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Report to Congressional Committees

January 2021

CLOSE AIR SUPPORT

Actions Needed to Enhance Friendly Force Tracking Capabilities and Fully Evaluate Training

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GAO Highlights

Highlights of GAO-21-99, a report to congressional committees

January 2021

CLOSE AIR SUPPORT

Actions Needed to Enhance Friendly Force Tracking Capabilities and Fully Evaluate Training

Why GAO Did This Study

The use of ordnance delivered by aircraft to support U.S. military forces that are in close proximity to enemy forces on the ground requires detailed planning, seamless communications, and effective training. Mistakes in communications or procedures used to identify and maintain an awareness of the positions of friendly forces on the battlefield during CAS can result in the loss of U.S. military personnel.

Senate Report 116-48 and House Report 116-120, accompanying bills for the National Defense Authorization Act for Fiscal Year 2020, included provisions for GAO to evaluate issues related to friendly-force identification capabilities in CAS missions. Among other things, this report evaluates the extent to which DOD has (1) implemented initiatives to enhance friendly-force identification capabilities during CAS, and (2) evaluated training for forces that participate in CAS. GAO analyzed documentation and interviewed officials regarding DOD efforts to develop and implement friendly force tracking capabilities for CAS; reviewed CAS training programs; and analyzed training data, including the number of hours that DOD used non-military contract aircraft for CAS training from 2017 through 2019.

What GAO Recommends

GAO is making 11 recommendations to DOD, including that DOD implement and assess initiatives to improve the interoperability of digital systems used in CAS and take additional steps to evaluate the training for certain forces that participate in CAS missions. DOD concurred with the recommendations.

View GAO-21-99. For more information, contact Cary Russell at (202) 512-5431 or RussellC@gao.gov.

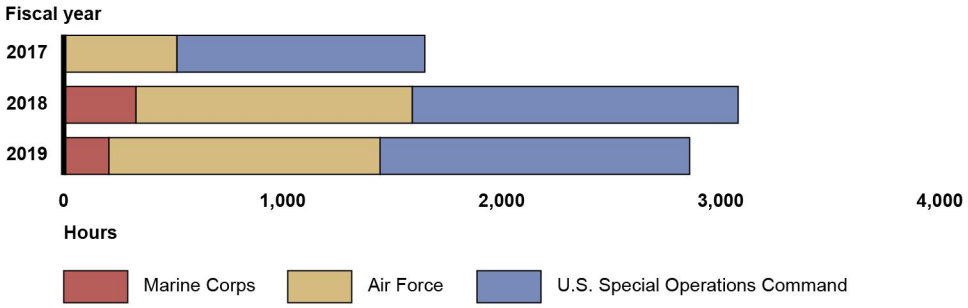
What GAO Found

The Department of Defense (DOD) has made progress implementing initiatives to enhance capabilities that are used to identify friendly force locations during close air support (CAS) missions, but GAO identified additional actions that are needed to strengthen these efforts. Specifically,

- DOD has made limited progress in implementing 10 changes the department approved to address gaps in the interoperability of digital communications systems used to conduct CAS, hindering efforts to improve the speed and accuracy of information exchanges.
- DOD's efforts to assess the interoperability of digital systems used to perform CAS have been limited in scope. GAO found that DOD had formally assessed two out of 10 approved changes during joint service and multinational events, and these assessments were not conducted in a training environment that replicated capabilities of near-peer adversaries.
- DOD implemented a new capability in the U.S. Central Command area of responsibility to help identify the positions of friendly forces during CAS missions. However, GAO found that DOD did not provide adequate training for personnel who operate it or conduct an evaluation to resolve implementation challenges that have hampered its performance.

DOD conducts evaluations of training programs for forces that participate in CAS missions, but GAO identified two areas where DOD can improve its efforts. First, the Army and Marine Corps have not systematically evaluated the effectiveness of periodic training for ground observers providing targeting information due to a lack of centralized systems for tracking training data and the absence of designated entities to monitor service-wide training. Second, the use of contract aircraft for training increased substantially between 2017 and 2019, but DOD has not fully evaluated the use of non-military contract aircraft to train air controllers for CAS (see fig.). GAO found that differences between U.S. military aircraft and contract aircraft (e.g., airspeed) can result in a misalignment of aircraft capabilities for certain types of training events. Without evaluating CAS training fully, DOD cannot have assurance that its forces are prepared to conduct CAS missions safely and effectively.

Number of Hours Non-Military Aircraft Were Used to Train for Close Air Support for Fiscal Years 2017 through 2019



Source: GAO analysis of Air Force, Marine Corps, and U.S. Special Operations Command data. | GAO-21-99

Data Table for Number of Hours Non-Military Aircraft Were Used to Train for Close Air Support for Fiscal Years 2017 through 2019

Fiscal year	Marine Corps	Air Force	U.S. Special Operations Command
2017	0	517	1132
2018	330	1261	1488
2019	206	1238	1414

Contents

Tables

Figures

Abbreviations

CAS	Close Air Support
Committee	Joint Fire Support Executive Steering Committee
DACAS	Digitally-Aided Close Air Support
DOD	Department of Defense
ECP	Engineering Change Proposal
JFO	Joint Fires Observer
JTAC	Joint Terminal Attack Controller
MOA	Memoranda of Agreement
SAS-E	Situational Awareness Service – Enhanced

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Congressional Committees

Close air support (CAS)—aircraft delivering ordnance on targets located near U.S. military or coalition friendly forces—has played a critical part in recent military operations. CAS requires detailed coordination between aircrews and ground forces, such as air controllers and maneuver units, among others, to maintain an awareness of the locations of friendly forces on the battlefield.[1] However, mistakes in communication and targeting can result in the inadvertent loss of U.S. military or coalition personnel. For example, in a 2014 friendly fire incident in Afghanistan involving a B-1 bomber, a lack of situational awareness of the location of friendly forces and inaccurate target information resulted in the loss of five U.S. military personnel.

Since 2000, the Department of Defense (DOD) has actively worked to address identified shortfalls in the CAS mission, including those raised in our prior work and by others, primarily by improving communications systems and equipment to exchange information seamlessly (i.e., "interoperability") and through training.[2] For example, DOD has developed a range of capabilities to move it closer to digitally-aided CAS (DACAS), which allows ground forces to communicate certain information digitally to improve the speed of transmissions and accuracy of data, and to mitigate the risk of human error. These capabilities are meant to complement traditional CAS procedures that use voice-over-radio communications, which can be constrained by distance and vulnerabilities to detection,

[1]For the purposes of this report, we refer to close air support (CAS) during joint operations conducted by joint forces. A joint force is composed of forces of two or more military departments operating under a single command.

[2]DOD Joint Publication 3-0, *Joint Operations,* defines interoperability as the ability to act together coherently, effectively, and efficiently to achieve tactical, operational, and strategic objectives. More specifically, Joint Publication 6-0, *Joint Communications System*, defines interoperability as the condition achieved among communications-electronics systems or items of communications electronics equipment when information or services can be exchanged directly and satisfactorily between them and/or their users. Department of Defense, *DOD Dictionary of Military and Associated Terms* (as of June 2020). For our prior work related to CAS see GAO, *Military Readiness: Lingering Training and Equipment Issues Hamper Air Support of Ground Forces*, GAO-03-505 (Washington, D.C.: May 2, 2003) and *Force Structure: Better Information Needed to Support Air Force A-10 and Other Future Divestment Decisions,* GAO-16-816 (Washington, D.C.: Aug. 24, 2016).

interception, and jamming. In addition, these capabilities help build the situational awareness of friendly force locations on the battlefield, which enhances effectiveness and reduces the risk of friendly fire incidents.[3] The Joint Staff has also led efforts to develop minimum training standards for forces responsible for integrating close air support.[4]

Senate Report 116-48 and House Report 116-120, accompanying bills for the National Defense Authorization Act for Fiscal Year 2020, included provisions for us to evaluate issues related to friendly force identification in CAS missions.[5] This report (1) describes DOD procedures and capabilities for identifying friendly forces and factors affecting the effectiveness of CAS missions, (2) evaluates the extent to which DOD has implemented initiatives to enhance friendly force identification capabilities during CAS missions, and (3) assesses the extent to which DOD has evaluated training for forces that integrate CAS. In addition, in appendix I we describe continuation training requirements for aircrew employing CAS.

For objective one, we reviewed DOD guidance and procedures to determine friendly force identification requirements associated with CAS missions. We also reviewed documentation, such as service publications and instructions related to CAS, and interviewed officials to identify capabilities used to 1) identify friendly forces and mark enemy positions, and 2) communicate this information between air controllers and aircrews.[6] We also reviewed DOD guidance and procedures to determine

[3]Because of the proximity of friendly forces during CAS missions, there is a chance that a U.S. or friendly force actively engaged with an enemy may be killed or wounded by mistake or accident. Such an event is referred to as a friendly fire incident. These incidents can be significantly reduced when all parties involved in the planning and execution of CAS missions make every effort to mitigate the associated risks. According to DOD guidance, friendly fire is often the result of confusion on the battlefield. This confusion can be a result of misidentification of targets; inaccurate target locations or descriptions; target locations incorrectly transmitted or received; or loss of situational awareness by the ground commander or his staff, which may include members of the tactical air control party. Joint Chiefs of Staff, Joint Pub. 3-09.3, *Close Air Support* (June 10, 2019).

[4]Forces integrating CAS include joint terminal attack controllers (JTAC), forward air controllers (airborne), and joint fires observers (JFO) from the military services and U.S. Special Operations Command.

[5]S. Rep. No. 116-48, at 43-44 (2019); H.R. Rep. No. 116-120, at 205-06 (2019).

[6]The term “mark” refers to target marking which involves providing timely and accurate target marks to help build situational awareness and reduce the possibility of friendly fire.

the factors that can affect friendly force identification and the effectiveness of CAS missions.

For objective two, we identified DOD initiatives to enhance friendly force identification capabilities during the execution phase of CAS missions. We interviewed officials from the Joint Staff, the Departments of the Army, Air Force, Navy, including the Marine Corps, Defense Information Systems Agency, U.S. Special Operations Command, U.S. European Command, U.S. Indo-Pacific Command, and U.S. Central Command to discuss friendly force identification capabilities currently used in combat operations as well as new technologies under development. We examined DOD efforts to ensure the different military services' equipment meet the operational requirements of CAS and are interoperable with other services' aircraft and equipment. We determined that the control environment, risk assessment, and control activities components of the *Standards for Internal Control in the Federal Government* were significant to this objective, along with the associated underlying principles that management should:

- establish an organizational structure, assign responsibility, and delegate authority to achieve the entity's objectives,
- define objectives clearly to enable the identification of risks and define risk tolerances, and
- design control activities to achieve objectives and respond to risks.[7]

We assessed DOD's efforts to manage the development, review, approval, and implementation of changes to DACAS capabilities against these internal control standards. We evaluated Joint Staff efforts to manage the assessment of changes to DACAS capabilities against DOD guidance.[8] We also reviewed DOD's efforts to implement a new ground-to-air situational awareness capability called Situational Awareness Service – Enhanced (SAS-E). We assessed the implementation of this capability against DOD guidance to determine whether adequate training

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

[8]Chairman of the Joint Chiefs of Staff Instruction 6265.01, *Coalition Capability Demonstration and Assessment (Bold Quest) Governance and Management* (July 23, 2015) and Department of Defense, *Summary of the 2018 of the National Defense Strategy of the United States of America*.

was provided on SAS-E and a post implementation review had been conducted.[9]

For objective three, we reviewed relevant joint and service-specific training programs of instruction that establish training standards for personnel that integrate CAS on the battlefield, including joint terminal attack controllers (JTACs), forward air controllers (airborne), and joint fires observers (JFOs). We also reviewed memoranda of agreement (MOA) developed by the Joint Fire Support Executive Steering Committee ("Committee") for these training programs and reviews of these programs.[10] We collected and analyzed JTAC training data for the Air Force, Navy (which included the Marine Corps), and U.S. Special Operations Command for fiscal years 2017 through 2019.[11] We assessed DOD's evaluations of these programs against DOD guidance and our work on strategic training and development programs.[12]

To identify the training requirements for aircrew employing CAS, we reviewed service-specific guidance, such as training and readiness manuals, that outline CAS annual continuation training requirements for Air Force, Navy, and Marine Corps combat aircraft with a CAS mission.[13] Appendix II provides further details on our objectives, scope, and methodology.

We conducted this performance audit from August 2019 to January 2021 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

[9]Chairman of the Joint Chiefs of Staff Instruction 3265.02, *Joint Command and Control Systems Training Management* (Oct. 10, 2014) and Department of Defense (DOD) Instruction 5000.82, *Acquisition of Information Technology (IT)* (Apr. 21, 2020).

[10]The signatories of the JTAC, forward air controller (airborne), and JFO memoranda of agreement (MOA) include the Army, Air Force, Marine Corps, Navy, and U.S. Special Operations Command, among others.

[11]We did not include data for the Army because the conventional Army does not train soldiers that are not assigned in special operations forces units as joint terminal attack controllers.

[12]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).

[13]The Army does not consider its attack helicopters as CAS aircraft, although they can conduct attacks using CAS tactics, techniques, and procedures during joint operations.

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

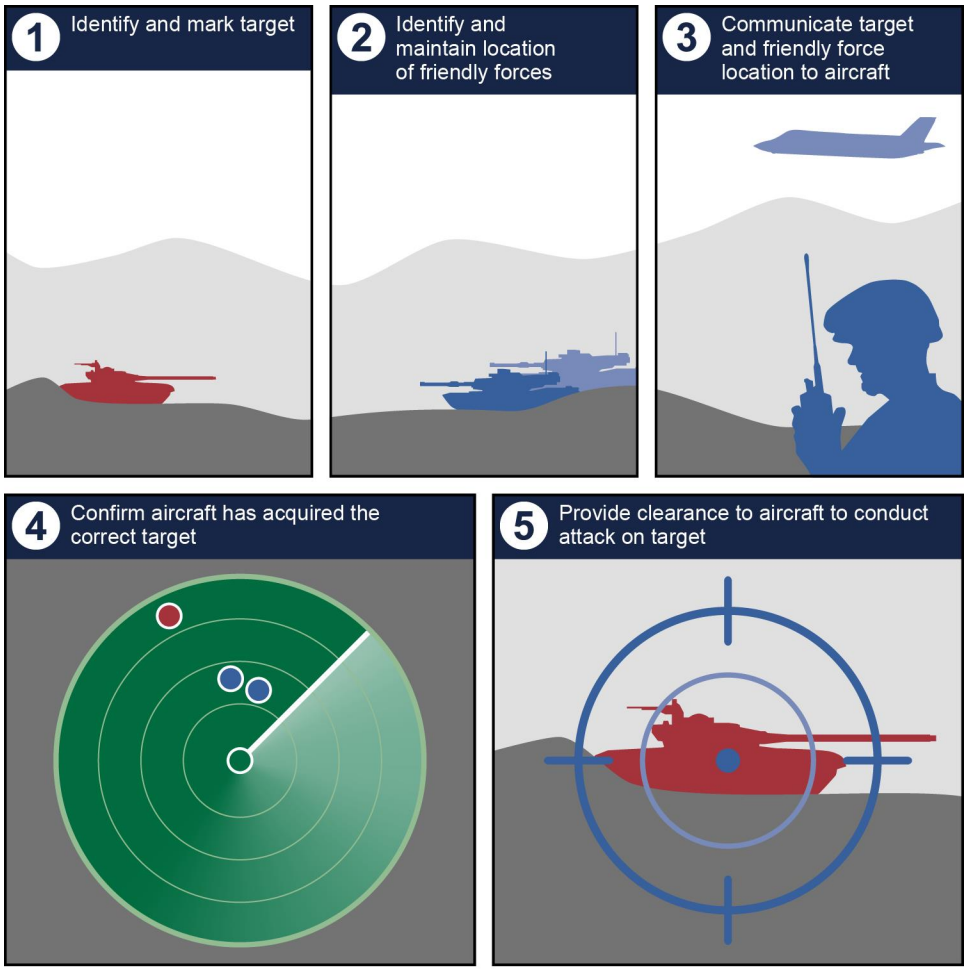
Overview of Close Air Support

CAS is an air action by aircraft against hostile targets that are in close proximity to friendly forces and that requires detailed integration of each air mission with the fire and movement of those forces.[14] All participants in CAS are responsible for identifying friendly and enemy forces and this relies on continuous communication between ground forces and aircrews. DOD relies on CAS to attack the enemy in a variety of military operations and to augment other fire support (e.g., surface-to-surface fires from artillery) in situations in which other fire support may not be able to effectively engage. Joint doctrine outlines a multiphase cycle for CAS, which includes planning, preparation, execution, and assessment.[15] Figure 1 provides an overview of the key steps involved in the execution phase of a CAS mission.

[14]Fundamental principles and guidance for planning, executing, and assessing CAS during joint operations are provided in Joint Publication 3-09.3, *Close Air Support* (June 10, 2019).

[15]According to joint doctrine, the CAS integration model is a continuous, multi-phase cycle (i.e., plan, prepare, execute, and, as part of the execution phase, assess) tailored for joint fire support and focused specifically on CAS. The CAS integration model assists the commander and staff in making planning decisions by integrating the planning and preparation of the supported and supporting components. Effective CAS relies on thorough, coherent planning, and detailed integration of air support into ground operations. The planning and preparation of CAS provides participants an opportunity to walk through the scheme of maneuver, gain familiarity with terrain and procedures, and identify shortfalls. See Joint Pub. 3-09.3 at III-1, I-7. The steps in the planning and preparation phases lay the groundwork for successful friendly force identification and CAS execution.

Figure 1: Overview of Key Steps during a Close Air Support Mission



Source: GAO analysis of Department of Defense guidance on close air support. | GAO-21-99

Text of Figure 1: Overview of Key Steps during a Close Air Support Mission

1. Identify and mark target
2. Identify and maintain location of friendly forces
3. Communicate target and friendly force location to aircraft
4. Confirm aircraft has acquired the correct target
5. Provide clearance to aircraft to conduct attack on target

CAS participants. The tactical air control party is the principal air liaison unit collocated with ground units that advises ground commanders on CAS capabilities and limitations and provides CAS terminal attack control

(i.e., control the maneuver of and grant clearance to release weapons to an attacking aircraft).[16] Ground commanders have the authority to decide the target priority, effects, and timing of CAS and other supporting fires in their respective operational areas.[17] Members of the tactical air control party include the JTAC, air liaison officer, air officer, and forward air controller (airborne). Certified and qualified JTACs and forward air controllers (airborne) are to be recognized across DOD as capable and authorized to perform terminal attack control. The JTAC is most often operating in a forward position with ground forces and directs the action of attack aircraft engaged in CAS. The forward air controller (airborne) operates from an airborne positon in a fixed-wing fighter or attack aircraft or rotary-wing aircraft equipped with capabilities that aid the forward air controller (airborne) in finding and fixing potential targets for CAS attacks. While not a member of the tactical air control party, a JFO can provide targeting information in support of CAS to JTACs or forward air controllers (airborne). JFOs cannot perform terminal attack control of CAS missions and do not replace JTACs or forward air controllers (airborne).[18]

CAS communication. According to DOD documentation, secure voice communications via radio between ground forces and an aircraft is the traditional means to communicate during a CAS mission. Digital communications are a means to supplement voice communication and can make transmissions faster, reduce the risk of human error, quickly build situational awareness, enhance target correlation, and shorten the CAS execution timeline overall, according to DOD.

DOD has developed a collection of digitally-aided CAS (DACAS)—capable networks, systems, and equipment to enable the exchange of

[16]"Terminal attack control" occurs in the CAS execution phase.

[17]For CAS, the ground commander is the supported commander inside the boundaries of an assigned operational area. The JTAC or forward air controller (airborne) is the ground commander's direct representative, and information passed by the JTAC or forward air controller (airborne) with regard to commander's intent and approval of fires should be viewed as coming directly from the ground commander.

[18]While JFOs do not perform terminal attack control, there are instances where a JTAC or forward air controller (airborne) is unavailable to perform terminal attack control of a CAS mission. In such a circumstances, a ground commander must consider the risk of using non-JTAC or non-forward air controller (airborne) personnel and notify the aircrew. In these circumstances, the aircrews bear increased responsibility for the detailed integration required to minimize friendly fire.

digital communications during the execution phase of CAS missions.[19] Information such as target location and description can be communicated digitally over these networks via DOD standard message formats that improve the interoperability of digital communications capabilities used by ground forces and aircrews. Digital systems equipped with tactical data links are capable of receiving and transmitting information in specific digital message formats. Table 1 provides an overview of DOD's tactical data links used for DACAS.

Table 1: Overview of Tactical Data Links used for Digitally-Aided Close Air Support (DACAS)

Digital System	Message Format	Description
Variable Message Format over Combat Net Radio	K-Series	• Combat Net Radio is a key enabling technology for the exchange of information via digital messages and it transmits and receives digital messaging over radio frequency voice communication, which means a ground user does not require an additional radio. • When coupled with Variable Message Format, Combat Net Radio is considered a tactical data link. • A benefit of the Variable Message Format is that the message set is designed to support common close air support information exchanges such as the on-station report/aircraft on station, standardized 9-line, and the aircraft target designation.
Situation Awareness Data Link	J-Series	• Situation Awareness Data Link has been customized from the U.S. Army Enhanced Position Location Reporting System to meet Air Force mission requirements. • Situation Awareness Data Link provides air-to-air, air-to-ground, and ground-to-air data links that are robust, secure, jam-resistant, and contention-free.
Link 16	J-Series	• Link 16 supports near real time information exchange between tactical communications systems. • It is a frequency-hopping, jam-resistant network that allows participants to share the battlespace picture, greatly enhancing situational awareness. • Link 16 is the fastest, most reliable, and most widely employed tactical data link on air platforms and can be accessed by Joint Terminal Attack Controllers via handheld Link 16 radios and tactical gateways.

Source: GAO analysis of Department of Defense documents. | GAO-21-99

In some instances, communication "gateways" are used to provide interoperability between incompatible systems or networks. These gateways can forward data and/or translate messages between different systems or networks, although differences in message formats (e.g., K-

[19]DOD components utilize different digital systems to plan and execute fires, including CAS. For example, the Army and Marine Corps utilize the Advanced Field Artillery Tactical Data System to command and control fire support. The military services also use digital systems to plan and manage air operations, including the Tactical Air Integration System and Theater Battle Management Core System. According to DOD, the Joint Air-Ground Integration Center brings each of these systems into one team effort to integrate air-ground operations, which includes CAS.

series to J-series) may occasionally result in the recipient not receiving some of the information.

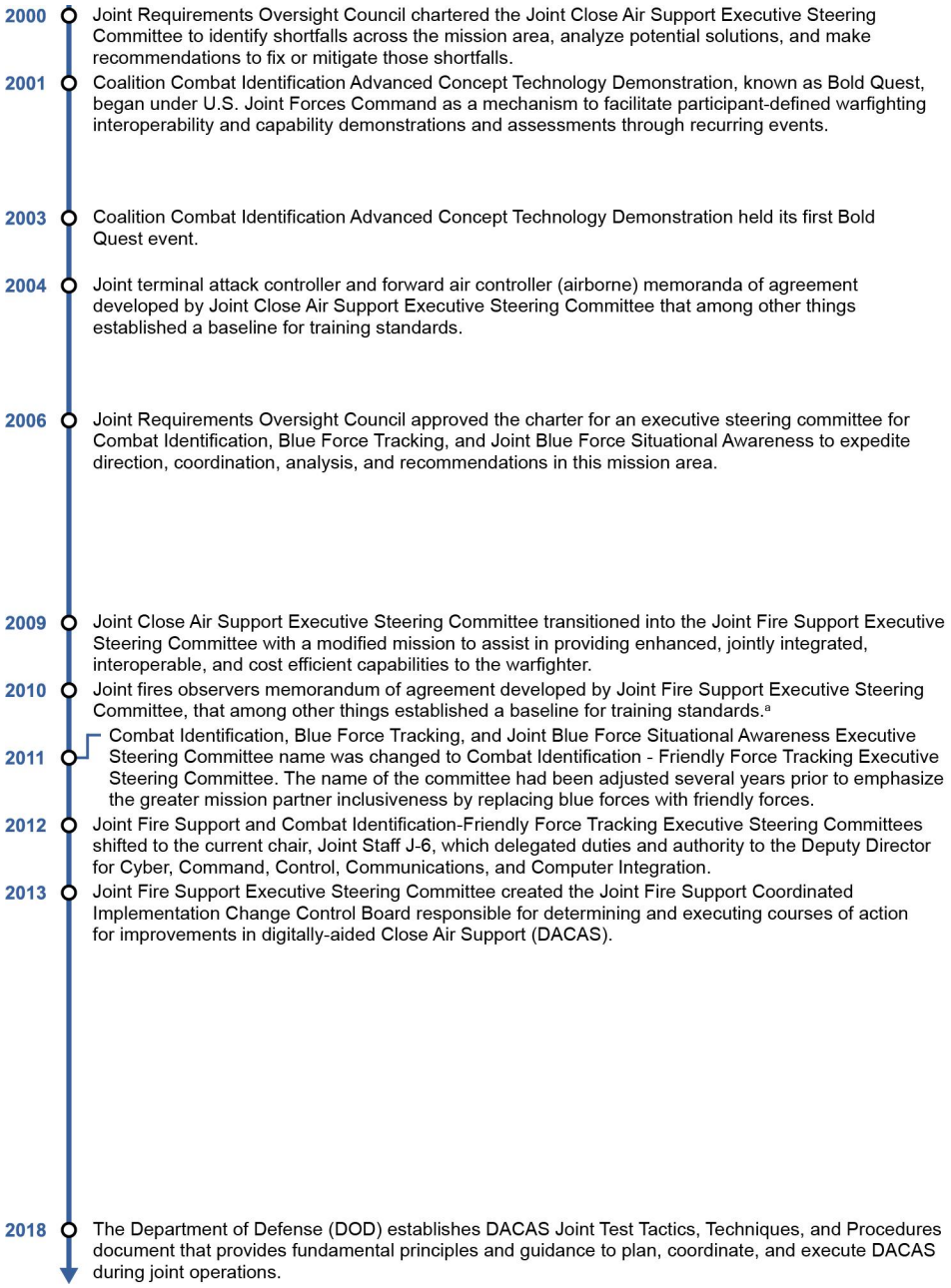
CAS is used in a range of military operations. U.S. military forces have performed CAS in a range of military operations, from permissive environments, such as in Afghanistan throughout Operation Enduring Freedom, to contested environments, such as in the initial stages of Operation Iraqi Freedom. A permissive environment is one where the enemy has minimal effect on operations and little influence on domains (e.g., air, land). A contested environment is one where the enemy can show temporary and successful influence on one or more domains and affect operations. A highly-contested environment is one where the enemy has produced an effect on operations during major combat operations and generally involves an environment with a peer/near-peer adversary possessing robust capabilities to influence various domains. In a highly-contested environment, JTACs, forward air controllers (airborne), and JFOs require the ability to communicate with aircrew across a wide range of communication methods using alternative means for conducting CAS beyond just line-of-sight communications.

DOD Efforts to Improve CAS

Since 2000, DOD has established a variety of efforts to improve interoperability of communications systems and equipment for CAS and training of CAS forces.[20] These initiatives have included the creation of executive steering committees, memoranda of agreement (MOAs), and capability demonstrations (see fig. 2). Among other activities, these initiatives have identified shortfalls across the CAS mission area, analyzed potential solutions, and made recommendations to fix shortfalls.

[20]In addition to DOD-wide efforts to improve CAS, the military services have also established organizations and adopted initiatives to improve the CAS mission. For example, according to Air Force officials, in 2006, the Army-Air Force Integration Forum was chartered to identify air-ground issues and recommend doctrine, organization, training, materiel, leadership and education, personnel, and facility solutions to improve effectiveness. In 2017, the Air Force identified the 57th Operations Group to serve as the Air Force's primary organization for CAS and air-ground integration. The 57th Operations Group was directed to establish a CAS Integration Group, charged with advancing joint CAS and joint fires culture, building CAS and joint air-ground expertise, and empowered to train CAS and related experts.

Figure 2: Timeline of Key DOD Efforts to Improve Close Air Support



Source: GAO analysis of DOD guidance on Close Air Support and interviews with DOD officials. | GAO-21-99

Text of Figure 2: Timeline of Key DOD Efforts to Improve Close Air Support

- 2000 - Joint Requirements Oversight Council chartered the Joint Close Air Support Executive Steering Committee to identify shortfalls across the mission area, analyze potential solutions, and make recommendations to fix or mitigate those shortfalls
- 2001 - Coalition Combat Identification Advanced Concept Technology Demonstration, known as Bold Quest, began under U.S. Joint Forces Command as a mechanism to facilitate participant-defined warfighting interoperability and capability demonstrations and assessments through recurring events
- 2003 - Coalition Combat Identification Advanced Concept Technology Demonstration held its first Bold Quest event.
- 2004 - Joint terminal attack controller and forward air controller (airborne) memoranda of agreement developed by Joint Close Air Support Committee that among other things established a baseline for training standards.
- 2006 - Joint Requirements Oversight Council approved the charter for an executive steering committee for Combat Identification, Blue Force Tracking, and Joint Blue Force Situational Awareness to expedite direction, coordination, analysis, and recommendations in this mission area.
- 2009 - Joint Close Air Support Executive Steering Committee transitioned into the Joint Fire Support Executive Steering Committee with a modified mission to assist in providing enhanced, jointly integrated, interoperable, and cost efficient capabilities to the warfighter
- 2010 - Joint fires observers memorandum of agreement developed by Joint Fire Support Executive Steering Committee, that among other things established a baseline for training standards. /a/
- 2011 - Combat Identification, Blue Force Tracking, and Joint Blue Force Situational Awareness Executive Steering Committee name was changed to Combat Identification - Friendly Force Tracking Executive Steering Committee. The name of the committee had been adjusted several years prior to emphasize the greater mission partner inclusiveness by replacing blue forces with friendly forces.
- 2012 - Joint Fire Support and Combat Identification-Friendly Force Tracking Executive Steering Committees shifted to the current chair, Joint Staff J-6, which delegated duties and authority to the Deputy

Director for Cyber, Command, Control, Communications, and Computer Integration.

- 2013 - Joint Fire Support Executive Steering Committee created the Joint Fire Support Coordinated Implementation Change Control Board responsible for determining and executing courses of action for improvements in digitally-aided Close Air Support (DACAS).

[a]According to officials, Army, Air Force, and U.S. Special Operations Command had previously established a multiservice joint fires observers memorandum of agreement in 2005.

The Joint Staff J6 oversees a number of joint forums and working groups to address CAS issues across the full doctrine, organization, training, materiel, leadership, personnel, facilities, and policy spectrum.[21] The J6 also oversees the development of guidance, action plans, and other activities, including:

- **Standardized guidance.** The Joint Staff J6 has led or participated in the development of a variety of publications to help standardize CAS procedures. For example, a Joint Publication on Close Air Support and multi-service tactics, techniques, and procedures guide established a standardized method for how U.S. forces engage enemy forces with air delivered ordnance.[22]
- **Action plans.** The Joint Staff J6-led joint fire support action plan has identified capability requirements and validated joint fires capability gaps. According to Joint Staff J6 officials, the action plan is reviewed and revised on a triennial basis. The issues identified in the action plan contain specified tasks that provide a framework for developing recommended solutions to improve joint fires integration and interoperability between U.S. and coalition forces. In addition, the J6 has led the development of a combat identification-friendly force tracking action plan that provides a framework for developing recommended solutions to improve combat identification and friendly

[21]These initiatives have been led mainly through the Joint Staff Command, Control, Communication, and Computers (C4)/Cyber Directorate. The directorate has delegated committee chair duties and authority to the Deputy Director for Cyber, Command, Control, Communications, and Computer Integration for both the Joint Fire Support and the Combat Identification – Friendly Force Tracking Executive Steering Committees. For the purposes of this report, this office will be referred to as Joint Staff J6.

[22]Joint Chiefs of Staff, Joint Pub. 3-09.3, *Close Air Support* (June 10, 2019); Army Techniques Publication 3-09.32, Marine Corps Reference Publication 3-31.6, Navy Tactics, Techniques, and Procedures 3-09.2, Air Force Tactics, Techniques, and Procedures 3-2.6, *JFIRE Multi-Service Tactics, Techniques, and Procedures For Joint Application of Firepower* (Oct. 2019).

force tracking capabilities, integration, and interoperability between U.S. and partner nation forces.

- **Training standardization.** The Joint Staff J6 has led the development of MOAs to establish JTAC, forward air controller (airborne), and JFO minimum certification and qualification training standards. Signatories to the MOAs agree to comply with the established standards and allow their training programs to be assessed by standardization teams formed at the direction of the Committee.[23] Committee standardization teams are led by Joint Staff J6 and are comprised of subject matter experts provided by the U.S. and partner nation signatories.
- **Joint Fire Support Coordinated Implementation Change Control Board.** Chaired by a member of Joint Staff J6, the board provides the military services with a single entity responsible to determine and perform engineering and fielding-related courses of action to deliver incremental improvements in DACAS and digitally-aided fire support capabilities. Its charter establishes the responsibilities, composition, and work product outputs of the board, the DACAS working group, the digitally-aided fire support working group, and the Engineering Change Implementation Group in supporting the coordinated implementation of interoperable solutions within the context of the CAS mission. The Engineering Change Implementation Group is led by the Joint Staff Joint Assessment Division.[24] Through the board, DOD has developed specific proposals to address interoperability gaps in CAS systems.
- **Technology demonstrations.** DOD also established the Coalition Capability Demonstration and Assessment known as "Bold Quest," currently overseen by the Joint Staff J6. Bold Quest is a means for the military services and partner nations to demonstrate and assess the interoperability and capability of their equipment through a recurring cycle of joint and multinational events. Bold Quest began as the Coalition Combat Identification Advanced Concept Technology Demonstration in 2001 and conducted its first operational

[23]For the purposes of this report, the Joint Fire Support Executive Steering Committee will be referred to as "Committee."

[24]The Joint Assessment Division was previously called the Joint Deployable Analysis Team. The Joint Assessment Division provides a deployable capability for analyzing current and emergent command and control information systems, supporting architectures, and procedures spanning the command and control, fires, and intelligence joint functions. The Joint Assessment Division assists the warfighter by recommending solutions to integration and interoperability issues.

demonstration in 2003. Since 2003, DOD has conducted 23 Bold Quest events of varying scope and scale at major training installations and test ranges across the U.S. and Europe.

Training U.S. Military Forces for the CAS Mission

The military services and U.S. Special Operations Command train forces to coordinate and integrate CAS on the battlefield, and aircrews to employ CAS.[25]

- **Coordination and integration of CAS.** JTACs, forward air controllers (airborne), and JFOs are the forces involved in coordinating and integrating CAS. These forces are trained and equipped by the Army, Air Force, Navy, Marine Corps and U.S. Special Operations Command.[26] The MOAs include Joint Mission Task Lists, which serve as the basis for developing academic training syllabi and curriculum for JTAC, forward air controllers (airborne), and JFO certification. Even though the MOAs establish minimum certification and qualification training standards for the DOD and partner nation signatories, they do not prohibit additional requirements for follow-on continuation training.
- **Employment of CAS.** The Air Force, Navy, and Marine Corps organize, train, and equip aircrews to employ CAS within their roles as part of the joint force. As a result, there are a wide range of aircraft across the Air Force, Marine Corps, and Navy that are trained for and equipped to perform CAS.[27] These aircraft include both fixed-wing and rotary-wing aircraft, as well as unmanned aircraft. The military services have different pipelines for training aircrew to deliver CAS. Generally, pilots are required to complete various phases of training before they are considered to be mission ready. Within DOD, pilots

[25]According to U.S. Central Command officials, CAS is employed in various types of scenarios to include Assist, Accompany, Advise & Escort, and Maritime Operations, among others.

[26]Not all services and U.S. Special Operations Command train the three types of forces that coordinate and integrate CAS. For example, the Army does not train soldiers that are not assigned in special operations forces units as joint terminal attack controllers or forward air controllers (airborne).

[27]The Army does not conduct CAS. The Army does not consider its attack helicopters to be CAS aircraft, although they can conduct attacks using CAS tactics, techniques, and procedures when operating in support of joint forces.

generally first complete initial qualification training followed by mission-related training.

A qualified pilot must maintain proficiency by completing regular continuation training. The frequency and requirements for continuation training vary by service, and each service has its own training guidance. For example, the Air Force uses Ready Aircrew Program Tasking Memorandums to establish the minimum number of live training events, or "sorties," and virtual simulator training events required during the annual training cycle to maintain mission readiness. The Navy and Marine Corps set similar requirements in their Training and Readiness manuals, although the frequency of these requirements may differ. There are separate Ready Aircrew Program Tasking Memorandums and Training and Readiness manuals for each aircraft. Appendix I provides an overview of the continuation training requirements for the Air Force, Navy, and Marine Corps aircraft with a CAS mission.

DOD Has Common Procedures and a Variety of Capabilities to Identify Friendly Forces, but Numerous Factors Determine the Effectiveness of CAS Missions

DOD has adopted common procedures to identify friendly units, enemy forces, and civilians during CAS missions, and relies on a number of capabilities to communicate and confirm the location of friendly forces in relation to enemy targets. A variety of operational and environmental conditions can affect CAS execution and effectiveness. For example, terrain can limit a JTAC's line of sight for identifying a target, friendly forces, and communicating with an aircraft.

The U.S. Military Has Established Several Approaches to Identifying, Communicating, and Confirming Position of Friendly Forces during Close Air Support Missions

U.S. forces identify friendly and enemy forces, communicate between ground forces and aircrews, and confirm friendly force locations in several ways during CAS missions. Joint Publication 3.09-3, *Close Air Support*, provides an overview of CAS planning, outlines CAS command and control and communication requirements, and provides standard formats

for CAS execution.[28] More specifically, the Joint Publication provides a standard format for the CAS brief, known as the "9-line" brief, used for communicating information during CAS missions. Line 8 of the 9-line brief is the location of friendly forces and provides aircrew the direction and distance of the nearest friendly forces from the enemy target.[29]

In addition, the Air Land Sea Application Center, an organization established by the military services' doctrine centers to develop solutions for interoperability issues, developed a guide for requesting fire support in accordance with approved joint tactics, techniques, and procedures.[30] The Chairman of the Joint Chiefs of Staff also issued operations guidance and technical and procedural direction for the use of friendly force tracking capabilities.[31] Among other things, the guidance assigns responsibilities and provides direction to DOD components involved in the development and employment of friendly force tracking systems, which are intended to increase mission effectiveness by enhancing situational awareness of friendly force locations and reducing friendly fire incidents. The Joint Staff also cosponsored the development of the DACAS-specific tactics, techniques, and procedures.[32] The initiative that led to the development of the guidance sought to address the lack of standardized joint tactics, techniques, and procedures to take advantage of DACAS capabilities to improve timeliness, decrease human input error, improve

[28]Joint Pub. 3-09.3 (June 10, 2019).

[29]The location is given in a cardinal/subcardinal direction and distance in meters from the target to the closest friendly position.

[30]Army Techniques Publication 3-09.32, Marine Corps Reference Publication 3-31.6, Navy Tactics, Techniques, and Procedures 3-09.2, Air Force Tactics, Techniques, and Procedures 3-2.6, *JFIRE: Multi-Service Tactics, Techniques, and Procedures For Joint Application of Firepower* (Oct. 2019). The guide contains calls for fire, a format for joint air strike requests, close air support coordination and planning procedures, communications architecture, weapons data, and medical or casualty evacuation procedures.

[31]Chairman of the Joint Chiefs of Staff Instruction 3910.01B, *Friendly Force Tracking Operations Guidance* (Nov. 17, 2014).

[32]Joint Test and Evaluation, *Digitally-Aided Close Air Support (DACAS) Joint Test (JT) Tactics, Techniques, and Procedures* (May 2018). The document was the result of a collaborative effort between Joint Staff J6 and the Joint Test and Evaluation Program under the Director, Operational Test and Evaluation, within the Office of the Secretary of Defense.

situational awareness and confidence prior to weapons release, and enable JTAC and aircrew to access existing networks.[33]

Identifying friendly force locations. Forces integrating CAS are deployed with different types of equipment to implement the common procedures established for CAS.[34] Equipment used for identifying friendly positions includes radar beacons, infrared strobes and pointers, and other devices, as well as radios to communicate with ground forces and aircrews on a variety of frequencies.[35] Specific equipment used by JTACs and JFOs varies by service, and can vary for each mission. For example, according to officials, while JTACs may have access to some equipment, they do not always carry each piece of equipment when deployed on a mission. Table 2 provides examples of types of capabilities used by JTACs to identify friendly force locations.

Table 2: Joint Terminal Attack Controller (JTAC) Capabilities Used to Identify Friendly Forces during Close Air Support (CAS) Missions

Capability	Description
Radar beacon	Beacons can be used to identify friendly positions relatively accurately, and some aircraft (e.g., the Air Force B-1 bomber), can receive beacon codes up to 70 nautical miles away from the source. However, the use of beacons must be preplanned, since beacons have many settings and will only work when they are detected by radar. While they can be used in all-weather conditions and day or night, according to Department of Defense (DOD) guidance radar beacons are not commonly carried and few aircrew and JTACs are trained on the uses of radar beacons.
Infrared strobe	Infrared strobes can be used to identify friendly locations. Strobe lights come in a variety of types and their use is dependent on the environment in which CAS is conducted. For example, the presence of urban lighting may preclude the use of infrared strobe lights. A JTAC must take into account an enemy's capability inside of the light spectrum when selecting the appropriate strobe type.

[33]In addition to the joint publication and multi-service tactics, techniques, and procedures, there is service specific guidance for each aircraft and JTACs.

[34]This equipment would be used by ground forces that integrate CAS – the JTAC and JFO. As part of the aircrew, the forward air controllers (airborne) are equipped with the capabilities of the aircraft they are flying.

[35]According to U.S. Special Operations Command officials, the Command has been leading an effort to develop an infrared strobe capability for friendly force identification. Since 2018, the Command has tested several capabilities and are still working the issue. House Report 115-676 directed U.S. Special Operations Command, in coordination with the Army and the Air Force, to provide a briefing on DOD's efforts to synchronize a friendly force identification mechanism, such as infrared strobes, for use during combat close air support operations. H.R. Rep. No. 115-676, at 176-77 (2018). As of January 2020, U.S. Special Operations Command is still working this effort.

Video receivers	Video receivers allow a JTAC to see aerial imagery on their ground kits. The receivers help JTACs and aircrew to build situational awareness by providing precise coordination and friendly force location. JTACs using video need to ensure they are operating on the appropriate video downlink frequency as the attack aircraft.

Source: GAO analysis of DOD documents. | GAO-21-99

Communicating and confirming location of forces. Similarly, aircraft can communicate and confirm the information received from forces integrating CAS in different ways. The aircrew in an attacking aircraft can visually confirm target markings and friendly locations or use aircraft capabilities such as infrared capability or camera to confirm and correlate information received. However, not all aircraft have the same capabilities and as a result cannot always see or confirm target marks provided by ground forces. For example, several aircraft do not have a radar beacon capability whereas some aircrews can observe infrared strobes via night vision goggles.[36] According to Joint Staff officials, the ability of aircrews to observe infrared strobes via an advanced targeting pod is not possible since advanced targeting pods on CAS aircraft operate in a different portion of the infrared spectrum and cannot see these strobes.

Aircraft and the ground units they support have a variety of communications equipment, which operate across a range of frequencies to enable voice or digital communications during a CAS mission.[37] For instance, JTACs are equipped with different types of radios to communicate with aircrews via voice communications.[38] JTACs are also equipped with equipment to enable digital communications for DACAS.[39] However, aircraft capabilities vary and can affect how an aircraft

[36]Different infrared strobes operate on a range within the infrared spectrum, such as mid-wave or short-wave infrared. The spectrum that can be detected depends on aircrew equipment or aircraft pods. For effective CAS operations, a JTAC should understand the particular strobe they are using and which systems can identify the friendly location using those strobes.

[37]Forward air controller (airborne) is an additional capability with terminal attack control authority, and can communicate with other aircraft via aircraft datalinks.

[38]JTACs are equipped with different types of radios that can operate on a range of different frequencies and can be used to transmit voice communications in different situations. For example, ultra-high frequencies over military satellite communications is the primary means of beyond-the-line-of-sight communications, whereas other frequencies are used for line-of-sight communications.

[39]There are two main sets of equipment currently being used by JTACs to perform DACAS. The Air Force and U.S. Special Operations Command utilize the Special Warfare Assault Kit to enable digital communications using the Situation Awareness Datalink, Link 16, or Variable Message Format over Combat Net Radio tactical data links. The Marine Corps uses the Target Handoff System version 2 to digitally communicate using Variable Message Format over Combat Net Radio when connected to a specific radio.

communicates with the JTAC, and not all aircraft are capable of digital communications across DOD's most common digital systems and message formats. Additionally, according to U.S. Central Command officials, every JTAC, depending on service, component, or unit, will maintain different communications and digital capabilities. For example, the Air Force F-15 can only receive digital communications via the Link 16 data link and would not be able to communicate directly via digital means with a Marine JTAC using the Marine Corps DACAS equipment unless a forwarding gateway system is available to translate between message standards. Table 3 shows the aircraft that are capable of communicating via the different digital systems and message formats.

Table 3: Overview of DOD Aircraft Capable of Digital Communications for Close Air Support

Digital System	Message Format	List of Aircraft
Variable Message Format over Combat Net Radio	K-Series	Air Force A-10C Air Force B-52 Air Force F-16 Air Force, Navy, and Marine Corps F-35[a] Navy and Marine Corps F/A-18 Marine Corps AV-8B
Situation Awareness Data Link	J-Series	Air Force A-10C Air Force AC-130[a] Air Force F-16
Link 16	J-Series	Air Force AC-130 Air Force B-1B Air Force B-2 Air Force F-15E Air Force F-16 Air Force MQ-9 Air Force, Navy, and Marine Corps F-35[a] Navy MH-60[a] Navy and Marine Corps F/A-18
Not Capable	N/A	Marine Corps KC-130J Marine Corps AH-1[a] Marine Corps UH-1Y

Source: GAO analysis of Department of Defense (DOD) documents. | GAO-21-99

[a]There are different variants of this aircraft.

Operational and Environmental Conditions and Training Can Affect Friendly Force Identification during Close Air Support Missions

Joint Publication 3-09.3 outlines several factors that can affect friendly force identification and determine the effectiveness of CAS missions.[40] These factors include:

- **Planning and integration.** Effective CAS relies on thorough, coherent planning and detailed integration of air support into ground operations. Planning should consider such key issues as communications, battle tracking, and the movement of the friendly forces, among other considerations.
- **Command and control.** CAS requires an integrated command and control structure to identify mission requirements, request air support, prioritize competing demands, task units, move CAS aircraft to the target area, provide threat warning updates, and enhance friendly force identification procedures.
- **Control of the air.** Typically, air superiority allows the desired degree of control of the air that permits CAS to function without prohibitive interference. Suppression of enemy air defenses may be required during CAS attacks.
- **Target marking.** Providing timely and accurate target marks can improve CAS effectiveness. Target marking builds situational awareness of friendly and enemy positions and reduces the possibility of friendly fire.
- **Procedures.** Responsive fire support allows a commander to respond to rapid changes on the battlefield. CAS procedures should be flexible enough to rapidly allow changes to targets, tactics, or weapons.
- **Appropriate ordnance.** To create the desired effects, JTACs/forward air controllers (airborne) and aircrews must match the weapons to the target. For example, general-purpose munitions are effective against area targets, such as troops and vehicles in the open, but not when friendly forces may be affected by the immediate strike or by unexploded ordnance.
- **Environmental conditions.** Favorable environmental conditions improve aircrew effectiveness regardless of aircraft or weapon capability. Before CAS missions are executed, minimum weather

[40] *See* Joint Pub. 3-09.3 at I-7 to I-10.

conditions must be considered. Targets located solely by radar or geographic coordinates may not offer the aircrew or JTAC adequate information to mitigate the risk to friendly forces. Environmental conditions may also limit the operations of one type of aircraft without affecting another and can also significantly affect the ability to use target marking devices. Different aircraft capabilities, such as targeting pod capabilities, need to be considered for effective CAS. In addition, terrain where CAS occurs can affect communications as well as visual lines of sight for both JTACs and aircrew.

- **Effective training.** CAS training should integrate all maneuver and fire support elements involved in executing CAS, to include rehearsing procedures to identify the positions of friendly forces.

DOD has determined that not considering or accounting for these factors can lead to poor CAS execution and the possibility of friendly fire incidents. Moreover, DOD has concluded that U.S. forces can reduce the likelihood of friendly fire by accounting for these factors.

DOD Has Taken Steps to Enhance Digitally-Aided CAS and Friendly Force Identification, but Could Strengthen Implementation and Assessment Efforts

DOD has made some progress over the past 20 years implementing initiatives intended to improve the speed and accuracy of information exchanges during CAS missions through DACAS, and by enhancing the situational awareness of ground forces and aircrews regarding friendly force locations. However, we identified additional actions that are needed to strengthen its efforts in three areas. First, DOD has identified changes needed to address interoperability challenges of systems used to conduct DACAS, but has made limited progress in fully implementing these changes. Second, DOD's Bold Quest capability events have been used to assess the interoperability of selected DOD and partner nation CAS capabilities, but the scope of these events has been too limited to assess whether effective CAS interoperability has been achieved. Third, in October 2019 DOD implemented a new capability in the U.S. Central Command area of responsibility to help aircrews identify the positions of friendly forces and mitigate potential friendly fire incidents during CAS, but has experienced implementation challenges that have hampered its performance.

DOD Has Identified Changes Needed to Address Interoperability Gaps to Perform Digitally-Aided CAS but Has Not Fully Implemented Them

DOD has worked to develop common standards for DACAS equipment to address interoperability challenges, however progress in implementing them has been limited. Specifically, DACAS capabilities continue to improve, but to date are not fully interoperable to achieve DOD's goals for these capabilities, which include expediting communications and improving situational awareness during CAS missions.[41] Since 2012, DOD has worked to establish a baseline of digital interoperability for DACAS across the joint community by developing a common message standard for use in DACAS. The Joint Fire Support Coordinated Implementation Change Control Board, under the Joint Fire Support Executive Steering Committee ("Committee"), manages the DACAS coordinated implementation process to address interoperability gaps in the equipment used by JTACs and aircraft systems.[42] Working groups established under the board are composed largely of engineers from the different military services and partner nations who are familiar with their systems' architecture, capabilities, and limitations. The working groups develop engineering change proposals (ECPs) designed to mitigate known DACAS interoperability challenges.[43] The Board approves ECPs

[41]DOD previously planned to develop one system to conduct DACAS that all the military services would use. However, DOD stopped this effort when the military services determined that their unique operational requirements prevented them from developing a single system. Instead, the military services agreed to pursue the individual development of their own systems, but to implement a common message standard that would make these systems interoperable.

[42]Since 2009, the DACAS Coordinated Implementation process has evolved and is now currently managed within the Joint Fire Support Coordinated Implementation Change Control Board, which is headed by the Joint Fire Support Executive Steering Committee. The board is responsible for determining and executing engineering change proposals (ECPs) and fielding related courses of action to deliver incremental improvements in DACAS and digitally-aided fire support capabilities.

[43]An ECP is the document specifying the recommended or required engineering change and associated guidance to achieve a capability. The final ECP includes the system of systems specification and a list of the platforms and systems affected. It includes a record of the cost estimates, installation schedules, and performance projections with sufficient information for the Joint Fire Support Coordinated Implementation Change Control Board to recommend implementation.

after achieving consensus among the participants, which include the military services and partner nations.

Since taking this approach, DOD has established standard message formats and achieved a DACAS capability that permits JTAC and JFO equipment and CAS aircraft to exchange some information and conduct the terminal attack control portion of a CAS mission using digital communications.[44] According to Joint Staff J6 officials, DOD is currently working on implementing additional changes to address interoperability gaps in DACAS capabilities, such as the ability to forward messages between variable message format and Link 16-capable systems and standardizing CAS messages on Link 16-capable systems. In total, DOD has identified 15 ECPs to address gaps for DACAS that should be addressed to achieve digital interoperability across the joint community (see table 4). As of May 2020, DOD has approved and signed 10 of the 15 ECPs.

Table 4: Engineering Change Proposals (ECP) to Improve Interoperability in Digitally-Aided Close Air Support (DACAS) Missions

ECP number	Description
1	Establishes the baseline specifications for close air support (CAS) digital interoperability across the joint community. ECP 1 focuses on communication between the strike aircraft and Joint Terminal Attack Controller (JTAC) and Joint Fires Observer (JFO) operators during the attack phase of a CAS mission.
2	Enables the exchange of Designated Ground Target and Sensor Point of Interest information between the strike aircraft and the JTAC.
3	Provides for the digital exchange of tactical imagery.
4	Provides for the automated management of the combat net radio networks for DACAS.[a]
5	Provides for a centralized joint DACAS network planning and dissemination process.
6	Establishes a common, interoperable Joint Tactical Air Request process from the origination of the request through, but not including, mission assignment.
7	Provides a digitally-aided forward air controller (airborne) capability during the terminal attack control phase of the CAS mission.
8	Integrates armed unmanned platforms as strike assets in DACAS.
9	Enables a JTAC to digitally control a network-enabled weapon over the tactical air direction voice network.
10	Enables multiple point targets in a single CAS 9-Line.[b]

[44]DOD MIL-STD-6017B, *Department of Defense Interface Standard Variable Message Format (VMF)* (Oct. 30, 2009) provides the military services and defense agencies with joint interoperability standards, including message, data element, and protocol standards. These standards are used for the design, development, test, certification, fielding, and continued operation of automated tactical data systems which support the requirement to exchange timely, critical, command and control information across joint boundaries.

11	Enables digital exchange of situational awareness data information from beyond-line-of-sight between strike platforms and JTACs and JFOs.
12	Provides for the transmission of three-dimensional coordinates with ability to categorize coordinates as either friendly, neutral, unknown, or hostile.
13	Enables the exchange of targeting data between JFO and JTAC.
14	Modifies and standardizes Link 16 J-series messages used by the JTAC, JFO, and strike aircraft in DACAS.[c]
15	Extends the transmission and reception range of messages.

Source: GAO analysis of Department of Defense data. I GAO-21-99

[a]Combat Net Radio is a key enabling technology in DACAS in that it is a radio that can transmit both voice and data. When paired with variable message format, it is one of the principal tactical data links used in DACAS and is known as "Variable Message Format over Combat Net Radio."

[b]The CAS 9-line is a standardized briefing used to quickly pass information pilots need to conduct a CAS mission. The 9-line includes such information as target location, target description, location of friendly units, and other important information.

[c]J-series messages is a message format used to transmit information over the Link 16 and situation awareness data link.

In September 2020, Joint Staff officials stated that none of the 10 approved ECPs were fully implemented across all U.S. aircraft and JTAC equipment, even though seven of the 10 were approved in 2012 and 2013 (see fig. 3). According to Joint Staff officials, the Committee determined in 2017 that programs that implemented ECP 1 and 2 would be operationally capable of conducting DACAS. The remaining ECPs provide added capabilities that may not be needed by all CAS participants, but a program would need to implement the ECP for it to be interoperable with other systems that have implemented that ECP.[45] In addition, the list of approved ECPs includes one ECP (ECP 3) that enables the exchange of digital imagery and may no longer be needed because, according to Joint Staff J6 officials, digital imagery has been replaced by the widespread use of full motion video.

[45]A military service or partner nation is not required to implement an ECP if it does not have a need for a given capability. For example, Joint Staff officials stated that if a partner nation does not use forward air controllers (airborne), it would not implement the ECP that addresses that capability.

Figure 3: Timeline of Engineering Change Proposals (ECPs) for Digitally-Aided Close Air Support

Source: GAO analysis of Department of Defense documentation on Engineering Change Proposals. | GAO-21-99

Note: According to DOD, an ECP is the document specifying the recommended or required engineering change and associated guidance to achieve a digitally-aided close air support capability. The final ECP includes the system of systems specification and a list of the platforms and systems affected. It includes a record of the cost estimates, installation schedules, and performance projections with sufficient information to recommend implementation.

We also found that there has been limited progress in finalizing the five additional ECPs needed to address DACAS interoperability gaps. For example, as shown in table 4 above, ECP 14 identifies a need to modify and standardize the message formats used on the Link 16 system, which would enable JTACs to communicate more information digitally during CAS missions.[46] The issue was first identified in a 2016 Committee working group meeting, but as of July 2020, an ECP has not been approved to address this issue. In addition, ECP 15, which would enable the forwarding of DACAS messages and ensure that all relevant CAS participants receive updated situational awareness information, is still awaiting a DOD sponsor to begin the ECP development process.

According to Joint Staff J6 officials, the process for DACAS ECP development, approval, and implementation requires the participation of the military services and partner nations, and relies on the military

[46]According to DOD officials, J-Series messages used on Link 16 digital systems were not originally designed for DACAS and can only handle a portion of the information exchanges required for CAS. The result is current Link 16 tactics, techniques, and procedures retain a large number of voice exchanges. Air Force efforts to mature the new handheld Link 16 systems and the Coordinated Implementation Working Group's ECP 14, an effort to baseline the implementation of Link 16 messages for DACAS, should improve capability and reduce the reliance on voice communications, according to these officials.

services' and partner nations' resources to implement the ECPs. Given the broad range of stakeholders involved with the various programs and resources, the Joint Staff J6 has faced challenges in overseeing efforts to develop and implement ECPs to improve the interoperability of DACAS capabilities, according to officials.

However, we identified gaps in the existing guidance for the DACAS ECP process and the lack of a current plan for developing, approving, and implementing ECPs that have hindered implementation efforts. First, the charter that governs the DACAS ECP process is outdated, and according to Joint Staff officials, does not effectively address the engagement of key participants. *Standards for Internal Control in the Federal Government* state that management should establish an organizational structure, assign responsibility, and delegate authority to achieve the entity's objectives and periodically evaluate this organizational structure to ensure it continues to support the organization efforts to meet its objectives.[47] Joint Staff J6 officials stated that inclusion of other offices in the charter, such as service acquisition authorities and the Office of Secretary of Defense, would improve the process for developing and implementing ECPs because these additional participants could authorize development of policy, manage resources, and play a key role in acquisition of capabilities, all of which could help prioritize necessary changes across DOD to implement the ECPs.[48]

Second, the Committee lacks a current plan with accountability measures, such as timeframes for developing, approving, and implementing ECPs, to facilitate the incorporation of the ECPs into DACAS systems, or a documented process to periodically review existing approved ECPs for relevance and service-level DACAS capabilities' compliance with ECPs. During our review, officials provided a plan signed in March 2010 that outlines the tasks and deployment approach necessary to stand up the joint coordinated implementation of interoperable capability upgrades for DACAS, but according to officials the plan has not been updated since that time. *Standards for Internal Control in the Federal Government* emphasize the need for an organization to establish objectives to provide a roadmap to achieve its

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

[48]DOD officials suggested that the Charter might even be modified to provide for an Office of Secretary of Defense co-chair to improve DACAS implementation.

mission and goals.[49] These objectives should be specific—that is, they should clearly define what is to be achieved, who is to achieve it, how it will be achieved, and the time frames for achievement—so they are understood at all levels of the organization. Further, the organization should define the objectives in measurable terms so that they can assess performance toward achieving them.

Joint Staff J6 officials confirmed that while they had not updated their 2010 plan for ECP implementation, doing so would be possible. However, officials stated that developing a precise timeline for implementing changes to improve ground equipment and aircraft systems interoperability would be difficult because updates to aircraft systems can be on a 7-year cycle. Although a 7-year cycle may make planning difficult, establishing an objective provides a target for an organization to focus its efforts over the years. Furthermore, we found, and Joint Staff J6 officials agreed, that there is no requirement or documented process for periodically reviewing approved ECPs to determine if approved ECPs continue to meet the objectives of the program or remain interoperable with other military services' equipment and aircraft.

Third, the guidance establishing the DACAS ECP process does not result in senior level review of the DACAS ECP implementation efforts to hold the military services accountable for implementing the ECPs. *Standards for Internal Control in the Federal Government* state that management should establish control activities, such as periodic, documented reviews to ensure the agency achieves its objectives.[50] The charter for the Joint Fire Support Coordinated Implementation Change Control Board requires the board to provide a quarterly status report on DACAS activities to the Committee. The Committee submits an annual report to the appropriate Functional Capabilities Boards for consideration and possible follow-on actions using the Joint Capability Integration Development System process.[51] However, we reviewed the 2017, 2018, and 2019 annual reports submitted by the Committee to the Functional Capabilities Board, and these reports only capture the top four Committee accomplishments

[49]GAO-14-704G.

[50]GAO-14-704G.

[51]Functional Capabilities Boards are advisory bodies to more senior entities within DOD, including the Joint Requirements Oversight Council. Among other responsibilities, functional capabilities boards provide assessments and recommendations required to validate and prioritize joint military capabilities. DOD has several Functional Capabilities Boards that are aligned with joint capability areas.

for that fiscal year. A direct reporting and documented review structure between the DACAS coordinated implementation process and the appropriate Functional Capabilities Board could facilitate progress by incentivizing participation in the process and implementation of ECPs.

The Chairman of the Joint Chiefs of Staff has identified interoperability as a fundamental element of the future Joint Force and emphasized the need to define and enforce interoperability standards for future capabilities.[52] By taking additional steps to address gaps in the existing guidance for the DACAS ECP process, including (1) updating the charter to better include additional relevant participants, (2) developing a plan for implementing ECPs and a periodic review process, and (3) implementing a documented review structure for service-level implementation of ECPs, DOD would be better positioned to ensure that service DACAS capabilities are interoperable across the joint force and available as a means to execute CAS.

DOD Efforts to Assess Digitally-Aided CAS Interoperability Have Been Limited in Scope

DOD has worked to assess ECPs to ensure the interoperability of DACAS capabilities, but these assessments have not included all ECPs and have been limited in scope. The Joint Staff J6, through the Committee and its subordinate organizations, assess the implementation of ECPs.[53] The Joint Staff J6 does this primarily through two venues.

The first venue for Joint Staff to assess ECP implementation and compliance is through its Engineering Change Implementation Group, which is responsible for overseeing the testing, assessment, and coordination of fielding of ECPs across participating programs.[54] The

[52] *See* Chairman of the Joint Chiefs of Staff Instruction 6265.01, encl. A, para. 1.

[53] The Joint Fire Support Coordinated Implementation Change Control Board, with oversight by the Joint Fire Support Executive Steering Committee, provides the military services and program managers with a single effort supporting the coordinated implementation of interoperable solutions within the context of CAS missions and directs the activities of the DACAS Working Group and the Engineering Change Implementation Group. Joint Staff J6 leads or facilitates all of these organizations.

[54] The Engineering Change Implementation Group is responsible for, among other things, assessing DACAS and digitally-aided fire support capability upgrades from a system of systems perspective, and conducting Risk Reduction Events. Risk Reduction Events assess a system's ability to meet derived technical requirements and are usually conducted during Bold Quest events.

Engineering Change Implementation Group is led by the Joint Staff J6 Joint Assessment Division. Officials with the Joint Assessment Division say they use a tool, termed the DACAS Variable Message Format Messaging Tool, to assess compliance or noncompliance of a piece of equipment with DACAS standards, as well as ECP implementation. The Joint Assessment Division offers to assess the military services' and partner nations' equipment at Eglin Air Force Base using the DACAS Variable Message Format Messaging Tool. In addition, Joint Staff officials stated that the Joint Assessment Division will provide the tool to any DOD component or partner nation that desires it. According to officials from the Joint Assessment Division, the DACAS Variable Message Format Messaging Tool can assess DACAS equipment compliance with some but not all ECPs. For example, in the past, the tool could not assess Link-16 messages because it was not programmed to do so. As of October 2020, according to Joint Staff officials, the tool has been updated and can now collect and process Link-16 messages, which will enable formal assessments of Link-16 once the related ECP is signed. The tool will be upgraded to address other ECPs as they are completed, signed, and required by the Committee, according to these officials.

The second venue for Joint Staff to assess ECP implementation and compliance is during Bold Quest biannual events. DOD established Bold Quest as a means for the military services and partner nations to, among other things, demonstrate and assess the interoperability of capabilities such as those used for DACAS.[55] Joint Staff J6 officials told us they have used Bold Quest events to assess ECP compliance. However, we found that the scope of past Bold Quest events has been limited, as discussed below, which has limited the usefulness of these events to assess ECP compliance. Based on our review of Joint Staff documentation and statements from Joint Staff J6 officials, only two of the 10 signed ECPs have been formally assessed for compliance in Bold Quest events to date.[56] The ECPs formally assessed include ECPs 1 and 2 which, according Committee guidelines, are thresholds a program must comply with to be operationally capable of performing DACAS.[57] However,

[55]*See* Chairman of the Joint Chiefs of Staff Instruction 6265.01, encl. A. para. 1.

[56]According to DOD officials, DOD components and partner nations have assessed compliance with other ECPs during Bold Quest events, but only ECP 1 and 2 have been formally assessed.

[57]According to Joint Staff officials, the Committee published an objective for programs to implement ECP 5, which centers on operational network planning. The remaining ECPs are only required for subsets of the DACAS community and do not affect overall interoperability or availability of friendly force tracking information.

officials identified limitations in the assessments for these two ECPs. For example, while the two ECPs have achieved a level of implementation for certain aircraft and ground equipment kits at points in time, officials stated that there is no guarantee the capability has maintained ECP compliance if an aircraft system or other equipment is updated after the assessment was conducted.

In addition, Bold Quest events have not assessed ECP compliance of DACAS capabilities in a contested operational environment. DOD expects that in any future conflict our adversaries will take steps, such as jamming our global positioning systems or communication systems, to block or impede our operations. However, according to Joint Staff officials, to date, Bold Quest events have only been conducted in a permissive environment where DACAS capabilities may not be demonstrated in the same way they would be in a contested environment.[58] Officials stated that, while operationally relevant, certain political and agency restrictions have limited their ability to conduct events in a contested environment. Joint Staff J6 officials stated that remote ranges could be used to simulate a contested environment, but that the use of these ranges is expensive, could be cost-prohibitive, and due to significant security requirements on these ranges, participation by partner nations could be difficult. According to Joint Staff J6 officials, they plan to incorporate measures to interfere or block global positioning systems communications in the 2020 Bold Quest event but have been unable to replicate a more contested event, such as including communications jamming, due to range and location limitations. Officials have considered conducting Bold Quest events in a virtual training environment to replicate certain capabilities presented by near-peer adversaries, but DOD does not currently have the capability to demonstrate and assess DACAS equipment in a contested virtual environment.

Joint Staff officials stated that DOD has some efforts underway outside of Bold Quest events that could be used to demonstrate DACAS capabilities in a contested environment. For example, DOD has established a joint cross-functional team that is exploring a “Joint All-Domain Command and Control” concept, and is working to develop policies, doctrine,

[58]A permissive environment is one where the enemy has minimal effect on operations and little influence on domains (e.g. air, land). A contested environment is one where the enemy can show temporary and successful influence on one or more domains and affect operations.

requirements and research and development strategies to implement it.[59] Under the Joint All-Domain Command and Control concept, Joint Staff officials believe DOD could use military service and combatant command exercises, demonstrations, and experiments to assess DACAS ECP compliance because these events have the requisite threat characteristics to replicate a contested operating environment.

The Chairman of the Joint Chiefs of Staff has assigned responsibility to Joint Staff J6 for managing the planning and execution of Bold Quest events and has issued guidance to govern the conduct of these events.[60] Specifically, among other purposes, Bold Quest events are designed to advance the interoperability of existing and emerging capabilities. Moreover, the 2018 *National Defense Strategy* also indicates that every domain is contested and that the U.S. should modernize key capabilities to enable the Joint Force to strike targets in a contested environment.[61]

In fulfilling its responsibilities, the Joint Staff developed a charter that establishes, among other things, the responsibilities, composition, and work product outputs of the Engineering Change Implementation Group in supporting the coordinated implementation of DACAS.[62] Under the charter, the Engineering Change Implementation Group is responsible for producing joint test/assessment plans and procedures. However, the Joint Staff J6 does not have a plan to ensure ECPs are assessed for implementation and compliance during Bold Quest or other events so that future events advance the interoperability of fielded and emerging capabilities to include operating in contested environment. Joint Staff J6 officials confirmed they do not have a plan for assessing all ECPs and stated they rely on the participants' objectives to drive the direction of the Bold Quest events, including what ECPs are assessed and when they are assessed. By broadening the scope of its efforts for assessing ECP implementation during Bold Quest or other events, DOD could build upon the progress of ECPs 1 and 2 to ensure that service DACAS capabilities

[59]Joint All-Domain Command and Control is DOD's concept to connect sensors from all of the military services into a single network.

[60]Chairman of the Joint Chiefs of Staff Instruction 6265.01, *Coalition Capability Demonstration and Assessment (Bold Quest) Governance and Management* (July 23, 2015).

[61]Department of Defense, *Summary of the 2018 of the National Defense Strategy of the United States of America*.

[62]Joint Chiefs of Staff, *Change Control Board Charter for Joint Coordinated Implementation of Digitally Aided Joint Fire Support* (Aug. 2013).

are interoperable across the joint force under various operating environments.

DOD Deployed a New Capability to Enhance Friendly Force Identification during CAS Missions, but Has Experienced Implementation Challenges

In October 2019, Air Force Central Command deployed a new capability—commonly referred to as the Situational Awareness Service-Enhanced (SAS-E)—meant to enhance friendly force identification and reduce the potential of friendly fire incidents.[63] SAS-E works first by having friendly units report their location to the Global Command and Control System – Joint database using their friendly force tracking system/device. When pilots request the information, they send a message to an air operations center to identify the location of friendly units near a target. SAS-E is designed to provide the friendly units' locations to the pilot's cockpit display through a series of messages.[64] The system is also designed to send a text message listing the number of friendly units near the target, which would include zero if there are no friendly units in the

[63]Joint Staff, *Situational Awareness Service - Enhanced (SAS-E) Capability Package (CP) – 1* (Suffolk, VA; Dec. 13, 2013). SAS-E, also referred to as "Ground-to-Air Situational Awareness" is a software solution integrated into the Global Command and Control System – Joint enterprise capability. Global Command and Control System – Joint is a DOD program of record that provides command and control capabilities across all combatant commands and other DOD sites. SAS-E is an embedded capability on the Global Command and Control System – Joint enterprise and it eliminated the need for standalone hardware solutions in each command or theater. According to DOD officials, SAS-E is currently only used in U.S. Central Command. Air Force Central Command operates SAS-E within the U.S. Central Command's area of responsibility. SAS-E is a follow-on capability to the Combat Identification Server, which U.S. Central Command identified a need for in 2011. The capability provided near-real time friendly ground force locations to U.S. and coalition aircraft cockpit displays via existing tactical data links. According to officials, the Combat Identification Server was only used in the U.S. Central Command area of responsibility.

[64]The message the pilot sends requesting the location of friendly/neutral ground and air units is the J12.6 Target Sorting Message. SAS-E sends the aircraft a predetermined number of friendly/neutral ground and air units that are within a preset range around the designated point. These are the J3.2 Air Track and J3.5 Land Track/Point Messages. The operator can change the maximum number of closest units reported, which is usually set at five, and the preset range around the designated point during system set-up and configuration. These friendly and neutral units appear on the pilot's cockpit display. In addition, SAS-E sends a text message with the type and the number of units reported within the configured range. This is the J28.2 text message. The operator can turn the J28.2 text message off if desired.

area. After 45 seconds, the system is designed to send another message deleting the friendly units from the cockpit display.[65] If desired, the pilot can submit another request for the friendly units' locations.

When we met with Air Force Central Command officials in April 2020, they reported a number of problems with SAS-E that began shortly after the system was installed and deployed in October 2019. First, SAS-E was not sending the location of ground units to the aircraft. Second, SAS-E was not removing the location of all friendly and neutral aircraft shown in an aircraft cockpit display after a preset time. Finally, SAS-E was sending multiple text messages reporting the type and the number of units within the configured range when it should have only sent one text message.

Subsequent to our meeting, Air Force Central Command officials stated they contacted the Defense Information Systems Agency for assistance, and a representative from Defense Information Systems Agency examined the problems. For the first problem, the representative found a configuration error in the system, which prevented SAS-E from sending ground unit locations to aircraft.[66] Defense Information Systems Agency officials reported they were unable to replicate the other two problems (i.e., removing the location of friendly and neutral aircraft in an aircraft cockpit display after 45 seconds and sending multiple text messages). According to Defense Information Systems Agency officials, Air Force Central Command turned the text message function off to prevent the system from sending multiple text messages and removed outdated air units from the display by turning the Link 16 communication channel off, deleting the air unit, and then turning the Link 16 channel back on. However, these measures were not intended to fix the problems, but were instead measures the users took to keep the system operating.

[65]The message SAS-E sends to remove the units is the J7.0 Drop Track Message. The operator can change how long before SAS-E sends the J7.0 Drop Track Message during system configuration. The time can be set to anywhere between 0 and 60 seconds, but the default is 45 seconds.

[66]According to the Defense Information Systems Agency, the "Staleness Time Out Value" for location of ground units was set to 1 second, which meant that ground unit locations would need to have been updated within 1 second or less in order to be transmitted to the cockpit display. These officials believe that the incorrect setting for this Staleness Time Out Value is why SAS-E was not sending the location of any ground units to the aircraft. The officials further explained that the typical setting for this value is 600 seconds to allow for the reporting to the aircraft of the location of any ground unit that had been updated within the previous 10 minutes.

According to officials, Air Force Central Command personnel responsible for administering SAS-E and integrating the data into the common operational picture and during CAS mission planning received initial familiarization training on how to set up and administer SAS-E when Defense Information Systems Agency officials installed SAS-E at Air Force Central Command. However, according to DOD officials no other training was provided and new personnel arriving at the command did not receive SAS-E training upon taking over responsibility for managing the system. The lack of training contributed to errors in configuring and using the system.[67] Specifically, when fielding SAS-E in fiscal year 2020, the Joint Staff's Joint Education and Doctrine Division did not ensure appropriate training and training support capabilities were in place before Air Force Central Command implemented SAS-E. Further, officials from the other joint training organizations with whom we spoke stated their organizations did not provide training on SAS-E and had no plans to do so at the time of our review.

Chairman of the Joint Chiefs of Staff Instruction 3265.02, *Joint Command and Control Systems Training Management*, establishes responsibilities, relationships, and a management structure related to training on joint command and control systems, which would include Global Command and Control System – Joint.[68] Specifically, the Joint Staff's Joint Education and Doctrine Division, in collaboration with the combat capability developers, materiel developers, and operational sponsors, is responsible for ensuring that appropriate, joint standards-based system training and training support capabilities are in place and meet warfighter needs when joint command and control capabilities are fielded.[69] Joint Staff officials confirmed that no training had been developed for SAS-E, but stated training for the system should be developed to mitigate errors in the configuration and use of the system. Without establishing training

[67]Subsequent to our meeting with Air Force Central Command, Defense Information Systems Agency officials reported they received a request from Air Force Central Command for assistance in correcting the problems with the SAS-E system and providing some additional training to personnel. According to an Air Force Central Command official, Defense Information Systems Agency provided this assistance in July 2020.

[68]Chairman of the Joint Chiefs of Staff Instruction 3265.02*, Joint Command and Control Systems Training Management* (Oct. 10, 2014).

[69]Other DOD organizations also have responsibilities related to training U.S. service members for joint command and control systems. These include the Joint Staff Joint Deployment Training Center, Joint Staff Joint Interoperability Division, and Defense Information Systems Agency, as well as certain military service training organizations.

for Global Command and Control System – Joint users that includes SAS-E, Air Force Central Command and other combatant commands will likely continue to experience problems with SAS-E because they lack the personnel to properly configure and operate the system.

In addition to requiring training for systems such as SAS-E, DOD also provides guidance for certain reviews after program implementation.[70] Post implementation reviews evaluate systems for effectiveness and efficiency and decide whether the system should be continued, modified, or terminated. Further, the post implementation review reports on the degree to which doctrine, organization, training, materiel, leadership, education, personnel, facilities, and policy changes have achieved established measures of effectiveness for the desired capability. The OMB *Capital Programming Guide* similarly discusses a post implementation review for projects and notes that the review usually occurs after a system has been in operation for about 6 months or immediately following investment termination.[71]

Joint Staff and Defense Information Systems Agency officials stated they have not conducted a post implementation review of SAS-E. DOD Instruction 5000.82 states that the information technology functional sponsor, in coordination with the DOD component chief information officer and program manager, is responsible for conducting the post implementation review. It defines the information technology functional sponsor as the DOD or component leader in information technology acquisitions responsible for conducting solution analysis and identifying the capability requirements necessary to meet operational, mission functionality.[72] According to Defense Information Systems Agency officials, their agency is the program manager. According to the Chairman of the Joint Chiefs of Staff Instruction 3265.01A, the Joint Staff J3 is the operational sponsor for command and control operational policy and process matters and J6 is the capability sponsor for joint command and control requirements and capability development matters, which would

[70]Department of Defense (DOD) Instruction 5000.82, *Acquisition of Information Technology (IT)* (Apr. 21, 2020). DOD Instruction 5000.82 establishes functional acquisition policy and procedures for programs containing information technology and includes in its procedures guidance pertaining to a post-implementation review.

[71]Office of Management and Budget, *Capital Programing Guide V. 3.1, Supplement to Office of Management and Budget Circular A-11: Planning, Budgeting, and Acquisition of Capital Assets* (2020).

[72]DOD Instruction 5000.82 at 17.

include capabilities related to the Global Command and Control System – Joint and SAS-E.[73] Defense Information Systems Agency, Joint Staff, and Air Force Central Command officials stated they were not the functional sponsors for SAS-E, but were unable to identify which DOD office or organization fulfilled this role.

Among other things, a post implementation review would examine the degree to which various changes—including with respect to training—have achieved established measures of effectiveness. A post implementation review, if DOD had conducted one, may have identified and reported the lack of SAS-E training and the problems Air Force Central Command personnel encountered with SAS-E. Without conducting a post implementation review, DOD will likely continue to experience the known implementation problems with SAS-E and may not be able to determine if other problems exist. Moreover, because SAS-E was set to deploy to other combatant commands when those commands updated Global Command and Control System – Joint by the end of fiscal year 2020, DOD should address current shortfalls with the system implementation.

DOD Has Taken Steps but Has Not Fully Evaluated Training for Forces that Integrate CAS

DOD has established minimum training standards and program evaluations for JTACs, forward air controllers (airborne), and JFOs, but we identified areas where additional evaluative steps are needed. More specifically, the Army and Marine Corps do not systematically evaluate their JFO programs. In addition, JTAC training programs have increased their use of non-military contract aircraft to complete training requirements, but DOD has not fully evaluated the use of the contract aircraft to meet training needs.

[73]Chairman of the Joint Chiefs of Staff Instruction 3265.01A, *Command and Control Governance and Management* (Oct. 21, 2013).

DOD Has Established Minimum Standards for Forces That Integrate CAS and Evaluates Training Programs for Compliance

DOD has developed MOAs that establish minimum training standards for JTACs, forward air controllers (airborne), and JFOs. Each MOA establishes minimum training and performance standards to attain initial certification and maintain qualification (i.e., sustainment training). For example, in order to become a certified JTAC, a trainee must (1) complete an accredited JTAC academics program, (2) demonstrate proficiency in a number of tasks through an evaluation by a qualified instructor, (3) complete an initial JTAC evaluation by a designated evaluator, and (4) complete certain tasks outlined in the Joint Mission Task List when conducting a terminal attack control.

In order to maintain qualification, a JTAC must complete certain currency training, which includes maintaining Joint Mission Task List knowledge and task proficiency, completing a minimum number of training events on a semiannual basis, and successfully completing an evaluation no less than every 18 months.[74] Initial certification training is accomplished when each JTAC, forward air controller (airborne), or JFO trainee completes a training course at a military service or partner nation school that is accredited to administer the training by the MOA. After that training is completed, trainees complete additional applicable mission qualification training as a part of their operational units.

The MOAs establish a minimum standard by which U.S. forces consider an individual qualified to perform terminal attack control tasks, but signatories to the MOA can exceed these standards or require additional follow-on training. In an effort to ensure each force is trained to a minimum standard, the Committee relies on standardization teams to conduct recurring program evaluations. These teams are responsible for conducting initial accreditation, triennial reviews of training programs, and implementing the standardization process outlined in the MOAs.[75] The

[74]According to the JTAC MOA, the military services, U.S. Special Operations Command, and partner nations determine their own evaluator and recurring evaluation requirements. However, the interval between evaluations will not exceed 18 months.

[75]The Forward Air Controller (Airborne) MOA discusses the conduct of assessments by standardization teams or internal assessment teams.

Committee initially accredits the JTAC, forward air controllers (airborne), and JFO training programs.[76]

Signatories to the MOAs host accreditation reviews that take place once every 3 years and are conducted by a standardization team.[77] Accreditation at a military service or partner nation school that administers the training may be suspended if its program is found not to be in accordance with guidelines. In addition, the standardization team may recommend accreditation of a program with discrepancies, but recommend actions to correct discrepancies and a timeline for providing documentation that all discrepancies have been cleared or addressed. According to Joint Staff J6 officials, as a part of the triennial reviews, the standardization teams select and visit one military service or partner nation school that administers each training program to ensure compliance with the MOA standards. As some programs have multiple schools, the frequency with which the standardization team visits any one school that administers the training programs varies, and it is possible that numerous years can pass without a school being visited. For example, the Army and Marine Corps have three schools that initially certify JFOs. Based on a triennial review process, each school may go up to 9 years without a review by the standardization team. According to Joint Staff officials, all MOA signatories with multiple schools have agreed to conduct self-assessments of those training programs that the standardization teams do not visit during the triennial review cycle, and report the results to the Committee.

Programs are evaluated against criteria established within each MOA.[78] At the completion of each review, the standardization team provides a

[76]With respect to accreditation, among other things, the MOAs note that the Committee will accredit (or recognize) training programs with a signed regulation or manual, which outlines policies and personnel responsibilities for certification and qualification training, and demonstrate compliance with academic, practical, simulated, and live (if applicable) training requirements in accordance with the MOA.

[77]The standardization team is led by Joint Staff J6 and formed at the direction of the Committee. The team is responsible for conducting initial accreditation and triennial reviews of schoolhouses/programs and implementing the standardization process.

[78]Criteria varies across each program – JTAC, forward air controller (airborne), and JFO – and is generally linked to the Joint Mission Task List for JTACs and forward air controllers (airborne) and the joint mission-essential task list for JFOs. DOD defines joint mission-essential tasks as mission tasks selected by a joint force commander deemed essential to mission accomplishment and defined using the common language of the Universal Joint Task List in terms of task, condition, and standard. *DOD Dictionary of Military and Associated Terms* (as of June 2020).

written report that includes discrepancies, observations, best practices, and recommended solutions to officials that administer the training programs, the parent command, and the Committee. For identified discrepancies, the report also includes recommended corrective actions and a projected timeline to provide documentation for clearing all discrepancies. The reports may also include observations with recommended actions, which according to officials do not require follow-up actions that need to be addressed by signatories. While programs may continue to operate and train students, if discrepancies are not cleared within an established timeline, the program's accreditation may be revoked. The JTAC and forward air controller (airborne) MOAs also indicate that, in some circumstances, all certifications issued by it in the preceding period will be revoked.

In addition to the accreditation and review processes, the Committee also holds an annual curriculum review to compare curricula, ensure joint standardization, share best practices and lessons learned, and discuss potential improvements and adjustments to the curriculum, certification, and qualification processes.

The Army and Marine Corps Do Not Systematically Evaluate JFO Sustainment Training

DOD components have processes for evaluating JTAC and forward air controller (airborne) certification and sustainment training, such as component-wide annual reviews, but the Army and Marine Corps-–the two military services that train JFOs—have not conducted systematic evaluations of JFO sustainment training. The Committee's triennial reviews have identified several issues with program management of Army and Marine Corps JFO sustainment training, including discrepancies in records management and reporting, that limit systematic analysis and standardization of JFO training.

Specifically, in 2015 and 2019, the reviews noted a lack of oversight of the Army's JFO program, poor tracking of training data at the unit level, and no ability to track JFO training data digitally. For example, the 2019 report noted that the designated unit-level official responsible for tracking JFO training status at the division could not produce a current roster of trained and qualified JFOs. Additionally, a sample of one operating unit showed the unit had less than 50 percent qualified JFOs. Similar observations were noted by the standardization team during a review of the Marine Corps' JFO program. A 2019 review found that a lack of an

automated management system to track JFO currency left an information gap in the ability to manage JFO training.

To address the observations, the standardization teams made several recommendations to the Army and Marine Corps to improve JFO program oversight. These recommendations included improvements to electronic systems to address the inability of program managers to access JFO training data and that JFO program managers should take a more active role in managing JFO training within their units. However, some of these recommendations for both the Army and Marine Corps programs were made based on observations during the triennial accreditation reviews, but did not require follow-up actions that needed to be addressed.[79]

Our prior work on federal training and development programs states that agencies should systematically evaluate the effectiveness of their training efforts and collect data corresponding to established training objectives to continually improve, deliver, and enhance training and ensure the effective allocation of resources.[80] However, the Army and Marine Corps expressed concerns similar to those identified in the accreditation reviews from 2015 and 2019 during the course of our review, and confirmed that systematic evaluations of JFO sustainment training have not occurred through September 2020. We found that the Army and Marine Corps are hindered in their ability to evaluate JFO sustainment training for the following two reasons:

- **The JFO programs for the Army and Marine Corps have limited headquarters-level oversight for service-wide issues.** Neither the JFO MOA nor Army and Marine Corps guidance establish specific service-level JFO program management responsibilities. The JFO MOA was updated in February 2020 and added some program manager responsibilities, which include tracking and reporting training and qualification status of all JFOs within a unit. However, the specific responsibilities listed in that MOA focus on program management at the unit level and only for the tracking, reporting, and maintaining of records, and do not specifically require service-level evaluations of the JFO program. Similarly, service-level guidance for the Army and

[79]For recommendations made in response to identified discrepancies, the report also includes recommended corrective actions and a projected timeline to provide documentation for clearing all discrepancies.

[80]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).

Marine Corps does not include specific JFO service-level program manager responsibilities regarding assessing training service-wide.

In our discussions, Army and Marine Corps officials noted that JFOs are expected to remain qualified by meeting established training requirements, but these officials also noted that there is no mechanism for headquarters-level accountability to assess training service-wide to meet that expectation. Officials stated this is because JFO is not a primary military occupational specialty within the Marine Corps or Army, and no entity has been assigned the responsibility for monitoring JFO training.[81]

- **The Army and Marine Corps have not established service-wide systems to monitor JFO currency training.** Notwithstanding the prior accreditation report findings, the Army and Marine Corps have not improved their electronic systems to access and evaluate JFO training data. Army Training and Doctrine Command officials stated that no centralized system exists to track completion and consistency of JFO training requirements. Records are managed in either hard copy or electronic form at the brigade level or lower. Army Training and Doctrine Command conducts periodic spot checks of JFO units' currency training, but it does not oversee the training completion of operational units because, according to officials, its oversight is limited to initial training at the schoolhouse and does not include direct control over JFO currency training conducted by those units. According to Army officials, they lack a centralized system to track JFO training data, and have not identified any plans to implement one.

  Similarly, the Marine Corps is unable to track data electronically on JFO training completion. Headquarters, Marine Corps officials stated that no electronic module exists to track JFO data to give headquarters officials service-wide oversight of the program. Training data is managed in paper evaluation folders by the JFO's parent command and are therefore dispersed across different commands in the service. As a result, any information from the data would have to be obtained by reviewing paper files provided by a unit commander. The current Marine Corps training information management system lacks a module for tracking JFO training data. Marine Corps

[81]The Army and Marine Corps delineate their force structure through the use of military occupational specialties. The occupational specialties represent the jobs that are necessary to meet their specific missions and cover a variety of jobs. According to officials, in addition to training for a specific military occupational specialty, the services also provide specialized skill training for certain positions within a unit. For example, the JFO skillset is something a soldier or marine will train to before potentially becoming a JTAC or returning to another unit.

Headquarters officials we spoke with noted that they have proposed an update to the Marine Corps' Training Information System to develop a JFO module that would allow them to track JFO currency training; however, as of September 2020 they have not developed this module.

Without establishing service-level guidance to clarify program management responsibilities and identifying a database to collect service-wide JFO training data, the Army and Marine Corps cannot systematically evaluate JFO training at the service level or identify shortfalls in training programs.

DOD Has Not Fully Evaluated the Use of Non-Military Contract Aircraft Used for JTAC Training

The JTAC MOA establishes requirements for JTAC training that include conditions, such as training events with an actual aircraft (with or without munitions) and training via a simulator.[82] In order to meet training requirements, address shortages in available military aircraft, and manage costs, officials stated that U.S. forces use non-military contract aircraft to replicate the role of combat aircraft during initial and sustainment training.[83] Our review of data on the usage of contract aircraft by the Air Force, Marine Corps, and U.S. Special Operations Command shows an overall increase in the total number of hours dedicated to meeting JTAC training requirements for CAS in the past 3 fiscal years, increasing substantially from about 1,600 hours in fiscal year 2017 to

[82]The JTAC MOA describes live, dry, and simulated terminal attack control. Live terminal attack control conditions involve actual aircraft where air-to-ground munitions (live, inert, or training ordnance) are present and release is intended. Dry terminal attack control conditions involve actual aircraft where munitions are not present or release is not intended. Simulated terminal attack control conditions involve simulated aircraft in a live or virtual environment. For purposes of this report, we use the term "actual aircraft" to refer to live terminal attack control and dry terminal attack control conditions.

[83]Officials stated that the use of contract aircraft to conduct CAS training stems from a lack of availability of military aircraft to meet training needs and the lower cost of using contract aircraft when compared to traditional fourth- and fifth-generation U.S. military aircraft. The fourth-generation fighter and attack fleet is made up of AV-8B, F-16s, F-15s, F/A-18s, and A-10s, many of which were purchased in the 1970s, 1980s, and 1990s. In 2001, DOD started to develop the F-35, a fifth-generation fighter aircraft intended to replace a range of aging aircraft in the U.S. military services' inventories.

almost 2,900 hours in fiscal year 2019.[84] Additionally, officials also stated they expect contract CAS usage to remain steady or increase in the future, due to the cost-per-hour expense to operate the F-35 and the shortage of pilots, which results in a reduced availability of military aircraft for training purposes.

The military services and service components of the U.S. Special Operations Command have contracts for non-military aircraft used for JTAC training, and there are differences in the contract requirements for the aircraft used. As outlined in table 5, our review of these contracts found that the minimum performance requirements of the contracted aircraft, such as airspeed and maneuverability, vary across the contracts. For example, the Air Force requires that contract aircraft be capable of operating in excess of 170 knots, have the capability to sustain a maximum of 4Gs, and have the ability to perform aerobatic tactical maneuvering to achieve up to 30-degree deliveries for simulated ordnance release.[85]

Table 5: Overview of Differences in Minimum Performance Requirements of Contracted Non-Military Aircraft Used for Close Air Support (CAS) Training, by Component

DOD component	Minimum airspeed requirement	Tactical maneuverability (Max G-force)[a]	Dive delivery profile
Air Force (Nellis 6th Combat Training Squadron)	In excess of 170 Knots true air speed	4Gs	Up to 30-degree deliveries for simulated ordnance release
Air Force (United States Air Forces in Europe)	In excess of 300 Knots Indicated Air Speed	4Gs	Up to 30-degree deliveries for simulated ordnance release
Air Force Special Operations Command	350 Knots Indicated Airspeed	+7G and - 3G turns	Up to 45-degree deliveries for simulated ordnance release
Army Special Operations Command[b]	Varied	Not listed	Not listed
Marine Corps[c]	300 Knots True Airspeed	Not listed	Straight path dive delivery of 15 degrees nose low
Navy Special Warfare Command	350 Knots Indicated Air Speed and a minimum sustained speed of 250 Knots True Air Speed	Not listed	Varied[d]

Source: GAO analysis of Department of Defense CAS contracts and related documents. | GAO-21-99

[a]Acceleration is described in units of force called “G”s.

[84]Navy JTACs are assigned to special operations units and therefore counted in the U.S. Special Operations Command data. The Navy does not train JTACs that are assigned to conventional force units.

[85]Acceleration is described in units of force called “G”s.

[b]The Department of Defense (DOD) provided various documents it identified as associated with Army Special Operations Command CAS training contracts, which varied in terms of performance requirements. For example, documentation associated with a contract supporting the 1st Special Forces Group (Airborne) required aircraft to be capable of up to 140 knots indicated airspeed. Documentation identified by DOD as associated with certain training for the 75th Ranger Regiment required the contractor to provide aircraft similar to the O-2 Skymaster, but did not specify minimum performance requirements. The O-2 Skymaster is a twin-engine propeller aircraft, produced from 1967-1970, capable of speeds up to 173 Knots.

[c]In addition to the minimum aircraft performance requirements, the Navy and Marine Corps contract also identifies aircraft objectives, described as capabilities above the minimum or threshold requirements that the government desires to be able to require at the task order level. These objectives include 350 Knots True Airspeed and an ordnance delivery profile of up to 30 degrees nose low.

[d]Contract aircraft shall be capable of conducting multiple delivery profiles to include low angle strafe, high angle strafe, level, loft, pop-up, and dive procedures.

However, there are differences in speed and maneuverability of the contract aircraft compared to U.S. military aircraft that can result in unrealistic training events. The airspeeds of some of the contract aircraft were substantively less than the maximum or operating airspeeds of combat aircraft. For example, according to officials the IAR-823 was the only contract aircraft used by the Air Force's 6th Combat Training Squadron for initial qualification training from 2017 through 2019 and its maximum airspeed is 180 knots, compared to a common Air Force CAS aircraft such as the A-10, which is capable of operating at airspeeds up to 300 knots, or the F-16, which according to officials, conducts CAS at approximately 400-500 knots.[86] The Committee standardization teams have previously cited some limitations associated with the use of contract aircraft for realistic JTAC training in their triennial review of JTAC schoolhouses. For example, the 2017 review of the U.S. Special Operations Command program found that the use of contract aircraft is a valuable tool for training, but that its effectiveness is dependent on the type of aircraft used. The standardization team noted that aircraft they observed during a live exercise did not fully replicate U.S. military aircraft listed in the training scenario and failed to meet the intent of the execution

[86]According to Air Force officials, while the IAR-823 was the primary aircraft previously contracted for JTAC initial qualification training at the 6th Combat Training Squadron, the contractor started fielding the A-90 in late 2019. The A-90 has a maximum airspeed of 250 knots and it is a 7G aircraft. Further, according to officials a September 2020 Air Force task order directed that the A-90 was the only aircraft approved to provide contracted close air support for the 6th Combat Training Squadron, the Air Force Special Operations Special Operations Terminal Attack Controller Course, and the Air National Guard training at Fort Smith. Officials also stated that training is supplemented with the use of military aircraft to enhance JTAC initial training whenever military aircraft are available.

tasks under the JTAC MOA.[87] Specifically, the review noted that trainees must have an opportunity to control high performance aircraft—more difficult than a lower flying and slower contract aircraft.

During a 2019 review of the Air Force JTAC schoolhouse, the standardization team raised a similar issue about the use of a contract propeller aircraft emulating an F-16 during a CAS training exercise for a type-1 control, and recommended that the Air Force use aircraft that emulate military aircraft for type-1 controls.[88] A type-1 control is used when the JTAC requires control of individual attacks and the situation requires the JTAC to visually acquire the attacking aircraft and target in order to provide clearance for each attack.

Further, during our review, officials stated that contract CAS aircraft—such as slower-moving propeller aircraft (e.g., an IAR-823)—do not compare to the capabilities of some U.S. military aircraft in actual combat operations. Officials further explained that those differences are acceptable in some training situations when the contract aircraft emulates an MQ-9 unmanned aircraft or A-29 light attack aircraft. However, these officials added that the use of slow-moving propeller planes for JTAC training has created the misalignment of aircraft capabilities with other training events, particularly in completing type-1 control training, during which the JTAC must acquire both the attacking aircraft and the target prior to granting weapons release. As a result, the use of a slower, less-

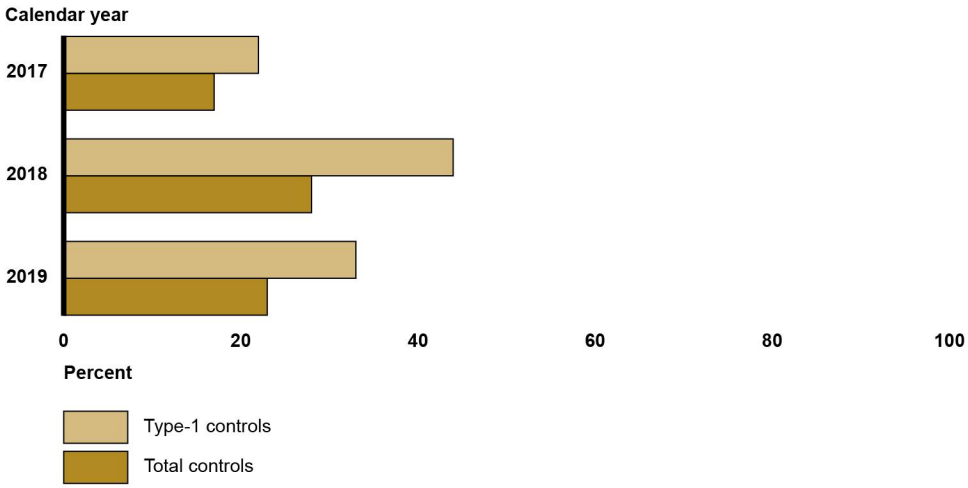
[87]According to Joint Staff officials, they worked with U.S. Special Operations Command officials to address this discrepancy and the issue was resolved by the JTAC students receiving follow-on training with military CAS aircraft. Further, the current version of U.S. Special Operations Command JTAC guidance places certain limitations on the use of contract aircraft for JTAC training. *See* U.S. Special Operations Command Manual 350-5, *Special Operations Forces Baseline Interoperability Standards for Special Operations Forces Joint Terminal Attack Controller Training* (Nov. 13, 2018).

[88]The standardization team also recommended that the Committee use the pending rewrite of the JTAC MOA, to clarify the intent with contract CAS platforms that emulate type-1 fixed wing controls. According to Joint Staff officials, as of July 2020 they are no longer considering updating the JTAC MOA to address this finding.

maneuverable contract aircraft allows more time to assess the situation than in an actual combat situation with a faster-moving military aircraft.[89]

Our analysis of available training data shows a high percentage of contract aircraft usage for some JTAC training events, including live-flown type-1 control events.[90] For example, Air Force data shows that contract aircraft provided between approximately 20 percent and 40 percent of live-flown CAS type-1 controls for initial JTAC training from calendar years 2017 through 2019 (see fig. 4).

Figure 4: Percentage of Contract Aircraft Usage for Live Flown Joint Terminal Attack Controller (JTAC) Initial Qualification Training and Control Type for Air Force, Calendar Years 2017-2019



Source: GAO analysis of Air Force Joint Terminal Attack Controller data from the Theater Air Control Training Information Computer System. | GAO-21-99

[89]Type-2 control is used when the JTAC or forward air controller (airborne) requires control of individual attacks and is unable to visually acquire the attacking aircraft at weapons release or is unable to visually acquire the target. A Type-3 control is used when the JTAC or forward air controller (airborne) requires the ability to provide clearance for multiple attacks within a single engagement subject to specific attack restrictions.

[90]Our analysis of JTAC reported training data was limited to data reported by the Air Force and U.S. Special Operations Command. Marine Corps data were unavailable for 2017 through 2019 due to data system limitations. U.S. Special Operations Command service components that train JTACs (e.g., Naval Special Warfare) are included in the U.S. Special Operations Command data.

Data table for Figure 4: Percentage of Contract Aircraft Usage for Live Flown Joint Terminal Attack Controller (JTAC) Initial Qualification Training and Control Type for Air Force, Calendar Years 2017-2019

Calendar year	Type-1 controls	Total controls
2017	22%	17%
2018	44%	28%
2019	33%	23%

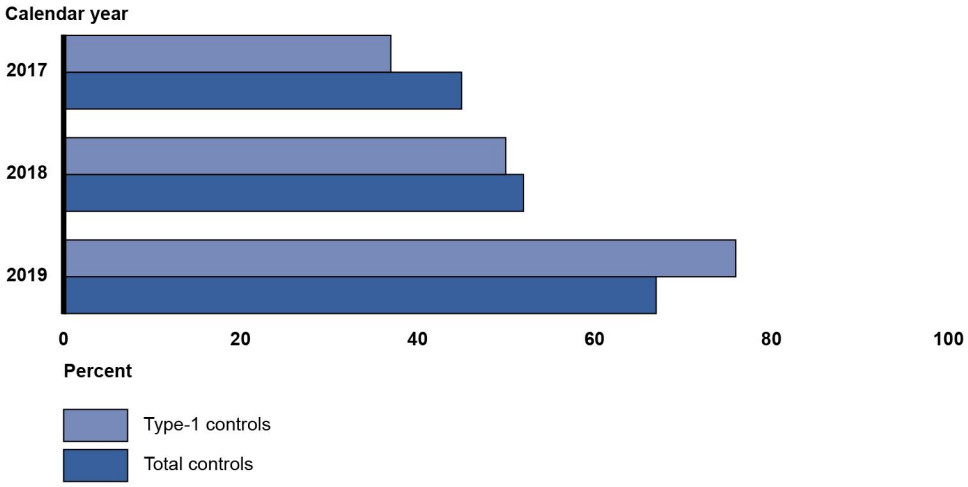
Note: Department of Defense close air support (CAS) procedures describe three types of controls. A CAS type-1 control is used when the JTAC or forward air controller (airborne) requires control of individual attacks and the situation requires them to visually acquire the attacking aircraft and target for each attack. A type-2 control is used when the JTAC or forward air controller (airborne) requires control of individual attacks and is unable to visually acquire the attacking aircraft at weapons release or is unable to visually acquire the target. A type-3 control is used when the JTAC or forward air controller (airborne) requires the ability to provide clearance for multiple attacks within a single engagement subject to specific attack restrictions. "Total controls" shown in the figure includes the use of contract aircraft to perform CAS type-1, -2, and -3 controls. In completing our analysis, we interpreted all controls recorded as "Other Currency Fighters" in the Air Force data, which could not be identified by specific aircraft type, to be performed by contract aircraft. According to Air Force officials, the system does not allow for specific contract aircraft types to be recorded and all contract aircraft data would be included in the "Other Currency Fighter" field.

According to Air Force officials, all contract aircraft usage for initial qualification training for all control types was conducted by the IAR-823 propeller aircraft.[91] U.S. Special Operations Command data shows that contract aircraft, in instances where a single type of aircraft was used, provided 76 percent of type-1 controls for initial JTAC training in 2019, which increased from 37 percent in 2017 (see fig. 5).[92]

[91]This is for initial training administered by the 6th Combat Training Squadron.

[92]As some CAS controls included multiple aircraft, our analysis is based on controls in which a single type of aircraft participated in the training event.

Figure 5: Percentage of Contract Aircraft Usage for Live Flown Joint Terminal Attack Controller (JTAC) Initial Qualification Training and Control Type for U.S. Special Operations Command, Calendar Years 2017-2019



Source: GAO analysis of U.S. Special Operations Command Joint Terminal Attack Controller (JTAC) data from the Automated JTAC Academic Currency Tracking System. | GAO-21-99

Data table for Figure 5: Percentage of Contract Aircraft Usage for Live Flown Joint Terminal Attack Controller (JTAC) Initial Qualification Training and Control Type for U.S. Special Operations Command, Calendar Years 2017-2019

Calendar year	Type-1 controls	Total controls
2017	37%	45%
2018	50%	52%
2019	76%	67%

Note: Department of Defense close air support (CAS) procedures describe three types of controls. A CAS type-1 control is used when the JTAC or forward air controller (airborne) requires control of individual attacks and the situation requires the controller to visually acquire the attacking aircraft and target for each attack. A type-2 control is used when the JTAC or forward air controller (airborne) requires control of individual attacks and is unable to visually acquire the attacking aircraft at weapons release or is unable to visually acquire the target. A type-3 control is used when the JTAC or forward air controller (airborne) requires the ability to provide clearance for multiple attacks within a single engagement subject to specific attack restrictions. “Total controls” shown in the figure includes the use of contract aircraft to perform type-1, -2, and -3 CAS controls. As some controls included multiple aircraft, we based our analysis on controls in which a single type of aircraft participated in the training event.

The Committee Action Plan, developed pursuant to Chairman of the Joint Chiefs of Staff Instruction 5127.01A, indicates that Joint CAS Working Group representatives from the military services, U.S. Special Operations Command, and Joint Staff should assess training and sustainment shortfalls and recommend potential solutions.[93] Further, our prior work on

[93]Joint Fire Support Executive Steering Committee Action Plan (Feb. 4, 2019).

federal training states that agencies should systematically evaluate the effectiveness of their training efforts and collect data corresponding to established training objectives to continually improve, deliver, and enhance training and ensure the effective allocation of resources.[94] According to DOD officials, the military services and U.S. Special Operations Command are responsible for evaluating the effectiveness of non-military contract aircraft used in CAS training events. Furthermore, the Committee standardization teams review the use of non-military contract aircraft for JTAC training during triennial review of selected schoolhouses.

Notwithstanding these evaluations, DOD is limited in its ability to fully assess the use of non-military contract aircraft in JTAC training for the following reasons. First, the JTAC MOA lacks specificity on the use of live aircraft for training. The JTAC MOA was designed to standardize training throughout DOD by establishing minimum training standards intended to improve joint force interoperability and reduce the potential for mishaps and friendly fire incidents. However, as written, the JTAC MOA identifies the need to train with a live aircraft, but does not specify what capabilities (e.g., speed or maneuverability) a live aircraft should possess to accomplish minimum JTAC training requirements. Joint Staff officials stated that DOD components have independently developed requirements for contract CAS aircraft that are specific to their needs and training goals. Accordingly, the evaluations conducted by the military services and U.S. Special Operations Command of contract aircraft for JTAC training are done against those requirements and not against common department-wide standards for the contract aircraft or for the capabilities, such as speed or maneuverability, that a live aircraft should possess.

Second, Joint Staff triennial reviews of JTAC training programs administered by military service schools do not fully assess the use of non-military contract aircraft. Joint Staff officials stated that they address the use of contract CAS through recommendations made during triennial reviews, which they believe is sufficient to make the necessary changes to their programs since the accreditation reports are shared with Committee members. However, the ability of a standardization team to fully assess and address the use of contract aircraft is limited by the extended duration between schoolhouse visits and the number of live training exercises they can observe during each visit. As noted earlier in

[94]GAO-04-546G.

our report, JTAC programs have multiple schoolhouses and the frequency with which the standardization team can visit each schoolhouse varies. As a result, it is possible that numerous years can pass without a schoolhouse being visited to evaluate the use of contract aircraft in JTAC training. Moreover, the standardization teams do not conduct any reviews of the use of contract aircraft for annual continuation training when JTACs are assigned to operational units.

DOD has previously considered revising the JTAC MOA to clarify the intent with respect to contract aircraft that emulate fixed wing U.S. military platforms during CAS type-1 control events. According to Joint Staff officials, the DOD components concluded that they did not want to see restrictions on contract CAS aircraft added to the MOA, and as of September 2020 they were no longer considering revising the JTAC MOA. DOD officials told us that this decision was based, in part, on the limited number of instances where the capabilities of contract aircraft were misaligned with the training scenario in which they were participating. The standardization team reports we reviewed confirmed this point, but these instances were identified during the standardization team visits, and not through an evaluation of the use of contract aircraft for training at all JTAC schoolhouses; therefore, there could have been more instances where there was misalignment.

Officials told us during our review that military aircraft are often unavailable to support JTAC training, making the contract aircraft the only resources available to support training, regardless of the training scenario. Officials also told us that changes to the JTAC MOA, for example adding detail about the speed or other parameters that are required for training, could result in changes to training programs that use contract aircraft. By fully evaluating whether the use of contract aircraft to meet minimum JTAC training requirements as outlined in the MOA provides adequate JTAC training, DOD would either have greater assurance that JTAC training is consistent with the MOA minimum standards or a sound basis to make revisions to the MOA standards to ensure the effectiveness of CAS training.

Conclusions

Effective CAS requires detailed coordination between aircrews and ground forces coupled with the ability to accurately identify and seamlessly communicate the locations of friendly units, enemy forces, and civilians. Any missteps in this complex process can lead to disastrous

consequences, including loss of life and mission failure. To mitigate these risks, DOD has looked to technology and training; however, its efforts in these areas have been hindered by a number of challenges that, if not addressed, could significantly impede DOD's progress.

With respect to technology, DOD has determined that enhanced coordination can be achieved with the aid of digital communications systems in addition to voice communications, which can improve the speed and accuracy of transmissions and reduce the risk of human error. DOD has identified changes to improve the interoperability of its digital communications systems for CAS, but gaps in existing guidance and management oversight have hindered implementation efforts. By updating its guidance, developing a plan for implementing changes and a periodic review process, and implementing a documented review structure to assess overall progress, DOD would be better positioned to enhance the interoperability of digital systems used during CAS missions.

In addition, documented assessments of changes to improve the interoperability of digital CAS systems have been limited in scope and have not been conducted in a training environment that replicated capabilities presented by near-peer adversaries. Broadening efforts for assessing the implementation of changes that DOD identified to address gaps would provide greater assurance that its digital CAS systems are interoperable across the joint force under various operating environments.

Furthermore, shortfalls in the implementation of a new system that DOD deployed in the U.S. Central Command area of responsibility that is designed to enable the sharing of real-time friendly ground force locations with aircraft conducting CAS missions have limited its usefulness in current combat operations. By developing and providing training for personnel who operate the system and conducting a review of the system to identify and address limitations, DOD will be able to better ensure that its personnel are capable of operating the system properly and that any configuration or other errors are not repeated as the system is deployed across the department.

With regard to training, DOD trains forces to coordinate and integrate CAS on the battlefield, and has developed minimum training standards for these forces to prepare them to operate in a joint environment and reduce the potential for friendly fire incidents. While DOD has a process for evaluating compliance with these minimum standards, it can do more to fully evaluate the training programs for these forces. Specifically, improving service-level JFO program management responsibilities and

identifying a database for collecting data for JFO training would allow the Army and Marine Corps to systematically evaluate training and identify shortfalls. In addition, fully evaluating the increased use of non-military contract aircraft to meet JTAC training requirements would provide greater assurance that JTAC training is consistent with minimum standards and provides adequate training, and a sound basis to determine whether the MOA that contains the training standards needs to be revised.

Recommendations for Executive Action

We are making the following 11 recommendations to DOD:

The Secretary of Defense, in coordination with the Chairman of the Joint Chiefs of Staff, should ensure the Joint Staff updates the *Joint Fire Support Coordinated Implementation Change Control Board Charter* roles and responsibilities to include relevant DOD components and offices with acquisition authority and the ability to implement changes. (Recommendation 1)

The Secretary of Defense, in coordination with the Chairman of the Joint Chiefs of Staff, should ensure the Joint Staff develops a detailed plan for ECP implementation, to include timeframes for developing, approving, and implementing ECPs intended to address interoperability gaps for DACAS, and establishes a process to periodically review approved ECPs for relevance and compliance with ECPs as programs update DACAS capabilities. (Recommendation 2)

The Secretary of Defense, in coordination with the Chairman of the Joint Chiefs of Staff, should ensure the Joint Staff updates the DACAS ECP process to include senior level review of ECP implementation beyond the Joint Fire Support Executive Steering Committee. (Recommendation 3)

The Secretary of Defense, in coordination with the Chairman of the Joint Chiefs of Staff, should ensure the Joint Staff, in coordination with the services, develops a plan to formally assess ECPs during future Bold Quest events or other military service exercises or events, to include demonstrating DACAS capabilities in a contested environment. (Recommendation 4)

The Secretary of Defense, in coordination with the Chairman of the Joint Chiefs of Staff, should ensure that the military services and Joint Staff

develop and provide training to relevant personnel that will use SAS-E. (Recommendation 5)

The Secretary of Defense, in conjunction with the Chairman of the Joint Chiefs of Staff, should ensure the appropriate official(s) conduct a post implementation review of SAS-E to identify the root causes of any outstanding problems, ensure the system is operating as intended, and address any identified deficiencies. (Recommendation 6)

The Secretary of the Army should update guidance to clarify roles and responsibilities for service-level JFO program oversight, including those related to the standardization and evaluation of training. (Recommendation 7)

The Secretary of the Army should identify a database to maintain JFO training data. (Recommendation 8)

The Secretary of the Navy should ensure that the Commandant of the Marine Corps updates guidance to clarify roles and responsibilities for service-level JFO program oversight, including those related to standardization and evaluation of training. (Recommendation 9)

The Secretary of the Navy should ensure that the Commandant of the Marine Corps identifies a database to maintain JFO training data. (Recommendation 10)

The Secretary of Defense, in coordination with the Chairman of the Joint Chiefs of Staff, should ensure the Joint Staff, in coordination with the military services and U.S. Special Operations Command, evaluates the use of contract aircraft for meeting minimum JTAC training requirements and revise the existing MOA based on the results of such an evaluation, as appropriate and feasible. (Recommendation 11)

Agency Comments

We provided a draft of this product to DOD for comment. In written comments, reproduced in appendix III, DOD concurred with all eleven of our recommendations and outlined its plan to address them. DOD also provided technical comments, which we incorporated in the report where appropriate.

In its comments on our fifth recommendation, DOD noted that the military services and Joint Staff are responsible agencies for SAS-E training, and suggested that we rephrase the recommendation to account for these responsibilities. We acknowledge that the military services also have a role in developing training for relevant personnel that will use SAS-E and updated the recommendation accordingly.

In its comments on our seventh recommendation, DOD suggested that we rephrase our recommendation to require that the Secretary of the Army clarify roles and responsibilities for service-level JFO program oversight, including those related to standardization and evaluation of training. We acknowledge DOD's comment and agree that the revised language meets the intent of our recommendation and updated our seventh and ninth recommendations accordingly.

We are sending copies of this report to the appropriate congressional committees, the Secretary of Defense, the Secretary of the Army, the Secretary of the Air Force, the Secretary of the Navy, the Commandant of the Marine Corps, and the Chairman of the Joint Chiefs of Staff. In addition, this report will be available at no charge on our website at http://www.gao.gov.

If you or your staff have questions about this report, please contact me at (202) 512-5431 or russellc@gao.gov. Points of contact for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix IV.

Cary Russell
Director, Defense Capabilities and Management

List of Committees

Chair
Ranking Member
Committee on Armed Services
United States Senate

Chair
Ranking Member
Subcommittee on Defense
Committee on Appropriations
United States Senate

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

Chair
Ranking Member
Subcommittee on Defense
Committee on Appropriations
House of Representatives

Appendix I: Close Air Support (CAS) Aircrew Continuation Training for Air Force, Navy, and Marine Corps

The Air Force, Navy, and Marine Corps have each established service-specific training programs for their respective aircrews that deliver CAS, and the standards and performance criteria for aircrew currency training vary across each service and for each aircraft.[1] For instance:

- **Air Force.** Air Force aircrews maintain currency by completing annual continuation training requirements outlined in the Ready Aircrew Program. The Ready Aircrew Program Tasking Memoranda defines the minimum number of live and simulator missions, such as CAS, for each type, model, and series aircraft that aircrews must complete during the annual training cycle to maintain basic currency and proficiency. Annual training requirements are developed through an annual process.[2]
- **Marine Corps.** Marine Corps aircrews maintain currency by training to missions in accordance with the Training and Readiness Manual for their specific aircraft and assigned program of instruction.[3] Training and readiness manuals include a series of training missions and tasks to be completed on a recurring basis. Most training and readiness manuals are sponsored by Marine Aviation and Weapons Tactics Squadron–One and are generally assessed every 3 years.
- **Navy.** Navy aircrews maintain currency by completing training and readiness requirements on an annual basis. According to Navy

[1]The Army does not consider its attack helicopters as CAS aircraft, although they can conduct attacks using CAS tactics, techniques, and procedures when operating in support of joint forces.

[2]For the purposes of this report, “maintaining basic currency and proficiency” means that an aircrew achieved mission qualification by completing a training program that upgrades aircrew from initial qualification training to accomplish the unit-specific missions.

[3]A program of instruction is a training track assigned to a Marine based on their proficiency in a skill. All Marines undergoing training are assigned to at least one program of instruction.

officials, training requirements are developed through a service-wide process, with input from the Naval Aviation Warfighting Development Center and the Type Wing Weapons School for each aircraft type.

The multi-role nature of U.S. military aircraft necessitates annual currency training that spans a range of missions with different standards and training events. Differences in the training standards and training events can be a result of different mission prioritization, and aircrew experience levels, among other factors. For example, within the Air Force, CAS is a primary mission for the A-10 and a secondary mission for the F-35. A-10 aircrews are expected to be proficient in CAS procedures, while F-35 aircrew are expected to be familiar with CAS procedures.[4] The Air Force, Navy, and Marine Corps have training programs for aircrews that employ CAS. Tables 6, 7, and 8 outline the standards and performance criteria for CAS aircrew training across each service and for each aircraft. The tables include the amount of CAS training aircrews complete on an annual basis, such as the number of missions, and particular events or conditions in the training, such as missions at night or in an urban environment.

[4]According to Air Force memos regarding the Ready Aircrew Program, “proficient” aircrews have a thorough knowledge of the mission area, are able to operate in a complex, fluid environment, and are able to handle most contingencies and unusual circumstances, but occasionally may make an error of omission or commission. In contrast, “familiar” aircrews have a basic knowledge of the mission area, are able to operate in a permissive environment, and are able to handle some basic contingencies and unusual circumstances, but may make errors of omission or commission. The memos further note that familiar aircrews may need additional training prior to being assigned their first mission.

Table 6: Air Force Aircrew Close Air Support (CAS) Annual Continuation Training Requirements

	Training requirement	A-10[a]	F-15E	F-16C	F-16CM	F-35	B-1B	B-52	MQ-9
Aircraft overview	CAS as a primary or secondary mission[b]	Primary	Primary	Primary	Secondary	Secondary	Primary	Primary	Primary
	Total sortie requirement	**96**	**96**	**96**	**96**	**96**	**36**	**36**	**36**
CAS sortie requirements	**Total CAS sorties**	**19**	**11**	**12**	**3**	**10**	**10**	**6**	**10**
	Day CAS	14	8	CDR	CDR	6	CDR	N/A	N/A
	Night CAS	5	3	CDR	CDR	4	CDR	N/A	N/A
Sortie event requirements	CAS with Special Operations Forces	4	2	3	2	3	N/L	N/L	N/L
	CAS with Joint Terminal Attack Controller	8	12	5	4	5	4	N/L	N/L
	CAS in urban terrain	3	4	6	6	6	2	N/L	N/L
	Simulated CAS Requirements[c]	6	3	7	CDR	2	4	2	N/L

Legend:
CDR= Commander Discretion regarding the mix of day and night CAS sorties and simulated CAS (for F-16CM).
N/A= No distinction made between night and day CAS missions.
N/L= Events not listed in the Ready Aircrew Program Tasking Memorandum.

Source: GAO analysis of Air Force Ready Aircrew Program Tasking Memorandums. | GAO-21-99

Note: Table information relates to Ready Aircrew Program minimum requirements for Combat Mission Ready experienced aircrew from the regular component of the Air Force and includes training requirements that indicate that aircrews are qualified, current, and proficient in all of the primary missions tasked to their assigned combat unit. Generally, inexperienced aircrew are required to fly additional sorties (i.e., 108 compared to the 96 for an experienced aircrew). Table does not include annual forward air controller (airborne) requirements.

[a]For the A-10, the number of missions may vary if aircrews are not certified as a Forward Air Controller (Airborne) or Combat Search and Rescue pilot.

[b]Whether a mission is primary or secondary determines an aircrews' level of training. Aircrew are expected to be "proficient" for primary missions and "familiar" with secondary missions. "Proficient" is defined as an aircrew having a thorough knowledge of the mission area but occasionally may make an error of omission or commission. Aircrew are able to operate in a complex, fluid environment and are able to handle most contingencies and unusual circumstances. Proficient aircrew are prepared for mission tasking on the first sortie in theater. "Familiar" is defined as aircrew having a basic knowledge of the mission area and may make errors of omission or commission. Aircrew are able to operate in a permissive environment and are able to handle some basic contingencies and unusual circumstances. Familiar aircrew may need additional training prior to first mission tasking.

[c]Simulated CAS missions represent additional missions to be completed in an accredited flight simulator.

Table 7: Marine Corps Aircrew Close Air Support (CAS) Training and Readiness Annual Continuation Requirements

Training Requirement	F/A-18	F-35	AV-8B	UH-1	AH-1	KC-130
Total close air support (CAS) events per year	**6**	**10**	**9**	**5**	**5**	**2**
Live flown event total	**4**	**4**	**8[a]**	**5**	**5**	**2[b]**
Live flown event --Day CAS	1	2	2	2	2	0
Live flown event --Night CAS	2	2	4	2	2	0
Live flown event --Urban CAS	1[c]	0	1[d, e]	1[d, e]	1[d, e]	0
Simulator events total	**2[c]**	**6**	**1**	**0**	**0**	**0**
Simulator events --Day CAS	0	0	1	0	0	0
Simulator events --Night CAS	0	2	0	0	0	0
Simulator events --Urban CAS	0	2[d]	0[e]	0[e]	0[e]	0
Simulator events --High threat night CAS	0	2	0	0	0	0
Simulator events --CAS as a core mission-essential task[f]	Core	Core	Core	Core	Core	Core Plus

Source: GAO analysis of Marine Corps Training and Readiness Aviation Manuals | GAO-21-99

Note: Table information relates to requirements included in Marine Corps Training and Readiness Aviation Manuals for CAS, not including any specific training requirements for forward air controllers (airborne). Information listed reflects annual requirements for aircrew who have achieved proficiency in their CAS requirements. UH-1 training requirements listed are those for pilots, and do not include crew chiefs; KC-130J training requirements listed are those for pilots and fire control officers, and do not include crewmasters.

[a]AV-8 pilots complete an additional low altitude based CAS training event that may be flown during the day or at night.

[b]These sortie requirements constitute CAS missions that may be flown or conducted day or night.

[c]These training requirements constitute CAS missions that may be flown or conducted day or night.

[d]These training requirements constitute urban CAS missions that may be flown or conducted day or night.

[e]The urban CAS training events listed for these platforms may be flown in aircraft or simulator, with aircraft preferred. In this table, the event is included under the “Live flown event” rows.

[f]Mission-essential tasks are drawn from the Marine Corps Task List and defined as Core or Core-Plus. Core mission-essential tasks are those tasks that a unit is expected to execute at all times. Core-Plus mission-essential tasks are additional capabilities to support missions or plans which are limited in scope, theater specific, or have a lower probability of execution.

Table 8: Navy Aircrew Close Air Support (CAS) Training and Readiness Annual Continuation Requirements

	F/A-18	F-35	MH-60S
Total close air support (CAS) events per year	**9**	**4**	**4[b]**
Live flown event total	**6**	**2**	**4[b]**
Live flown event --Urban CAS	0	N/L[a]	N/L
Simulator events total	**3**	**2**	**N/L**
Simulator events --Urban CAS	1	N/L[a]	N/L

Legend:
N/L= Events not listed in the training and readiness manual.

Source: GAO analysis of Navy Training and Readiness Manuals | GAO-21-99

Note: In the case of the F/A-18 and F-35, the documents indicate that the simulator events can be accomplished live or by simulator. Table does not include annual forward air controller (airborne) requirements.

[a]The F-35 training and readiness requirements document lists CAS, Urban CAS, and Armed Overwatch as one category, and does not specify a number of events for each.

[b]Training requirements for MH-60S vary by squadron; for some squadrons, training events may be up to eight.

According to officials, in addition to the training requirements for aircrews listed in service training guidance, squadron commanders have discretion to prioritize mission-specific training and to design training plans for each training sortie for continuation training. For example, Air Force Air Combat Command officials stated that training practices are designed to give flexibility to the squadron commander to develop specific training requirements based on the mission tasks the squadron will be expected to undertake in upcoming deployments. Specific examples include training with Special Operations Forces, or training to perform CAS in a contested environment. Officials with the Air Force, Navy, and Marine Corps also told us that commanders prioritize missions based on their squadron's upcoming deployment.

Appendix II: Objectives, Scope, and Methodology

Senate Report 116-48 and House Report 116-120, accompanying bills for the National Defense Authorization Act for Fiscal Year 2020, included provisions for us to evaluate issues related to friendly force identification in Close Air Support (CAS) missions.[1] This report (1) describes Department of Defense (DOD) procedures and capabilities for identifying friendly forces and factors affecting the effectiveness of CAS missions, (2) evaluates the extent to which DOD has initiatives to enhance friendly force identification capabilities during CAS missions, and (3) assesses the extent to which DOD has evaluated training for forces that integrate CAS.

For objective one, we reviewed DOD guidance and procedures to determine friendly force identification requirements associated with CAS missions. We also reviewed documentation, such as service publications and instructions related to CAS, and interviewed officials to identify capabilities used to 1) identify and mark friendly forces and enemy positions, and 2) communicate this information between air controllers and aircrews. We reviewed DOD guidance and procedures to determine the factors that can affect friendly force identification and the effectiveness of CAS missions.

For objective two, we reviewed documents and interviewed DOD officials to discuss initiatives to enhance friendly force identification capabilities for CAS missions and the extent these capabilities are interoperable. We interviewed officials from the Joint Staff, the Departments of the Army, Air Force, Navy, including the Marine Corps, Defense Information Systems Agency, U.S. Special Operations Command, U.S. European Command, U.S. Indo-Pacific Command, and U.S. Central Command to discuss friendly force identification capabilities currently used in combat operations as well as new technologies under development. We reviewed documentation on these capabilities to understand what they can do and the extent the equipment is interoperable with other military services' aircraft and equipment. We examined the organization and processes DOD uses to ensure the different military services' equipment meet the operational requirements of CAS and are interoperable with other services aircraft and equipment. We focused our review on capabilities

[1]S. Rep. No. 116-48, at 43-44 (2019); H.R. Rep. No. 116-120, at 205-06 (2019).

and technologies used during the execution of CAS missions, such as the equipment used by joint terminal attack controllers (JTAC) during CAS. We determined the control environment, risk assessment, and control activities components of the *Standards for Internal Control in the Federal Government* were significant to this objective, along with the associated underlying principles that management should:

- establish an organizational structure, assign responsibility, and delegate authority to achieve the entity's objectives,
- define objectives clearly to enable the identification of risks and define risk tolerances, and
- design control activities to achieve objectives and respond to risks.[2]

We assessed DOD's efforts to manage the development, review, approval, and implementation of changes to digitally-aided CAS (DACAS) capabilities against these internal control standards. Specifically, we examined the Chairman of the Joints Chiefs of Staff instructions that established the Joint Fire Support Executive Steering Committee and the Bold Quest events and the charter that established the Joint Fire Support Coordinated Implementation Change Control Board to determine the organizations involved, their responsibilities, and the process DOD employs to update DACAS capabilities.[3] We then interviewed Joint Staff J6 officials to obtain their views on the process and address any issues we may have identified in our review of the documents.

To evaluate how DOD assesses the interoperability of DACAS equipment, we interviewed DOD officials and reviewed assessment reports. We discussed with military service officials how they address any findings from assessments, and discussed with Joint Staff officials what actions, if any, they take to address the findings from Bold Quest events. We interviewed Joint Staff officials on the Joint Fire Support Coordinated Implementation Change Control Board and Engineering Change

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

[3]Chairman of the Joint Chiefs of Staff Instruction 5127.01A, *Joint Fire Support Executive Steering Committee Governance and Management* (Dec. 14, 2018). Chairman of the Joint Chiefs of Staff Instruction 6265.01, *Coalition Capability Demonstration and Assessment (Bold Quest) Governance and Management* (July 23, 2015). Joint Chiefs of Staff, *Change Control Board Charter for Joint Coordinated Implementation of Digitally Aided Joint Fire Support* (Aug. 2013).

Implementation Group Working Group to understand their role and efforts to assess DACAS capabilities.[4] We reviewed the charter that established the Joint Fire Support Coordinated Implementation Change Control Board.[5] We evaluated DOD's efforts to assess whether DACAS capabilities were functional and interoperable against Chairman of the Joint Chiefs of Staff Instruction 6265.01 and the charter for the Joint Fire Support Coordinated Implementation Change Control Board.[6]

We reviewed DOD's efforts to implement a new ground-to-air situational awareness capability called Situational Awareness Service – Enhanced (SAS-E). We interviewed officials from Joint Staff J6, U.S. Central Command, Air Force Central Command, and the Defense Information Systems Agency on the SAS-E capability, implementation, and employment. We reviewed the SAS-E Capability Package, user manual, and several briefings on SAS-E. We assessed implementation efforts against guidance in DOD Instruction 5000.82, *Acquisition of Information Technology (IT)*.[7] To assess whether training is provided to personnel on SAS-E, we reviewed Chairman of the Joint Chiefs of Staff Instruction 3265.02, *Joint Command and Control Systems Training Management*, to determine what organizations are responsible for providing training on the Global Command and Control System – Joint, which after the implementation of version 6.0.1.0 of Global Command and Control System – Joint includes SAS-E.[8] We interviewed officials from those

[4]For the purposes of this report, Joint Fire Support Executive Steering Committee will be referred to as Committee.

[5]Joint Chiefs of Staff, *Change Control Board Charter for Joint Coordinated Implementation of Digitally Aided Joint Fire Support* (Aug. 2013).

[6]Chairman of the Joint Chiefs of Staff Instruction 6265.01, *Coalition Capability Demonstration and Assessment (Bold Quest) Governance and Management* (July 23, 2015); Joint Chiefs of Staff, *Change Control Board Charter for Joint Coordinated Implementation of Digitally Aided Joint Fire Support* (Aug. 2013).

[7]DOD Instruction 5000.82, *Acquisition of Information Technology (IT)* (Apr. 21, 2020).

[8]Chairman of the Joint Chiefs of Staff Instruction 3265.02, *Joint Command and Control Systems Training Management* (Oct. 10, 2014).

organizations to discover what training their organizations provide, or plan to provide, on SAS-E.[9]

For objective three, we reviewed current training programs of instruction and service guidance that establish annual training standards for forces integrating CAS.[10] These include training programs for joint terminal attack controllers, forward air controllers (airborne), and joint fires observers (JFO) across the military services and U.S. Special Operations Command. We also reviewed memorandums of agreement (MOA) developed by the Joint Fire Support Executive Steering Committee for these training programs and Committee reviews of these programs. We assessed Committee and service efforts to monitor and evaluate the effectiveness of training standards, including accreditation reviews and assessments. We interviewed Committee and services officials to corroborate information in assessment reports and obtain additional information on evaluation procedures and the services' programs. To assess the JFO training program, we evaluated current guidance and processes against our work on strategic training.[11]

We also evaluated the services and U.S. Special Operations Command service components use of contract aircraft for JTAC training. We collected and analyzed documents related to contracts for the Air Force, Navy (which included the Marine Corps), and U.S. Special Operations Command service components from 2016 to present. We also collected data from contracting offices on contract usage in terms of hours of contract aircraft flown and types of aircraft used for JTAC training for

[9]These organizations include Joint Staff's Joint Education and Doctrine Division, Joint Interoperability Division, Joint Deployment Training Center, Air Force Air Education and Training Command, U.S. Marine Corps Joint Delta Training program, Defense Information Systems Agency, and Air Force Central Command.

[10]The scope of this review focuses on the annual continuation training standards within the military services and U.S. Special Operations Command. In addition to these standards, there are other venues, which provide U.S. forces the ability to train for CAS. For example, according to Air Force officials, the Combat Training Centers, especially the National Training Center provide the Army and the Air Force valuable opportunities to plan, prepare, execute, and assess CAS. Further, at the National Training Center, maneuver commanders, their staffs, and supporting Tactical Air Control Party get the opportunity to plan, rehearse, and execute CAS with live/thinking enemy, maneuver, fires, and CAS aircraft. These lessons and the training allow forces to develop the tools and build the experience to successfully battle-track, identify friendly forces, and execute CAS in operations.

[11]GAO, *Human Capital: A Guide for Assessing Strategic Training and Development Efforts in the Federal Government*, GAO-04-546G (Washington, D.C.: March 2004).

fiscal years 2017 through 2019. Marine Corps contract data was not available for 2017, since according to officials, prior to 2018 data was not tracked. In addition to these data, we collected and analyzed additional data from Air Force and U.S. Special Operations Command databases on JTAC training. Specifically, we collected and analyzed data from the Air Force's Theater Air Control Training Information System and Special Operations Command's Automated JTAC Academic Currency Tracking System to determine the usage of contract aircraft for different training events for calendar years 2017 through 2019. Our analysis did not include Marine Corps JTAC training data from the Marine Corps Training Information Management System because according to officials, Marine Corps data was unavailable for 2017 through 2019 due to data system limitations that did not allow for a look back to prior years. We evaluated the usage of contract aircraft for JTAC training against training requirements under the MOA and the roles and responsibilities related to assessing CAS training.[12]

To identify the training requirements for aircrew delivering CAS, we reviewed service-specific guidance, such as training and readiness manuals that outlines CAS annual continuation training requirements for combat aircraft with a CAS mission. We reviewed training requirements for 18 CAS aircraft across the Air Force, Marine Corps, and Navy. We examined annual training guidance for combat aircraft in our scope to identify the requirements for CAS training.

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

- Joint Staff, J6, Directorate for Command, Control, Communications, & Computers/Cyber
  - Joint Fires Integration Division
  - Joint Assessment Division
- Joint Staff J7, Directorate for Joint Force Development
  - Joint Interoperability Division
  - Joint Deployment Training Center
- Defense Information System Agency

[12]*Joint Fire Support Executive Steering Committee (JFS ESC) Action Plan Memorandum of Agreement 2004-01 Joint Terminal Attack Controller (JTAC) (Ground)* (Dec. 1, 2017); Joint Fire Support Executive Steering Committee Action Plan (Feb. 4, 2019).

- Air Land Sea Application Center
- Air Force
  - Air Education and Training Command
  - Air Combat Command
  - Headquarters Air Force
  - 57th Operations Group – CAS Integration Group
  - 6th,12th, and 549th Combat Training Squadrons
  - 24th Tactical Air Support Squadron
  - 422nd Test and Evaluation Squadron
  - 17th, 26th, 66th, 77th, 325th, and 561st Weapons Squadrons
  - 422nd Test and Evaluation Squadron
  - 727th Expeditionary Air Control Squadron
  - AFLCMC/WISN Special Warfare Program Office
- Army
  - Training and Doctrine Command
  - Combat Capabilities Development Command
- Marine Corps
  - Marine Forces Command
  - Headquarters Marine Corps - Plans, Policies & Operations
  - Capabilities Development Directorate
  - Command Element Information Warfare
  - Marine Aviation Weapons and Tactics Squadron – One
  - Marine Corps Fires Branch Program Office
  - Marine Corps Training and Information Management System Program Office
- Navy
  - Navy Air Warfare Division N98
  - Naval Aviation Warfighting Development Center
  - Naval Air Force Atlantic
- U.S Central Command

- U.S. Air Forces Central Command
- U.S. Special Operations Command
- U.S. Indo-Pacific Command
- U.S. European Command

We conducted this performance audit from August 2019 to January 2021 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 III: Comments from the Department of Defense

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THE JOINT STAFF
WASHINGTON, DC

17 December 2020

Mr. Cary Russell
Director, Defense Capabilities Management
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Mr. Russell:

Enclosed is the Department of Defense (DoD) response to the Government Accountability Office (GAO) Draft Report, GAO-21-99SU, "CLOSE AIR SUPPORT: Friendly Force Identification," dated October 30, 2020 (GAO Code 103703). The DoD acknowledges GAO's findings and agrees with the recommendations. Technical comments on the report were provided under separate correspondence.

On behalf of the DoD, I would like to thank GAO for the opportunity to review and comment on this draft report and for the professionalism and thoroughness of their team. Once implemented, the recommendations will enhance ongoing DoD efforts to improve friendly force tracking capabilities and improve close air support training. The Joint Staff point of contact for this matter is Mr. John Twiddy, Chief, Joint Fires/Joint Close Air Support Branch, J-6; 202-512-5431.

Sincerely,

ANDREW P. POPPAS, LTG, USA
Director, Joint Staff

Enclosure:
As stated

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GAO DRAFT REPORT DATED OCTOBER 30, 2020
GAO-21-99SU (GAO CODE 103703)

"CLOSE AIR SUPPORT FRIENDLY FORCE IDENTIFICATION"

DEPARTMENT OF DEFENSE COMMENTS TO THE GAO RECOMMENDATION

RECOMMENDATION 1: The Secretary of Defense (SecDef), in coordination with the Chairman of the Joint Chiefs of Staff (CJCS), should ensure the Joint Staff updates the Joint Fire Support Coordinated Implementation Change Control Board Charter roles and responsibilities to include relevant Department of Defense (DoD) components and offices with acquisition authority and the ability to implement changes.

DoD RESPONSE: Concur. The Joint Staff J-6 Deputy Directorate for Cyber, Command, Control, Communications and Computers Integration (DDC5I), Joint Fires Integration Division (JFID), as the responsible agency for chairing the Joint Fire Support Coordinated Implementation Change Control Board (JFS CI CCB), will update the charter. The revised charter will include tri-chairs with acquisition oversight authorities to include the Under Secretary of Defense for Acquisition and Sustainment and Chief Information Officer of the Department of Defense. The revision effort will be complete no later than September 2021.

RECOMMENDATION 2: The SecDef, in coordination with the CJCS, should ensure the Joint Staff develops a detailed plan for Engineering Change Proposal (ECP) implementation, to include timeframes for developing, approving, and implementing ECPs intended to address interoperability gaps for Digitally Aided Close Air Support (DACAS), and establishes a process to periodically review approved ECPs for relevance and compliance with ECPs as programs update DACAS capabilities.

DoD RESPONSE: Concur. Joint Staff J-6 DDC5I, Joint Assessments Division (JAD) and JFID, as responsible agencies for chairing the Engineering Change Implementation Group (ECIG) and the JFS CI CCB (respectively), will develop a specific implementation and assessment plan for the ECPs that address DACAS interoperability gaps. Each interoperability-focused ECP will have a unique timeframe for development and implementation based on the complexity of each separate ECP. This effort will be complete no later than August 2021.

RECOMMENDATION 3: The SecDef, in coordination with the CJCS, should ensure the Joint Staff update the DACAS ECP process to include senior level review of ECP implementation beyond the Joint Staff Executive Steering Committee.

DoD RESPONSE: Concur. Beginning immediately, Joint Staff J-6 DDC5I, JAD, as the responsible agency for chairing the Joint Fire Support Executive Steering Committee's (JFS ESC) ECIG, will publish a semi-annual report that details the implementation of each DACAS ECP. The report will include current and forecast status for the participating programs/systems. Each report will be provided first to the JFS ESC, then the C4/Cyber Functional Control Board, and finally the Joint Capabilities Board.

RECOMMENDATION 4: The SecDef, in coordination with the CJCS, should ensure the Joint Staff, in coordination with the Services, develop a plan to formally assess ECPs during future

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Bold Quest events or other Military Service exercises or events, to include demonstrating DACAS capabilities in a contested environment.

DoD RESPONSE: Concur. Joint Staff J-6 elements will continue to formally assess ECPs at Bold Quest events. Formal ECP assessments in contested environments will occur at U.S. Service events due to releasability issues unique to those types of operations. Joint Staff J-6, DDC5I, JFID and JAD will publish a plan, to include a proposed schedule of events and specific ECP assessment goals, no later than August 2021.

RECOMMENDATION 5: The SecDef, in coordination with the CJCS, should ensure that the Joint Staff Joint Education and Doctrine Division develop and provide training to relevant personnel that will use Situational Awareness Service-Enhanced (SAS-E).

DoD RESPONSE: Concur if this recommendation is rephrased as: "The Secretary of Defense, in coordination with the Chairman of the Joint Chiefs of Staff, should ensure that the Services and the Joint Staff develop and provide training to relevant personnel that will use SAS-E."

The Services and Joint Staff, as responsible agencies for SAS-E training, will modify training courses, develop training materials, and provide training to relevant personnel that will use SAS-E no later than June 2021.

RECOMMENDATION 6: The SecDef in conjunction with the CJCS, should ensure the appropriate official(s) conduct a post implementation review of SAS-E to identify the root causes of any outstanding problems, ensure the system is operating as intended, and address any identified deficiencies.

DoD RESPONSE: Concur. Joint Staff J-36 and Joint Staff J-6 DDC5I will work with the Defense Information Systems Agency Global Command and Control System-Joint program office to conduct a post implementation review of the SAS-E capability no later than September 2021.

RECOMMENDATION 7: The Secretary of the Army should update guidance to clarify roles and responsibilities for Joint Fires Observer (JFO) program managers, including those related to the service-wide evaluation of training.

DoD RESPONSE: Concur if this recommendation is rephrased as: "The Secretary of the Army should update guidance to clarify roles and responsibilities for Service-level JFO program oversight, including those related to standardization and evaluation of training."

The Army will staff a change to AR 220-1 which will require brigade commanders to include standardization and evaluation of JFO training on the Unit Status Report (USR) for Service-level JFO program oversight. Estimate no earlier than March 2022 for service-wide implementation due to the extent and complexity of changes required within the reporting system. Interim service-level JFO program oversight will be accomplished by requiring commanders to include remarks on standardization and evaluation of JFO training in the USR Commander's Comments.

RECOMMENDATION 8: The Secretary of the Army should identify a database to maintain JFO training data.

DoD RESPONSE: Concur. The Digital Training Management System (DTMS) was the identified database to maintain JFO training until the capability was removed from DTMS in December 2019. Currently, there is no identified database to maintain JFO training above the brigade level, and JFO training qualifications and currencies are being tracked manually at the

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unit level. The Army will staff a course of action to include 13F MOS fire supporters, to include JFOs, in current systems used by Special Operations Command Joint Terminal Attack Controllers (JTACs), i.e., Odyssey Systems Automated JTAC Academic Currency Tracking System. Estimate June 2022 for resolution due to required contract modifications and fiscal year funding issues.

RECOMMENDATION 9: The Secretary of Navy should ensure that the Commandant of the Marine Corps updates guidance to clarify roles and responsibilities for JFO program managers, including those related to Service-wide evaluation of training.

DoD RESPONSE: Concur. The Marine Corps utilizes Marine Corps Order (MCO) 3311.2, Marine Corps Tactical Air Control Party (TACP) Program, to clarify Program Management (PM) roles and responsibilities. This MCO is currently under revision and will be updated to ensure the roles and responsibilities for JFO PMs, to include training and evaluation criteria are included. Routing at General Officer-level, expected completion no later than January 2021.

RECOMMENDATION 10: The Secretary of Navy should ensure that the Commandant of the Marine Corps identifies a database to maintain JFO training data.

DoD RESPONSE: Concur. The Marine Corps is in the process of developing a digital JFO Individual Performance Record. Once developed, all JFO training will be captured by the Marine Corps Training Information System. Currently in contest development. Expected completion no later than Dec 2021.

RECOMMENDATION 11: The SecDef, in coordination with the CJCS, should ensure the Joint Staff, in coordination with the Military Services and U.S. Special Operations Command, evaluates the use of contract aircraft for meeting minimum JTAC training requirements and revise the existing memorandum of agreement (MOA) based on the results of such an evaluation, as appropriate and feasible.

DoD RESPONSE: Concur. The Joint Chiefs of Staff-chartered JFS ESC will conduct an evaluation of the use of contract aircraft for meeting minimum JTAC training requirements within the next six months, and any recommended changes will be incorporated into the JTAC MOA no later than June 2021.

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Text of Appendix III: Comments from the Department of Defense

Page 1

17 December 2020

Mr. Cary Russell

Director, Defense Capabilities Management

U.S. Government Accountability Office 441 G Street, NW

Washington, DC 20548

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Andrew P. Poppas, LTG, USA

Director, Joint STaff

Enclosure:

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Page 2

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DoD RESPONSE: Concur. The Joint Chiefs of Staff-chartered JFS ESC will conduct an evaluation of the use of contract aircraft for meeting minimum JTAC training requirements within the next six months, and any recommended changes will be incorporated into the JTAC MOA no later than June 2021.

Appendix IV: GAO Contacts and Staff Acknowledgments

GAO Contact

Cary Russell, (202) 512-5431 or russellc@gao.gov.

Staff Acknowledgments

In addition to the contact named above, Matthew Ullengren (Assistant Director), Nirmal Chaudhary, Christopher Gezon, Kevin Keith, Joshua Leiling, Alice Paszel, William Reeves, Michael Silver, Michael Shaughnessy, Sarah Veale, and Lillian M. Yob made key contributions to this report.

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