



April 6, 2020

## Defense Capabilities: Joint All Domain Command and Control

### What is Joint All Domain Command and Control (JADC2)?

The increased speed and reach of war combined with an exponential growth in available data led the Chief of Staff of the Air Force (CSAF) to advocate in the Air Force's congressional budget request for an enhanced command and control (C2) system that would improve situational awareness, rapid decisionmaking, and the ability to direct forces across multiple domains (air, space, cyber, land, sea). The CSAF originally called this concept Multi-Domain Command and Control (MDC2), a term that has since evolved into a Department of Defense (DOD) initiative called Joint All Domain Command and Control (JADC2).

The Air Force asserts that pre-information age technologies facilitating today's C2, which the DOD defines as "the exercising of authority and direction by a properly designated commander over assigned or attached forces," are not optimized for future highly contested conflicts. According to Air Force officials, commanders executing C2 in today's conflicts do so by exchanging data through manpower-intensive procedures and technologically limited systems, all of which typically focus on a single domain. This affects a commander's situational awareness, speed of decisionmaking, and action by forces, therefore limiting the rapid and continuous integration of capabilities across multiple domains.

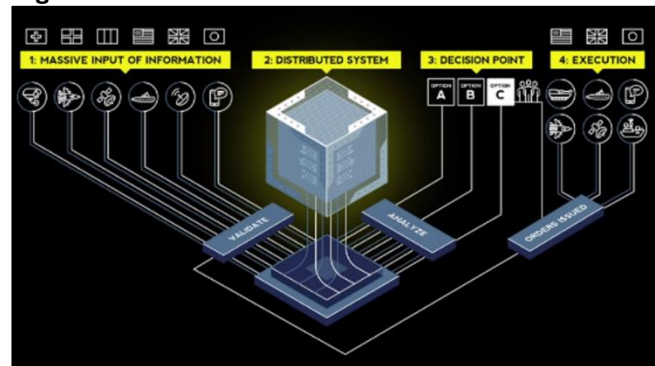
To explain JADC2, DOD makes an analogy with the ride-sharing service Uber. The Uber application calculates a user's geographic position and the position of available drivers. It transmits information over a cellular or Wi-Fi network and matches the customer to the ride through artificial intelligence (AI) and machine learning. The user's screen provides situational awareness of his or her position, identifies features in the vicinity, the location of the driver, supports data exchanges, and can coordinate multiple responses and riders in the same car. The military services contend that enhancing old processes and capabilities is insufficient. Each service is advocating for this type of advanced technology to support operations in a highly contested fight, ensuring not just cars, but aircraft, munitions, satellites, ships, submarines, tanks, and people are at the right place at the right time prosecuting the right target with the right effects, in seconds.

### Why evolve to JADC2?

The U.S. military contends that future conflicts within a sophisticated, highly contested, anti-access/area denial environment will be won by the side with an information advantage, enabling the ability to outpace, outthink, and outmaneuver adversaries across multiple domains. To maintain its information advantage and dominate this new battlefield, the U.S. military is reportedly adopting a

network-centric approach (connecting every sensor with every shooter) in an attempt to move data at machine speed and execute joint all domain operations (JADO) in order to overwhelm an adversary by attacking them from all domains.

Figure 1. Multi-Domain Command and Control



Source: 2019 Air, Space, and Cyber Conference.

JADO provides commanders access to information to allow numerous options for simultaneous and sequential operations using surprise and the rapid and continuous integration of capabilities across all domains to try to gain physical and psychological advantages and influence and control over the operational environment.

The Air Force asserts that aging C2 capabilities (Air & Space Operation Centers, E-8C Joint Surveillance and Target Attack Radar System, and E-3 Airborne Warning and Control System) are not optimized for the speed, complexity, and lethality of future conflict; that the decades-old platforms cannot adequately leverage new technology; and that the supporting structures to enable future C2 either do not exist or require maturation. The CSAF reasons that a JADC2 architecture would enable commanders to (1) understand the battlespace more rapidly, (2) direct forces faster than the enemy, and (3) deliver synchronized combat effects across multiple domains.

Some analysts take a more skeptical approach to JADC2. They raise questions about the technology itself, whether it is affordable, and whether it is realistic to field a network that can securely and reliably connect sensors to shooters and support command and control in a lethal, electronic warfare-rich environment. Others question who would have decisionmaking authority across domains in JADO and question the human role in making JADC2 decisions in real time.

### Joint Force Perspective and Integration

**DOD.** DOD is leading a Joint Cross-Functional Team to explore JADC2 as the concept rapidly evolves. The team

includes representatives from the offices of the DOD Chief Information Officer, the Under Secretary of Defense for Research & Engineering, and the Under Secretary of Defense for Acquisition & Sustainment.

**Joint Staff.** Joint Staff is leading efforts to move JADC2 from the conceptual arena to developing policies, joint doctrine, joint requirements, and overarching research and development strategies. The Joint Requirements Oversight Council, responsible for achieving consensus across the services regarding acquisition priorities, appointed the Air Force the lead service for JADC2 technological testing.

**Air Force.** The CSAF singled out a FY2021 budget proposal request for \$435 million for a digital architecture and cloud architecture that “we need to be able to not only connect the Air Force, but to connect the joint force.” This proposal suggests the Air Force intends to pursue the Advanced Battle Management Family of Systems as a joint architecture foundation for JADC2.

**Figure 2. MDC2 and Advanced Battle Management Family of Systems**



**Source:** 2019 Air, Space, and Cyber Conference.

**Army.** According to the director of the Concept Development and Learning Directorate at the Army Capabilities Integration Center, the service intends to develop the force structure and end strength needed to execute JADO with the Air Force, Navy, and Marine Corps. These focus areas are reportedly being informed by a Multi-Domain Task Force that combines intelligence, information operations, cyber and electronic warfare, space and signals under a single command. This battalion-sized unit is testing new tactics via wargames and exercises in the Pacific.

**Navy and Marine Corps.** Reportedly, the Navy’s Distributed Maritime Operations concept and the Marine Corps’ Expeditionary Advanced Base Operations build on the vision of distributed lethality to connect ships, submarines, aircraft, and satellites in networks to inform command and control elements and connect sensors with shooters. The Chief of Naval Operations acknowledged that to be effective against China or Russia, the Navy must be able to connect with its joint partners and is pursuing development of a joint network with the Air Force.

To test the concept and the technology, the Joint Force has begun a series of JADC2 exercises at four-month intervals. The first exercise, led by U.S. Northern Command, kicked off in December 2019, focusing on a simulated cruise

missile threat to the homeland. The exercise represented the first real-world test of the Advanced Battle Management System. Air Force and Navy aircraft (F-22, F-35), a Navy destroyer at sea, an Army Sentinel radar system, a mobile artillery system, plus commercial space and ground sensors were able to collect, analyze, and share data in real-time and provide a fuller picture of the operating environment to a C2 cell in Florida. According to Air Force officials, the C2 cell “watched real-time data pour in, and out of, the command cell. They observed information from platforms and people flowing instantly and simultaneously across air, land, sea, and space that provided shared situational awareness updates as events occurred whether the information originated from jets, or passing satellites, or from sea and ground forces on the move.” Reportedly, 26 of 28 tested capabilities demonstrated functionality.

## FY2020 National Defense Authorization and Appropriations

The Administration’s FY2020 budget request included \$150.9 million in MDC2 Research, Development, Test and Evaluation (RDT&E) and \$35.6 million in Advanced Battle Management System RDT&E.

The NDAA for FY2020, P.L. 116-92, authorized \$150.9 million for MDC2 and \$33.6 million for the Advanced Battle Management System; this amount includes both a reduction of \$10 million that the conference report labels as an “unjustified request,” and an \$8 million program increase for sensor fusion and AI technology.

The FY2020 DOD Appropriations Act, P.L. 116-93, appropriated \$100.8 million for MDC2 RDT&E. This includes both a reduction of \$10 million that the record labels as “unjustified growth,” plus an additional \$40 million transfer for Operations and Maintenance at the request of the Air Force. The act also appropriated \$43.6 million for Advanced Battle Management System RDT&E, which includes an \$8 million program increase for requirements refinement and technology identification.

## Potential Issues for Congress

Some potential issues for Congress include the following:

- What is the relative priority for JADC2 compared with other major DOD programs?
- What personnel, equipment, facilities, and training resources would be required to achieve JADC2?
- What role would humans have in the decision to engage if sensors are linked to shooters in real time?
- What role would AI have in JADC2 development?
- What alternatives to the Advanced Battle Management System exist?
- What is the estimated cost for force-wide implementation and lifecycle upkeep of JADC2?

*This report was originally written by Nishawn S. Smagh during his military fellowship with the Congressional Research Service.*

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