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Key Points

Decades of budget-driven force-structure divestments have eroded the comparative U.S. military advantage over China, and current command and control must evolve to meet new warfighting demands.

Built upon the advantages of space-based capabilities, JADC2 will enable information and decision superiority and become the operational commander's pathway for creating effects in all warfighting domains.

Space is the ultimate high ground, affording an extremely broad view for sensor data collection. This is critical to establishing a JADC2 architecture in the Indo-Pacific region.

Given that capabilities in the space domain are the cornerstone of a viable JADC2 construct, the U.S. Space Force should lead and oversee the integration and interoperability of the entire JADC2 system.

DOD must define the overarching operational concepts and strategies directing the use of JADC2. Integration of service-designed components into the space elements of JADC2 requires open architectures and data standardization.

Orbital JADC2 assets must be resilient and defended, given adversaries have declared their intent to attack U.S. capabilities on orbit.

The Indispensable Domain: The Critical Role of Space in JADC2

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Abstract

Coming out of the Cold War, the U.S. military possessed the capabilities and capacity to dominate global military operations when and where it chose. Due to three decades of budget-driven force structure divestments, this is no longer the case, and U.S. military capabilities and capacity simply have not tracked with growing peer adversary threats. Furthermore, adversary strategies that prioritize information and decision-making superiority indicate that success in future wars will go to the side that possesses better battlespace knowledge, makes better decisions, more efficiently directs its forces, and closes kill chains faster.

Space will empower all these critical actions. This is the vision of Joint All Domain Command and Control (JADC2). JADC2 will collect information from any sensor and any domain, rapidly transmit large volumes of data across vast physical distances, process the information to support dynamic battle management and commander decisions, and then ensure that the right information gets to the right warfighters at the right time to achieve the desired effect, all at a global scale.

This can only be achieved with foundational space-based capabilities. Only the space domain can move information at the speed, size, and range required of an effective JADC2 architecture. If the United States hopes to prevail in a peer conflict, the Department of Defense and the Space Force must prioritize a robust space transport layer, sensors, and the space superiority to protect these capabilities.

JADC2 will fundamentally rely on its space-based elements, so its space architecture must be resilient and defendable. This requires pursuing both passive and active defense features, to include the rapid acceleration of offensive and defensive space warfighting concepts and capabilities. If not understood and resourced with urgency, DOD's force design will lay vulnerable in the face of China and other countries seeking military dominance in space ahead of the United States and its allies.

Introduction

Warfighting in the space domain will determine the outcome of future conflicts. The reason for this is simple: success in war will go to the side that possesses superior battlespace knowledge, makes better decisions, directs forces more effectively, and closes kill chains faster. Technologies on orbit are pivotal in securing this advantage, especially when it comes to sensors and connectivity.

Realizing the importance of information and decision advantage, defense leaders have formulated a concept termed Joint All Domain Command and Control (JADC2). It envisions an enterprise in which data is collected from a broad array of multi-domain sensors, rapidly transmitted across vast distances, processed into actionable information, and provided to consumers on a demand-relevant basis to empower smart decision-making across the tactical, operational, and strategic command realms.[1] Importantly, this concept is not a singular program or capability. It comes down to using the right mix of capabilities to get relevant information to each warfighter at the right time to achieve the desired effects, all at a global scale. As the Department of Defense's (DOD) official JADC2 strategy explains, the goal is to "produce the warfighting capability to sense, make sense, and act at all levels and phases of war, across all domains and with partners, to deliver information advantage at the speed of relevance."[2]

The schema does not imply all actors will know everything all the time. Instead, the aim is to supply the right pieces of information to the appropriate actors in a timely manner to best inform a given set of decisions. Given the significant capability and capacity limitations facing U.S. military forces, as well as the scale, breadth, and sophistication of adversary threats facing them, this sort of advantage will prove crucial. It is a force multiplier and reduces risk on multiple levels.

Space-based technologies will prove absolutely essential for manifesting this vision—especially when it comes to global communication links able to move data from all sensors. As the U.S. Space Force's doctrine emphasizes, "One key distinction of warfare in the Information Age is that many weapon systems rely on external sources of information to function."[3] Space is the ultimate high ground, affording an extremely broad view for sensor data collection. This vantage also enables forces separated by tremendous distances to connect, which is particularly important in the critical Indo-Pacific region, where distance is one of the primary challenges to fielding effective defenses against China. Space Force leaders understand this imperative and the centrality of these capabilities, and it is why Chief of Space Operations General Jay Raymond explained that "our ability to sense from the space domain, transport and make sense of data, and then get that data into the hands of our joint warfighting partners on land, in the air and at sea, is what the Space Force delivers to JADC2. . . . Space capabilities underpin modern warfare."[4]

However, manifesting this vision requires the national security space community, and particularly the Space Force, to develop a new suite of sensor capabilities and a robust space transport data transmission layer scaled for global operations.[5] While JADC2 will be the operational commander's pathway for creating effects in the air and on the ground, its orbital assets must then be resilient and defended, given that multiple adversary nations have declared their intent to attack U.S. capabilities on orbit. This latter point reflects a major paradigm shift in the way

the U.S. national security establishment views the space domain. Former Commander of the Space and Missile Systems Center General Ellen Pawlikowski pointed out in the year leading up to the creation of the Space Force that, in previous eras, "survivability [in space] wasn't even on the sheet."[6] U.S. defense leaders recognize that circumstances are now far different.

Anyone questioning the necessity of JADC2 should reflect on the Battle of Britain in the summer of 1940. It is a classic example of how information and decision superiority can be the deciding factor in conflict. Having just occupied France, Germany was set on invading the United Kingdom, and an air offensive was the first component of their campaign. Royal Air Force (RAF) combat aircraft were badly outnumbered by more than seven-to-one. When the Luftwaffe raids commenced, over 3,500 German combat aircraft were massed across the English Channel. The RAF possessed only 446 operational fighters. In the ten days between August 8 and August 18, 1940, the RAF lost 154 pilots, with only 63 green airmen available from training squadrons to backfill casualties.[7] Yet British forces prevailed against these overwhelming odds because their information and decision superiority enabled them to direct their Hurricane and Spitfire fighter aircraft more effectively and efficiently against the more numerous Luftwaffe. The system allowed the posturing of fighter aircraft at the right time and place to best defend the homeland while avoiding zones of undue risk.

Chain Home radars along the English coast and ground observers inland gathered enemy aircraft position data and transmitted it for processing via telephone and radio networks to Fighter Command Headquarters. There, highly trained personnel processed this data into actionable information and then alerted fighter squadrons to scramble their aircraft. They also helped vector the fighter pilots to their targets once they were airborne. Without this system to maximize their limited assets, the RAF would have had to keep a large percentage of their fighters roaming around the sky searching for Luftwaffe aircraft. This approach would have diluted the effectiveness of limited aircraft numbers, and it would have failed to detect many incoming attacks. Instead, Fighter Command Headquarters knew exactly where incoming raids were located, at what altitude, and how many aircraft, and this enabled them to use their fighters precisely and efficiently in the defense of England.[8]

While the technology, systems, and processes have changed over the ensuing decades since the Battle of Britain, information and decision superiority remain vital military attributes, especially when a force is stretched thin—exactly the circumstances facing the U.S. military in a fight against China. As Deputy Secretary of Defense Kathleen Hicks explained, "Command and Control in an increasingly information-focused warfighting environment has never been more critical."[9]

There is no question that space capabilities will be critical to realizing the JADC2 concept. However, what specific systems and capabilities are needed, how many, and at what cost remain undefined. While many technologies may already be available, many are still on the drawing board. Moreover, there is no clear path for procuring and fielding these capabilities. Confusion regarding the ultimate scale and scope of the JADC2 construct has not helped these efforts. Overarching operational concepts and strategies directing their use must be defined, especially those related to JADC2 functions on orbit.

This analysis aims to explore the JADC2