA) loop, to understand situations, develop options to solve problems, and reach decisions.[23] Figure 3 illustrates the OODA loop approach in theory and in practice.

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[22]As previously stated, in this report we mainly focus on the extent to which leaders are receiving the education and training experiences needed to understand fully the adversary's effect on their defensive capabilities.

[23]The OODA loop, as it is commonly referred to, stands for Observe, Orient, Decide, Act. This loop reflects how command and control is a continuous, cyclical process. As part of this process, effective decision-making at all levels of command is essential to effective command and control, according to Marine Corps guidance. U.S. Marine Corps, MCDP 6, *Command and Control* (Apr. 4, 2018).

Figure 3: OODA Loop in Theory and Practice

OODA loop in theory	OODA loop in practice

The security environment (i.e., the set of conditions, circumstances, and influences that affect the employment of armed forces) may affect the speed of the decision-making process. For example, leaders could have an over-abundance of information to observe or adversary insertion of disinformation into intelligence, surveillance, and reconnaissance systems to change the location of adversaries displayed to the decision-maker on computer systems.

Human aspect
Influence how people perceive, process, and act upon information by affecting how the human mind applies meaning to the information it has received.

Informational aspect
The way that information is communicated or exchanged by individuals, information systems, and groups.

Physical aspect
Material characteristics (natural and manufactured) of the environment that may inhibit or enhance communication.
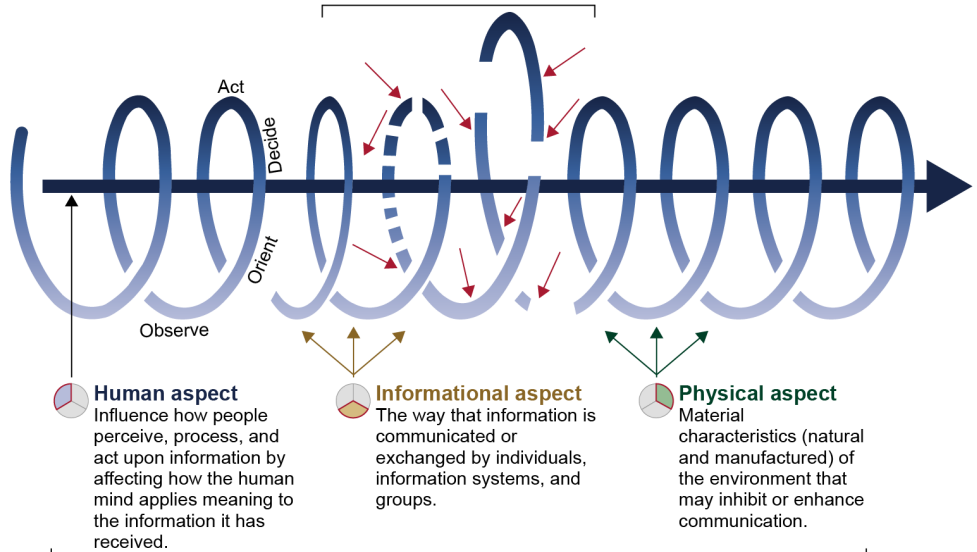
The OODA loop in theory appears as a consistent cycle of observe, orient, decide, and act. However, operational and adversarial inputs can distort this process in a number of ways.

The information environment—that is, the aggregate of social, cultural, linguistic, psychological, technical, and physical factors—may affect how information is received and understood and, thus, affect a decision-maker's ability to consistently and effectively cycle through the OODA loop.

OODA loop   Observe, Orient, Decide, Act loop

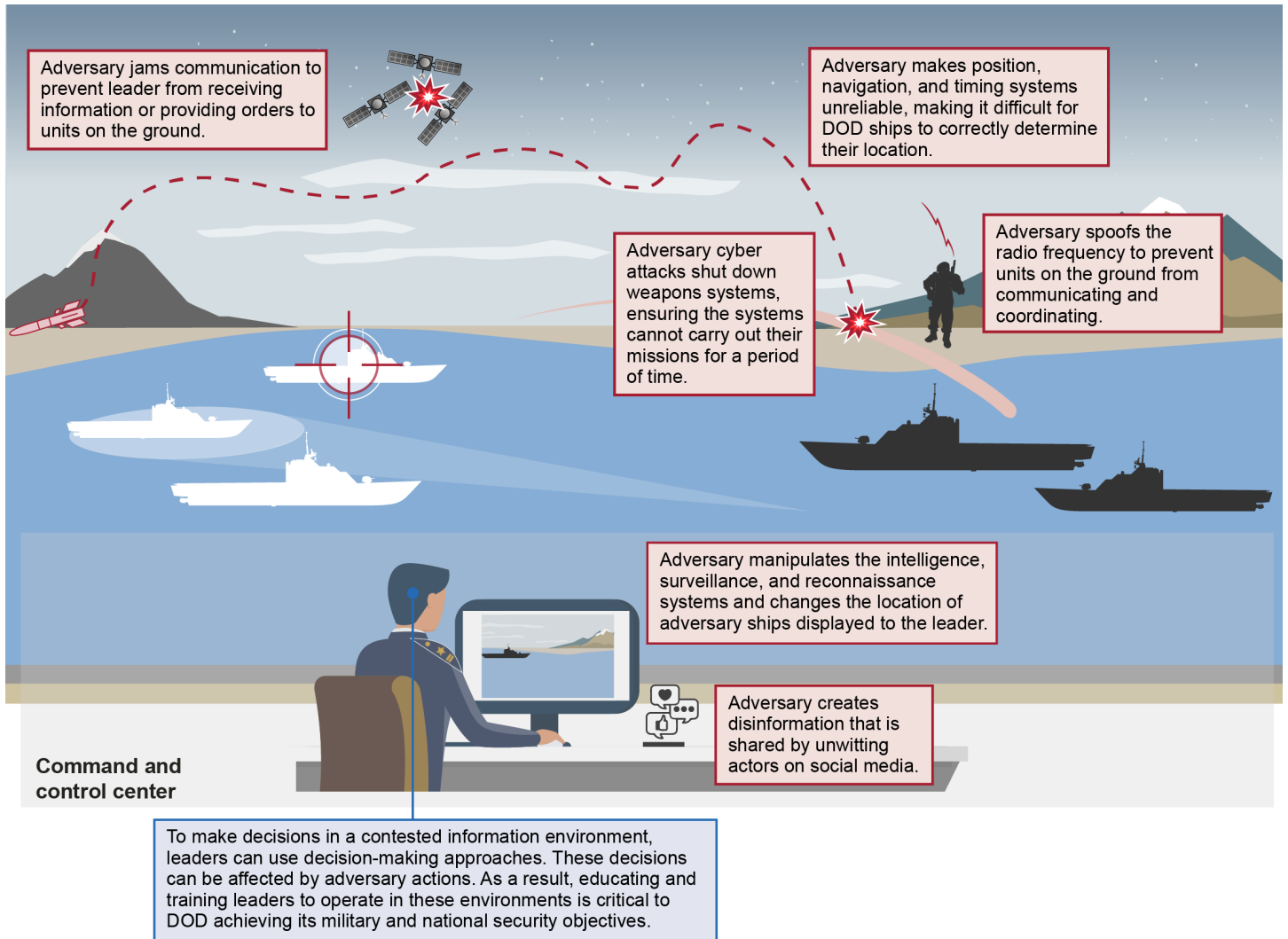Source: GAO analysis of Department of Defense information. | GAO-23-105608

Furthermore, figure 4 illustrates notional examples of adversary actions in a contested information environment that can affect DOD leader decision-making approaches.

Figure 4: Examples of Adversary Actions That Can Affect DOD Leader Decision-Making in a Contested Information Environment

Adversary jams communication to prevent leader from receiving information or providing orders to units on the ground.

Adversary makes position, navigation, and timing systems unreliable, making it difficult for DOD ships to correctly determine their location.

Adversary cyber attacks shut down weapons systems, ensuring the systems cannot carry out their missions for a period of time.

Adversary spoofs the radio frequency to prevent units on the ground from communicating and coordinating.

Adversary manipulates the intelligence, surveillance, and reconnaissance systems and changes the location of adversary ships displayed to the leader.

Command and control center

Adversary creates disinformation that is shared by unwitting actors on social media.

To make decisions in a contested information environment, leaders can use decision-making approaches. These decisions can be affected by adversary actions. As a result, educating and training leaders to operate in these environments is critical to DOD achieving its military and national security objectives.

Source: GAO analysis of Department of Defense (DOD) information and prior GAO reports. | GAO-23-105608

DOD Roles and Responsibilities for Education and Training Efforts Associated with Operations in a Contested Information Environment

DOD is responsible for deploying and managing a well-trained, educated, and ready force to meet emerging requirements, according to DOD's 2016 *Strategy for Operations in the Information Environment*. The

following selected officials and organizations across DOD play a role in overseeing and implementing the department's decision-making education and training efforts for operations in a contested information environment:[24]

- **Under Secretary of Defense for Personnel and Readiness.** Develops and ensures oversight and sufficiency of DOD policies, programs, and resources (including the cost-effective application of training systems and technologies) to ensure the readiness of U.S. Forces for peacetime contingencies, crises, and warfighting.[25]

- **Under Secretary of Defense for Policy.** Serves as the Principal Staff Assistant for oversight of DOD information operations and as the Principal Information Operations Advisor to the Secretary of Defense for all matters regarding the formulation of national security and defense strategy and policy and the integration and oversight of DOD policy, strategy, plans, execution, and capabilities to achieve national security objectives.[26]

- **Chairman of the Joint Chiefs of Staff.** Formulates policies and technical standards, and executes actions for joint training of the U.S. Armed Forces relating to joint force development matters. The Chairman also provides advice, plans, and policies for the participation of combat support agencies in joint training events and exercises, assessing their performance to established standards to determine readiness and identifying resource shortfalls.[27]

- **Military services.** Develop concepts, doctrine, tactics, techniques, and procedures. The military services also organize, train, equip, and provide forces that enable joint force commanders to conduct operations across the spectrum of conflict in order to achieve the desired end state.[28] Before deploying forces for an exercise, the

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[24]Operations in a contested information environment consist of military actions involving the integrated employment of multiple information forces to affect drivers of behavior. Joint Pub. 3-04.

[25]CJCSI 3500.01J. Additional responsibilities can be found in DOD Directive 5124.02, *Under Secretary of Defense for Personnel and Readiness (USD(P&R))* (June 23, 2008).

[26]DOD Directive 5111.01, *Under Secretary of Defense for Policy (USD(P))* (June 23, 2020).

[27]CJCSI 3500.01J. Additional responsibilities can be found in DOD Directive 5100.01, *Functions of the Department of Defense and Its Major Components* (Dec. 21, 2010, incorporating change 1, Sept. 17, 2020).

[28]DOD Directive 5100.01.

military services ensure their forces are trained and ready to meet exercise objectives and are prepared to train in the specified exercise design using joint doctrine.[29]

- **Unified combatant commands.** Combatant commanders maintain trained and ready forces, exercise contingency plans, and support campaign plan engagement activities for their combatant command through the Joint Exercise Program.[30]

Key U.S. Strategic Guidance Documents

The *National Defense Strategy* outlines DOD's approach to implementing the President's *National Security Strategy*, according to joint doctrine.[31] This and other national-level strategies and guidance have informed DOD's contested information environment efforts, as described in figure 5.

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[29]CJCSI 3500.01J. According to this instruction, military service training is based on military service policy and doctrine to prepare individuals and interoperable units. This training includes basic, technical, and operational training in response to operational requirements deemed necessary by the unified combatant commands to execute assigned missions.

[30]CJCSI 3500.01J.

[31]Joint Pub. 5-0 states that strategic guidance is strategic direction contained in key documents. The President, Secretary of Defense, and Chairman of the Joint Chiefs of Staff use strategic direction to communicate their broad objectives and issue-specific guidance to DOD. Strategic direction provides the common thread that integrates and synchronizes the planning activities and operations of the Joint Staff, combatant commands, military services, joint forces, combat support agencies, and other DOD agencies. Chairman of the Joint Chiefs of Staff, Joint Pub. 5-0, *Joint Planning* (Dec. 1, 2020).

Figure 5: Hierarchy and Description of Key U.S. Strategic Guidance Documents

National Security Strategy

The *National Security Strategy* issued in 2022 highlights the ever-evolving ways in which authoritarianism seeks to subvert global order—notably by weaponizing information to undermine democracies and polarize societies—and proposes a response that includes exposing disinformation campaigns.

National Defense Strategy
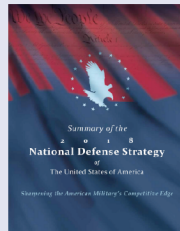
The *National Defense Strategy* issued in 2022 states that given the growing kinetic and non-kinetic threats to the U.S. homeland from strategic competitors, DOD will act as needed to increase its resilience to withstand, fight through, and recover quickly from disruption, including from threats in the contested information environment.

National Military Strategy
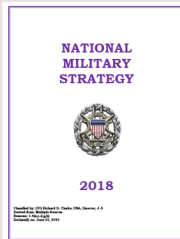
The *National Military Strategy* issued in 2018 addresses how the joint force implements both the defense objectives in the *National Defense Strategy*—to include its response to great power competition with China and Russia—and the direction from the President and the Secretary of Defense through the application of instruments of national power, including information, across the continuum of conflict.

Source: GAO analysis of White House and Department of Defense (DOD) information. | GAO-23-105608

Joint Force Development Principles and Authorities

Joint force development provides a structured mechanism for adapting and applying current functions, capabilities, and concepts to improve and evolve the strength, agility, endurance, resilience, flexibility, interoperability, and awareness of the current force, according to DOD

guidance.[32] It includes joint doctrine, joint education, joint training, joint lessons learned, and joint concept development.

According to Joint Publication 1, joint force development involves the synchronized execution of the legislated authorities of the Chairman of the Joint Chiefs of Staff, the military service chiefs, and others, such as the commander of U.S. Special Operations Command. For example, section 153 of Title 10, U.S. Code, gives the Chairman of the Joint Chiefs of Staff authority to develop the joint force. Specifically, it provides authority to (1) develop doctrine for the joint employment of the armed forces, and (2) formulate policies for joint training, to include policies for the military education and training of members of the armed forces. See table 1 for additional descriptions of the doctrine, education, and training joint force development functions, along with techniques DOD uses to present or conduct these functions.

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[32]Chairman of the Joint Chiefs of Staff Instruction 3030.01, *Implementing Joint Force Development and Design* (Dec. 3, 2019). Through this structured mechanism, the joint force can improve operational readiness and effectiveness, generally within a 2–7 year timeframe.

Table 1: Descriptions of Selected Joint Force Development Functions and Techniques for Presenting or Conducting Specific Functions

Joint Force Development Function	Description	Techniques for Presenting or Conducting Specific Functions
Doctrine	• Provides the fundamental principles that guide the employment of U.S. military forces in coordinated action toward a common objective. • Provides authoritative guidance from which joint operations are planned and executed.	• Joint publications (including Joint Publication 1, Joint Publication 3-04)[a]
Education	Consists broadly of the following three categories: • *Joint Professional Military Education* Consists of the rigorous and thorough instruction and examination of officers of the armed forces in an environment designed to promote a theoretical and practical in-depth understanding of joint matters and, specifically, of the subject matter covered.[b] • *Officer Joint Professional Military Education* Consists of five levels of formal military education that apply to officers at various grades. These levels are: (1) precommissioning; (2) primary—at grades O-1 through O-3; (3) intermediate—at grade O-4; (4) senior—at grades O-5 through O-6; and (5) general officer/flag officer—at grade O-7 and above. In addition to these formal levels are multiple learning opportunities that are made available by the military services during an officer's career.[c] • *Enlisted Joint Professional Military Education* Consists of four educational levels that span an enlisted member's career and apply to all enlisted personnel at various grades. These levels are: (1) basic—through grade E-6; (2) career—in grades E-6 and E-7 and above; (3) senior—in grades E-7 to E-9; and (4) keystone—command senior enlisted leaders in grade E-9.[d] • *Other joint education* Provides both specialist education in specific joint functional areas and topic-specific education of joint material for officers and enlisted personnel. Other joint education conveys a specific body of knowledge relevant to the specific field and is also based on approved joint doctrine and concepts.[e]	• Case studies • Courses, via web-based portals, such as Joint Knowledge Online, or military education institutions through institutional learning • Exercises (including command post, tabletop, and field training exercises) • Seminars • Simulations (including war games)
Training	• Prepares individuals, joint forces, or joint staffs to respond to strategic, operational, or tactical requirements considered necessary by the combatant commanders to execute their assigned or anticipated missions. • Encompasses both individual and collective training of joint staffs, units, and the military service components of joint forces.	• Exercises (including command post, field training, tabletop exercises) • Facilitated instruction • Lectures • Mentoring • Seminars • War games • Workshops

Source: GAO analysis of Department of Defense information and federal statutes. I GAO-23-105608

aJoint Chiefs of Staff, Joint Pub. 1, *Doctrine for the Armed Forces of the United States* (Mar. 25, 2013, incorporating change 1 Jul. 12, 2017); and Joint Chiefs of Staff, Joint Pub. 3-04, *Information in Joint Operations* (Sept. 14, 2022).

bJoint Professional Military Education is the rigorous and thorough instruction and examination of officers of the armed forces in an environment designed to promote a thorough and practical in-depth understanding of joint matters and is delivered in both military service and purely joint (e.g., the National Defense University) venues. 10 U.S.C. § 2151; and Chairman of the Joint Chiefs of Staff Instruction 1800.01F, *Officer Professional Military Education Policy* (May 15, 2020).

cOfficer Joint Professional Military Education programs will, among other things, build on officer development learning outcomes achieved sequentially across a career from pre-commissioning through general/flag officer, elevating cognitive achievement at every level. CJCSI 1800.01F.

dEnlisted Joint Professional Military Education is a Chairman of the Joint Chiefs of Staff-approved body of outcomes, policies, and procedures supporting the educational requirements for enlisted personnel. It is largely delivered in military service professional military education venues. Chairman of the Joint Chiefs of Staff Instruction 1805.01C, *Enlisted Professional Military Education Policy* (Nov. 1, 2021).

eOther joint education, albeit significant to joint officer development, does not otherwise meet standards to be accredited as Joint Professional Military Education. This type of education is sponsored by topic-specific relevant services and organizations (i.e., joint logistics education by the joint logistics community). Joint Pub. 1.

The Joint Training System Methodology

DOD uses the Joint Training System to deploy a joint force that integrates military service capabilities to execute assigned missions, according to joint training guidance.[33] This system is an integrated, requirements-based, four-phased methodology that aligns joint training programs—to include education and training strategy—with assigned missions that are consistent with command priorities and available resources to produce trained and ready organizations. The four phases of this methodology are the requirements, plans, execution, and assessment phases, as generally described below.

- **Phase 1: Requirements.** Derived from guidance such as the National Military Strategy, DOD directives and strategies, and joint doctrine and concepts; assigned missions; after-action reports; and commanders' intent.

- **Phase 2: Plans.** Driven by mission requirements, training audiences, and training support tools available—to include simulation and online resources.

- **Phase 3: Execution.** Conducted by the Chairman of the Joint Chiefs of Staff and combatant commands, among others, to execute joint

[33]Chairman of the Joint Chiefs of Staff Manual 3500.03E, *Joint Training Manual for the Armed Forces of the United States* (Apr. 20, 2015).

training events (including education), observe performance objectives, and evaluate performance outcomes.

- **Phase 4: Assessment.** Conducted by the commander to assess training effectiveness and joint readiness to perform missions.

DOD Guidance for Decision-Making Education and Training Is Evolving

DOD Continues to Develop Guidance

DOD guidance is evolving to support the department's education and training efforts, to include preparing leaders to make decisions in a contested information environment. With the issuance of DOD's 2016 *Strategy for Operations in the Information Environment*, the department began to develop a framework intended to prepare its force to achieve an advantage in the information environment, emphasizing tasks associated with four key lines of effort: people, programs, policies, and partnerships.[34] DOD issued the strategy to serve as a cornerstone document to align DOD actions and ensure effective integration of department efforts in a dynamic information environment.[35]

Throughout the history of warfare, militaries have sought advantage through actions intended to affect the perception and behavior of adversaries, according to the *Strategy for Operations in the Information Environment*. Although the term information environment is relatively new, the concept of an "information battlefield" is not, according to this same strategy. Since 2016, DOD has taken actions to support the strategy's acknowledgment that the role of information is an important consideration

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[34]DOD, *Strategy for Operations in the Information Environment* (June 2016). This strategy was issued in part as a response to the requirement for an "information operations" strategy in the National Defense Authorization Act for Fiscal Year 2014. *See* Pub. L. No. 113-66, § 1096 (2013).

[35]In line with the Joint Training System's four-phased methodology, this strategy also serves to align joint education and training strategy with assigned missions to produce trained and ready organizations, according to joint training doctrine. CJCSI 3500.01J and CJCSM 3500.03E.

in military planning and operations, including within an information environment that is contested. In support of the strategy, DOD elevated information as a joint function and issued multiple guidance documents that include:

- ***2017-2020 Chairman's Joint Training Guidance.*** Updated in January 2017, this guidance states that the joint force must aim to develop, educate, and train leaders to fully understand dynamic and complex threat environments to assure future success.[36]

- ***Joint Publication 1, Doctrine for the Armed Forces of the United States.*** Updated in July 2017, this joint publication articulates seven joint functions, including "information" and "command and control." This is the first time that DOD established information as the seventh joint function of the military.[37] This joint publication is being replaced by Joint Publication 1, volume 1, *Joint Warfighting* and volume 2, *The Joint Force*.[38]

- ***Joint Concept for Operating in the Information Environment (JCOIE).*** Issued in July 2018, the joint concept aimed to institutionalize and operationalize the military's approach to information operations.[39]

- ***Special Areas of Emphasis for Joint Professional Military Education in Academic Years 2020 and 2021.*** Issued in May 2019, the Chairman of the Joint Chiefs of Staff identified *Globally Integrated*

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[36]Chairman of the Joint Chiefs of Staff Notice 3500.01, *2017-2020 Chairman's Joint Training Guidance* (Jan. 12, 2017). The most recent version of this guidance was issued in December 2021 and is classified. As a result, we cite the unclassified version here.

[37]Joint Chiefs of Staff, Joint Pub. 1, *Doctrine for the Armed Forces of the United States* (Mar. 25, 2013, incorporating change 1, July 12, 2017). The seven joint functions of the military are: information, command and control, intelligence, fires, movement and maneuver, protection, and sustainment.

[38]The Joint Publications website lists the dates of issuance for these volumes as June 29 and June 19, 2020, respectively, and the July 2017 version of Joint Pub. 1 is no longer available. However, as of October 2022, Joint Pub. 1, volume 1 is still identified as a reference copy, or draft for reference purposes only, and has not yet been signed.

[39]Joint Chiefs of Staff, *Joint Concept for Operating in the Information Environment (JCOIE)* (July 25, 2018).

Operations in the Information Environment as a special area of emphasis within this memorandum.[40]

- *Joint Publication 3-0, Joint Campaigns and Operations.* Updated in June 2022, this publication revises the discussion on the information joint function consistent with Joint Publication 3-04, *Information in Joint Operations*.[41]

Figure 6 depicts examples of DOD guidance documents issued since 2016 that support the education and training of leaders to make decisions in a contested information environment.

Figure 6: Examples of DOD Guidance Documents That Support Education and Training for Decision-Making in a Contested Information Environment, 2016-2022
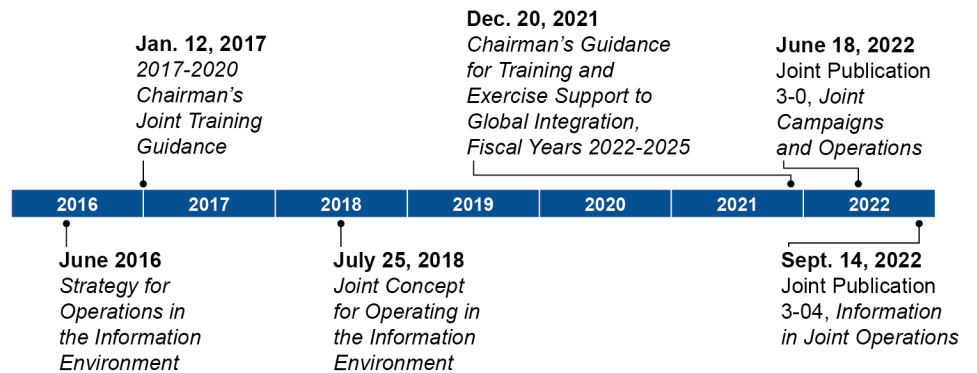
Source: GAO analysis of Department of Defense (DOD) information. | GAO-23-105608

DOD guidance documents also address decision-making through using information, gaining information advantage, exercising command and

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[40]Chairman of the Joint Chiefs of Staff Memorandum, *Special Areas of Emphasis for Joint Professional Military Education in Academic Years 2020 and 2021* (May 6, 2019). The Joint Staff selects special areas of emphasis for the Chairman of the Joint Chiefs of Staff's consideration on a biennial basis. The selection process allows DOD organizations to propose and discuss any additional key areas needed in coursework, according to joint education policy. The Chairman of the Joint Chiefs of Staff ultimately selects special areas of emphasis from the proposals and issues a memorandum describing each area. This process enables a timely and relevant education curriculum and allows institutions to incorporate new content proposed by DOD organizations, according to Joint Staff and military service officials. CJCSI 1800.01F.

[41]Joint Pub. 3-0.

control, and executing mission command concepts.[42] Table 2 describes examples of concept descriptions related to the conduct of joint and military operations in a contested information environment.

Table 2: Examples of Concept Descriptions Related to the Conduct of DOD Joint and Military Operations in a Contested Information Environment

Concepts	Descriptions
Use of information	• Commanders use information to visualize and understand the operational environment and direct and coordinate actions. • The joint force uses information to improve understanding, decision-making, and communication; and leverages information to affect the perceptions, attitudes, decision-making, and behavior of relevant actors.
Information advantage	• Information advantage is the operational advantage gained through the joint force's use of information for decision-making and its ability to leverage information to create effects on the information environment.
Command and control	• Command and control is the exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. • Command and control enhances the commander's ability to make sound and timely decisions and successfully execute them. • Effective command and control depends on the right person having the right information at the right time to support decision-making.
Mission command	• Mission command is the conduct of military operations through decentralized execution based upon mission-type orders. • Essential to mission command is the thorough understanding of the commander's intent at every level of command and a command climate of mutual trust and understanding.

Source: GAO analysis of Department of Defense (DOD) information. I GAO-23-105608

DOD Has Efforts Underway Aimed at Mitigating Limitations of Existing Guidance

While DOD has taken positive steps to develop guidance to support decision-making in a contested information environment, DOD officials recognize certain limitations associated with its existing body of guidance. These limitations include the use of differing doctrine, definitions, and concepts related to the information environment and operations in this environment.

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[42]Joint Pub. 3-04; Joint Pub. 1, volume 2; Joint Pub. 3-0; DOD, *Summary of the Joint All-Domain Command and Control (JADC2) Strategy* (March 2022); Joint Chiefs of Staff, *Joint Concept for Operating in the Information Environment (JCOIE)* (July 25, 2018); Chairman of the Joint Chiefs of Staff Memorandum, *Special Areas of Emphasis for Joint Professional Military Education in Academic Years 2020 and 2021* (May 6, 2019); and CJCSN 3500.01.

To make additional progress in this area, officials from the Office of the Under Secretary of Defense for Personnel and Readiness, the Office of the Under Secretary of Defense for Policy, and the Joint Staff emphasized the existence of multiple efforts across the department that are underway to address the limitations of DOD's existing guidance in addressing operational issues. These efforts include issuing new or updated guidance that address aspects of decision-making in operational and information environments. Specifically:

- DOD issued the *Joint All Domain Command and Control (JADC2) Strategy* and *JADC2 Strategy Implementation Plan* to set up a doctrinal, operational, and technical framework to operate in a contested information environment.[43]

- DOD also issued a new Joint Publication 3-04, *Information in Joint Operations*, in 2022 to provide fundamental principles and guidance to plan, coordinate, execute, and assess the use of information during joint operations.[44] This publication includes a revised definition of the "information environment" and updates the terminology used to discuss operations in the information environment.[45]

- DOD completed an assessment of capability gaps and challenges associated with operations in the information environment (i.e., a posture review) in September 2022 that is informing the department's ongoing efforts to revise the 2016 *Strategy for Operations in the Information Environment*, according to officials from the Office of the

[43]DOD, *Summary of the Joint All-Domain Command and Control (JADC2) Strategy* (March 2022); and DOD, *JADC2 Strategy Implementation Plan* (March 2022). The strategy and its accompanying implementation plan are classified. As a result, we cite the unclassified summary and titles of these documents here.

[44]Joint Pub. 3-04, *Information in Joint Operations* (Sept. 14, 2022).

[45]These revisions and updates include: (1) revising the current definition of the "information environment" (which emphasizes the individuals, organizations, and systems that collect, process, disseminate, or act on information), to instead emphasize how intangible factors can affect how these actors derive meaning from, are impacted by, and act upon information; and (2) removing terms, such as "information operations" and "information superiority," from the *DOD Dictionary of Military and Associated Terms*.

Under Secretary of Defense for Policy.[46] These officials plan to submit their strategy revisions to the Secretary of Defense for approval early in 2023.

With these ongoing efforts, DOD is on track to improve its understanding of the information environment and to better meet related operational needs across the department—including those involving education and training for decision-making in a contested information environment. By continuing to take such steps to issue joint doctrine and update department-wide strategy to address contested information environment-related threats and decision-making concepts, DOD should have a solid basis for educating and training the joint force.

DOD Provides Education and Training but Components Lack Clarity and Resource Needs Have Not Been Assessed

DOD provides some education and training to prepare leaders to make decisions in a contested information environment. However, DOD components lack clarity about what contested information environment content to include, and report that resources for these education and training efforts may be limited.

DOD Provides Leaders with Education and Training for Decision-Making in a Contested Information Environment

DOD components provide education and training throughout leaders' careers to prepare them to make decisions in a contested information environment. DOD components we focused on in our work include the

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[46]In prior work, we recommended that DOD conduct such a review, but DOD disagreed with this recommendation. Congress has addressed DOD's role in the information environment with a number of provisions in National Defense Authorization Acts—including a requirement that led to DOD initiating the posture review. GAO, *Information Operations: DOD Should Improve Leadership and Integration Efforts*, GAO-20-51SU (Washington, D.C.: Oct. 18, 2019); GAO, *Information Environment: DOD Operations Need Enhanced Leadership and Integration of Capabilities*, GAO-21-525T (Washington, D.C.: Apr. 30, 2021); and the National Defense Authorization Act for Fiscal Year 2020, Pub. L. No. 116-92, § 1631 (2019).

military services, U.S. European Command, U.S. Indo-Pacific Command, U.S. Special Operations Command, and the National Defense University.
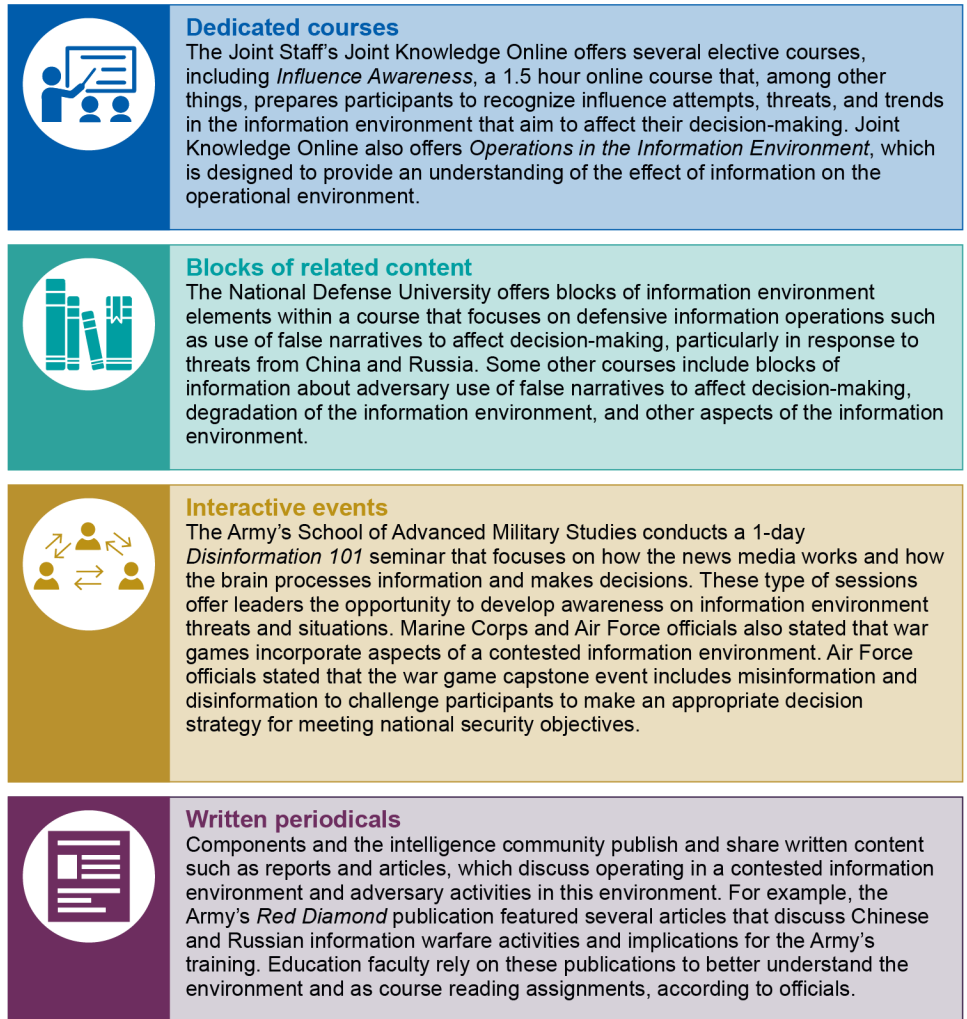
Decision-Making Education

DOD joint education policy currently requires professional military education programs, taught at military service colleges and schools, to teach about the information environment. Specifically as of 2022, these institutions must incorporate *Globally Integrated Operations in the Information Environment* into coursework.[47] This special area of emphasis builds on permanent education requirements related to decision-making in the Joint Learning Areas, such as *Strategic Thinking and Communication*, which require that officers learn to distinguish reliable from unreliable information and critically evaluate information to inform understanding of context and meaning and make decisions.[48] Education institutions incorporate this content through dedicated courses, blocks of related content, interactive events, and written periodicals (see figure 7).

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[47]Chairman of the Joint Chiefs of Staff Memorandum, *Special Areas of Emphasis for Joint Professional Military Education in Academic Years 2020 and 2021* (May 6, 2019). As of June 2022, the Chairman of the Joint Chiefs of Staff requires joint professional military education institutions to incorporate special areas of emphasis into coursework. Chairman of the Joint Chiefs of Staff Instruction 1800.01F, *Officer Professional Military Education Policy* (May 15, 2020).

[48]Chairman of the Joint Chiefs of Staff Manual 1810.01, *Outcomes-Based Military Education Procedures for Officer Professional Military Education* (Apr. 1, 2022). Joint Learning Areas are categories of knowledge and capabilities that officers acquire over their careers through joint education, training and experience.

Figure 7: Examples of Information Environment Content in DOD Coursework, Fiscal Years 2018–2022

Dedicated courses
The Joint Staff's Joint Knowledge Online offers several elective courses, including *Influence Awareness*, a 1.5 hour online course that, among other things, prepares participants to recognize influence attempts, threats, and trends in the information environment that aim to affect their decision-making. Joint Knowledge Online also offers *Operations in the Information Environment*, which is designed to provide an understanding of the effect of information on the operational environment.

Blocks of related content
The National Defense University offers blocks of information environment elements within a course that focuses on defensive information operations such as use of false narratives to affect decision-making, particularly in response to threats from China and Russia. Some other courses include blocks of information about adversary use of false narratives to affect decision-making, degradation of the information environment, and other aspects of the information environment.

Interactive events
The Army's School of Advanced Military Studies conducts a 1-day *Disinformation 101* seminar that focuses on how the news media works and how the brain processes information and makes decisions. These type of sessions offer leaders the opportunity to develop awareness on information environment threats and situations. Marine Corps and Air Force officials also stated that war games incorporate aspects of a contested information environment. Air Force officials stated that the war game capstone event includes misinformation and disinformation to challenge participants to make an appropriate decision strategy for meeting national security objectives.

Written periodicals
Components and the intelligence community publish and share written content such as reports and articles, which discuss operating in a contested information environment and adversary activities in this environment. For example, the Army's *Red Diamond* publication featured several articles that discuss Chinese and Russian information warfare activities and implications for the Army's training. Education faculty rely on these publications to better understand the environment and as course reading assignments, according to officials.

Source: GAO analysis of Department of Defense (DOD) information. | GAO-23-105608

DOD also continues to incorporate updated decision-making content in its education offerings. For example, the Army University School of Command Preparation is developing a 1-hour lesson on *Data Science Literacy* to improve decision-making in a degraded information environment. The lesson aims to educate commanders about how data analytics can improve unit effectiveness through rapid understanding and decision-making. Nevertheless, Air Force, Army, and National Defense University officials stated the majority of education coursework is driven

by requirements from Congress and DOD, and that it is challenging to add course content without removing material.

Decision-Making Training

DOD components have also incorporated decision-making concepts in a contested information environment into training exercises and seminars. In after-action reports and summaries of training, we found that many components introduce a contested information environment in exercises by spoofing information systems, inserting disinformation, or jamming communication systems.

For example, the Marine Corps held a 15-day warfighting exercise in February 2021 that included more than 3,000 participants. Competition in the information environment was a key aspect of the exercise, in which leaders and staff practiced operating in a contested multi-domain environment that included the information environment. During the exercise, units were exposed to phishing emails intended to gain unauthorized access to networks and expose technical and tactical data. They also learned how to operate in a challenging command and control environment. The exercise also leveraged the Army's Information Operations Network, which provides an isolated and immersive environment that emulates social media and digital domains.

In addition, the Army's National Training Center leverages the Army-owned Information Operations Network, the Cyber Environment Replication Program of Record, and the Independent Commercially Compatible Cellular Network System to jointly simulate a contested information environment.[49] For example, in the Information Operations Network, participants can use social media and read posts and news articles from role players that inject information such as local public sentiment or disinformation. DOD components, to include the Joint Staff and U.S. European Command, also leverage the network for training to make decisions in a contested information environment.

Moreover, components consistently practice disruptions in mission command that DOD expects to be targeted by adversaries.[50] Officials from all seven training components in our scope stated that the

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[49]The Information Operations Network is part of the Army's Cyber Environment Replication program of record, which includes a number of software and system capabilities related to these efforts, according to Army officials.

[50]DOD, *Electromagnetic Spectrum Superiority Strategy* (October 2020).

components practice disruptions in mission command by removing the leader from the exercise or by degrading communication systems. For example, in one 2019 training exercise, a Marine Corps leader decided to impose strict limitations on the use of the communication system when contacting higher command officials because the leader was concerned that the opposition force might intercept communications.[51] By using mission command principles to make decisions, the leader and the unit were able to practice it in training. Scenarios like these allow leaders to practice simulated attempts to impede command and control activities, according to officials. Figure 8 illustrates Marine Corps officers conducting a war-gaming scenario designed to improve decision-making during training.

Figure 8: Marine Corps Officers Conduct a War-Gaming Scenario to Increase Proficiency in Real-Time Decision-Making, October 2021

Source: U.S. Marine Corps/Corporal Yvonne Guyette. | GAO-23-105608

[51]Opposition forces are used in training and exercises to simulate adversaries, according to Marine Corps officials.

DOD Components Are Unclear about Content to Include in Education and Training

While DOD and its components provide some education and training for decision-making in a contested information environment, officials are unclear about what content to include and report that resources may be limited for these education and training efforts.

DOD Components Are Unclear about What Content to Include in Education and Training

Decision-Making Education

Current DOD education guidance on the information environment does not specify what content to include and is set to expire in 2023. As previously discussed, the Chairman of the Joint Chiefs of Staff identified *Globally Integrated Operations in the Information Environment* as a special area of emphasis in May 2019. While the 2019 memorandum for the current special areas of emphasis includes a requirement to cover operations in the information environment content, it does not specify what aspects of the information environment should be covered in coursework.[52] Specifically, the memorandum that describes the topic area does not specify what aspects of operations should be covered for the information environment, such as whether to focus on DOD affecting the adversary's information environment (i.e., offensive-oriented actions) or scenarios where an adversary degrades or modifies DOD's information environment (i.e., defensive-oriented actions). As a result, while institutions have incorporated this content into coursework based on current guidance and their understanding of what the information environment entails, there is a lack of clarity about what specific content to include.

Furthermore, the designation of the information environment as a special area of emphasis is due to expire in 2023 when the Chairman of the Joint Chiefs of Staff's memorandum expires and new special areas of emphasis are identified.[53] As of July 2022, the final list of proposals for

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[52]Chairman of the Joint Chiefs of Staff Memorandum, *Special Areas of Emphasis for Joint Professional Military Education in Academic Years 2020 and 2021* (May 6, 2019).

[53]Special areas of emphasis are in effect for 2 years unless an extension is issued. Joint Staff officials review special areas of emphasis annually, and according to officials, new special areas of emphasis are typically selected every 2 years. CJCSI 1800.01F.

2023 did not include the information environment as a special area of emphasis, and the proposals also did not focus on decision-making in this environment, according to a cognizant Joint Staff education official. Some institutions may continue to teach the information environment in courses in response to the *Strategic Thinking and Communication* Joint Learning Area based on their recognition of the importance of emerging issues, such as the information environment. However, the removal of the information environment as a special area of emphasis could mean that institutions may no longer educate DOD leaders on this critical battlespace—much less not address how to make timely and effective decisions in a contested information environment.

Decision-Making Training

We found that training may not include the full spectrum of threats that could arise within a contested information environment because there is no requirement that it do so. At a high level, joint guidance calls for exercises that simulate activities in a contested information environment and include effects based on realistic adversary capabilities.[54] The guidance further calls for exercises that address the ability of adversaries to undermine strategic and operational strength by impeding or denying command and control abilities.

DOD components have responded to the general recommendations in guidance and provided training that includes decision-making and information environment content. According to our review of selected training documentation provided by components (including training guidance, exercise scenarios, and summaries of completed training, and interviews with DOD officials), training content is inconsistent, though. For example, training may only include certain effects, does not consistently include decision-making in a contested information environment, and focuses more on offensive rather than defensive scenarios, as described below.[55]

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[54]Chairman of the Joint Chiefs of Staff Guidance 3500.01, *Chairman's Guidance for Training and Exercise Support to Global Integration, Fiscal Years 2022-2025* (Dec. 20, 2021) (S).

[55]We asked officials from each training component to provide a sample of after-action reports from exercises conducted between fiscal year 2018 through 2022 that include scenarios with a contested information environment.

- **Training includes certain contested information environment effects, but not others.** Officials in six of seven DOD training components told us they expose leaders to the information environment by teaching information environment concepts, inserting disinformation or misinformation, and disrupting communications.[56] However, these examples do not comprise the full known spectrum of information environment adversary effects. For example, Army documentation states that installations currently lack the capability to train formations at home stations to operate effectively in a contested environment. In response, the Army currently has a pilot program underway to improve replication of electromagnetic spectrum and electromagnetic warfare in training. Army officials also noted that the process for receiving approval to jam the full range of frequencies within the electromagnetic spectrum during time periods necessary for training is both lengthy and cumbersome. Also, the times approved are often not available to support a commander's desired training windows. Moreover, contested effects, specifically jamming against protected frequencies, are not generated, and this decreases training realism.[57]

  Air Force officials told us that the Air Force needs to improve training. These officials noted that while leaders are familiar with cybersecurity, training should include greater exposure to the information environment, including potential challenges, to make training more realistic.

- **Training exercises do not consistently include decision-making in a contested information environment.** While all training components we interviewed stated that they include decision-making topics in training and exercises, only four of the seven stated that they practice decision-making in a contested information environment. Specifically, these four components use scenarios that include

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[56]We spoke to components involved in providing training, specifically the Army's National Training Center, 16th Air Force, Navy Commander Pacific Fleet and Commander Fleet Forces Command, Marine Corps Air Ground Task Force Training Command, as well as training officials from several combatant commands including Special Operations Command, Indo-Pacific Command, and European Command.

[57]Army officials stated they must coordinate with the Federal Aviation Administration and Federal Communications Commission for approval prior to contesting certain frequencies within the electromagnetic spectrum. It is particularly difficult to use "protected frequencies," which includes Global Positioning Systems. These frequencies are often approved for jamming during low-impact times, which are more prevalent at night. These narrow windows and necessity to train at night can negatively affect training scenarios and opportunities for service members to develop and improve their decision-making skills in a contested operational environment, which includes a contested information environment.

adversary effects on the decision-making process, disinformation, and misinformation. However, three components we interviewed do not use scenarios with these or other adversary effects in the information environment. In addition, exercise reports that we reviewed included varying amounts of content about a contested information environment, if any. For example, DOD components practice decision-making in training by leveraging decision-making strategies and tables as guides. However, making decisions in an actual contested information environment is distinct and includes conditions, such as disinformation, that are not accounted for in current decision-making strategies. This type of contested information environment may be unexpected for officials who only practice decision-making within a narrow range of training scenarios, and, therefore, not as frequently as other officials.

- **Components focus more on offensive information environment scenarios than defensive scenarios.** Some exercise scenarios focus on DOD offensively affecting the adversary's information environment and do not frequently focus on defensive scenarios where an adversary degrades DOD's information environment. Six of seven training components in our scope told us they expose leaders to the information environment during training. However, even with clarification when asked about defensive training and education efforts for decision-making in a contested information environment, several groups of officials responded with a focus on offensive, rather than defensive, scenarios. In addition, some of the exercise reports we reviewed mention the information environment but focus on influencing the adversary's environment. These exercises do not discuss practicing for an environment that becomes contested when manipulated by an adversary. While DOD components may include information environment content in training, the more frequent emphasis on *offensive* scenarios rather than *defensive* scenarios means that there is less of an emphasis on the specific skills necessary for decision-making under the latter.

DOD Has Not Provided Clear Guidance for Education and Training

Officials from two training components told us that additional guidance is needed for them to incorporate more contested information environment content into coursework. Several DOD officials affirmed that such guidance was missing and would be helpful to ensure commanders are prioritizing this content and not arbitrarily adding it into training exercises. Joint Staff officials agreed that additional guidance may be necessary to ensure education institutions include contested information environment

content into coursework. In addition, officials from one other training component told us that the lack of a common understanding of the information environment makes training challenging.

DOD's joint training guidance provides that joint training must be realistic: forces should train the way they fight, and training must be based on relevant conditions and realistic standards.[58] DOD's 2016 *Strategy for Operations in the Information Environment* recognizes the importance of operating in a contested information environment and educating and training commanders for these operations.[59] In addition, *Standards for Internal Control in the Federal Government* state that management should design control activities to achieve objectives and respond to risks, and implement these control activities through policies.[60]

However, the Chairman of the Joint Chiefs of Staff has not developed department-wide guidance about what content to include in its education and training efforts for decision-making in a contested information environment, as well as the type and frequency of efforts needed for leaders to develop skills in this area. Specifically, the current education and training guidance only contains general recommendations and does not include clear guidance or information to help components understand education and training goals.[61]

Until DOD develops clear, department-wide guidance about what content to include in its education and training efforts for decision-making in a contested information environment, as well as the type and frequency of efforts needed, DOD will not be positioned to effectively operate in an increasingly contested information environment.

DOD Has Not Assessed Resource Needs

DOD officials also noted that there are simulation, infrastructure, and personnel resource limitations associated with their contested information environment education and training efforts. These officials cited examples of resources that would be helpful for planning and executing realistic education courses and training exercises to practice decision-making in a

[58]CJCSI 3500.01J.

[59]DOD, *Strategy for Operations in the Information Environment* (June 2016).

[60]GAO-14-704G.

[61]Chairman of the Joint Chiefs of Staff Memorandum, *Special Areas of Emphasis for Joint Professional Military Education in Academic Years 2020 and 2021* (May 6, 2019).

contested information environment. Figure 9 describes these limited resources as they relate to education and training in the information environment.

Figure 9: Description of Limited Resources Identified by DOD Officials for Information Environment Education and Training
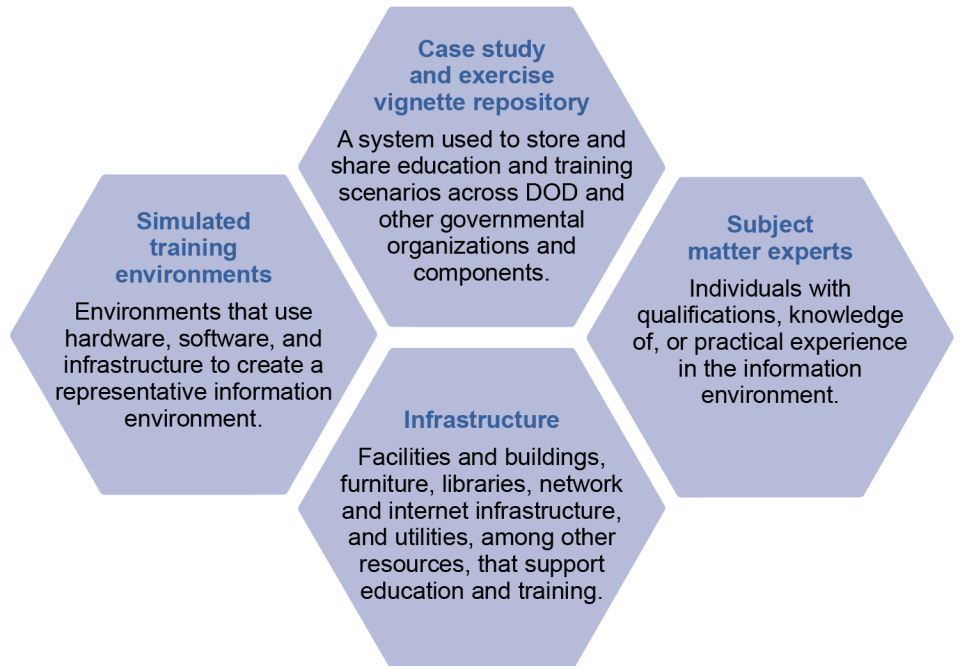
Source: GAO analysis of Department of Defense (DOD) information. | GAO-23-105608

Note: DOD officials provided input in the development of these descriptions.

- **Simulated training environments.** Officials from three of seven education components and five of seven training components identified simulation capabilities as lacking.[62] While they are able to meet existing requirements, they are challenged to reproduce a realistic training environment. These resources can be leveraged to simulate varying effects in a contested information environment in a more realistic way. For example, U.S. Indo-Pacific Command officials

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[62]We spoke with several components involved in providing education: the National Defense University, professional military education officials of the Army, Navy, Air Force, and Marines; and military education officials from U.S. Special Operations Command's Joint Special Operations University and European Command. Although not officially recognized as professional military education institutions, U.S. European Command and U.S. Special Operations Command provide education, including some professional military education, to military service members. As a result, we decided to include both of these commands' interviews in our analysis.

stated that it is difficult to replicate a realistic information environment outside of a training center, given challenges with bounding the exercise. These officials highlighted the need for a persistent, interconnected training capability to execute high-end, all-domain exercises with a continuous and integrated joint experimentation campaign. In addition, Navy officials stated that they are limited in certain electromagnetic spectrum effects in live training due to safety concerns.

The Joint Special Operations University of the U.S. Special Operations Command expressed interest in creating an information environment lab to replicate a contested information environment through virtual reality simulations. This simulation environment would allow students to engage in decision-making under a contested environment to practice specific concepts and skills as many times as necessary.

- **Infrastructure.** Officials from two of seven education components and six of seven training components identified lacking infrastructure as a challenge for adding some information environment content to education and training. The lacking infrastructure they identified includes facilities and buildings, furniture, libraries, network and internet infrastructure, and utilities, among other resources that support education and training. Such infrastructure would allow more service members to be educated and trained in a limited period of time, including those based in distant locations like Hawaii, according to Marine Corps officials.

  Marine Corps Air Ground Task Force Training Command officials stated that their main training center does not have the training capability or wireless network infrastructure, such as 4G or 5G networks, to effectively simulate a realistic information environment. Furthermore, Army education officials noted that basic resources such as software, computers, and maintenance are limited. Newer software and hardware, for example, would allow Army education officials to more effectively complete education outcomes that could include preparing leaders to make decisions in a contested information environment, according to these same officials.

- **Subject matter experts.** Three of seven education components and two of seven training components identified their ability to find, hire, retain, or leverage current DOD subject matter experts in the information environment or decision-making fields as a challenge. Specifically, officials stated that experts who understand the

information environment can be leveraged to help to develop and execute education and training, as well as provide feedback to leaders. However, education and training officials from three components stated that it is challenging to leverage these experts, in part because of private sector competition or internal demand for their expertise. In addition, officials stated that many experts hold positions focused on the information environment rather than positions conducting education and training on the topic. For example, Joint Staff officials stated that exercise planners are unable to leverage experts on the information environment as frequently as necessary due to their other responsibilities. Consequently, the exercises are at risk of not including concepts or context that subject-matter experts could provide.

Yet, some components leverage subject matter experts to improve training. For example, the Navy and the Marine Corps leverage subject matter experts (including information warfare officers and retired commanders) during exercises. These individuals attend the exercise with the commander and provide feedback and mentorship throughout the exercise. Air Force officials noted that there have been some discussions with other components to integrate information environment experts into teams across military services to better distribute the expertise where it is needed.

- **Case study and exercise vignette repository.** One of seven education components and four of seven training components identified as a challenge the ability of trainers to develop and maintain exercise scenarios, vignettes for courses and exercises, and other materials. Army education officials stated that a repository with case studies, including those on the information environment, would help them leverage resources created by other components. Such a resource would assist with course and exercise design in the absence of specific experts.

Some component organizations maintain similar resources. For example, U.S. Special Operations Command officials told us they coordinated with Marine Special Operations Command to write many vignettes for exercises. Also, the Navy's Carrier Strike Group-4 playbook contains scenarios that can be incorporated into training exercises. Each scenario is one to several pages long and provides trainers and Navy units key information, such as the main intents of the training and the training objectives.

Education and training officials also identified a number of other challenges that limit the creation of a realistic contested information environment, such as available time to meet all training and education requirements and funding to implement training and education.

According to our *Human Capital: A Guide for Assessing Strategic Training and Development Efforts in the Federal Government*, periodic reassessments should be part of a continual effort to evaluate and improve an agency's education and training efforts, and evidence of timely changes should be reflected in those efforts.[63]

However, DOD officials stated that the Chairman of the Joint Chiefs of Staff has not conducted an assessment or comprehensively reviewed related component assessments of the resources necessary to meet needs for educating and training leaders to make decisions in a contested information environment. Conducting such efforts could help DOD identify modifications, if any, needed to improve the results of future education and training efforts to increase the preparedness of DOD's leaders to make such decisions.

While the Chairman of the Joint Chiefs of Staff has not comprehensively reviewed related component assessments of the resources needed, some DOD components have conducted such assessments to improve education and training for future multi-domain operations—including operations in a contested information environment. In speaking with DOD components, all groups of officials who discussed challenges referenced the lack of at least one resource (i.e., simulated training environments, infrastructure, or subject matter experts) as affecting their ability to educate and train leaders to make decisions in a contested information environment. A Joint Staff education official also agreed that resources will always be a challenge, especially since the information environment is an evolving field that is garnering more attention. For example, the Army's Combat Training Center Master Plan notes that the future force will require an agile training environment that replicates timely and realistic effects across all domains, among other things.[64] While individual corrective actions may address some of the resource challenges identified, a department-wide assessment that includes a comprehensive

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[63]GAO-04-546G.

[64]United States Army, *Combat Training Center Master Plan FY2024-2028* (Dec. 3, 2021).

review of related component assessments can enhance the department's ability to address DOD-wide issues.

Until the Chairman of the Joint Chiefs of Staff conducts an assessment and comprehensively reviews related component assessments of the resources necessary to achieve education and training objectives and makes any appropriate modifications, DOD will not be well-positioned to ensure that leaders are prepared for an increasingly contested information environment. This could adversely affect DOD's success in its operations and its ability to achieve military and national security objectives.

Conclusions

DOD operations in the information environment play a pivotal role in engaging our adversaries in military operations. The information environment is influenced, either positively or negatively, by the people, organizations, and systems that interact with given information. As such, it is critical for leaders to be prepared to engage with the information environment when it is contested and to understand how adversaries may seek to influence their decision-making.

DOD continues to take positive steps to evolve guidance for decision-making in a contested information environment and has previously promulgated some education and training content related to such decision-making. However, current DOD guidance does not address what content to include in decision-making education and training for leaders when operating in a contested information environment. Further, training may not include the full spectrum of threats that could arise in this environment. By addressing this gap, DOD has an opportunity to clarify for its components what contested information environment content to incorporate into its leader development efforts to operate and make decisions effectively across multi-domain operations.

While DOD offers some simulations, infrastructure, and experts to provide education and training, DOD has not assessed or comprehensively reviewed resources needed to educate and train leaders to be prepared to make decisions in a contested information environment. By working to better understand resource needs, DOD can continue its momentum to prepare the future fighting force for multi-domain operations. In doing so, DOD also has an opportunity to take advantage of component

assessments already completed as well as to better assess what resources the department requires.

Recommendations for Executive Action

We are making the following two recommendations to DOD:

The Secretary of Defense should ensure that the Chairman of the Joint Chiefs of Staff, in consultation with the combatant commands and the military services, develops department-wide guidance about what content to include in its education and training efforts for decision-making in a contested information environment, as well as the type and frequency of such efforts necessary for leaders to develop skills in this area. (Recommendation 1)

The Secretary of Defense should ensure that the Chairman of the Joint Chiefs of Staff, in consultation with the Under Secretary of Defense for Personnel and Readiness, the combatant commands, and the military services, conducts an assessment and comprehensively reviews related component assessments of the resources necessary to meet current needs for educating and training leaders to make decisions in a contested information environment. The assessment should also identify modifications, if any, needed to improve the results of future education and training efforts to increase the preparedness of DOD's leaders to make such decisions. (Recommendation 2)

Agency Comments and Our Evaluation

We provided a draft of this report to DOD for review and comment. DOD provided written comments, in which it partially concurred with one of our recommendations and concurred with the other. We reprinted DOD's written comments in their entirety in appendix II. DOD also provided technical comments, which we incorporated into the report as appropriate.

DOD partially concurred with our first recommendation to develop department-wide guidance about what content to incorporate in its education and training efforts for decision-making in a contested information environment, to include the type and frequency of these efforts. In its comments, the department stated that the Secretary of Defense would develop department-wide guidance regarding what

content to include in education and training efforts for decision-making in a contested information environment, as appropriate. The department noted, though, that the combatant commands would determine the frequency of such efforts based on their respective operational tempos. We agree that the appropriate officials or components responsible for taking action will differ depending on the situation. To the extent that the appropriate officials in DOD develop guidance that includes topics and conditions identified in this report—such as the specific content, type, and frequency of the department's related education and training efforts—we believe this will help address the intent of our recommendation.

DOD concurred with our second recommendation and stated that the department will assess the resources necessary to meet related education and training needs, as appropriate. The department did not provide a timeframe for completing such an assessment. Given the critical nature and challenges associated with conducting operations in a contested information environment, the department will be better positioned to provide any required education and training resources by taking these actions in the near future.

We are providing copies of this report to the appropriate congressional committees; the Secretary of Defense; the Under Secretary of Defense for Personnel and Readiness; the Under Secretary of Defense for Policy; the Chairman of the Joint Chiefs of Staff; the Secretaries of the Army, Navy, and Air Force; the Commandant of the Marine Corps; and the Chief of Space Operations, U.S. Space Force. In addition, the report is available at no charge on the GAO website at https://www.gao.gov.

If you or your staff have any questions concerning this report, please contact me at 202-512-9971 or KirschbaumJ@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix III.

Joseph W. Kirschbaum
Director, Defense Capabilities and Management

Appendix I: Scope and Methodology

To describe Department of Defense (DOD) guidance that supports the department's education and training efforts to prepare leaders to make decisions in a contested information environment, we reviewed and analyzed—including through manual reviews and the conduct of keyword-based context extraction using text analytics—overarching DOD policy and strategy documents issued since fiscal year 2018.[1] These documents include guidance related to various aspects of education and training to prepare the joint force for operations in a contested information environment. Specifically, we reviewed the Information in *Joint Operations*, *Joint Concept for Operating in the Information Environment (JCOIE)*, and the *Summary of the Joint All-Domain Command and Control (JADC2) Strategy* guidance documents, among others.[2]

We also reviewed other guidance documents most relevant to the topic that pre-date the fiscal year 2018 timeframe based on related, prior work

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[1]In conjunction with our review of DOD guidance and the conduct of text analytics, we also reviewed the department's terminology program to identify existing definitions of terms, including "information environment," and developed terminology and concepts where they were absent. For example, because DOD has not established a definition of the term "contested information environment," we developed related concepts for this term, which we use throughout this report. We generally limited our review to guidance issued since fiscal year 2018 because the *Joint Concept for Operating in the Information Environment (JCOIE)*, which aimed to institutionalize and operationalize the military's approach to information operations, was issued on July 25, 2018 (i.e., fiscal year 2018). According to Joint Pub. 3-04, the joint force is transitioning from information operations to operations in the information environment. Joint Chiefs of Staff, Joint Pub. 3-04, *Information in Joint Operations* (Sept. 14, 2022).

[2]Joint Pub. 3-04; Joint Chiefs of Staff, *Joint Concept for Operating in the Information Environment (JCOIE)* (July 25, 2018); and DOD, *Summary of the Joint All-Domain Command and Control (JADC2) Strategy* (March 2022). The other documents we reviewed are the Joint Chiefs of Staff, Joint Pub. 3-0, *Joint Campaigns and Operations* (June 18, 2022); Chairman of the Joint Chiefs of Staff Guidance 3500.01, *Chairman's Guidance for Training and Exercise Support to Global Integration, Fiscal Years 2022-2025* (Dec. 20, 2021) (S); Chairman of the Joint Chiefs of Staff Instruction 1800.01F, *Officer Professional Military Education Policy* (May 15, 2020); Chairman of the Joint Chiefs of Staff Instruction 3500.01J, *Joint Training Policy for the Armed Forces of the United States* (Jan. 13, 2020); Chairman of the Joint Chiefs of Staff Memorandum, *Special Areas of Emphasis for Joint Professional Military Education in Academic Years 2020 and 2021* (May 6, 2019); and DOD, *Fact Sheet: 2022 National Defense Strategy* (Mar. 28, 2022).

and as identified by officials representing the DOD components in our scope. For example, we reviewed, among other guidance documents referenced in this report, *Information Operations (IO)*, *Doctrine for the Armed Forces of the United States*, and the *Strategy for Operations in the Information Environment*.[3]

We interviewed DOD officials from the following selected department components who play a role in overseeing and implementing the department's decision-making education and training efforts for operations in a contested information environment:

- the Office of the Under Secretary of Defense for Personnel and Readiness,

- the Office of the Under Secretary of Defense for Policy,

- the Joint Staff,

- five military services, and

- three unified combatant commands.

We interviewed these officials to obtain their perspectives on the department's strategic guidance related to education and training efforts and to discuss initiatives they have underway in support of these efforts.[4]

To evaluate the extent to which DOD provides education and training designed to prepare leaders to make decisions in a contested information environment, we reviewed and analyzed key information and documents related to DOD strategy, doctrine, policies, education, and military training

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[3]DOD Directive 3600.01, *Information Operations (IO)* (May 2, 2013, incorporating change 1, May 4, 2017); Joint Chiefs of Staff, Joint Pub. 1, *Doctrine for the Armed Forces of the United States* (Mar. 25, 2013, incorporating change 1, July 12, 2017); and DOD, *Strategy for Operations in the Information Environment* (June 2016). This strategy was issued in part as a response to the requirement for an information operations strategy in the National Defense Authorization Act for Fiscal Year 2014, Pub. L. No. 113-66, § 1096 (2013). The other documents we reviewed included Chairman of the Joint Chiefs of Staff Notice 3500.01, *2017-2020 Chairman's Joint Training Guidance* (Jan. 12, 2017); Chairman of the Joint Chiefs of Staff Manual 3500.03E, *Joint Training Manual for the Armed Forces of the United States* (Apr. 20, 2015); and Joint Chiefs of Staff, Joint Pub. 3-13, *Information Operations* (Nov. 27, 2012, incorporating change 1, Nov. 20, 2014), which was cancelled on September 14, 2022, per Joint Pub. 3-04.

[4]We selected the following five military services—Army, Marine Corps, Navy, Air Force, and Space Force—and the following three unified combatant commands—U.S. European, U.S. Indo-Pacific, and U.S. Special Operations Commands.

exercises.[5] We conducted semi-structured interviews with a nongeneralizable sample of officials from selected DOD components that (1) provide, educate, and train service members who comprise the bulk of the joint force and (2) represent a diversity of geographic and functional commands.

We selected five of six military services—Army, Marine Corps, Navy, Air Force, and Space Force—because they provide, educate, and train the majority of military service members who comprise the bulk of the joint force.[6] Within four of the services that we selected, excluding Space Force, we spoke with officials from the education institutions identified by the military services and officials from at least one key training center for each component.[7] We also included three unified combatant commands—U.S. European Command, U.S. Indo-Pacific Command, and U.S. Special Operations Command—because they are expected to have direct battlefield engagement with adversaries. Additionally, we included the National Defense University because of its mission to educate joint warfighters and national security leaders.

During these interviews, we discussed education and training efforts between fiscal year 2018 through 2022. We also discussed related challenges. We selected fiscal year 2018 as the start of our timeframe because the *Joint Concept for Operating in the Information Environment*, which addresses the role of information and its potential to change or maintain the drivers of behavior, was issued on July 25, 2018 (i.e., fiscal

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[5]In its broadest sense, education conveys general bodies of knowledge; develops habits of mind applicable to a wide spectrum of endeavors; and fosters diverse perspectives, critical analysis, abstract reasoning, comfort with ambiguity and uncertainty, and innovative thinking, particularly with respect to complex, nonlinear problems. Training is defined as instruction and applied exercises for acquiring and retaining knowledge, skills, abilities, and attitudes necessary to complete specific tasks. CJCSI 3500.01J. For the purposes of this report, we mainly focus on the extent to which leaders are receiving the education and training experiences needed to fully understand the adversary's effect on their defensive capabilities.

[6]We did not include the Coast Guard within our scope given our compressed audit time frames, and because the Coast Guard is part of the Department of Homeland Security, except when operating as part of the Navy under section 103 of Title 14, U.S. Code.

[7]We spoke with officials from Space Force regarding their education and training efforts but did not include them in the semi-structured interviews because they are still developing their education and training programs and largely rely on Air Force education and training efforts. Key training components include, for example, the Army's National Training Center. For a listing of additional training centers, see table 3 below.

year 2018).[8] Moreover, beginning with fiscal year 2018 allowed us to include over 2 years of time prior to COVID-19 to ensure that our 5 (fiscal) year timeframe included baseline years that were not affected by COVID-19-related operations. We scoped our review through fiscal year 2022 to provide current information regarding ongoing education and training efforts.

We included within our scope different grades of commanders—O-5 and above and noncommissioned officers (E-8 and E-9)—which we refer to collectively as leaders.[9] We selected these grades as the leaders group after consulting officials across multiple DOD components, because of the leadership roles these individuals have, at both the operational and tactical levels of warfare, in overseeing how service members conduct operations in an information environment that becomes contested.[10]

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[8]Joint Chiefs of Staff, *Joint Concept for Operating in the Information Environment (JCOIE)* (July 25, 2018). This joint concept also aimed to institutionalize and operationalize the military's approach to information operations, now referred to as "operations in the information environment," according to Joint Pub. 3-04.

[9]The term "grade" means a step or degree, in a graduated scale of office or military rank that is established as a grade by law or regulation. 10 U.S.C. § 101. **Officer grades** range from O-1 to O-10, with O-1 being the lowest ranking grade and O-10 being the highest ranking grade. For example, in the Army, the Marine Corps, the Air Force, and the Space Force, O-5s and O-6s are known as "lieutenant colonels" and "colonels," respectively; in the Navy, they are known as "commanders" and "captains," respectively. **Enlisted grades** range from E-1 to E-9, with E-1 being the lowest ranking grade and E-9 being the highest ranking grade. At the E-8 level, the Army, Marine Corps, and Air Force have two positions at the same paygrade. For example, E-8s in the Army are known as "master sergeants" or "first sergeants"; in the Marine Corps are known as "master sergeants" or "first sergeants"; and in the Air Force are known as "senior master sergeants" or "first sergeants." In the Navy, E-8s are known as "senior chief petty officers," and in the Space Force, E-8s are known as "senior master sergeants." *See* DOD, "U.S. Military Rank Insignia" (Washington, D.C.), accessed Aug. 17, 2022. https://www.defense.gov/Resources/Insignia/.

[10]According to Joint Pub. 3-0, there are three levels of warfare: (1) strategic; (2) operational; and (3) tactical. The **strategic level of warfare** is the level at which a nation determines national or multinational guidance, develops strategic objectives, then develops and commits national resources to achieve those objectives. The **operational level of warfare** is the level of warfare in which campaigns and operations are planned, conducted, and sustained to achieve operational objectives to support achievement of strategic objectives. The **tactical level of warfare** is the level of warfare at which forces plan and execute battles and engagements to achieve military objectives. For the purposes of this report, we mainly focus on leaders functioning at the operational and tactical levels because (1) the operational level of warfare links the tactical employment of forces to strategic objectives, and (2) the tactical level of warfare includes planning and executing battles, engagements, and activities to achieve military objectives.

To conduct the semi-structured interviews, we asked officials from each DOD component in our scope to identify a group of relevant officials able to speak broadly about their components' efforts to educate or train leaders to make decisions in a contested information environment. We elected to conduct these interviews with the groups of officials identified because the dispersed nature of education and training efforts across DOD precluded us from conducting interviews with every relevant official or subcomponent department-wide while meeting directed reporting timeframes.[11]

We interviewed a total of 16 groups of officials, seven for education and nine for training.

- **For education**, we met with groups of officials from the Army, Navy, Air Force, Marine Corps, U.S. European Command, U.S. Special Operations Command, and the National Defense University.[12] We did not include U.S. Indo-Pacific Command in this group because command officials noted that there are no education- or joint professional military education-related organizations at this command.[13] As such, there were seven total components and seven semi-structured interviews for education.

- **For training**, we met with groups of officials from the Army, Navy, Air Force, Marine Corps, U.S. Special Operations Command, U.S. Indo-Pacific Command, and U.S. European Command. We met with two groups of Army training officials and two groups of Navy officials to accommodate different schedules and availability, but considered responses from both groups as a whole. As such, in our final analysis, there were seven total components and nine semi-structured interviews for training.

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[11]House Report 117-118, accompanying a bill for the National Defense Authorization Act for Fiscal Year 2022, included a provision for us to review DOD training that prepares leaders and service members to operate and make decisions in a contested information environment and to submit a report not later than July 2, 2022.

[12]Although not officially recognized as professional military education institutions, U.S. European Command and U.S. Special Operations Command provide education, including some professional military education to military service members. As a result, we decided to include both of these commands' interviews in our analysis.

[13]According to officials from U.S. Indo-Pacific Command, each directorate within their command manages its personnel for attendance at the Joint Professional Military Education-II program with administrative support from their J1 (Manpower and Personnel Directorate).

We used a standard set of questions for both education and training interviews, with only slight variations to account for the differences between training and education.[14] We asked probing questions throughout the discussion to clarify the meaning of statements made or to obtain illustrative examples as we deemed necessary. With modifications for each interview group, as appropriate, we designed the questions to address DOD component efforts to provide education and training related to decision-making in a contested information environment. Prior to the semi-structured interviews, we sought feedback on the interview questions from DOD officials to refine the question language.

We asked similar questions of Joint Staff officials as those posed to the education- and training-related groups of officials, but did not include their responses in the semi-structured interview analysis because their position as officials in the Joint Staff offers a broader and less component-specific vantage point. As such, we used information from interviews with these officials to support or add additional context to the information shared with us by officials from the selected DOD components.

To aggregate and analyze the results of the semi-structured interviews, we conducted a content analysis of the interview summaries to determine common themes, if any, from officials' responses regarding the provision of education and training. Specifically, we analyzed whether DOD

- components include content regarding decision-making in a contested information environment into education and training;

- efforts to ensure education and training include realistic adversary information and tactics, techniques, and procedures;

- training focuses on mission command disruption.

We also asked about challenges faced by each component during efforts to conduct such education and training. We identified which resource challenges were most frequently raised by officials. To clearly describe these challenges, we developed descriptions of these resource terms by leveraging existing definitions from DOD, the Congressional Research

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[14]For example, the training question set contained questions regarding disruption in mission command and use of force-on-force exercises. These efforts are specific to training, and are not typically conducted in education settings, according to Marine Corps officials.

Service, Office of Personnel Management, and the Merriam-Webster dictionary, as well as descriptions provided by DOD officials.

We reviewed interview responses from the group as a whole and do not specify the number of individuals who expressed various statements. Instead, we specify the number of interview groups in which a category was discussed. The information and perspectives of the officials we spoke to cannot be generalized to other officials or DOD components that we did not interview; they represented only the views and experiences of the individuals with whom we spoke. Nevertheless, the interview groups provided illustrative examples of education and training efforts, as well as insights into the challenges education institutions and training centers face as they provide this education and training.

To corroborate the testimonial evidence, we also reviewed component documents provided by DOD officials.[15] For example, we reviewed and analyzed joint and military service strategies and plans.[16] Moreover:

- **For education**, we reviewed education institution course materials that describe course content and efforts to update curricula and determined whether courses were required or optional.[17] For example, we requested syllabi of relevant courses from each institution we spoke with, as well as any additional education institution documentation that relates to the information environment. We also reviewed DOD component and joint documentation to identify the education requirements and guidance.[18]

- **For training**, we requested DOD provide relevant documents for our review, including after-action reports, exercise summaries, and

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[15]We requested both unclassified and classified information but primarily reviewed unclassified documentation given the challenges associated with working in a classified workspace during the COVID pandemic. However, in some instances, we also reviewed classified documentation.

[16]DOD, *Electromagnetic Spectrum Superiority Strategy* (October 2020); *United States Army, Combat Training Center Master Plan FY2024-2028* (Dec. 3, 2021).

[17]For example, course syllabi for courses that include blocks of information environment content such as the Naval War College Operations in the Information Environment and Air University's Senior Joint Information Operations Application Course; presentations of the Marine Corps War College curriculum changes; and publications such as the Army's *Red Diamond* publication.

[18]CJCSI 1800.01F; and Chairman of the Joint Chiefs of Staff Memorandum, *Special Areas of Emphasis for Joint Professional Military Education in Academic Years 2020 and 2021* (May 6, 2019).

additional training-related documentation. We reviewed this material to understand the scenarios used in each training.[19] We also asked officials whether training and exercise participation was required or optional. We reviewed DOD component and joint documentation to identify the training requirements and guidance.[20]

We assessed the information we obtained against criteria on joint training, to include education, found in joint guidance, DOD strategy documentation, and in our prior work highlighting the assessment of strategic training to identify actions DOD has taken related to its efforts to prepare leaders to make decisions in a contested information environment.[21] We determined that the control activities component of the *Standards for Internal Control in the Federal Government* was significant to this objective, along with the underlying principles that management should design control activities to achieve objectives and respond to risks and implement control activities through policies.[22]

To address both of our objectives, we interviewed officials and, where appropriate, obtained documentation from the organizations listed in table 3.

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[19]For example, Army's Mission Command Training Program Key Observations documentation and Center for Army Lessons Learned reports; and After Action Reports; among other documents.

[20]In addition to aforementioned guidance, this includes memoranda, training plans, and other documentation that describes content that can or should be included in training.

[21]See, for example, CJCSI 3500.01J; DOD, *Strategy for Operations in the Information Environment* (June 2016)*;* and GAO, *Human Capital: A Guide for Assessing Strategic Training and Development Efforts in the Federal Government*, GAO-04-546G (Washington, D.C.: Mar. 1, 2004). According to CJCSI 3500.01J, training and education are not mutually exclusive, and they are partners in the generation and sustainment of an individual's abilities to perform. Moreover in our prior work highlighting the assessment of strategic training, we state that training can be defined as making available to employees planned and coordinated educational programs of instruction in professional, technical, or other fields that are or will be related to the employee's job responsibilities. This training can be accomplished through a variety of approaches, such as classroom training, e-learning, and professional conferences that are educational or instructional in nature. As a result, we assessed both education and training against criteria contained in this joint training policy and in GAO-04-546G.

[22]GAO, *Standards for Internal Control in the Federal Government*, GAO-14-704G (Washington, D.C.: Sept. 10, 2014).

Table 3: Organizations Contacted by GAO

Lead organization	Subordinate organizations
Office of the Under Secretary of Defense for Policy	• Assistant Secretary of Defense for Special Operations / Low-Intensity Conflict (ASD SO/LIC) ○ Office of Information Operations Policy (OIOP)
Office of the Under Secretary of Defense for Personnel and Readiness	• Force Education and Training ○ Military Professional Military Education • Office of the Chief of Public Affairs

The Joint Staff	• Joint Force Development (J-7)
	    ○ Joint Training Division
	        ▪ Deployable Training Division
	        ▪ Joint Exercise Division
	        ▪ Joint Knowledge Online Division
	    ○ Joint Education and Doctrine Division
	• Operations (J-3)
	    ○ Joint Information Operations Warfare Center
	• Strategy, Plans, and Policy (J-5)
	• National Defense University

Army	• U.S. Army Training and Doctrine Command
	    ○ Headquarters TRADOC, G-3/5/7 (G-37 Training)
	    ○ U.S. Army Combined Arms Center
	        ▪ Noncommissioned Officer Leadership Center of Excellence (NCOLCoE)
	        ▪ Army University
	            • Command and General Staff College
	    ○ Combined Arms Center – Training
	        ▪ Mission Command Training Program
	• United States Army Forces Command
	    ○ National Training Center
	• Army War College

Lead organization	Subordinate organizations

Navy	• Commander Fleet Forces Command
	   o Policy and Standards (N7)
	   o Carrier Strike Group-4
	      ▪ Plans and Policy (N5)
	      ▪ Systems and Command, Control, Communications, Computers and Intelligence (C5I) (N6)
	      ▪ Expeditionary Warfare Training Group Atlantic
	• Commander Pacific Fleet
	   o Joint Training and Readiness (N3T)
	   o Ballistic Missile Defense (N36)
	   o Fleet Training (N7)
	   o Commander Third Fleet
	      ▪ Carrier Strike Group-15
	• Naval War College
	   o Rochefort Group

Air Force	• Deputy Chief of Staff for Manpower, Personnel and Services (AF/A1) • Deputy Chief of Staff for Intelligence, Surveillance, Reconnaissance and Cyber Effects Operations (AF/A2/6) • Deputy Chief of Staff for Operations (AF/A3) • Air Force Reserve Command • Air Combat Command • Air Force Futures (A5/7) • Secretary of the Air Force for Public Affairs (SAF/PA) • 16th Air Force • Air Education and Training Command • Air University • Air Command and Staff College • Air War College • Air Force Institute of Technology
Marine Corps	• Training and Education Command • Marine Air Ground Task Force Training Command (MAGTFTC) o MAGTFTC Training Directorate (G-3/5/7) • Marine Corps War College • Marine Corps University • Marine Corps Command and Staff College
U.S. Space Force	• U.S. Space Training and Readiness Command

Lead organization	Subordinate organizations

Unified Combatant Commands	• U.S. European Command
	   ○ Directorate of Exercises and Assessments (ECJ7)
	   ○ Information Operations and Special Activities Division (J-39)
	   ○ EUCOM Public Affairs (ECPA)
	• U.S. Indo-Pacific Command
	   ○ Plans, Exercises and Engagements Division (J-25)
	   ○ Operations Directorate (J-3)
	      ■ Information Operations (J-39)
	   ○ Exercises Division (J-71)
	   ○ All-Domain Training Division (J-72)
	   ○ K. Mark Takai Pacific Warfighting Center (J-73)
	• U.S. Special Operations Command
	   ○ Intelligence Directorate/Operations, Plans, Engagements and Training (J-25)
	   ○ Joint Collective Training Division (J3-JCT)
	   ○ Joint Special Operations University

Non-DOD Entities	• Applied Research Laboratory for Intelligence and Security • Center for Naval Analyses • Information Professionals Association

Source: GAO. I GAO-23-105608

We conducted this performance audit from December 2021 to January 2023 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.

Appendix II: Comments from the Department of Defense

ASSISTANT SECRETARY OF DEFENSE
4000 DEFENSE PENTAGON
WASHINGTON, D.C. 20301-4000

READINESS

DEC 2 1 2022

Dr. Joseph Kirschbaum
Director, Defense Capabilities Management Office
U.S. Government Accountability Office
441 G Street, NW
Washington DC 20548

Dear Dr. Kirschbaum:

This is the Department of Defense (DoD) response to the Government Accountability
Office Draft Report, "Contested Information Environment: Actions Needed to Strengthen
Education and Training for DoD Leaders," November 10, 2022 (GAO Code 105608).

The Department appreciates the opportunity to comment on the draft report. We partially
concur with recommendation 1 and concur with recommendation 2. The Department's
comments on the GAO draft recommendations are enclosed.

The Defense Office of Prepublication and Security Review determined that the report is
publicly releasable. The point of contact is Lieutenant Colonel Amelia B. Kays, who can be
reached at amelia.b.kays.mil@mail.mil or 571-372-5395.

Sincerely,

Shawn G. Skelly

Enclosure:
As stated

**GAO DRAFT REPORT DATED NOVEMBER 10, 2022
GAO-23-105608SU (GAO CODE 105608)**

**"CONTESTED INFORMATION ENVIRONMENT: Actions Needed to Strengthen
Education and Training for DoD Leaders"**

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

RECOMMENDATION 1:
The Secretary of Defense should ensure that the Chairman of the Joint Chiefs of Staff, in
consultation with the combatant commands and the military services, develops department-wide
guidance about what content to include in its education and training efforts for decision-making
in a contested information environment, as well as the type and frequency of such efforts
necessary for leaders to develop skills in this area.

DoD RESPONSE: Partially Concur. The Secretary of Defense will develop department-wide
guidance regarding what content to include in education and training efforts for decision-making
in a contested information environment, as appropriate. However, the frequency of "such
efforts," particularly training efforts, must be based on operational tempo and determined at the
Combatant Command level; it should not be dictated by the Secretary of Defense.

RECOMMENDATION 2:
The Secretary of Defense should ensure that the Chairman of the Joint Chiefs of Staff, in
consultation with the Under Secretary of Defense for Personnel Readiness, the combatant
commands, and the military services, conducts an assessment and comprehensively reviews
related component assessments of the resources necessary to meet current needs for educating
and training leaders to make decisions in a contested information environment. The assessment
should also identify modifications, if any, needed to improve the results of future education and
training efforts to increase the preparedness of DoD's leaders to make such decisions.

DoD RESPONSE: Concur. The Department of Defense will assess the resources necessary to
meet related education and training needs, as appropriate.

Accessible Text for Appendix II: Comments from the Department of Defense

DEC 21 2022

Dr. Joseph Kirschbaum
Director, Defense Capabilities Management Office
U.S. Government Accountability Office
441 G Street, NW
Washington DC 20548

Dear Dr. Kirschbaum:

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Office Draft Report, "Contested Information Environment: Actions Needed to
Strengthen Education and Training for DoD Leaders," November 10, 2022 (GAO
Code 105608).

The Department appreciates the opportunity to comment on the draft report. We
partially concur with recommendation 1 and concur with recommendation 2. The
Department's comments on the GAO draft recommendations are enclosed.

The Defense Office of Prepublication and Security Review determined that the report
is publicly releasable. The point of contact is Lieutenant Colonel Amelia B. Kays, who
can be reached at amelia.b.kays.mil@mail.mil or 571-372-5395.

Sincerely,

Shawn G. Skelly

Enclosure:
As stated

GAO DRAFT REPORT DATED NOVEMBER 10, 2022 GAO-23-105608SU (GAO
CODE 105608)

"CONTESTED INFORMATION ENVIRONMENT: Actions Needed to Strengthen
Education and Training for DoD Leaders"

DEPARTMENT OF DEFENSE COMMENTS
TO THE GAO RECOMMENDATION

RECOMMENDATION 1:
The Secretary of Defense should ensure that the Chairman of the Joint Chiefs of
Staff, in consultation with the combatant commands and the military services,
develops department-wide guidance about what content to include in its education
and training efforts for decision-making in a contested information environment, as
well as the type and frequency of such efforts necessary for leaders to develop skills
in this area.

DoD RESPONSE: Partially Concur. The Secretary of Defense will develop
department-wide guidance regarding what content to include in education and
training efforts for decision-making in a contested information environment, as
appropriate. However, the frequency of "such efforts," particularly training efforts,
must be based on operational tempo and determined at the Combatant Command
level; it should not be dictated by the Secretary of Defense.

RECOMMENDATION 2:
The Secretary of Defense should ensure that the Chairman of the Joint Chiefs of
Staff, in consultation with the Under Secretary of Defense for Personnel Readiness,
the combatant commands, and the military services, conducts an assessment and
comprehensively reviews related component assessments of the resources
necessary to meet current needs for educating and training leaders to make
decisions in a contested information environment. The assessment should also
identify modifications, if any, needed to improve the results of future education and
training efforts to increase the preparedness of DoD's leaders to make such
decisions.

DoD RESPONSE: Concur. The Department of Defense will assess the resources
necessary to meet related education and training needs, as appropriate.

Appendix III: GAO Contact and Staff Acknowledgments

GAO Contact

Joseph W. Kirschbaum, 202-512-9971 or KirschbaumJ@gao.gov.

Staff Acknowledgments

In addition to the contact named above, key contributors to this report were Tommy Baril (Assistant Director), Yecenia Camarillo (Analyst in Charge), Tracy Barnes, Ashley Houston, Anastasia Kouloganes, Amie Lesser, Lillian Moyano Yob, Patricia Powell, Pamela Snedden, Mario Tiberie, Meg Tulloch, and John Yee.

Related GAO Products

Information Environment: Opportunities and Threats to DOD's National Security Mission. GAO-22-104714. Washington, D.C.: September 21, 2022.

Artificial Intelligence: DOD Should Improve Strategies, Inventory Process, and Collaboration Guidance. GAO-22-105834. Washington, D.C.: March 30, 2022.

Information Environment: DOD Operations Need Enhanced Leadership and Integration of Capabilities. GAO-21-525T. Washington, D.C.: April 30, 2021.

High-Risk Series: Federal Government Needs to Urgently Pursue Critical Actions to Address Major Cybersecurity Challenges. GAO-21-288. Washington, D.C.: March 24, 2021.

Electromagnetic Spectrum Operations: DOD Needs to Take Action to Help Ensure Superiority. GAO-21-440T. Washington, D.C.: March 19, 2021.

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Electromagnetic Spectrum Operations: DOD Needs to Address Governance and Oversight Issues to Help Ensure Superiority. GAO-21-64. Washington, D.C.: December 10, 2020.

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Information Operations: DOD Should Improve Leadership and Integration Efforts. GAO-20-51SU. Washington, D.C.: October 18, 2019.

Future Warfare: Army Is Preparing for Cyber and Electronic Warfare Threats, but Needs to Fully Assess the Staffing, Equipping, and Training of New Organizations. GAO-19-570. Washington, D.C.: August 15, 2019.

DOD Training: U.S. Cyber Command and Services Should Take Actions to Maintain a Trained Cyber Mission Force. GAO-19-362. Washington, D.C.: March 6, 2019.

National Security: Long-Range Emerging Threats Facing the United States as Identified by Federal Agencies. GAO-19-204SP. Washington, D.C.: December 13, 2018.

Internet of Things: Enhanced Assessments and Guidance Are Needed to Address Security Risks in DOD. GAO-17-668. Washington, D.C.: July 27, 2017.