

AIR FORCE DOCTRINE PUBLICATION 3-99

SPACE DOCTRINE PUBLICATION 3-99

**THE DEPARTMENT OF THE
AIR FORCE ROLE IN
JOINT ALL-DOMAIN
OPERATIONS**



U.S. AIR FORCE



U.S. SPACE FORCE

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The Department of the Air Force, for the first time since becoming a multi-Service organization, presents unified operational doctrine for the entire department. This Department of the Air Force Doctrine Publication 3-99, *The Department of the Air Force Role in Joint All-Domain Operations*, is a guiding doctrinal statement of the way ahead for both Services in the vital and growing area of joint all-domain operations. Each Service contributes to the full range of forces and capabilities made available to the joint force commander. Together, they provide the incomparable ability to exploit air and space in the service of our Nation.

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Air Force Doctrine Publication 3-99
Space Force Doctrine Publication 3-99
*Department of the Air Force Role in Joint All-Domain
Operations*

Table of Contents

CHAPTER 1: JOINT ALL-DOMAIN OPERATIONS	1
JADO PRINCIPLES	1
THE COMPETITION CONTINUUM	2
DEFINITIONS	4
CHAPTER 2: COMMAND AND CONTROL	5
PLANNING	6
EXECUTION	8
ASSESSMENT	9
CHAPTER 3: INFORMATION	10
OPERATIONS IN THE INFORMATION ENVIRONMENT (OIE)	10
CHAPTER 4: INTELLIGENCE	13
PLANNING	14
CHAPTER 5: FIRES	15
CONVERGENCE	15
TARGETING AND FIRES INTEGRATION	15
CHAPTER 6: MOVEMENT AND MANEUVER	17
CHAPTER 7: PROTECTION	19
AGILE COMBAT EMPLOYMENT (ACE)	19
CHAPTER 8: SUSTAINMENT	21
MANEUVER LOGISTICS	21
APPENDIX A: DOMAINS, ENVIRONMENTS AND ELEMENTS	23
APPENDIX B: AGILE COMBAT EMPLOYMENT CONSIDERATIONS	24
APPENDIX C: DEGREES OF HUMAN AND MACHINE CONTROL	26
APPENDIX D: JOINT ALL-DOMAIN DOCTRINAL GAPS	27
APPENDIX E: CONCEPTS TO DOCTRINE CYCLE	29

“The Air Force organizes, trains, and equips forces to be an air component to a joint force commander (JFC). As part of the joint force’s air component, our forces must be prepared to accomplish JFC objectives. The air component commander’s administrative authorities are derived from Title 10, U.S. Code, and exercised as the commander, Air Force forces (COMAFFOR). The air component commander’s operational authorities are delegated from the JFC and exercised as both the COMAFFOR, over Air Force Forces, and as the functional joint force air component commander (JFACC), over joint air forces made available for tasking. Thus, the air component commander leads Air Force forces as the COMAFFOR and the JFC’s joint air operations as the JFACC. This duality of authorities is expressed in the axiom: Airmen work for Airmen and the senior Airman works for the JFC.”

--Air Force Doctrine Publication (AFDP) 1, *The Air Force*

Since the COMAFFOR and JFACC are nearly always the same individual, this AFDP will use the term “air component commander” when referring to duties or functions that could be carried out by either or both, unless explicit use of the term “COMAFFOR” or “JFACC” is necessary for clarity.

CHAPTER 1: JOINT ALL-DOMAIN OPERATIONS

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

- ★ Describe the need for joint all-domain command and control (JADC2) structures.
- ★ Accelerate and increase capacity to develop and exploit decision-quality information.
- ★ Organize, train, and equip forces to converge effects in multiple domains in operationally-relevant timeframes.
- ★ Improve and increase the options by which the joint force can succeed while cutting off adversary pathways for success.

The DAF's ability to operate is challenged by anti-access and area denial threats and the rapid proliferation of advanced technologies that restrict freedom of maneuver. The DAF does not fight alone and joint force operations are increasingly interconnected, interdependent, and challenged. This operating environment requires the DAF and Department of Defense (DOD) to examine how forces will sense, plan, decide, and act in concert across all domains to gain the freedom of action necessary for success. Success requires the convergence of effects globally, across all domains, to consecutively or simultaneously present an adversary with multiple *dilemmas*. Synergistic employment of capabilities in different domains enhances effectiveness and compensates for vulnerabilities, creating outcomes not readily attainable through single-domain action. Such dilemmas, when presented at an operational tempo that complicates or negates an adversary's response, enable the joint force to operate inside an adversary's decision cycle.

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

JADO PRINCIPLES

- ★ Mission Command through centralized command, distributed control, and decentralized execution through mission-type orders (MTO) when appropriate.
- ★ Delegation of authority to lower echelons and to other component and Service leaders as required.

- ✦ Information sharing.
- ✦ Integrated multi-domain planning.
- ✦ Risk identification and mitigation.
- ✦ Synergistic effects.
- ✦ Flexibility and Versatility.
- ✦ Concentration.

Functions of the military departments are codified in DOD Directive 5100.01, [Functions of the Department of Defense and Its Major Components](#). Though the directive promotes unity of command and unity of effort within each domain, it also allows for stovepiped operations and limited integration, planning, and synergy between activities. This creates vulnerabilities and reduces dynamic exploitation of emergent opportunities. Conversely, a joint all-domain approach leverages the joint force's full capability and permits lower-level integration in operationally-relevant timeframes.

Current decision-making processes (e.g., the joint planning process) employ linear planning and force synchronization to execute operations. These operations lead to continuous cycles of heightened activity followed by a period of reduced activity. Current processes can be slow and predictable; peer competition requires processes that create adversary dilemmas by facilitating rapid synchronization of [effects](#). This requires continuous and iterative, near-term tactical planning, longer-term operational planning, and campaign refinement as conditions change. Reframing integration and synchronization in this manner allows for sustained and dynamic combat operations.

THE COMPETITION CONTINUUM

The DAF presents forces to the JFC and synergizes and integrates capabilities into JADO across the competition continuum. Those forces operate principally in the air, space, cyberspace, and the [electromagnetic spectrum](#) (EMS). [Appendix A](#) depicts the relationships between DOD domains and their associated elements.

The competition continuum is presented in Joint Doctrine Note 1-19, [Competition Continuum](#). The doctrine note describes a comprehensive and flexible spectrum of strategic relations between the United States and other actors. The competition continuum, rather than a world either at peace or at war, describes a world of enduring competition conducted through a mixture of cooperation, competition below armed conflict, and armed conflict. The joint force is never solely in cooperation (or in competition below armed conflict or in armed conflict) but instead campaigns through a mixture of cooperation, competition below armed conflict, and armed conflict calculated

to achieve the desired strategic objectives.¹ The competition continuum describes the environment and how the United States government applies instruments of national power across the continuum.

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 partner nation interoperability. ★ Obtain and maintain all-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.
Armed Conflict	<ul style="list-style-type: none"> ★ Gain information advantage. ★ Project global combat power. ★ Integrate and synchronize action in, from, or through all domains to gain and maintain theater access. ★ Overmatch adversary forces at decisive points. ★ Preserve combat capability to conduct future operations.

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

DEFINITIONS

Domain: A sphere of activity or influence with common and distinct characteristics in which a force can conduct [joint functions](#).²

Decision Advantage: The product of situational understanding, the ability to assure and exchange information, make and communicate decisions by maintaining advantages in all domains.

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.

Joint All-Domain Command and Control (JADC2): The art and science of decision-making to rapidly translate decisions into action and leverage capabilities across all domains, with mission partners, to achieve operational and informational advantage in both competition and conflict.

Information Advantage: A condition in the information environment, favorable to achievement of a commander's objectives, achieved through the application of information capabilities and influence, that results in a comparative advantage to support all-domain operations. This includes targeting an adversary's ability to conduct C2 through observing, interpreting, and acting.

Information advantage can be achieved by deliberately using information to:

- ★ Influence relevant actors.
- ★ Inform target audiences.
- ★ Attack, exploit, and defend information, information networks, and systems.
- ★ Support decision-making.

² 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 EMS. 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.

CHAPTER 2: COMMAND AND CONTROL

DOD strategy defines JADC2 as “the warfighting capability to sense, make sense, and act at all levels and phases of war, across all functional areas, domains, and with partners, to deliver information advantage at the speed of relevance.”³ The DAF’s vision for C2 provides an alternate but complementary definition: JADC2 — the art and science of decision-making to rapidly translate decisions into action and leverage capabilities across all domains, with mission partners, to achieve operational and informational advantage in both competition and conflict. It is the **natural extension of C2 across domains and functional components and is essential for JADO**. The DAF’s vision for JADC2 connects distributed sensors, shooters, and data across all domains, to all forces, to enable mission command for the scaled, coordinated exercise of authority to integrate planning and ensure the convergence of effects across a dynamic battlespace. The convergence of effects in all domains requires:

- ★ Robust, resilient, and distributed C2 enterprise capable of simultaneous C2 of multiple domains.
- ★ Unity of effort through shared understanding of commander's intent.
- ★ A shared understanding of the operational environment.
- ★ Integrating global and geographically-focused forces and capabilities with effective command relationships.
- ★ Secure, adaptable, interoperable (joint and allied partners), and integrated data networks to provide information synthesis, distributed decision-making, and assessment.
- ★ Operating with agility and resilience through MTO and delegation of authority at each echelon.

The airpower tenet, mission command, guides the C2 of joint air operations. It is executed through centralized command, distributed control, and decentralized execution (AFDP 1, [The Air Force](#)). Mission command empowers subordinate decision making through MTO to provide resiliency and flexibility required for JADC2. Mission command provides the greatest freedom of action proportional to acceptable risk. Commanders should determine and delegate levels of control based on the operating environment. Exceptions to the use of MTO are when authorities for operations are held at the highest levels, such as nuclear operations.

To actualize JADC2, the DAF’s solution calls for a C2 construct composed of processes and systems that compress decision making cycles and facilitate convergence of effects

³ DOD JADC2 Strategy & DOD JADC2 Posture Review, (Washington, DC: OSD, 2020)

across domains to enable globally integrated operations. The four key elements of this construct are:

- ★ Sensing Grid
- ★ Advanced Networking
- ★ Decision Making
- ★ Authorities & Effects Delivery

These elements provide the capability to observe the environment, share information to make sense of the environment, enhance decision making, and convergence effects to overwhelm an adversary.

Effective JADC2 requires communications architectures that are distributed, robust, and resilient in nature. Similarly, information and intelligence should be accessible and shared at all echelons. The sensing grid harnesses information and applies automated data processing through artificial intelligence (AI) and machine learning (ML) to provide data to warfighters. This data is transferred across domains and classification boundaries through an integrated, resilient, self-healing advanced network. JADC2 architectures should ensure interoperability with allies, partner nations, and agencies, enable integration into central C2 nodes, and simultaneously provide the ability to operate independently at the tactical edge, disconnected from C2. This all-domain data enables decision-makers to understand relationships between information from different domains with acceleration provided by AI and ML capabilities. Cross-domain perspectives provide insight on impacts to the joint force, and ways to enhance or mitigate those impacts. These capabilities combine to achieve decision advantage, and translate it into operational-advantage, through the integrated, synchronized convergence of lethal and non-lethal effects across all domains. Human-Machine relationships are further discussed in [Appendix C](#)

“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, USAF, Retired, Commander, Air Combat Command (2020)

PLANNING

JADC2 requires an appropriate level of distributed control, decentralized execution, 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 in a contested and degraded environment. **To achieve decentralized execution, commanders must clearly convey intent, and subordinates must be empowered to act on that intent absent further guidance.**

Early and clear communication of commander's intent and force prioritization is critical for JADO planning, generating joint force opportunities while creating adversary dilemmas across all domains. Operations in contested environments may necessitate a greater degree of distributed control, but also increase the risk of unintended consequences if forces lack an accurate understanding of overall mission context and evolving operational constraints and restraints.

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.

JADC2 requires efficient management of resources and sophisticated information gathering, processing, and sharing across domains. JADC2 tools and methods enable information advantage and decision superiority. Where available, analytic modeling and simulation tools should be employed to support and enhance commander decision making and inform strategy choices (e.g., apportionment).

To ensure convergence of effects, the planning process for the air tasking order should expand to support joint all-domain planning and execution. JADC2 will orchestrate this convergence through an integrated tasking order (ITO) employing assigned, attached, and supporting forces, capabilities, and effects. The ITO should incorporate and synchronize capabilities across components and domains to allow for mutual support and convergence of forces or effects. Knowledge of joint force capabilities, a common lexicon, common data standards, and the ability to communicate across echelons enables DAF forces to integrate across domains.

"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., USAF,
Commander, Pacific Air Forces (2019)**

Early all-domain planning allows forces to sustain initiative despite contested operations and C2 degradation. Integrating planning cycles across domains may induce

inefficiencies. However, those inefficiencies are outweighed by the increased adaptability and force flexibility it affords. Longer planning cycles with faster adaptation and refinement permit subordinate commanders to understand and execute intent in a contested/denied environment. JADO planning considerations include:

- ✦ Commander intent and objectives.
- ✦ Capabilities, available for tasking, that can achieve effects necessary to meet objectives.
- ✦ Limiting and enabling factors for effects.
- ✦ Reusability of non-kinetic capabilities for follow-on operations.
- ✦ Indirect effects and consequence management plans to include information operations (IO), military deception (MILDEC), and operations security.
- ✦ [Rules of engagement](#) and judge advocate review.
- ✦ Flexibility to re-role assets quickly to contingency options to deliver unscheduled effects or attack unanticipated targets. This may include missions that forces have not been trained to conduct.
- ✦ Lead time required to access capabilities needed to deliver effects.
- ✦ Authorities required to deliver necessary effects.
- ✦ Effects timing, including start time, duration, and flexibility.
- ✦ Cross-component synchronization processes to include C2 with the air operations center non-kinetic operations coordination cell (NKOCC).
- ✦ Integration of partners and allies.

EXECUTION

JADC2 synchronizes operations across domains to integrate kinetic and non-kinetic actions to produce lethal and non-lethal effects. By providing a fused view of the battlespace, JADC2 enhances the ability to monitor and adapt operations to meet evolving operational requirements and political directives and adjust the weight of effort at tactical and operational levels as needed. Effective JADC2 requires successful execution or implementation of the following:

- ✦ Synchronize application of forces and capabilities.
- ✦ Define conditions for delegation of authorities.

- ★ Synthesize legal and policy implications of force employment.
- ★ Commence, accelerate, delay, or terminate operations at an operational tempo necessary to maximize advantages over an adversary.
- ★ Leverage domain advantages and mitigate disadvantages, by actions in and through other domains, to generate joint force opportunities and create adversary dilemmas.
- ★ Continue tactical action through MTO.
- ★ Integrate between combatant commands to ensure efficient and effective use of limited forces (e.g., global integrated intelligence, surveillance, and reconnaissance).
- ★ Develop and prepare follow-up actions as needed to account for a changing operating environment.
- ★ Refine transition criteria to account for the full range of conditions across domains.

ASSESSMENT

JADC2 assessment provides answers to these 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 due to authorities' delegation delays? ★ What effects were not able to be accomplished due to a lack of authorities? ★ What opportunities advanced the JFC's objectives through all-domain synchronization?
Are we doing things right?	<ul style="list-style-type: none"> ★ Were the right communication channels in place between domains to enable convergence? ★ Were effects sequenced between domains as planned? ★ Was the desired operations tempo achieved? ★ Were contingency plans developed and executed and able to maintain mission timelines?
Are we measuring the right things?	<ul style="list-style-type: none"> ★ How was the measure of the effectiveness of the integrated portions of the campaign accomplished? ★ What, if any, indicators were used from one domain to make assessments in others? ★ Are the means to collect relevant metrics within operationally relevant timeframes available?

CHAPTER 3: INFORMATION

Within JADO, the DAF uses information as a central element of operational-level planning, execution, and assessment. It does so by providing component commanders and the joint force with the capability to leverage informational power to achieve operational and strategic effects in concert with other elements of airpower. When designing air operations, the DAF uses information to craft plans and courses of action that ensure convergence of effects on target audiences. USAF Information Warfare (IW) capabilities and considerations of effects in the information environment are integrated throughout the targeting process early and not thought of simply as an adjunct to operations. For more information on USAF IW see AFDP 3-13, [Information in Air Force Operations](#).

OPERATIONS IN THE INFORMATION ENVIRONMENT (OIE)

OIE are an integral element of JADO. They are characterized by the sequencing of actions using information to affect behavior by: informing audiences; influencing relevant actors; and affecting information, information networks, and information systems. OIE are designed, planned, and synchronized to complement and reinforce operational effects from other domains. Sequencing should be accounted for in the initial operational planning phases and executed in concert with other domain operations. Failure to do so will limit JADO from achieving the desired effects on adversary actors and systems.

All actions, to include written or spoken words and displayed or related images, have informational aspects capable of communicating a message or intent. Shaping and leveraging those messages to influence target audiences, is an integral component of operations and planning to support JFC objectives.

Effective joint force application of timely and relevant information is vital to attain enduring strategic advantage across the competition continuum. Deliberate, long-term IO campaigns shape perceptions and behaviors by capitalizing on the cumulative and reinforcing effects of multiple coordinated operations, activities, and investments (OAI). Component commanders, in coordination with the joint force, achieve JFC outcomes through nested activities integrating informational and military power. The JFC's operational approach shapes the information environment to gain, maintain, and protect information advantage in support of decision superiority.

The table "OIE for Information Advantage" shows representative OIE activities, across the competition continuum that can be used to create and leverage information advantage. Information advantage is created by:

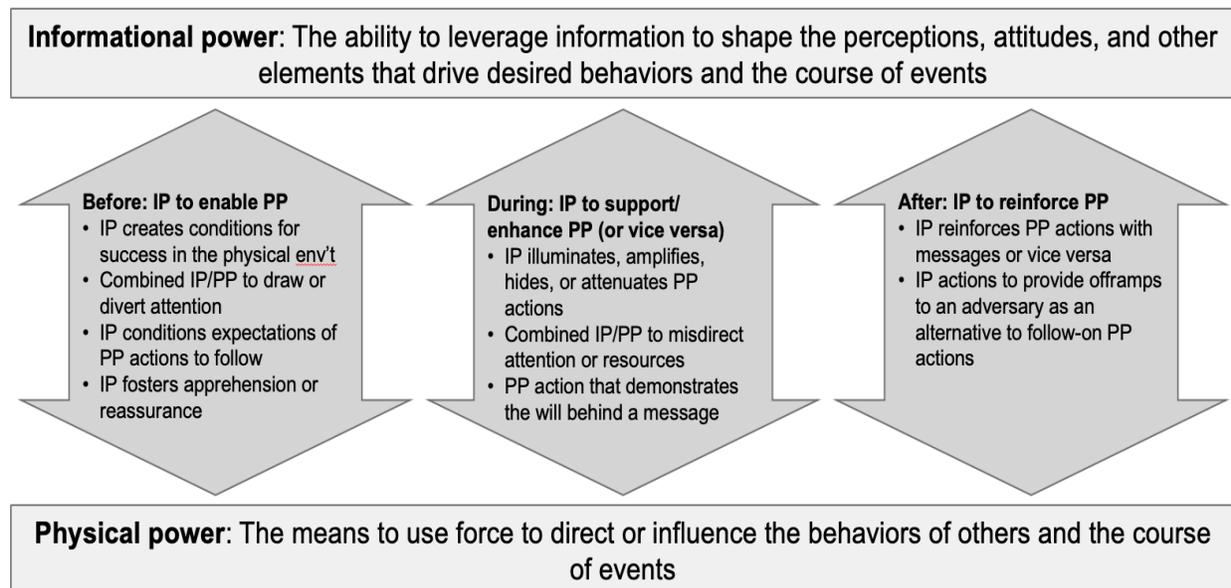
- ✦ Bolstering domestic and international understanding, trust, and support with timely, accurate, contextualized, and purposeful communication related to both component and joint force activities.
- ✦ Distracting an enemy's ability to observe, orient, decide, and act effectively.
- ✦ Eroding an adversary's confidence in their capabilities, strategies, and relationships relative to that of the joint force.

OIE for Information Advantage	
Representative activities	Outcome
<ul style="list-style-type: none"> ✦ Develop and demonstrate enhanced information sharing, cooperative agreements and activities. ✦ Provide public attribution of joint force activities to secure legitimacy. ✦ Build domestic and international audience resilience against disinformation and propaganda. ✦ Synchronize messaging with allies and partners. ✦ Highlight foreign military sales. 	<p>Increased understanding, trust, and support with domestic and international audiences in the purpose of and approach to component and joint force activities</p>
<ul style="list-style-type: none"> ✦ Counter disinformation and propaganda. ✦ Expose and counter malign influence. ✦ Mislead adversary decision-makers on joint force dispositions, capabilities, and vulnerabilities causing diversion of cognitive and physical resources towards unproductive ends. ✦ Conduct selective demonstrations of unique joint force capabilities. 	<p>Erosion of adversary confidence in their capabilities, strategies, and relationships</p>
<ul style="list-style-type: none"> ✦ Create operational surprise by deceiving enemy decision-makers on joint force dispositions, capabilities, intentions, and actions. ✦ Deny enemy freedom of action in cyberspace and the EMS while ensuring it for the joint force. ✦ Provide transparent response to accidents or inadvertent events. 	<p>Diminished enemy ability to observe, orient, decide, and act effectively</p>

Campaigns are executed through a series of OAls, spanning day-to-day operations (cooperation) through crisis response (conflict). Individual OAls are designed and selected for their ability to advance JFC objectives by shaping the information environment. By integrating informational power (IP) and physical power (PP), OAls are reinforced and their value maximized through appropriate timing, tempo, scope, and purpose. Such integration maximizes an OAI's ability to create an advantage for the joint force. The figure below, "Integration of Informational Power and Physical Power",

illustrates the potential linkages between PP and IP actions from a temporal perspective – before, during, and after employment of physical military power. Before a PP action, IP can be used in an enabling capacity:

- ★ To create physical conditions for success.
- ★ To impose costs by drawing or diverting an actor's attention from the true purpose and nature of joint force actions (e.g., MILDEC).
- ★ To shape relevant actor expectations through overt and covert messaging.



Integration of Informational Power and Physical Power

While they can be effective when applied separately, IP and PP work best together in a variety of ways. When PP is employed, IP can act concurrently, or in advance, to support or enhance the effort. Likewise, following PP employment, IP can reinforce impressions and interpretations of what occurred and condition expectations for what may happen next. Alternatively, PP action may be employed for informational purposes; i.e. to demonstrate the will behind a comprehensive set of OIE.

Such combined actions require both **integration** and **synchronization**--integration in planning is predicated on an accurate understanding of the operational environment and requires an effective combination of informational and physical effects to drive the target audience behavior. Synchronization in execution converges those effects with the right timing, tempo, scope, and intensity.

CHAPTER 4: INTELLIGENCE

Intelligence, surveillance, and reconnaissance (ISR) operations are executed 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 improve joint intelligence preparation of the operational environment (JIPOE). 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.

In JADO, intelligence must develop, maintain, and share an awareness of the operational environment that spans geographic, functional, domain, classification, and organizational boundaries. The scope of awareness should include intelligence on ongoing operations, adversary forces, indications and warnings (I&W), target information, and account for military, political, and environmental considerations. JADO intelligence operations require a foundational understanding that encompasses battlespace awareness, but also expands to include an understanding of the complex, interrelated nature of events across areas of responsibility; how they affect campaign plans, and the effect (positive or negative) they may have on the commander's ability to project force. Awareness is challenged by the need to fuse information of varying quality and classification from multiple sources, over multiple networks, and across multiple intelligence organizations.

JADO requires the combination of DAF and other Service ISR platforms and 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.

The ability to sense the operating environment across domains relies predominately on expensive, high-tech, purpose-built systems. However, JADO requires a broad array of collection platforms, capabilities, and methods. JADO relies on the ability to fuse intelligence data together in ways that are nimble, that work together, and present solutions that work on the tactical edge.

JADO relies on the ability to fuse intelligence data sets together in ways that are nimble, work together, and present solutions that work on the tactical edge.

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 classification level possible. The need to conduct cross-domain, cross-source synthesis significantly increases demand for fusion capacity and capability.

Current intelligence processes do not adequately integrate all-domain sensing activities for JADO. Sensing must be a continuous effort to feed multiple decision loops. Cross-cueing and fusing collection activities among domains results in improved JIPOE.

PLANNING

To support JADO planning and execution, intelligence timeliness should be integrated and synchronized with all-domain operations. Increased intelligence requirements necessitate synchronization of traditional and nontraditional intelligence capability. To keep pace with the emerging environment, ISR must also leverage nontraditional sources of intelligence to complement traditional ISR activities. Further, ISR collection platforms produce intelligence at varying speeds. For example, space based imagery can often be accessed quickly, whereas human intelligence collection must be developed over time. Production speeds vary according to a collection platforms' ability to maneuver or position, its persistence, flexibility, and the speed at which data can be processed, exploited, and disseminated. Such variances should be accounted for to ensure successful integration and synchronization.

PLANNING CONSIDERATIONS FOR INTELLIGENCE OPERATIONS:

- ★ 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.
 - ★ Evaluating potential strategic impacts of tactical actions.
 - ★ Evaluating how impacts in one domain affect actions in other domains.
 - ★ Incorporating global 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.
-

CHAPTER 5: 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, the results of which being greater than the sum of their efforts alone. Air, space, cyberspace, land, maritime and EMS targeting cycles are synchronized and integrated at the JFC level. Integration and synchronization of targeting and planning cycles based on the JFC’s objectives is required to execute 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, USAF, Retired,
Commander, Air Combat Command (2020)**

CONVERGENCE

In JADO, effects are massed through the synchronized application of kinetic and non-kinetic capabilities. Massing effects requires alignment of disparate planning timelines and resource availability to ensure forces and capabilities are brought to bear at the proper time and place to create desired effects. Each participating force element must understand: the overall scheme of maneuver; its role within it; interdependent support relationships; and the coordinating method to ensure desired effects convergence.

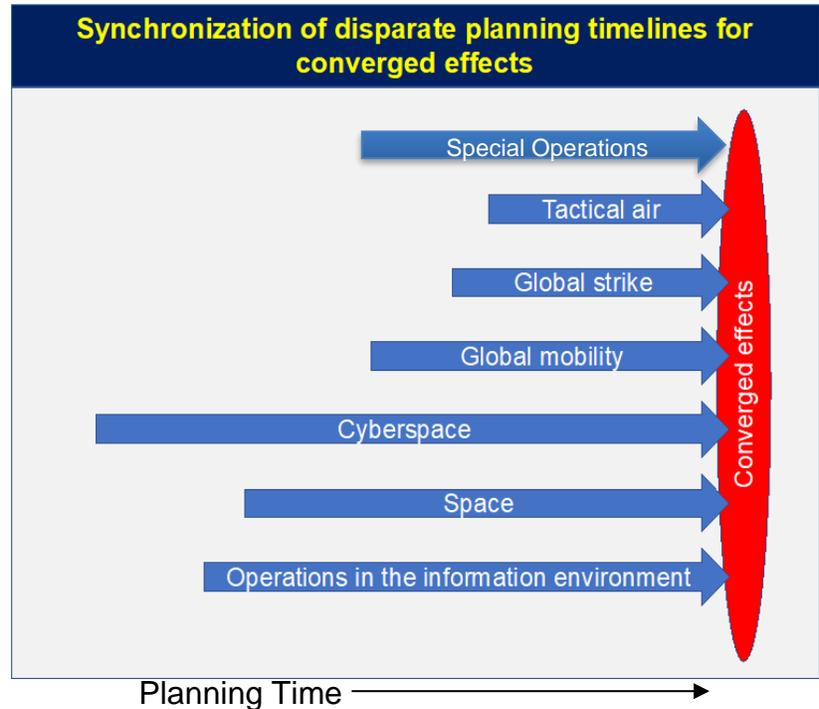
Traditional methods for achieving mass necessitate generation of large force quantities in close proximity to create overwhelming effects against a target. Alternatively, the prevalence of precision-guided munitions, augmented by non-kinetic capabilities, enables fires to be massed with smaller numbers and/or dispersed forces. Reducing and dispersing the footprint of forces deployed forward presents adversary challenges and increases friendly freedom of maneuver to achieve desired effects. Additionally, nontraditional fires can be used to mass effects. An example would be, mobility platforms employing precision munitions from standoff ranges. Non-kinetic fires through space, cyberspace, the EMS, or other means provide additional mechanisms for creating effects.

TARGETING AND FIRES INTEGRATION

Targeting supports the process of linking desired effects to actions and tasks at the component level ([JP 3-0](#)). For successful cross-domain effects, synchronization is

necessary. Typically, synchronization occurs at the JFC level during a joint targeting coordination board, as planning capabilities are presented by each component. In JADO, synchronization planning must occur at echelons below the JFC to provide resiliency and speed in execution.

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



CROSS DOMAIN KILLCHAIN EXAMPLE

During a recent operation, an enemy combatant was tracked by following his digital footprint. Using multi-domain intelligence sources, the individual was geolocated in an area that precluded a kinetic strike. As a result, ground forces were employed to disable critical communications infrastructure, forcing the combatant to move. Intelligence from multiple domains confirmed his new location, a window of opportunity was found, and the enemy agent was eliminated without collateral damage.

Though this vignette offers a specific example, similar scenarios have played out many times over the last two decades. The example displayed here relates the effects of integration on a single operation. Through JADO, a JFC is enabled to scale this type of integration to support major operations and campaigns.

CHAPTER 6: MOVEMENT AND MANEUVER

Movement and maneuver enables deliberate and opportunistic convergence, and preserves freedom of action, by positioning forces and capabilities to create multiple unexpected vectors of attack against an adversary. JADO movement and maneuver synchronizes and aligns actions from multiple domains in a complimentary and reinforcing manner to create exploitable advantages (physical, temporal, or psychological) over an adversary.

All-domain maneuver increases available options for the joint force to succeed while cutting off adversary paths to success. However, for success, commanders should anticipate the difficulties created by degraded or denied C2 environments and should seek to achieve convergence by enabling units to operate on commander's intent through MTO. Opportunistic (or reactive) convergence emerges from changes in the operational environment that can be exploited to advance joint force objectives. Building schemes of maneuver that enable 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 to coordinate actions within and across domains. The movement and maneuver of forces depends on the JFC's scheme of maneuver and intent. The JFC's movement and maneuver concepts should be outlined in the operations plan and further refined in an ITO. Execution of the JFC's movement and maneuver plans requires a JADC2 structure capable of converging effects to create multiple adversary dilemmas and support friendly freedom of action. Each force element should have a clear understanding of its role, and be aware of the sequencing mechanisms used to converge actions within and across domains to create and preserve positions of advantage.

Maneuver exists in all domains. In JADO, maneuver in one domain should complement, and be complemented by, maneuver within other domains. Maneuver in the air, land, and maritime domains is well established. However, an understanding of maneuver in the EMS, space, and cyberspace is equally important for JADO.

- ★ Maneuver in the EMS supports JADO by providing resiliency against adversary degradation and denial attempts. The ability to use frequency agility to evade or overcome interference (e.g., an EMS jammer) increases adversary dilemmas and allows for resilient, friendly force command, control, and communication.
- ★ Maneuver in space supports JADO through deployment, repositioning, reorienting, or reprioritizing the tasking of space forces. These actions support asset optimization, protection from environmental hazards, passive defense, and positioning of active defensive or offensive measures. Space maneuver creates multiple dilemmas for an adversary by supporting follow-on space actions, as well as follow-on actions in other domains.

- ✦ 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, and protecting friendly networks. These cyberspace actions create multiple dilemmas for an adversary.

CROSS DOMAIN CONVERGENCE

During an operation in Africa, an Air Force aircraft conducted overhead ISR, providing real-time intelligence to the ground force commander. Live video of the operation and voice communication transmitted via satellite to allied headquarters, allowed commanders to enact conditions-based, delegated authorities as the situation on the ground changed.

While over the target area, the aircraft's sensors detected a threat to the assault force. After confirming indications with intelligence, the aircrew advised the ground team that their interpreter was acting as a double-agent and had compromised the operation.

This example demonstrates JADO's agility to converge capabilities and assets and provide intelligence, fires, and protection across land, air, space, and the EMS. JADO enables scaling of this type of operation to support major operations and campaigns.

CHAPTER 7: PROTECTION

Threats to friendly forces and operations can emerge from any domain. The varied nature of threats dictate proactive and responsive protection operations synchronized across domains to facilitate a holistic defensive approach. Protection in JADO is focused on protecting each domain and mitigating vulnerabilities using forces and capabilities from multiple domains. Just as convergence synchronizes all-domain action against adversary forces and capabilities, protection planning and execution mitigates joint force threats originating from any domain.

Integrating effects planning and synchronization, sharing information, and all-domain risk identification and mitigation are critical enablers of JADO protection. Further, by employing MTOs with conditions based authorities that empower subordinate decision making, JADO enables the necessary agility, flexibility, and force responsiveness to minimize vulnerabilities across all domains in anticipation of, and in response to, adversary action. I&W, a process that relies heavily on information and intelligence, must evolve to provide the clarity needed to determine the intent behind adversary attacks. Just as all-domain warfare uses complementary attacks in multiple domains, JADO protection requires convergence of protection capabilities to protect forces and respond in all domains.

AGILE COMBAT EMPLOYMENT (ACE)

ACE is the Air Force's concept to provide a proactive and reactive operational scheme of maneuver executed within operationally relevant threat timelines to increase survivability while generating combat power.

ACE operations generate rapid and resilient combat airpower 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 employs multi-capable Airmen practicing mission command through delegation of authorities, a distributed joint C2 structure reliant on MTO, a network of resilient airbases and austere operating locations, and an adaptive logistics system.

ACE is an operational concept that leverages networks of well-established and austere air bases, multi-capable Airmen, pre-positioned equipment, and airlift to rapidly deploy, disperse and maneuver *combat capability*.

“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, USAF, Retired, Commander, Air Combat Command (2020)

ACE's use of dispersal and maneuver operations increases survivability of friendly capabilities, decreasing time and distance problems faced in large theaters, allowing forces to attack and defend quickly. To fully realize JADO protection, the use of nontraditional facilities and capabilities is necessary; see [Appendix B](#) for ACE considerations.

CHAPTER 8: SUSTAINMENT

In JADO, sustainment must ensure the continued ability to project power and maintain initiative in contested environments. Historically, units have assumed a certain level of continuous infrastructure and support. Such assumptions about immediacy of logistics support and available operating location infrastructure are likely to be unreliable when facing a peer adversary. Sustainment actions in foreseeable conflict with a peer nation are more complex and put legacy logistics and sustainment supply hubs and distribution routes at risk. These complexities are exacerbated by degradations in C2 that complicate requests for support, the status of forces, and combat assessment.

Forces conducting JADO may operate with less intensive sustainment processes and fewer resources. JADO forward positions require simple, modular, and maintainable systems, necessitating a shift away from: static infrastructure; centrally controlled (hub-and-spoke) logistics; highly specialized maintenance equipment and materials; and large contractor and support footprints. By increasing modularity, JADO sustainment

“Sustainment is more than a warfighting function; it is the advantage necessary to win, and it must be integrated at all echelons, rather than merely deconflicted.”

**-- MG Rodney Fogg, USA,
BG Michelle Letcher, USA,
& COL Kenneth Letcher, USA,**

[Sustainment: The Advantage that “Wins” in Contested Environments](#)

reduces reaction time and sustains worldwide warfighting capability. Robust, multi-modal distribution systems facilitate greater sustainment options for joint forces. Lower echelon units should see and share sustainment and logistical information to enable integrated planning and enhance risk identification and mitigation. Joint and Service component logistics enterprises and supporting industrial bases must be more responsive to increased needs and be able to operate with limited or degraded communications.

MANEUVER LOGISTICS

JADO highlights the importance of logistical movement through contested environments and critically links maneuver, protection, and sustainment functions, often to a degree in which they are indistinguishable. The adaptive nature of JADO maneuver logistics enables sustainment from range with minimal dependence on large, fixed infrastructure, and can support sustainment in contested areas through disaggregated supply infrastructure. To generate adaptive capability independent of centralized logistics, effectiveness should be prioritized over efficiency. 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 distributed forces to sustain personnel and operations.

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

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 ACE-supporting logistical concept. Prepositioned caches of materiel in dispersed 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. Three requirements to sustain and project the force during multi-domain operations are:

- ★ Resilient and integrated sustainment mission C2
- ★ Assured joint power projection.
- ★ Ability to sustain in a distributed environment.

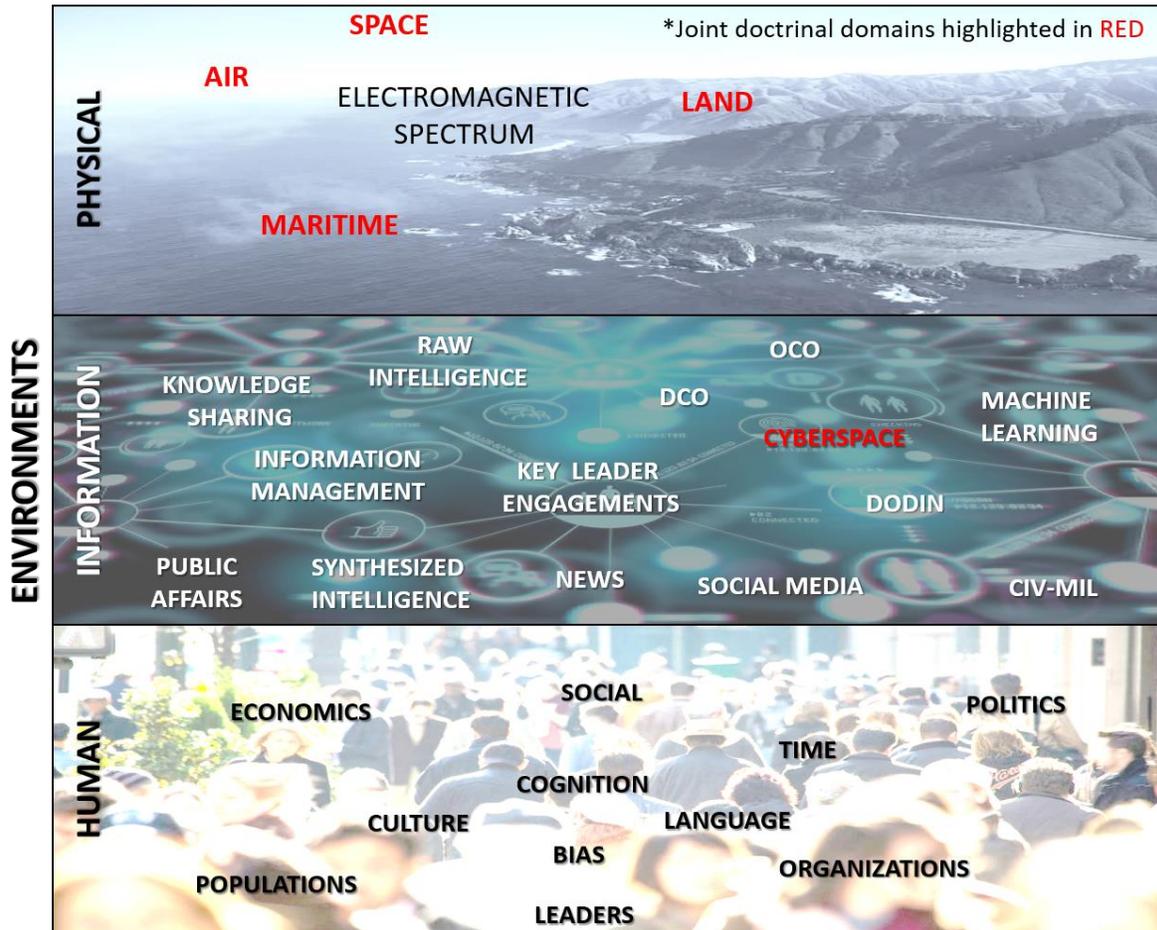
“Joint logistics must integrate our combined capabilities ...to shoot, move, communicate, and win... with the expectation that the force is contested throughout the process, and is equally challenged with time, speed, and distance.”

**-- MG Rodney Fogg, USA,
BG Michelle Letcher, USA,
& COL Kenneth Letcher, USA,**

Sustainment: The Advantage that “Wins” in Contested Environments

APPENDIX A: DOMAINS, ENVIRONMENTS AND ELEMENTS

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



APPENDIX B: AGILE COMBAT EMPLOYMENT CONSIDERATIONS

- ★ Component commanders should operate on JFC intent and communicate with subordinate commands through MTO, when appropriate.
- ★ The coordination of ISR and air refueling assets in a degraded communications environment is difficult, and might require alternative organizational structures akin to the composite wing structure mentioned in [*The Composite Wing: Back to the Future!*](#).
- ★ DAF leaders should have a clear understanding of commander's intent, including the operation as described in the air operations directive, the joint air operations plan, and follow-on MTO.
- ★ Operations will require greater risk acceptance at each level of command. To maintain momentum, conditions may necessitate higher risk activities like integrated combat turns, specialized fueling operations, or wet wing defueling. Other examples include operations inside an adversary's integrated air defense system, limited defenses at landing sites, and short notice dispersal operations.
- ★ To complicate adversary targeting, 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.
- ★ Operations will require increased theater access within and across partner nations, complicating the area air defense, combat support, and airspace control plans.
- ★ Multi-capable Airmen and Guardians, with multiple qualifications or skill sets, trained to operate as cross-functional teams, enable continued operations while maintaining a smaller footprint at forward operating sites.
- ★ Reliance on sustainment and [reachback](#) from the continental US will be challenging and may not be responsive enough to meet operational needs. Organic and theater sustainment options should include pre-positioned materiel caches.
- ★ Because of advances in adversary anti-access and area denial capabilities, the ability to avoid, defend against, withstand, and/or recover from airfield attacks are key components of ACE.
- ★ Traditional force protection plans and strategies focused on main operating bases are insufficient to meet the needs of short-term, austere, or dispersed operations. JIPOE 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 with information to make basing and risk mitigation decisions. JIPOE also provides insight into enemy kinetic and non-kinetic capabilities and threats to proposed ACE operating locations.

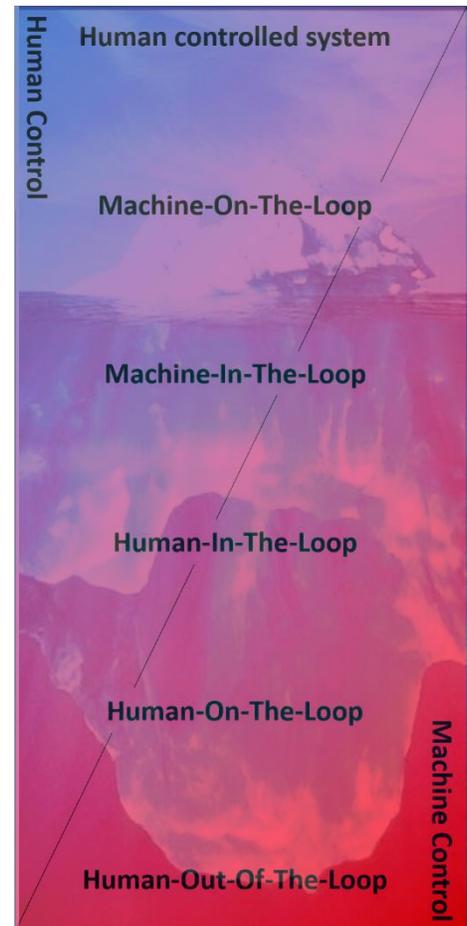
- ✦ Plans should be established for providing just-in-time force protection and intelligence support. To do so, DAF intelligence, counterintelligence, and law enforcement entities should leverage existing access to, and relationships within, planned and potential ACE basing locations. In locations with no current presence, DAF personnel initiate and develop new relationships with individuals and organizations capable of providing necessary information and support.
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APPENDIX C: DEGREES OF HUMAN AND MACHINE CONTROL

HUMAN MACHINE TEAMING

To achieve rapid adaptation necessary for all-domain operations, improved human-machine teaming is required. Machine-to-machine communication and predictive modeling will be critical to moving away from imprecise procedural controls outlined in current airspace control doctrine; such advanced human-machine teaming capabilities are in development. Employing these systems effectively requires a framework for understanding their employment. Commanders should understand and balance the benefits and risks of human-machine relationships. Human-machine teaming may aid all forms of military decision making. However, commanders and operators should exercise appropriate levels of human judgment, especially for decisions regarding the use of force.⁴ To build appropriate levels of understanding, trust, and skepticism with their machines, Airmen need to train as part of human-machine teams. Examples of human-machine teaming terms are:

- ✦ **Human Controlled System:** A drill (machine requires direct control or performs only as directed).
- ✦ **Machine-On-the-Loop:** Aircraft fly-by-wire systems (machine performs some processes to simplify operation).
- ✦ **Machine-In-the-Loop:** Automotive driver assist technologies (machine aids, assists, or provides inputs to human-controlled processes)
- ✦ **Human-In-the-Loop:** Power plant control system (machine seeks input for critical decisions).
- ✦ **Human-On-the-Loop:** Self-driving cars (machine can run autonomously, but can be overridden).
- ✦ **Human-Out-of-the-Loop:** Swarm drones (machine runs without human intervention).



Degrees of Human and Machine Control

⁴ [DoD Directive 3000.09, *Autonomy in Weapons Systems*](#)

APPENDIX D: JOINT ALL-DOMAIN DOCTRINAL GAPS

DAF JADO doctrine establishes a framework for air components supporting JADO. It guides the organization and employment of forces and capabilities presented to the JFC. This section examines two doctrinal gaps that experiments, wargames, and exercises will explore to refine JADO principles.

SUPPORT RELATIONSHIPS

Regardless of Service, 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. Commanders must be empowered to coordinate dynamic all-domain re-tasking throughout execution.

JADO requires the reexamination of supported and supporting relationships. 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 lines of operation and effort, but cannot change priorities between these lines. Priorities for support between two or more supported commanders are set by the establishing authority, the common superior commander over both subordinate commanders ([JP-1, *Doctrine for the Armed Forces of the United States*](#)).

This binary supported and supporting construct works well when operations are conducted in one primary domain supported by another. However, in complex scenarios involving multiple interdependencies along multiple lines of effort in multiple domains, **traditional supported and supporting relationships are inadequate to affect rapid 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 and a greater ability to rapidly task and re-task forces to meet specific, time-critical scenarios with less procedural delay. To meet operational requirements of multiple supported commanders while achieving the establishing authority's intent, the supporting commander needs authority to shift the priority of supported forces as the operational situation changes. Since recourse to the establishing authority may not be feasible in time-sensitive operations, supported commanders also need the authority to coordinate laterally to reprioritize efforts as the operational situation changes. This requires a more agile, 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.

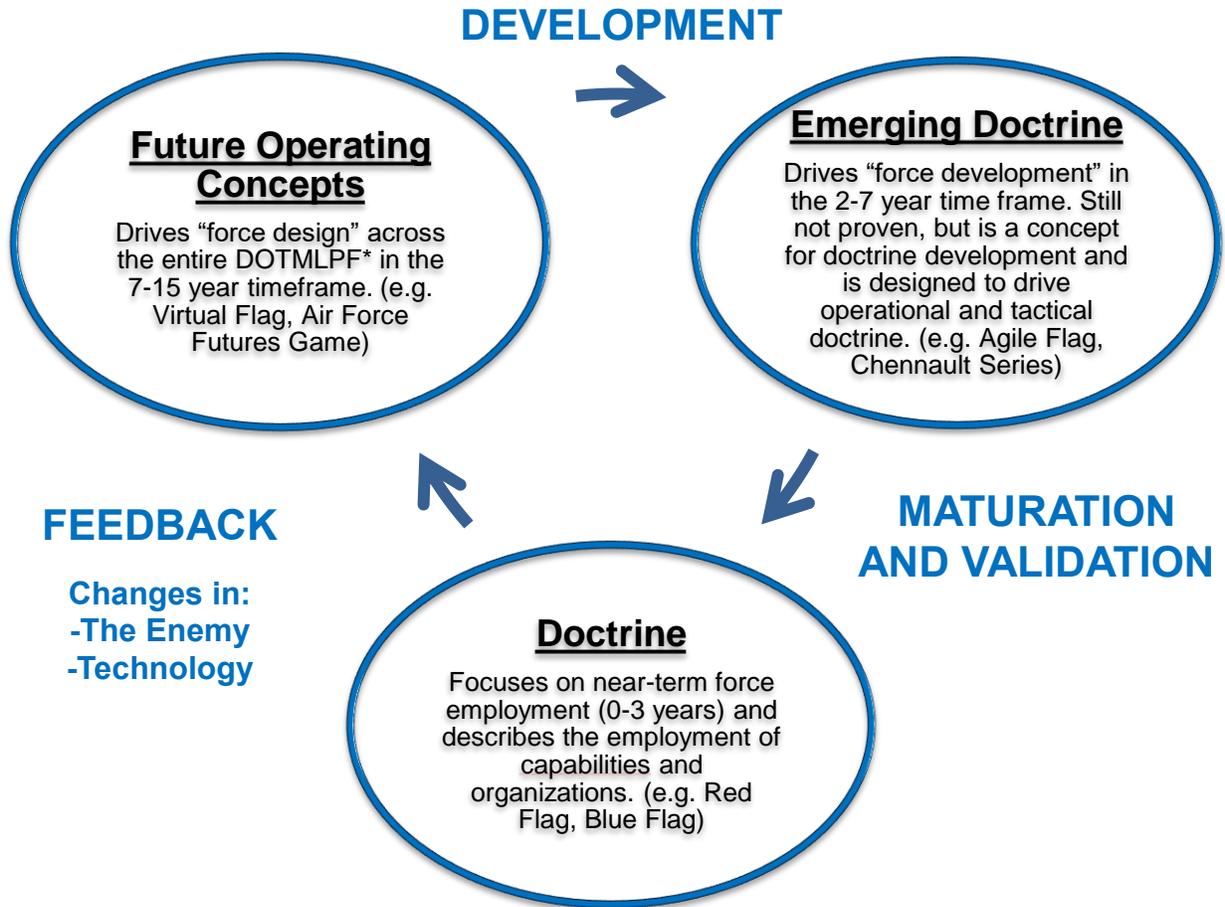
JOINT COMMAND AND CONTROL AT ALL ECHELONS

Transition to joint C2 at all echelons represents a significant change in DOD organizational structure. JADO's speed and adaptability requires a degree of connectivity and mission assurance at the global or theater-level. However, 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 coordination with local multinational partners.

So long as commanders require support from other geographically-dispersed commands, forces, and capabilities, there will always be a need for resilient theater-level communications to support global integration and dynamic force employment. However, relying exclusively on 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 an 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

Traditional doctrine codifies extant best practices. This AFDP focuses on both near-term emerging doctrine and doctrine being tested and matured in real time. Modeling and simulation, experimentation, wargaming, and tabletop exercises are essential to the concepts shown in the figure below. Users, groups, members, and/or aspects of all domains and environments will use these tools throughout the cycle.



Concepts to Doctrine Cycle