



CATALOG OF DOCTRINE TOPICS

01 JUN 2020

Introduction

Command and Control

Information

Intelligence

Fires

Movement and Maneuver

Protection

Sustainment

Appendix A: Domains, Environments and Associated Elements

Appendix B: Key Considerations for Agile Combat Employment (ACE)

Appendix C: Degrees of Human and Machine Control

Appendix D: Joint All-Domain Doctrinal Gaps

Appendix E: Concepts to Doctrine Cycle



INTRODUCTION

01 JUN 2020

This doctrine annex establishes a framework for air and space components supporting joint all-domain operations (JADO). It combines a vision of JADO with near-term practical approaches. Near-term approaches are grounded in operational experience and battle-tested processes for [operational planning, execution, and assessment](#). This annex guides the Department of the Air Force (DAF) in organizing and employing the full range of forces and capabilities it presents to the [joint force commander](#) (JFC). Experiments, wargames, and exercises will refine JADO operational principles. The role of this annex as emerging doctrine is depicted in Appendix E.

JOINT ALL-DOMAIN OPERATIONS

DAF and joint force operations are increasingly interconnected, interdependent, and challenged. Anti-access and area denial threats, reduced freedom of maneuver, and rapid proliferation of advanced technologies challenge the DAF's ability to operate. This operating environment requires examining how forces will sense, plan, decide, and act in concert across all domains. Achieving freedom of action requires convergence across domains that presents adversary *dilemmas* at an operational tempo complicating or negating adversary responses and enabling the joint force to operate inside the adversary's decision-making cycle. Synergistic employment of capabilities in different domains enhances effectiveness and compensates for vulnerabilities, creating outcomes not readily attainable through single-domain action.

A dilemma is a situation in which one must make a difficult choice between two or more alternatives, often equally undesirable.

DAF's support to JADO principles:

- ✦ [Centralized control and decentralized execution](#) through mission-type orders.
- ✦ Delegation of authority.
- ✦ Sharing of information.
- ✦ Integrated planning.
- ✦ Risk identification and mitigation.

- ✦ Use of joint structures for command and control (C2) and force employment.

Outcomes of DAF's support to JADO:

- ✦ Describe the need for joint all-domain command and control structures.
- ✦ Accelerate and increase capacity to develop decision-quality information.
- ✦ Organize, train, and equip forces to converge in multiple domains in operationally-relevant timeframes.
- ✦ Create dilemmas for an adversary.

DAF contribution to JADO synergizes air and space forces. It ensures the DAF presents capabilities to the JFC in ways that can be integrated into JADO. In 1947 the roles and functions of the Services were originally determined and live today in Department of Defense Directive 5100.01, [Functions of the Department of Defense and Its Major Components](#). While it promotes unity of command and effort within each domain, it stovepipes operations, limits integration, planning, and synergies between activities, creates vulnerabilities, and reduces dynamic exploitation of emergent opportunities. All-domain approaches leverage the joint force's full capability and permit lower-level integration in operationally-relevant timeframes.

Peer competition requires reframing integration and synchronization for sustained and dynamic combat operations. Current decision-making processes (e.g., joint planning process for air) employ linear planning and force synchronization to execute operations. If successful, these operations lead to reduced activity, followed by another cycle of the process. Current processes are slow and predictable; peer competition requires process changes to facilitate rapid synchronization of [effects](#) to create adversary dilemmas. This requires continuous and iterative near-term tactical planning, longer-term operational-level planning, and campaign refinement as conditions change.

JADO ACROSS THE COMPETITION CONTINUUM

The DAF provides forces to JFCs for JADO throughout the competition continuum. Those forces operate principally in air, space, cyberspace, and the electromagnetic spectrum (EMS).¹

Joint Doctrine Note 1-19 introduced the competition continuum: a comprehensive and flexible spectrum of strategic relations between the United States and other actors.² The competition continuum describes a world of enduring competition conducted via **cooperation, competition below armed conflict, and armed conflict, depicting the relationship between the US and strategic actors (state or non-state)** concerning

¹ Appendix A depicts the relationship between the DOD domains and associated elements.

² Joint Doctrine Note 1-19, [Competition Continuum](#).

policy objectives. The competition continuum describes the environment in which the United States government applies instruments of national power. Key points are:

- ★ **Cooperation:** Mutually beneficial relationships with compatible interests.
- ★ **Competition:** Relationships with incompatible interests—none seeking to escalate to armed conflict.
- ★ **Armed conflict:** A situation in which combat is the primary means to satisfy interests.

“The reemergence of long-term strategic competition, rapid dispersion of technologies, and new concepts of warfare and competition that span the entire spectrum of conflict require a Joint Force structured to match this reality.”

[National Defense Strategy of the United States of America, 2018](#)

[unclassified summary]

Air and space forces support JADO across the competition continuum, as shown through examples in the figure below.

JADO Across the Competition Continuum	
Continuum region	Joint all-domain operations, activities, and investments
Cooperation	<ul style="list-style-type: none"> ★ Improve materiel and non-materiel partner nation interoperability. ★ Obtain and maintain air and cyberspace domain access enabling global reach and rapid projection of military power. ★ Establish cooperative sharing agreements improving mutual support in crisis response.
Competition	<ul style="list-style-type: none"> ★ Incorporate all-domain approaches into flexible deterrent options. ★ Expose and counter malign influence. ★ Maintain freedom of access and maneuver in the global commons.
Conflict	<ul style="list-style-type: none"> ★ Projecting global combat power. ★ Synchronizing action in, from, or through all domains to gain and maintain theater access. ★ Overmatching adversary forces at decisive points. ★ Preserve combat capability to conduct future operations

JADO Across the Competition Continuum

DEFINITIONS OF TERMS

Domain: A sphere of activity or influence with common and distinct characteristics in which a force can conduct joint functions.³

Joint All-Domain Operations (JADO): Comprised of air, land, maritime, cyberspace, and space domains, plus the EMS. Actions by the joint force in multiple domains integrated in planning and synchronized in execution, at speed and scale needed to gain advantage and accomplish the mission.⁴

Joint All-Domain Command and Control (JADC2):

The art and science of decision-making to rapidly translate decisions into action, leverage capabilities across all domains with mission partners to achieve operational and informational advantage in both competition and conflict.^{5 6}

Information Advantage:

Conditions in the information environment favorable to achievement of the commander's overall objectives. Such conditions may arise on their own or be the result of deliberately using information to influence relevant actors; inform desired audiences; attack, exploit, and defend information, information networks, and systems; and support human and automated decision-making. Information advantage can exist in the human or systems dimensions of the information environment separately or simultaneously.



“Victory in future combat will depend less on individual capabilities and more on the integrated strengths of a connected network available for coalition leaders to employ....

What I’m talking about is a fully networked force where each platform’s sensors and operators are connected.

The goal [is to] produce multiple dilemmas for our adversaries in a way that will overwhelm them.... An even better outcome...is to refine [JADO] to the point where it produces so many dilemmas for our adversaries that they choose not to take us on in the first place.”

--Air Force Chief of Staff Gen David Goldfein
Remarks to the Air Force Association,
17 September 2019

³ Joint Publication (JP) 3-0, [Joint Operations](#), describes the operational environment as encompassing the physical domains of air, land, maritime, and space; the information environment, which includes the cyberspace domain; and the electromagnetic spectrum. It also describes the joint functions as related capabilities grouped to help commanders integrate, synchronize, and direct operations. The [joint functions](#) are C2, information, intelligence, fires, movement and maneuver, protection, and sustainment. Also refer to appendix A for a graphical depiction.

⁴ Air Force Doctrine Note 1-20, [USAF Role in Joint All-Domain Operations](#).

⁵ JADC2 Cross-Functional Team Charter/Terms of Reference.

⁶ [Air Force Doctrine Note 1-20](#).



ANNEX 3-1 DEPARTMENT OF THE AIR FORCE ROLE IN
JOINT ALL-DOMAIN OPERATIONS (JADO)

COMMAND AND CONTROL (C2)

01 JUN 2020

JADO VISION FOR COMMAND AND CONTROL

The JADO vision for [command and control](#) is **joint-all-domain command and control** (JADC2). It is the art and science of decision-making to achieve operational and informational advantage in the competition continuum.⁷ It is the natural extension of C2 across domains and Service components. The Department of the Air Force's **JADC2** vision calls for connecting distributed sensors, shooters, and data from all domains to joint forces, enabling coordinated exercise of authority to integrate planning and synchronize convergence in time, space, and purpose. To create effects in all domains this requires:

- ✦ A shared understanding of the operational environment (amplified further in this annex's chapters on **Information** and **Intelligence** joint functions).
- ✦ Integrating global and geographically-focused capabilities with command relationships.
- ✦ Supporting information synthesis and distributed decision-making.
- ✦ Operating with agility and resilience through mission-type orders and delegation of authority at each echelon.

"We need purple command and control. It takes too long for us to do air command and control, and ground command and control, and navy command and control, and then try to come back together and talk about what we are going to do."

**-- General James M. Holmes,
Commander, Air Combat Command**

JADC2 requires information access at all echelons. Dynamic all-domain adaptation is possible when leaders can determine which actions are appropriate for operational and strategic objectives and can detect when contextual changes invalidate assumptions underpinning command intent. JADC2 enables decision-makers to understand relationships between information from disparate domains. Cross-domain perspectives enable visibility into the impacts on joint forces, and how to enhance or mitigate those impacts.

⁷ JADC2 Cross-Functional Team Charter/Terms of Reference.

JADC2 requires robust, resilient communications structures. Traditional communications structures rely on highly centralized communications nodes acting as C2 nodes while modern structures rely on multiple simultaneous paths. Effective JADC2 requires modern communications; distributed, robust, and resilient in nature.

PLANNING AND EXECUTION OF C2

Centralized control and decentralized execution is a key tenet of DAF doctrine (Volume 1, [Basic Doctrine](#)) and C2 for joint air operations (JP 3-30, [Joint Air Operations](#)). It is how joint air and space forces execute mission command⁸ through mission type orders⁹.

JADC2 requires greater decentralized execution, a higher degree of delegated authority, and less dependence on central planning and mission direction than recent, low-intensity conflict operations. Decentralized execution is enabled through the designation of conditions-based authorities, in which conditions triggering delegation to a lower echelon are planned for and designated prior to an operation. Conditions-based authorities enable C2 processes to function under contested and degraded conditions. **To achieve decentralized execution, commanders must clearly convey intent, and subordinates must be empowered to act on that intent absent further guidance.**

Conditions-based authorities are authorities delegated to a subordinate under certain pre-defined conditions. This may include (but is not limited to):

- ★ Degradation in communications.
- ★ Significant changes in the operational environment.

Planning

JADC2 planning requires clear and early expression of commander's intent and force prioritization. Commanders should address the **exploit versus explore tension** when providing intent and priorities to subordinate planners and commanders. This tension is a balance between exploiting the knowledge you already have, versus exploring to discover new knowledge (e.g., the specification of specific collection assets and analysts between targeting and surveillance). JADO enables better management of this tension through enhanced information gathering, processing, and sharing across domains. JADC2 tools and methods harness the existing capability of the joint force to both surveil widely, and focus their gaze narrowly.

⁸ Mission command is the conduct of military operations through decentralized execution based upon mission-type orders (Joint Publication [JP] 3-31, [Joint Land Operations](#)).

⁹ Mission-type orders are those issued to lower units that include the accomplishment of the total mission assigned to the higher headquarters and orders units to perform the mission without specifying how it is to be accomplished (JP 3-50, [Personnel Recovery \[common access card required\]](#)).

The current air tasking order (ATO) needs to evolve into an integrated tasking order (ITO) that directs assigned, attached, and supporting forces and capabilities. The ITO incorporates capabilities across components and domains. Joint force visibility on intended actions presents synchronization opportunities allowing for mutual support. Knowledge of joint force capabilities, a common lexicon, and the ability to communicate across echelons enables DAF forces to integrate across domains.

Early planning visibility allows forces to sustain initiative despite degradation. Longer planning cycles with faster adaptation and refinement permit subordinate commanders to understand and execute intent when communication is degraded. The longer planning cycle induces inefficiencies, but those inefficiencies are outweighed by increased adaptability and flexibility of the force.

“It is a given in future conflicts that the joint force will be conducting operations in a contested environment. We must be prepared to execute in a degraded C2 environment where clearly delineated and forward-thinking commander’s intent will be a requirement. It is imperative senior leaders provide our commanders with conditions-based authorities delegated to the lowest capable and competent level, and empower command by negation to accept the appropriate level of risk, all while working toward moments of clear C2.”

**-- General C.Q. Brown, Jr.,
Commander, Pacific Air Forces**

JADC2 Plans Considerations:

- ★ Desired effects and supported objectives.
- ★ Second- or third-order effects and consequence management plans.
- ★ Limiting factors.
- ★ Effects timing, including start time, duration, and flexibility.
- ★ Capabilities used to create an effect and required accesses.
- ★ Lead times required to access needed capabilities.
- ★ Authorities required and from whom they are delegated.
- ★ [Rules of engagement](#) and judge advocate review.
- ★ Integration of Nuclear Command, Control, and Communications (NC3) for Conventional-Nuclear Integration (CNI).
- ★ Reusability of non-kinetic capabilities for follow-on operations.

Execution

JADC2 synchronizes integrated, lethal, and nonlethal effects and adjusts weight of effort, requiring monitoring and adapting integrated operations plans with forces and capabilities. Execution priorities:

- ★ Synchronize application of available forces and capabilities.
- ★ Establish conditions to delegate authorities.
- ★ Synthesize the legal and policy implications of force employment.
- ★ Commence, accelerate, delay, or terminate execution of ongoing operations for maximum advantage and desired operational pace.
- ★ Mitigate operational disadvantages in one domain through action in or through other domains.
- ★ Exploit advantages in one domain to create opportunities in others.
- ★ Ensure effective tactical action through mission-type orders.
- ★ Create effects via supporting (not assigned or attached) forces, through effective coordination between combatant commands.
- ★ Develop follow-up actions for unexecuted orders.
- ★ Ensure transition criteria account for the full range of conditions across domains.

ASSESSMENT

JADC2 assessment provides the commander answers to three questions:

JADC2 Assessment Considerations	
Category	Examples of key questions
Are we doing the right things?	<ul style="list-style-type: none"> ★ What effects were late-to-need due to authorities delegation delays? ★ What were we not able to accomplish due to a lack of authorities? ★ What opportunities advanced the JFC’s objectives through all-domain synchronization? Did we have the right communication channels in place between air, space, and cyberspace forces to enable convergence?
Are we doing things right?	<ul style="list-style-type: none"> ★ Did we have the right communication channels in place between air, space, and cyberspace forces to enable convergence? ★ Did we sequence effects between domains as planned? ★ Did we achieve the desired operations tempo?
Are we measuring the right things?	<ul style="list-style-type: none"> ★ How do we measure the effectiveness of the integrated air, space, and cyberspace portions of our campaign? ★ Can we use indicators from one domain to make assessments in others? ★ Do we have the means to collect relevant metrics within operationally relevant timeframes?

JADC2 Assessment Considerations



INFORMATION

01 JUN 2020

JADO VISION FOR INFORMATION

The JADO vision for information is to make it a central element of air and space forces' operational-level planning, execution, and assessment by advising air and space components of information's operational effects on global audiences.

PLANNING AND EXECUTION OF INFORMATION

Operations in the information environment are the sequence of actions that use information to affect behavior by informing audiences; influencing external relevant actors; and affecting information, information networks, and information systems.¹⁰

Information warfare is the employment of military capabilities in and through the information environment to deliberately affect adversary human and system behavior and preserve friendly freedom of action during cooperation, competition, and conflict.¹¹ Information warfare creates multiple dilemmas for the adversary.

Effective joint force application of information is vital to attain enduring strategic advantage. Deliberate, long-term information operations, capitalizing on cumulative effects across multiple coordinated operations, are key to shaping perceptions and behaviors. Air and space component commanders, in coordination with the joint force, achieve JFC outcomes through nested activities integrating informational power and military power. The JFC's operational approach shapes the information environment to gain, maintain, and protect decision advantage in support of JFC objectives.

To achieve information advantage, the information joint function must feed the [command and control](#) (C2) joint function. A key tenet of maintaining information advantage in an all-domain context is automated synthesis processes which fuse data into usable situational awareness. The DAF leverages machine-to-machine communications (e.g., datalinks and other digital communications) in expediting

¹⁰ Headquarters Air Force, Operations Directorate Memo, "Definitions and Working Descriptions for Information-Related Terms."

¹¹ Ibid.

information flows to gain and maintain all-domain situational awareness. Resiliency of communication systems is paramount to retain information advantage and ensure cooperative information sharing persists despite communication degradation.

JADO requires air and space components to design their portions of joint campaigns around information effects on global audiences. To do this the air and space components define the narrative they are supporting or enabling, and then demonstrate that narrative in their actions.



INTELLIGENCE

01 JUN 2020

JADO VISION FOR INTELLIGENCE

The JADO vision for intelligence is to develop, maintain, and share an awareness of the operational environment spanning geographic, functional, domain, classification, and organizational boundaries. The scope of awareness includes information on friendly forces, ongoing operations, adversary forces, indications and warnings (I&W), target information, as well as military, political, environmental, and other considerations. Intelligence operations for JADO require understanding not only what is taking place in the battlespace but also understanding how events impact each other across areas of responsibility, affect campaign plans, and hamper (or enhance) the commander's ability to project force and create effects. Awareness is challenged by the need to integrate information from multiple sources of varying quality over multiple networks and classifications, and across multiple intelligence agencies and organizations.

The ability to sense the operating environment across domains predominately relies on expensive, high-tech, purpose-built systems, but JADO requires a broad array of collection platforms, capabilities, and methods.

All-source intelligence is leveraged across the joint and interagency enterprise, but much of the synthesis is done manually. JADO requires intelligence to be automatically synthesized and shared at the lowest possible classification level. The need to conduct cross-domain, cross-source synthesis significantly increases demand for fusion capacity and capability.

PLANNING AND EXECUTION OF INTELLIGENCE

Current intelligence processes do not adequately integrate all-domain sensing activities for JADO. In JADO, sensing is a continuous effort feeding multiple decision loops; cross-cueing and fusing collection activities among domains results in an improved joint intelligence preparation of the operational environment (JIPOE).

Intelligence, surveillance, and reconnaissance (ISR) operations are conducted in, from, and through all domains across the [competition continuum](#). All-domain intelligence

capabilities enable globally-integrated ISR forces to quickly collect, analyze, process, and disseminate relevant information to operational forces, and refine foundational intelligence to inform mission planning and JIPOE.

JADO requires air, space, cyberspace, and human ISR platforms and capabilities to combine with other Service ISR capabilities for a global interoperable intelligence sensing architecture. This architecture produces massive volumes of data to meet JADO intelligence needs; processes and technologies should be continually designed to incorporate legacy and future capabilities.

Planning

Increased intelligence requirements necessitate synchronization of traditional and nontraditional intelligence platforms. Individual ISR collection platforms produce intelligence at varying speeds; for example, human source intelligence collection takes longer than space-based ISR assets. To support JADO planning and execution, intelligence timeliness should be integrated and synchronized with all-domain operations. To keep pace with the emerging environment, ISR must also leverage nontraditional sources of intelligence to complement traditional ISR activities.

ISR planning considerations for JADO:

- ✦ Cross-cueing collection activities between domains.
- ✦ Correlating information from multiple sensors, sources, and domains.
- ✦ Integrating open-source reporting into a comprehensive picture of the operational environment.
- ✦ Establishing strategic impacts of tactical actions.
- ✦ Establishing how events in one domain impact freedom of maneuver in another.
- ✦ Using battlespace information from one domain to mitigate knowledge gaps in another.
- ✦ Leveraging joint, inter-Service, interagency, multinational, and commercial partner situational awareness capabilities and data sources.
- ✦ Incorporating all-domain considerations into intelligence gain or loss assessments.

Execution

ISR execution in JADO requires integrating all-domain intelligence and establishing common intelligence infrastructure that accelerates the flow of decision-quality

information to commanders. That information must also support analysts, ISR planners, and targeteers.

All-domain ISR operations are executed across the competition continuum. Intelligence collected during cooperative or competitive activities will be leveraged during armed conflict, providing commanders a comprehensive understanding of adversary attitudes, activities, forces, and other considerations that inform decision-making.

FIRES

01 JUN 2020

JADO VISION FOR FIRES

The JADO vision for fires is to achieve convergence across domains—the synchronization and integration of kinetic and non-kinetic capabilities to create lethal and nonlethal effects whose results are greater than the sum of their parts.¹² Air, space, cyberspace, land, maritime and electromagnetic spectrum (EMS) targeting cycles are synchronized and integrated at the [joint force commander](#) (JFC) level. Integration of planning cycles is required to synchronize, sense, target, and execute across domains for effective all-domain operations. To maintain tempo, staffs at each echelon need flexibility to observe and orient on new opportunities and quickly decide, target, and execute across all domains.

“There are no boundaries on this battlefield...there are no hiding places...there are no sanctuaries on this battlefield... So how do you win? I think you win by operating at a tempo that they can’t keep up with, and by putting them on the horns on multiple dilemmas... We need to create enough options for our warfighting commanders, that the enemy doesn’t know where we are going to come from next.”

**-- General James M. Holmes,
Commander, Air Combat Command**

PLANNING AND EXECUTION OF FIRES

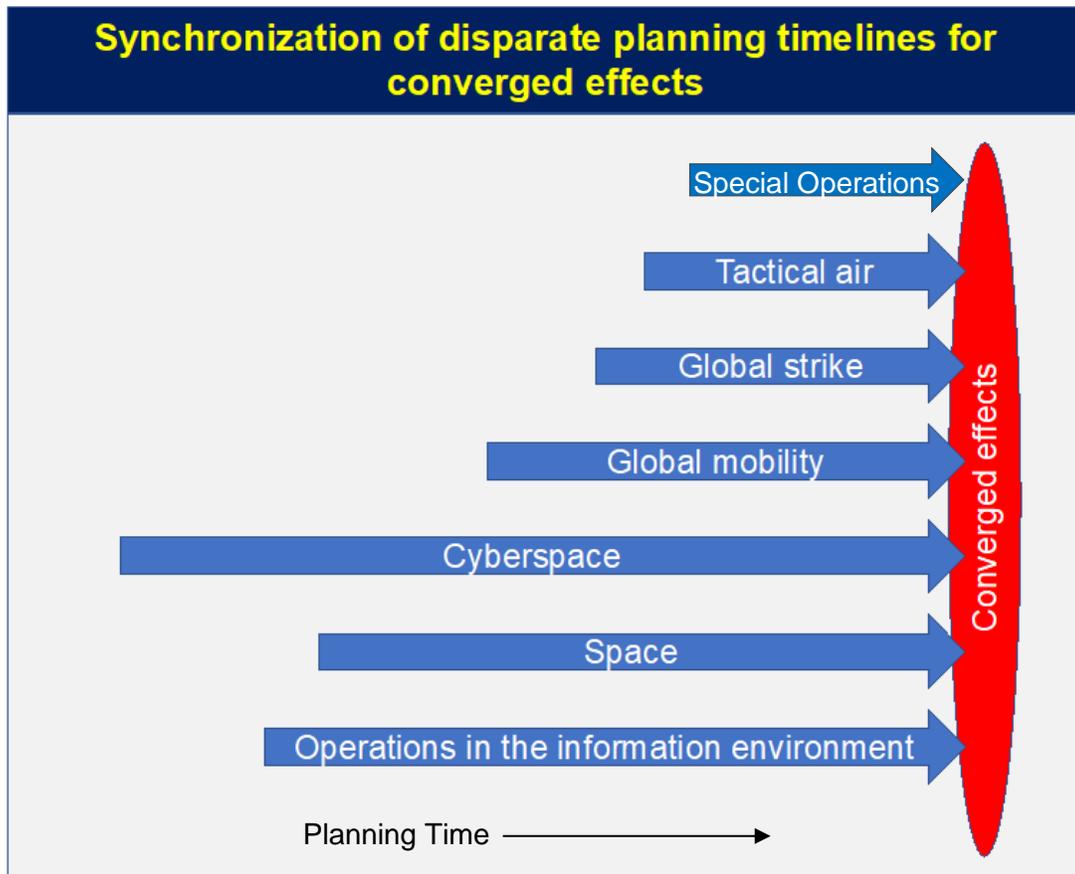
Convergence

Traditional methods for achieving mass¹³ mean generating large quantities of forces to create overwhelming action against a target. Prevalence of precision-guided munitions, enabled by positioning, navigation, and timing, augmented by non-kinetic capabilities, allows for massing of fires with small numbers of dispersed forces. This complicates

¹² Annex 3-0, [Operations and Planning](#).

¹³ Joint Publication (JP) 3-0, [Joint Operations](#).

adversary defenses and allows friendly forces to create effects. Commanders can employ nontraditional fires to generate mass. As an example, mobility platforms can employ precision munitions from standoff ranges. Non-kinetic fires through space, cyberspace, the EMS, or other means provide additional mechanisms for creating effects. In JADO, mass accrues from synchronized convergence of kinetic and non-kinetic forces and capabilities. Achieving convergence requires alignment of disparate planning timelines so forces and capabilities are brought to bear at the time and place required to create desired effects.



Synchronization of Disparate Planning Timelines for Converged Effects

Targeting and Fires Integration

Targeting supports the process of linking desired fires effects to actions and tasks at the component level.¹⁴ For successful cross-domain fires effects, synchronization is necessary. Typically, synchronization occurs at the JFC level during a targeting coordination board as planning capabilities are presented by each component and domain. In JADO, synchronization planning must occur at echelons below the JFC to provide resiliency and speed in execution.

¹⁴ [JP 3-0](#).

The current targeting process includes air apportionment, but with JADO, the entire joint force requires an air apportionment-like process to ensure convergence. Using the JFC joint force apportionment decision and through collaboration, component commanders allocate forces, synchronize effects, and ensure weight of effort meets JFC intent and objectives. The integrated tasking order is the mechanism to frame fires synchronization in the targeting process.

CROSS DOMAIN KILLCHAIN EXAMPLE

During a recent operation, an enemy agent was tracked via their digital persona. Utilizing multi-domain intelligence sources, the interagency geolocated the individual in an untargetable location. As a result, the JFC chose to utilize a ground force to disable a critical piece of communications infrastructure which forced the enemy actor to move. Intelligence from multiple domains confirmed his new location, and the enemy agent was eliminated with no collateral damage.

Variations on this historical vignette have played out many times over the last two decades. JADO enables this level of integration at a scope and scale of a major combat operation.



MOVEMENT AND MANEUVER

01 JUN 2020

JADO VISION FOR MOVEMENT AND MANEUVER

The JADO vision for movement and maneuver enables deliberate and opportunistic convergence through positioning of forces and capabilities to create multiple adversary dilemmas.

JADO movement and maneuver requires forces and capabilities from multiple domains, synchronizing and aligning actions, and deliberate positioning to converge effects to gain and maintain advantage. Convergence is also achieved through timely exploitation of emergent opportunities. Convergence is more difficult to achieve in degraded or denied [command and control](#) (C2) environments that require units to operate on commander's intent and mission-type orders.

PLANNING AND EXECUTION OF MOVEMENT AND MANEUVER

Opportunistic convergence emerges from changes in the operational environment that can be exploited to further joint force objectives. Building schemes of maneuver which provide for opportunistic convergence should be considered across domains at all echelons.

Movement and maneuver planning for JADO requires integrated planning teams and shared information across the joint force. The joint force commander's (JFC) movement and maneuver concepts are outlined in the operations plan and further refined in an integrated tasking order (ITO). The movement and maneuver of forces largely depends on the JFC's scheme of maneuver and intent. Execution of the JFC's movement and maneuver plans requires a joint all-domain C2 structure capable of converging effects at a time and place to create multiple adversary dilemmas and supporting friendly freedom of action.

Maneuver in the electromagnetic spectrum (EMS) supports JADO by providing resiliency to adversary degradation and denial attempts. The ability to change spectrum bands and use frequency agility to evade interference (e.g., a jammer) increases

adversary dilemmas in intelligence, surveillance, and reconnaissance and allows for persistent friendly communication.

Maneuver in space supports JADO through deployment, repositioning, or reorienting of on-orbit assets and terrestrial space forces. These actions support asset optimization, protection from environmental hazards, passive defense, positioning enabling active defense or offense measures, and follow-on space actions, as well as follow-on actions in other domains, creating multiple dilemmas for an adversary.

Maneuver in cyberspace supports JADO without establishing a physical presence. It includes accessing adversary networks to support follow-on offensive and defensive actions in cyberspace, enabling convergence of effects in the EMS and other domains, while protecting friendly networks. These cyberspace actions create multiple dilemmas for an adversary.

CROSS DOMAIN CONVERGENCE

During an operation in Africa, a USAF aircraft conducted overhead ISR, providing real-time intelligence to the ground force commander. Live video of the operation streamed via satellite to the allied headquarters, and voice communications over SATCOM allowed the headquarters to enable conditions-based, delegated authorities as the situation on the ground changed.

While overhead the target area, the US aircraft's EMS suite detected a threat to the assault force. After confirming their indications, the aircrew advised the ground team that intelligence confirmed their interpreter had been acting as a double-agent and had compromised the operation.

This historical vignette demonstrates agility across land, air, space, and the EMS, and the ability to converge capabilities and assets to provide intelligence, fires, and protection. JADO will enable this type of operation at the scope and scale of major combat operations.



PROTECTION

01 JUN 2020

JADO VISION FOR PROTECTION

The JADO vision for protection is to protect and mitigate vulnerabilities in each domain using forces and capabilities from multiple domains. Just as convergence synchronizes all-domain action against adversary forces and capabilities, protection planning and execution mitigates threats to the joint force originating from any domain.

PLANNING AND EXECUTION OF PROTECTION

Threats to friendly forces and operations can emerge from any domain, and the varied nature of the threats dictates proactive and responsive protection operations, synchronized across domains, to facilitate a holistic defensive approach.

Traditionally, protection of friendly forces focuses on stopping or mitigating physical attacks from the land, air, or maritime domains. JADO requires protecting against threats using mission-type orders and conditions-based authorities, integrated planning and synchronization of effects, sharing of information, and all-domain risk identification and mitigation.

JADO protection requires evolution in indications and warnings and understanding of the purpose of adversary attacks, relying heavily on intelligence and information. Just as all-domain warfare uses complementary attacks in multiple domains, JADO protection requires convergence of protection capabilities to prepare forces and then respond in all domains.

Agile Combat Employment (ACE)

ACE is a proactive and reactive operational scheme of maneuver executed within threat timelines to increase survivability while generating combat power.¹⁵

ACE is an operations framework generating rapid and resilient combat airpower

¹⁵ Memorandum from Air Combat Command/CD RE: "Air Force Agility Common Lexicon," 10 Jan 2020.

throughout an operational area in response to potential adversary anti-access and area denial efforts. ACE enhances survivability and the ability to seize the initiative, deliver lethal force with operational unpredictability, and succeed across the competition continuum. ACE requires multi-capable air and space professionals practicing centralized control and decentralized execution through delegation of authorities, a distributed joint [command and control](#) structure reliant upon mission-type orders, a network of resilient airbases, austere operating locations, and an adaptive logistics system.

ACE's use of dispersal and alert operations increases survivability of friendly capabilities, decreasing time and distance problems faced in large theaters, allowing forces to attack and defend quickly, and increasing political consequences by bringing other nations into conflict. To fully realize JADO protection, the use of nontraditional facilities and capabilities is necessary. Appendix B provides a list of key considerations for ACE.

SUSTAINMENT

01 JUN 2020

JADO VISION FOR SUSTAINMENT

The JADO vision for sustainment ensures a continued ability to project power and maintain initiative in contested environments. Historically, units have assumed a certain level of continuous infrastructure and support; JADO requires questioning assumptions about immediacy of logistics support and available operating location infrastructure. JADO capabilities function with less intensive sustainment processes and fewer resources. JADO forward positions require simple, modular, and maintainable systems, shifting away from static infrastructure, centrally controlled (hub-and-spoke) logistics, highly specialized maintenance equipment and materials, and large contractor and support footprints. JADO logistics require greater modularity to reduce reaction time and sustain worldwide warfighting capability. Robust, multi-modal distribution systems facilitate greater sustainment options for [joint force commanders](#). Lower echelon units should see and share sustainment and logistical information, enabling integrated planning and enhancing risk identification and mitigation. Joint and Service component logistics enterprises and supporting industrial bases must be more responsive to increased needs and limited communications.

“When they deploy, they deploy with their own sleeping bag, their own shelter half, and a stove. And they’re not waiting for anybody to build the tent city for them... they are coming ready to fight.”

**-- General James M. Holmes,
Commander, Air Combat Command**

PLANNING AND EXECUTION OF SUSTAINMENT

Sustainment actions are more complex when facing a peer adversary and put legacy logistics and sustainment main supply routes and hubs at risk. These complexities are exacerbated by degradations in [command and control](#) that complicate requests for support, the status of forces, combat assessments, etc.

Maneuver Logistics

JADO critically links maneuver and sustainment functions, often to a degree in which they are indistinguishable, and highlights the importance of logistical movement through contested environments. The adaptive nature of JADO maneuver logistics provides sustainment from range with minimal dependence on large, fixed infrastructure, and in some cases, supports contested area sustainment through disaggregated supply infrastructure. Effectiveness should be prioritized over efficiency to generate adaptive capability not dependent on centralized logistics. JADO's distributed operations require redundancy in supply distribution and deliberately-planned logistics chain slack. Enhancing partnerships with host nation forces and establishing contingency contracts with local suppliers allows decentralized forces to sustain personnel and operations.

Logistics under attack is expected in a contested environment and complicates delivery of just-in-time logistics. Redundant logistics systems are necessary to ensure the delivery of critical assets. Nontraditional logistics are required to counter adversary anti-access and area denial posture, and reliance on commercial logistics infrastructure (e.g., contract airlift and sealift) cannot be assumed.

Limited duration self-sustainment is necessary to enable certain functions during periods of logistics denial or degradation. Limited duration self-sustainment includes periods of increased risk, decreased connectivity, and limited capacity.

Dispersed sustainment is an agile combat employment-supporting logistical concept. Caches of materiel prepositioned in disparate locations increase adversary targeting complexity and provide additional friendly survivability and resiliency. This tradeoff favors survivability over ease of access, and increases the logistical burden of the operating location.



CURTIS E. LEMAY CENTER

FOR DOCTRINE DEVELOPMENT AND EDUCATION

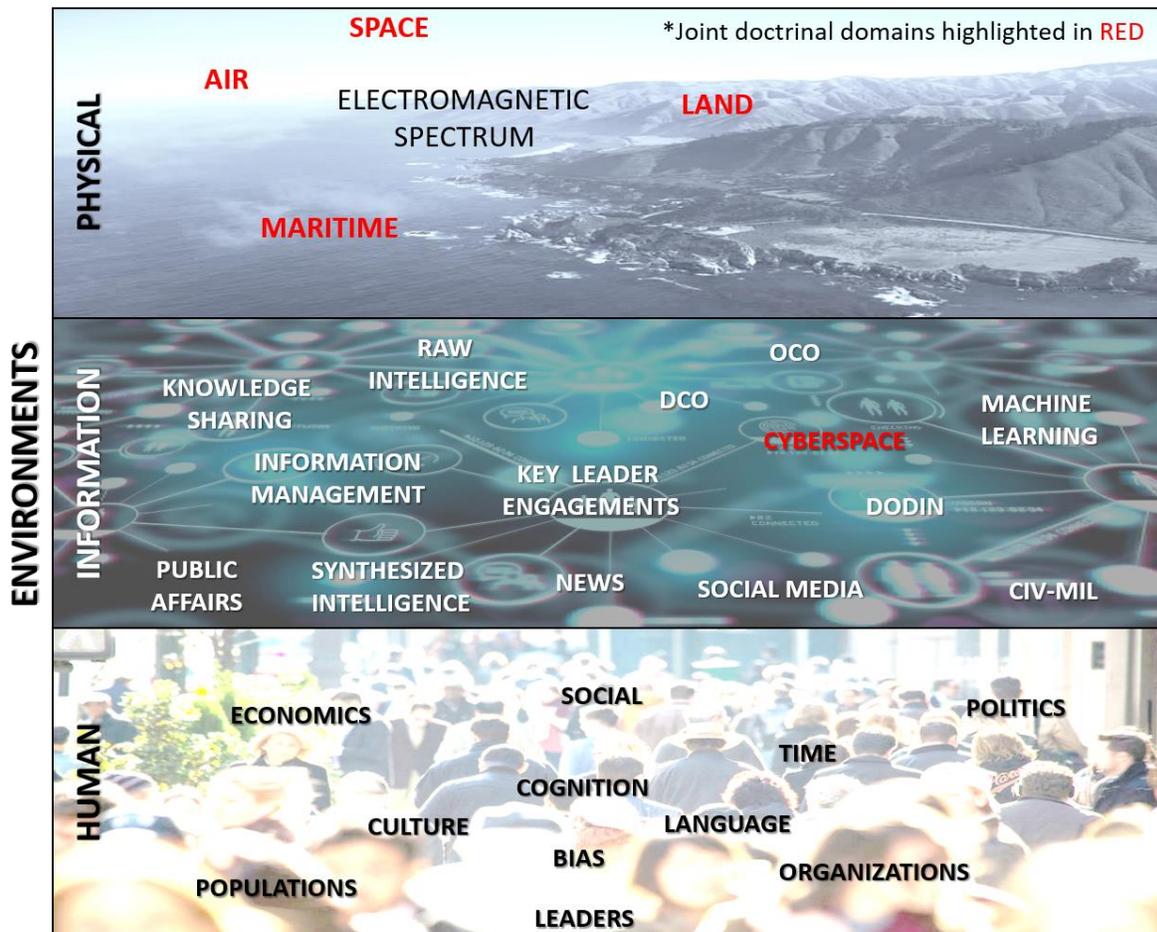


ANNEX 3-1 DEPARTMENT OF THE AIR FORCE ROLE IN JOINT ALL-DOMAIN OPERATIONS (JADO)

APPENDIX A: DOMAINS, ENVIRONMENTS AND ASSOCIATED ELEMENTS

01 JUN 2020

The diagram below depicts three different environments (physical, information, and human). Each of these environments is addressed by various functions in warfare. Each environment contains elements that are simultaneously diverse in character and highly interconnected.





APPENDIX B: KEY CONSIDERATIONS FOR AGILE COMBAT EMPLOYMENT (ACE)

01 JUN 2020

- ✦ The senior-ranking Airman must operate on [joint force commander](#)'s intent communicated through a series of mission-type orders to subordinate commands.
- ✦ Individual wings, groups, and squadrons require more planning personnel and systems to handle the workload, such as allocation and weaponeering, previously performed within the [air operations center](#) in non-contested environments.
- ✦ The coordination of intelligence, surveillance, and reconnaissance and air refueling assets in a degraded communications environment is more difficult and requires alternative organizational structures akin to the composite wing structure to execute operations.
- ✦ DAF leaders throughout the chain of command require greater understanding of commander's intent, including the operation as described in the air operations directive and joint air operations plan, as well as follow-on mission-type orders.
- ✦ ACE operations require greater risk acceptance throughout the chain of command. ACE involves higher risk activities like integrated combat turns, specialized fueling operations, or wet wing defueling to maintain momentum. Operations inside an adversary's integrated air defense system, landing sites operating with limited defenses, short notice dispersal operations, etc., may also be necessary.
- ✦ ACE-resilient basing plans consist of main operating bases with significant passive and active defenses, a network of forward operating sites used for dispersal and short term operations, and a series of additional landing sites used for refueling and reloading to complicate adversary targeting.
- ✦ ACE requires increased theater access within and across partner nations, complicating the area air defense plan, combat support plan, and airspace control plan.

- ✦ ACE combat support requires personnel with multiple qualifications to continue operations and maintain a smaller footprint at forward operating sites.
 - ✦ In a contested environment, relying on sustainment and [reachback](#) from the continental US is tenuous; develop organic and theater sustainment options should include pre-positioned materiel caches.
 - ✦ Advancements in adversary anti-access and area denial capabilities make defending against, withstanding, recovering from, and avoiding airfield attacks key components of ACE.
 - ✦ Traditional, main operating base-focused force protection plans and strategies prove insufficient to meet needs of short-term, austere, or dispersed operations. On-demand force protection-related intelligence and support enables survivability of air operations against ground-based threats.
 - ✦ Intelligence preparation of the operational environment activities precede operational ACE execution to identify ground-based, foreign intelligence, and criminal threats at potential forward operating sites and refueling points, providing planners and leaders information to make basing and risk mitigation decisions.
 - ✦ DAF intelligence, counterintelligence, and law enforcement entities leverage existing access to and relationships within planned and potential ACE basing locations to establish plans to provide just-in-time force protection and intelligence support. In locations with no current presence, DAF equities initiate and develop new relationships with individuals and organizations capable of providing desired information.
-

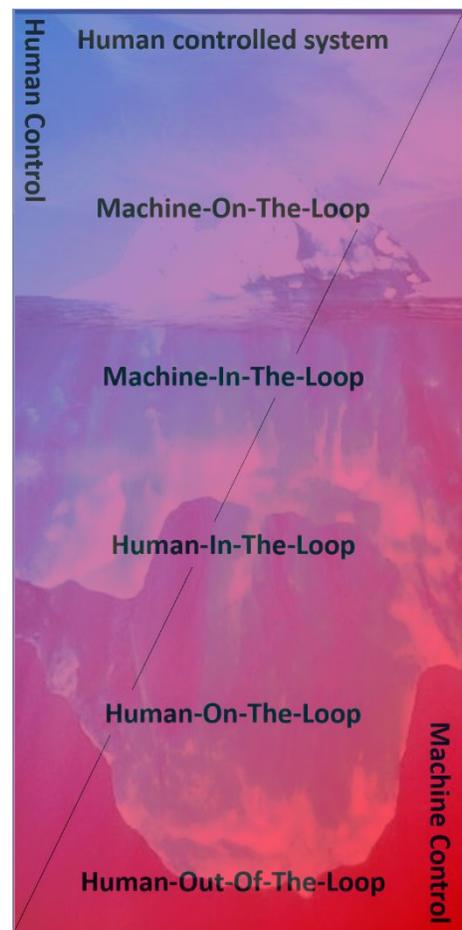
APPENDIX C: DEGREES OF HUMAN AND MACHINE CONTROL

01 JUN 2020

HUMAN-MACHINE TEAMING

To achieve rapid adaptation necessary for all-domain operations, better human-machine teaming is required. Machine-to-machine communication and predictive modeling will be critical to moving away from current, imprecise procedural controls like those outlined in airspace control doctrine; these advanced human-machine teaming capabilities are in development. Effectively employing these systems requires a framework for understanding their employment. Nuanced value judgements require human decisions, and when and how leaders make those decisions will vary. Commanders should understand and balance benefits and risks of human-machine relationships. Airmen need to train as part of human-machine teams in order to build appropriate levels of understanding, trust, and skepticism with their machines. Examples:

- ✦ Human Controlled System: A drill (machine does exactly what you tell it to)
- ✦ Machine-On-the-Loop: Dashboard lights (machine performs some processes to simplify operation)
- ✦ Human-In-the-Loop: Power plant control system (machine seeks input at critical decisions)
- ✦ Human-On-the-Loop: Self-driving cars (machine can run by itself, but can be overridden)
- ✦ Human-Out-of-the-Loop: Swarm drones (machine runs without human intervention)



**Degrees of Human and
Machine Control**



APPENDIX D: JOINT ALL-DOMAIN DOCTRINAL GAPS

01 JUN 2020

Department of the Air Force (DAF) support to JADO doctrine establishes a framework for air and space components supporting JADO. It guides the DAF in organizing and employing the full range of forces and capabilities presented to the [joint force commander](#). This section examines three doctrinal gaps that experiments, wargames, and exercises will explore in order to refine JADO principles.

CHANGES TO SUPPORT RELATIONSHIPS

Regardless of Service or domain expertise or affiliation, joint commanders should leverage information, forces, and capabilities from all domains. Planners at all levels should consider all domains from the beginning of the planning process, and commanders must be empowered to coordinate dynamic all-domain retasking throughout execution.

JADO requires the DAF to reexamine the way it frames supported and supporting relationships between commanders.

Current doctrine envisions support relationships as a relatively static form of procedural control along lines of operation. A supporting commander has the authority to decide how and with what forces to meet multiple supported commanders' operational requirements, but does not have the authority to reprioritize the supporting effort either within or between the supported lines of operations. Each supported commander sets the priorities within their line of operations but cannot change priorities between lines of operation. Priorities for support between two or more supported commanders are set by the establishing authority (the common superior commander over both the supporting and the supported commanders).¹⁶

When operations are conducted in one primary domain supported by others, this binary supported/supporting construct works well. In complex scenarios involving multiple interdependencies along multiple lines of effort in multiple domains, **traditional supported and supporting relationships are inadequate to effect rapid**

¹⁶ Joint Publication 1-0, [Doctrine for the Armed Forces of the United States](#).

reprioritization among efforts. Assets, like aerial tankers or satellite constellations, may be requested simultaneously with each commander citing their supported relationship. Currently this situation would require the asset allocation decision of the establishing authority, a time consuming process.

JADO requires a more agile support relationship, a greater ability to rapidly task and retask forces to meet specific, time-critical scenarios with less procedural delay. To meet operational requirements of multiple supported commanders and still achieve the establishing authority's intent, the supporting commander needs authority to shift the priority of supported forces as the operational situation changes. Supported commanders also need the authority to coordinate laterally to reprioritize efforts as the operational situation changes, since recourse to the establishing authority may not be feasible in time-sensitive operations. This requires a more agile, more positive control-based system that rapidly reprioritizes and reflows support to multiple commanders. **Commanders at all levels must have the information and authority to adapt to rapidly changing contexts.**

JOINT COMMAND AND CONTROL (C2) AT ALL ECHELONS

Transition to joint C2 at all echelons represents a significant change in DOD organizational structure. While JADO's speed and adaptability requires a degree of connectivity and mission assurance at the global or theater-level, threats to communications also require units to have a local capability to sense, collaborate, plan, and execute all-domain joint responses within their available local networks, to include coordinating with local multinational partners.

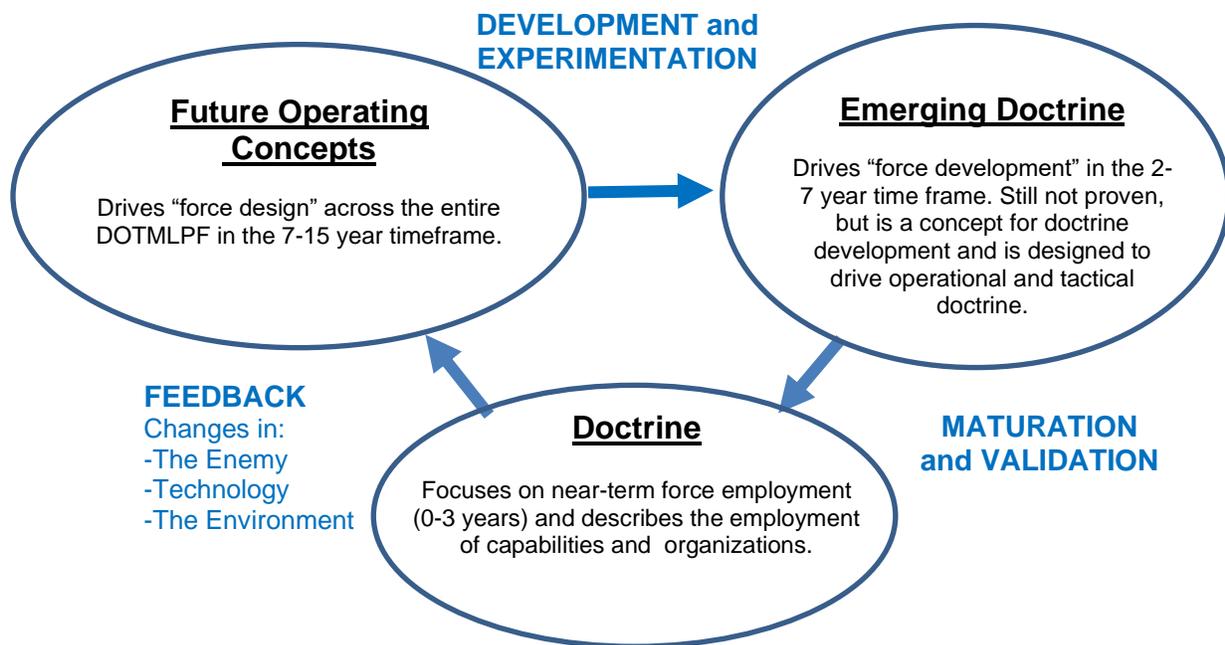
There will always be a need for resilient theater-level communications to support Global Integration and Dynamic Force Employment so long as commanders require support from other geographically-dispersed commands, forces, and capabilities. However, **relying exclusively upon theater-level integration of domain-oriented assets without local ability for all-domain integration and backup C2 presents a communications chokepoint and a targeting opportunity for the adversary.** Local C2 capabilities should enable geographically co-located forces to build all-domain options in accordance with higher headquarters guidance, including the capability to sustain operations during times of intermittent communications.



**APPENDIX E:
CONCEPTS TO DOCTRINE CYCLE**

01 JUN 2020

Traditional doctrine codifies extant best practices. This annex focuses on both near-term emerging doctrine and doctrine being tested and matured in real time.



Concepts to Doctrine Cycle