

The U.S. Army Functional Concept for

Sustainment

2020-2040

February 2017

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Foreword

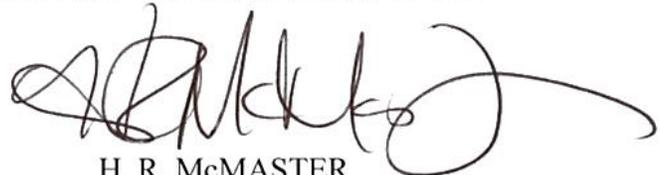
*From the Director
United States (U.S.) Army Capabilities Integration Center*

The U.S. Army is the Nation's principal land force organized, trained, and equipped for prompt and sustained combat on land. Army organizations provide foundational sustainment capabilities to the joint force. Sustainment provides the endurance required to operate in sufficient scale over ample duration. Joint and Army commanders rely on logistics, personnel services, and health service support to maintain operations until mission accomplishment against determined and capable enemies. Future armed conflict will require Army sustainment forces to conduct precision, manned, unmanned, and autonomous air and surface (including subterranean), delivery of supplies, services, and equipment. A combination of logistics demand reduction and novel distribution capabilities is essential to enabling multi-domain battle and semi-independent operations.

TRADOC Pamphlet (TP) 525-4-1, *The U.S. Army Functional Concept for Sustainment (AFC-S)*, expands on sustainment required capabilities identified in TP 525-3-1, *The U.S. Army Operating Concept: Win in a Complex World (AOC)*, TP 525-3-6, *The U.S. Army Functional Concept for Movement and Maneuver (AFC-MM)*, and the TRADOC *Multi-Domain Battle: Combined Arms for the 21st Century White Paper*. The AFC-S describes how future Army forces sustain freedom of movement and action across multiple domains.

While technology is a central sustainment enabler, adaptive and innovative leaders, Soldiers, and teams will remain the most critical requirement to provide the right sustainment at the right time, location, and quantity. Because delivery timeliness is critical to uninterrupted operations, the future Army realizes mission command with communication and information systems that provide a sustainment common operating picture that allows leaders from the strategic level agency to the tactical level to anticipate requirements and improve responsiveness. Because enemies will act to disrupt sustainment, every echelon maintains scalable sustainment capabilities to preserve freedom of action even if logistical support slows.

This concept serves as a foundation for developing future sustainment capabilities and helps Army leaders *think* clearly about future armed conflict, *learn* about the future through the Army's campaign of learning, *analyze* future capability gaps and identify opportunities, and *implement* interim solutions to improve current and future force combat effectiveness.



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27 January 2017

Military Operations

U.S. ARMY FUNCTIONAL CONCEPT FOR SUSTAINMENT 2020-2040

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History. This pamphlet is a major revision of U.S. Army Training and Doctrine Command (TRADOC) Pamphlet (TP) 525-2-1 dated 13 October 2010. Because this publication is revised extensively, not all changed portions have been highlighted in the summary of change.

Summary. TP 525-4-1 describes the broad capabilities the Army will require to sustain multi-domain battle and cross-domain maneuver with joint, interorganizational, and multinational partners during 2020-2040. The ideas presented have been integrated with the evolving estimates of the operational environment; and joint and Army strategic guidance. This functional concept will lead force development and employment efforts by establishing a common framework to guide developments for sustaining future Army operations.

Applicability. This concept is the foundation for future capability development and the basis for subsequent developments of supporting concepts, products within the Joint Capabilities Integration and Development System, and capability needs analysis process. It supports experimentation described in the Army Capabilities Integration Center (ARCIC) Campaign of Learning and is the conceptual basis for developing solutions related to future Army forces across doctrine, organization, training, materiel, leadership and education, personnel, facilities, and policy (DOTMLPF-P). This concept applies to all TRADOC, Department of Army (DA), Army National Guard, and United States Army Reserve activities that develop DOTMLPF-P requirements.

Proponent and supplementation authority. The proponent of this pamphlet is the Director, ARCIC. The proponent has the authority to approve exceptions or waivers to this pamphlet that

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are consistent with controlling law and regulations. Do not supplement this pamphlet without prior approval from Director, ARCIC (ATFC-ED), 950 Jefferson Avenue, Fort Eustis, VA 23604-5763.

Suggested improvements. Users are invited to submit comments and suggested improvements using DA Form 2028 (Recommended Changes to Publications and Blank Forms) to Director, ARCIC (ATFC-ED), 950 Jefferson Avenue, Fort Eustis, VA 23604. Suggested improvements may also be submitted using DA Form 1045 (Army Ideas for Excellence Program Proposal).

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Summary of Change

TRADOC Pamphlet 525-4-1

U.S. Army Functional Concept for Sustainment 2020-2040

This major revision, dated 27 January 2017-

- o Updates the applicability period to 2020-2040 and revises the foreword.
- o Updates the background, operational context, and assumptions that provide the basis for the concepts solutions (chap 1).
- o Updates the military problem, central idea, and solution components based on an updated Army Operating Concept, the emerging Army concept for multi-domain battle, and the updated Army Functional Concept for Movement and Maneuver (chap 3).
- o Updates required capabilities (app B).
- o Removes sustainment by echelon and adds science and technology (app C).
- o Adds risk and mitigation (app D).

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Chapter 1

Introduction

1-1. Purpose

United States (U.S.) Army Training and Doctrine Command (TRADOC) Pamphlet (TP) 525-4-1, the U.S. Army Functional Concept for Sustainment (AFC-S) discusses how sustainment forces will support and enable future multi-domain battle (MDB) and cross-domain maneuver. This concept supports and expands on key ideas found in TP 525-3-1, The U.S. Army Operating Concept: Win in a Complex World (AOC), TRADOC U.S. Army White Paper, Multi-Domain Battle: Combined Arms for the 21st Century (MDB), Joint Operating Environment 2035: The Joint Force in a Contested and Disordered World, the Joint Concept for Logistics (JCL), and Joint Operational Access Concept (JOAC). The AFC-S integrates fully with the other Army functional concepts (AFCs). It describes the capabilities required to carry out sustainment operations across the range of military operations (ROMO) within the context of the future operational environment (OE) and is the foundation for experimentation under Force 2025 Maneuvers, science and technology investigation, development of doctrine, organization, training, materiel, leadership, education, personnel, facilities, and policy (DOTMLPF-P) solutions that address gaps and support overcoming Army Warfighting Challenges (AWFCs).¹

1-2. References

Appendix A lists required and related publications.

1-3. Explanations of abbreviations and terms

The Glossary explains abbreviations and key terms used in this pamphlet.

1-4. Background

a. Sustainment is the provision of logistics, personnel services, and health service support to maintain operations until mission accomplishment.² The sustainment warfighting function includes the related tasks and systems that provide support and services to ensure freedom of action, extend operational reach, and prolong endurance. The endurance of Army forces is primarily a function of their sustainment which determines the scale and duration of operations essential to retaining and exploiting the initiative.³

b. The Army sustains operations by employing integrated processes involving people and systems to deliver support and services. Figure 1-1 illustrates the complexity of the sustainment warfighting function. Strategically, sustainment forces integrate joint, interorganizational, and multinational partners to build capability, train, and account for a combat ready Army for the joint force commander (JFC). Operationally, sustainment forces provide support to and assist with force deployment and sustain operations to enable freedom of action and operational reach across multiple theaters. Tactically, sustainment forces deliver supplies and services to the warfighter to enable cross-domain maneuver and prolong endurance.

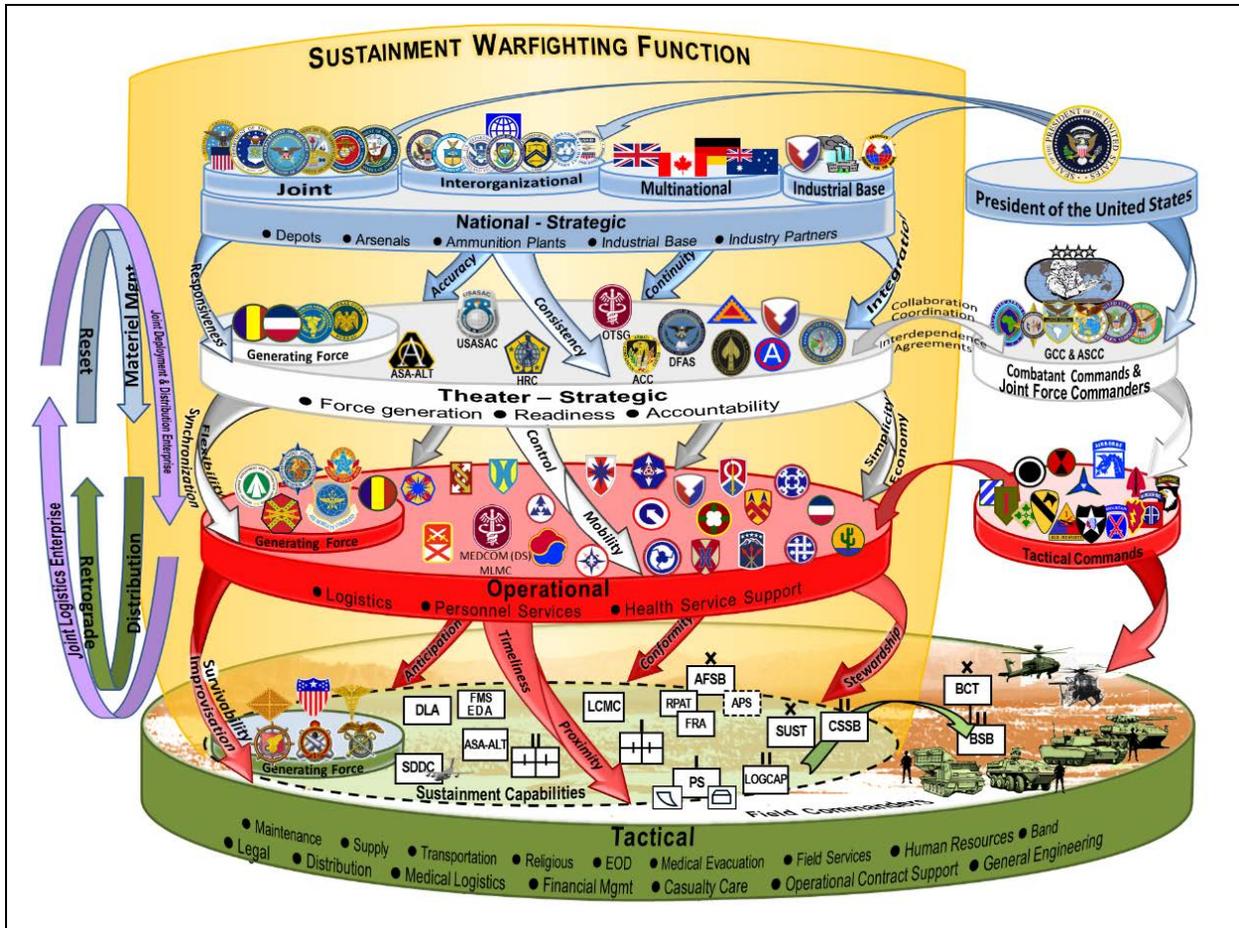


Figure 1-1. Sustainment warfighting function overview

AFSB	Army field support brigade	GCC	global combatant commander
ASA-ALT	Assistant Secretary of the Army for Acquisition, Logistics, and Technology	HRC	Human Resources Command
ASCC	Army service component command	LCMC	Lifecycle Management Command
BSB	brigade support battalion	LOGCAP	Logistics Civil Augmentation Program
CSSB	combat sustainment support battalion	MEDCOM (DS)	Medical Command (Deployment Support)
DFAS	Defense Finance and Accounting Service	MLMC	Medical Logistics Management Center
DLA	Defense Logistics Agency	OTSG	Office of the Surgeon General
EDA	excess defense articles	PS	personal support
EOD	explosive ordnance disposal	RPAT	redistribution property accountability team
FMS	foreign military sales	SUST	sustainment brigade
FRA	forward repair activity	USASAC	U.S. Army Security Assistance Command

Figure 1-2. Sustainment warfighting function overview glossary

1-5. Assumptions

a. The assumptions from TP 525-3-0, *The U.S. Army Capstone Concept* (ACC) and AOC apply to this concept.⁴

b. The following additional assumptions also apply to this concept:

(1) The Army will be more expeditionary, mission tailored, regionally aligned, and globally responsive.⁵

(2) Army forces will be predominantly continental U.S. (CONUS)-based, regionally aligned and deploy from the U.S. or forward bases to operate in areas where enemies attempt to deny access and cyberspace capabilities are degraded.⁶

(3) The Army will continue to support joint, interorganizational, and multinational partners within a global land power network which adds significant demands on sustainment forces.⁷

(4) The Army will continue to develop existing and establish new multinational and interorganizational logistics support partnerships where required to enable more responsive, interoperable, and flexible sustainment of operations.

(5) The Army will continue to support and integrate with the Joint Logistics Enterprise (JLEnt) which includes the Joint Deployment and Distribution Enterprise.

(6) The Army will be required to sustain a mix of interdependent conventional and special operations forces throughout the ROMO and all phases of joint operations.⁸

(7) The Army will continue to preposition equipment globally. Pre-positioning equipment becomes more important to sustaining a predominately CONUS-based expeditionary Army.⁹

(8) The U.S. will maintain a viable and responsive industrial base with sufficient surge capacity to sustain persistent and simultaneous global joint force operations.¹⁰

(9) The Army will continue to contract for commercial services, supplies, and infrastructure to augment and supplement military sustainment capability across the ROMO.¹¹

(10) Department of Defense (DOD) organic strategic lift capability and capacity will not increase and a robust partnership with the U.S. commercial transportation industry will continue to be necessary to provide the required augmentation.

(11) A combination of DOD and commercially owned enterprise services and information systems infrastructure will be available to enable employment of sustainment related information technology.

(12) The Army will continue to develop seabasing capability to exploit maritime domain options for staging and supporting joint forces.¹²

(13) The Army will be unable to execute sustainment without capabilities provided by the U.S. Army Reserve (USAR) and Army National Guard (ARNG).¹³

(14) Sustainment forces will conduct security force assistance (SFA) to build partner capacity and shape regional security consistent with U.S. interests.¹⁴

(15) Reception, staging, onward movement, and integration (RSOI) remains an enduring requirement of expeditionary maneuver, however, tasks may be simplified and reduced through combat configured forces.¹⁵

(16) Fundamental reduction in demand and significant reinvestment in sustainment force structure and capacity will be sufficient to meeting semi-independent brigade combat team (BCT) sustainment requirements.¹⁶

(17) Future threats will specifically target sustainment information systems and networks as part of anti-access and area denial to interdict and disrupt U.S. joint force projection.¹⁷

1-6. Linkage to the Army Concept Framework (ACF) and multi-domain battle (MDB)

a. The ACF is comprised of the ACC, the AOC, AFCs (including this concept), existing concept capability plans, and other directed concepts. This framework provides the intellectual underpinnings for the institutional adaptations and future investments necessary to enhance the Army's ability to conduct operations. The ACC reflects the Army's vision of future armed conflict and describes the broad capabilities the Army requires to accomplish its enduring missions successfully. The AOC establishes operational adaptability as the Army's fundamental attribute required by Army leaders, Soldiers, and civilians based on: critical thinking, comfort with ambiguity and decentralization, a willingness to accept prudent risk, and an ability to make adjustments rapidly based on a continuous assessment of the situation. Operational adaptability requires resilient Soldiers and cohesive teams that overcome the psychological and moral challenges of combat, proficient in the fundamentals, masters of the operational art, and cognizant of the human aspects of conflict and war. It also requires flexible organizations and adaptable institutions that tailor and scale to support a wide variety of missions.¹⁸

b. Building on the ACC's ideas, the AOC describes how future Army forces will prevent conflict, shape security environments, and win wars. The key to a strategic win is presenting the enemy multiple dilemmas, providing the JFC multiple options, and operating in multiple domains with multiple partners. The AOC guides future force development by identifying first order capabilities that the Army needs to support U.S. policy objectives. It provides the intellectual foundation and framework for learning and for applying learning to future force development under *Force 2025 and Beyond*.¹⁹

c. The AOC recognizes that Army forces will be essential components of joint operations to create sustainable political outcomes while defeating enemies and adversaries who will challenge U.S. advantages in all domains: land, air, maritime, space, and cyberspace. Joint operations are critical to cope with such complexity and the Army's contribution must provide unique capabilities and multiple options to the President, the Secretary of Defense, and geographic combatant commanders. These capabilities include tailorable and scalable combinations of special operations and conventional forces, regionally aligned and globally responsive combined arms teams, and foundational theater capabilities to enable joint combined arms operations and winning in a complex world.²⁰

d. MDB describes how future ground combat forces, operating as part of joint, interorganizational, and multinational teams, will defeat highly-capable peer enemies, secure terrain, and project combat power to obtain advantage and achieve objectives. MDB emphasizes the need to achieve cross-domain synergy through coordinated, simultaneous actions across contested spaces. Future ground forces with cross-domain capabilities provide a credible capability to deter adversary aggression, deny the enemy freedom of action, overcome enemy anti-access and area denial, secure terrain, compel outcomes, and consolidate gains for sustainable outcomes.²¹ The AFC-S discusses the implications for sustainment forces within the context of the AOC and MDB in the future operational environment.

Chapter 2

Operational Context

2-1. Operational environment

a. The 2020-40 OE is an environment of contested norms where increasingly powerful states and select non-state actors use any and all elements of power to establish their own set of rules unfavorable to the United States and its interests. Many weaker states become increasingly incapable of maintaining good governance creating persistent disorder. Adversaries coerce neutrals, partners, and allies through economic pressure, political subversion, and the threat of military force. Potential enemies use deception, surprise, and speed of action to achieve their objectives and exploit seams within established U.S. operating methods.²² The AOC identifies five key characteristics of the future OE: increased velocity and momentum of human interaction and events; potential for overmatch; proliferation of weapons of mass destruction (WMD); the spread of advanced cyberspace and space capabilities; and demographics and operations among populations, in cities, and in complex terrain.²³

b. Adversaries attempt to counter U.S. power projection and limit freedom of action, in all domains: land, air, maritime, space, and cyberspace, using anti-access and area denial capabilities. Air supremacy or even air superiority may be unachievable in future wars. Achieving only air superiority poses significant problems for ground sustainment forces designed for and accustomed to Joint Force air superiority required to execute effective multi-domain sustainment operations.²⁴ Without air superiority, sustainment operations are vulnerable to threat surveillance (including unmanned aerial systems), air interdiction, and targeting with massed artillery. Threats will degrade U.S. communications, and position, navigation, and timing, challenging U.S. forces across the breadth and depth of the battlefield. Peer threats will exploit multi-domain anti-access and area denial capabilities with extended ranges, integrated precise near-real time information collection enabled by space and cyber-electromagnetic activities, air defense, and fires, challenging U.S. power projection, entry and freedom of action in all domains.²⁵

c. Enemies will attempt to interdict and disrupt sustainment operations both physically in the land, maritime and air domains; and electronically in the cyberspace domain to isolate forces from support. Enemy long range target acquisition and fires capabilities will increase the vulnerability of sustainment forces both at the halt and on the move. Diverse threats will employ traditional, unconventional, and hybrid strategies to threaten perceived weaknesses including sustainment

forces and operating bases. Enemies use diverse technologies from improvised explosive devices to cyberspace attacks to disrupt support and services.

d. U.S. sustainment information systems are vulnerable to cyber threats. Adversaries are developing capabilities to attack U.S. platforms, systems, and networks in space, cyberspace, and the electromagnetic spectrum. Current sustainment systems depend on assured communications and access to space capabilities, and are not designed for disconnected operations. Sustainment information systems support force generation and readiness, set the theater, and theater sustainment operations essential for force projection. Dispersed operations, over extended distances in multiple domains, increase vulnerability to cyber-attack. Successful sustainment operations require protected communications networks and cyber-electromagnetic activities to operate effectively in an increasingly connected world.

e. Future sustainment forces will respond rapidly, and in sufficient scale to sustain missions in the homeland or abroad. These missions include military engagement, security cooperation, and deterrence; crisis response and limited contingency operations; and major operations and campaigns. These operations may be required anywhere in uncertain, austere, and degraded communications conditions. Sustainment forces will retain overmatch with adversaries by using technology to develop new capabilities including the ability to integrate and synchronize operations across multiple domains. Application of new technologies, including unmanned systems and automation, will change sustainment operations significantly and shape the future force. Supporting Army forces operating in the future OE, including dense urban environments, requires decentralized sustainment operations, employment of joint capabilities, innovative and, adaptive leaders, and cohesive teams.

f. Recent and ongoing conflicts highlight the limitations associated with strategic lift, communications, and asset visibility. Army forces must reassess sustainment practices derived from earlier assumptions of assured communications and timeliness of resupply. Unlike the last decade of war, sustainment forces will be CONUS-based primarily and will need to reestablish an expeditionary mindset that makes best use of limited resources and relationships with joint, interorganizational, and multinational partners. Sustainment forces require increased organic lethality and advanced protection to generate security and provide overmatch necessary to address emerging threats on a multi-domain battlefield.

2-2. Industrial environment

a. Key social, business, and technology trends drive changes that affect future Army sustainment operations positively. Customers demand an experience with suppliers that allows them to decide how and when to be involved in decisions from point of sale to manufacturing and delivery. Use of mobile and wearable devices has significantly changed how sustainment is conducted from a manufacturing, order fulfillment, delivery, and human resources perspective. The internet of things enables objects to become smart and participate in event driven sustainment processes. Autonomous devices and systems characterize the future supply chain and unlock the potential for new military applications. Customers demand cloud based sustainment services that make secure data and services available remotely. Lastly, big data has untapped potential for enhancing decision support that leads to optimizing sustainment capacity, utilization, and risk

reduction. Industrial and commercial sustainment sector development will continue to outpace military sustainment force development significantly.

b. An expeditionary Army requires a viable industrial base that can surge to meet demands. The Army organic industrial base and commercial industry are key strategic partners that enable military capability by identifying technologies that have military application to maintain overmatch with adversaries. Sustainment challenges will require innovative solutions delivered by partnerships with the joint, interorganizational, and multinational community, the rapid aggregation and disaggregation of logistic nodes, increased reliance on unmanned systems for routine tasks, and situational understanding through improvements in information systems and network connectivity. This connectivity also facilitates and expedites financial transactions, personnel accountability, and readiness.

2-3. The human dimension

Army leaders, Soldiers, and Army Civilians must master the skills necessary to act, react, and adapt to uncertain conditions in populations, including dense urban environments. The Army must recruit, manage, and retain talented individuals capable of learning these skills. The Army's challenge is to optimize every Soldier and Army Civilian's performance through innovation and investment in education, training, professionalism, leader development, holistic health, total fitness, talent acquisition, and Army's human capital precision talent management.²⁶

Chapter 3

Military Problem and Components of the Solution

3-1. Military problem

How does the U.S. Army sustain multi-domain battle in the future operational environment, in sufficient scale, for ample duration, and in coordination with joint, interorganizational, and multinational partners, to achieve JFC objectives?

3-2. Central idea

Army forces sustain MDB in the future OE with a scalable, global sustainment architecture consisting of multiple routes, multiple modes, multiple nodes, and multiple suppliers that provide multiple options to the supported commander and presents multiple dilemmas to adversaries. The Army improves endurance and preserves Joint Force freedom of movement and action through semi-independent operations, cross-domain maneuver, and integrated security operations in the land, air, maritime, space, and cyberspace domains. Global enterprise information and communications systems protected by cyber-electromagnetic activities support effective and efficient decision making at every echelon. Sustainment forces form joint, interorganizational, and multinational teams to support shaping operations, conduct force generation and readiness, mobilize and deploy the force, set and expand the theater, sustain high tempo operations rapidly, and conduct theater drawdown and closure. The Army integrates strategic, operational, and tactical sustainment operations to provide the foundational support framework to the force which provides multiple options to the JFC. The Army optimizes sustainment operations at every echelon to develop ready, expeditionary, and globally responsive sustainment capabilities and capacity.

3-3. Solution synopsis

a. The character of sustainment operations must adapt to the nature of the future OE and the expected requirements to sustain MDB in 2025 and beyond. Fundamentally, the Army continues to provide logistics support and services necessary to move and maintain the force, provides personnel services to optimize human performance and manage resources, and provides expeditionary health service support from the point of injury through the continuum of care to preserve the force. Figure 3-1 below illustrates how the central idea, components of the solution, derived Army sustainment key tasks, future sustainment force attributes, and sustainment principles provide a framework that is used to develop future capabilities.

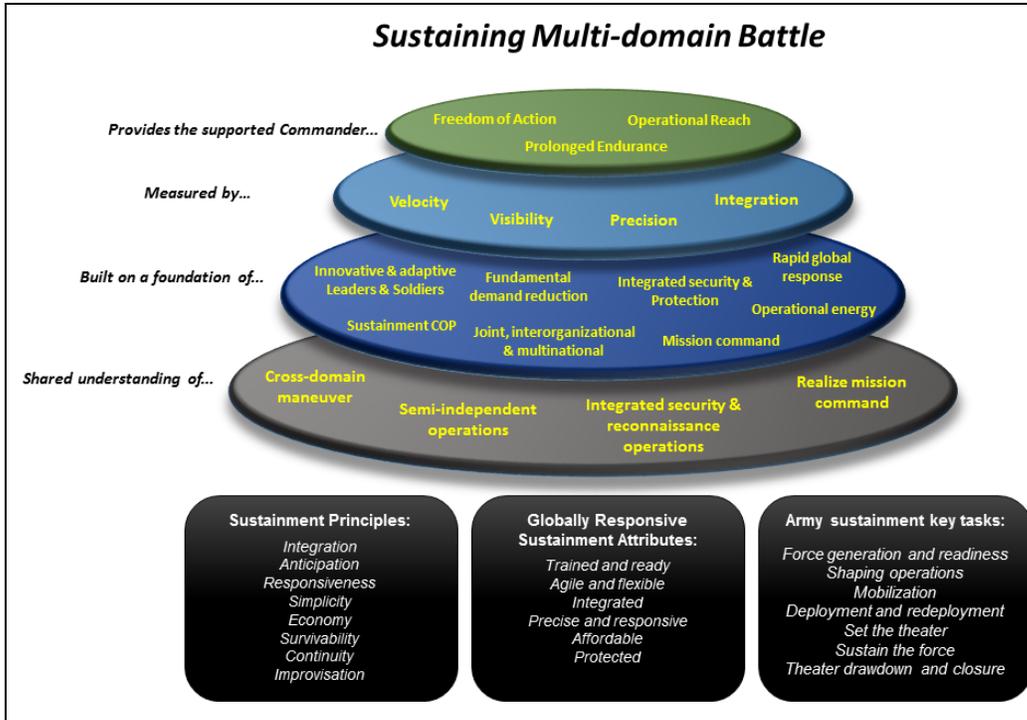


Figure 3-1. Sustainment concept framework

b. The Army conducts precise, responsive, and affordable sustainment operations to support multiple, concurrent operations dispersed over wide areas. Future sustainment forces are trained and ready to project and sustain an expeditionary force; they are agile and flexible to support multiple options and rapidly shift effort. The future Army measures the performance of sustainment operations using visibility, velocity, precision, and integration (V2PI) metrics.

c. Future Army sustainment forces produce adaptive and innovative sustainment leaders and Soldiers capable of conducting operations in complex environments with constrained resources applied to priority tasks. Sustainment leaders exercise mission command to empower leaders at lower echelons to take disciplined initiative. Future Army sustainment forces integrate mission command systems and sustainment information systems to generate an inherent sustainment common operating picture (COP) that allows decision support from the strategic level agency to the tactical level consumer underpinned by a secure Army information network. The future Army fundamentally reduces the demand characteristics of the force and provides operational energy

more effectively to optimize the sustainment footprint and enable an expeditionary Army conducting cross-domain maneuver. The Army integrates joint, interorganizational, and multinational partners through the JLEnt supported by a viable and innovative industrial base. Sustainment forces integrate security operations and protection to operate effectively in the future OE without reliance on maneuver forces and enablers.

e. However, this solution is not without risk. The multiple options concept will require DOTMLPF-P changes and may create extra dependencies on other warfighting functions. There is an inherent risk in sustaining expeditionary MDB from a predominantly CONUS-based force with limited strategic lift over long and contested lines of communication. Maintaining sufficient sustainment forces at a high state of readiness to act within short time frames will require significant resources and effort. There is risk that the demand characteristics of the force cannot be reduced sufficiently to enable semi-independent operations with the required freedom of movement and action. There is risk that degraded communications disrupt sustainment information systems to the point where Army operations are interrupted. Appendix D addresses risks and mitigation factors in greater detail.

3-4. Globally responsive sustainment attributes and metrics

a. Successful future sustainment operations require globally responsive attributes. These attributes will inform continued development of the sustainment principles:²⁷

(1) Trained and ready. Sustainment forces are trained, educated, exercised, and ready to deploy rapidly and conduct sustainment operations across the ROMO. Sustainment leaders think critically, communicate effectively, understand the complexity of the future OE, and use advanced decision-support tools.

(2) Agile and flexible. Future Army sustainment forces provide support and services to the joint force through agile and flexible organizations. Sustainment forces support multiple, concurrent operations, when and where required, regardless of the infrastructure available. The Army tailors the sustainment force to meet the supported commander's specific needs allowing for a rapid response to a diverse range of missions and tasks.

(3) Integrated. Army sustainment forces integrate joint, interorganizational, and multinational partners including the industrial base through training, operations, sustainment information systems, and processes from strategic to tactical levels. Sustainment forces coordinate and synchronize assets, organizations and information at all levels in support of the JFC to enable unity of effort.

(4) Precise and responsive. Future sustainment operations will achieve precision with minimum planning and response time. Distribution based sustainment uses situational understanding to deliver the right materiel, personnel, and supplies at the right time, location, and condition. Predictive analytics delivers operational performance and readiness that enables overall cost and risk reduction but retains sufficient flexibility and purposeful redundancy to mitigate operational risk.

(5) Affordable. The future Army responsibly consumes fewer resources while maintaining capability and lethal overmatch by fundamentally reducing overall demand, reducing unnecessary duplication, and improving process efficiency. The Army culture changes the mindset for both sustainers and warfighters that enable active balancing of effectiveness and efficiency with risk.

(6) Protected. Future sustainment forces possess organic self-protection capabilities and, when required, have the necessary mobility, firepower, protection, and communications required to sustain MDB, and survive against advanced threats including cyberspace attack in the future OE. The Army must consider protection requirements for commercially provided sustainment capabilities based on mission specific factors.

b. V2PI metrics. The Army measures sustainment operations by the ability to provide the right supplies and services, at the right time, in the right place, in the right condition and quantity. V2PI provides the key metrics that drive meeting customer requirements. Visibility from the sustainment COP, including contract support, is critical for decision support and effective sustainment operations in applying limited resources against priority tasks. Velocity from demand to delivery is essential to meet requirements in a constantly changing OE. Integrated and precise sustainment forces maximize sustainment effects with available resources.

3-5. Components of the solution

a. Producing adaptive and innovative leaders, Soldiers, and Army Civilians.

(1) Future sustainment forces develop agile, adaptive, and innovative leaders who thrive in conditions of uncertainty and chaos and are capable of understanding, visualizing, describing, directing, leading, and assessing operations in complex environments and against adaptive enemies. Sustainment leaders at all levels possess the capabilities necessary to work effectively within culturally diverse environments, make decisions, adapt readily, and respond appropriately in complex and dynamic situations. The future Army increases its focus on cognitive, physical, and social component learning in line with the human dimension integration framework to optimize human performance. The Army also optimizes holistic health and fitness to assist leaders and Soldiers to learn faster and accelerate information gathering, improve critical thinking and creative problem solving abilities, and make informed decisions.²⁸ Future sustainment leaders have the ability to fight and integrate joint and combined arms capabilities to achieve mission objectives. They are experts at interacting with the media and social networks to support the operational narrative.²⁹

(2) Sustainment leaders develop the attributes and competencies expected of all Army leaders and also develop core sustainment competencies: understanding of joint combined arms maneuver, expeditionary sustainment, total force sustainment integration, strategic sustainment enterprise operations, partner integration, and sustainment information systems.³⁰ They have a thorough understanding of the tactical and operational force, its composition, capabilities and operations, and support. Sustainment leaders and Soldiers are experts at conducting a wide range of dispersed and semi-independent sustainment missions.³¹ They are capable of assessing the OE and the effects their actions will have on themselves, Army forces, joint, interorganizational, and multinational partners, the enemy, and civilians.

(3) Leaders and Soldiers possess the skills and attitudes to develop and cultivate relationships with partners, to become literate and culturally competent, according to their regional alignment.³² They possess a base knowledge of cultural characteristics, histories, values, belief systems, and behaviors of members from cultural groups across a theater and use this knowledge to affect operational plans positively. Leaders and Soldiers form professional relationships with people within culturally acceptable norms. Through these relationships, the Army builds partner sustainment capacity and enables future access to logistics infrastructure and host nation support.

(4) Sustainment forces are trained and ready. Future training promotes adaptive and innovative leaders with emphasis on junior leader development and encompasses joint and Army policy and processes using collaborative and other support tools.³³ Future sustainment forces extend training support systems from the institutional Army out to the operating force so units can use live, virtual, gaming, and constructive capabilities in the integrated training environment. Realistic training is paramount to creating adaptive and responsive sustainment units including the use, interpretation, analysis, and application of data and information derived from mission command and sustainment information systems. Future experimentation and training center rotations must ensure a realistic environment in which the support concept is stressed sufficiently to enable learning. Training includes joint, interorganizational, multinational, host nation, and contractor partners.³⁴ Training develops leaders, Soldiers, and Army Civilians to achieve tactical and technical competence, builds confidence, cognitive agility, and understanding of multifunctional sustainment.³⁵

b. Exercise mission command.

(1) Sustainment leaders convey clear intent, empower leaders at lower echelons to take disciplined initiative and make effective decisions that have strategic impacts in line with JFC objectives. Sustainment forces exercise mission command by facilitating freedom of action and the retention of the initiative for widely dispersed operations while maintaining mutual support and the ability to concentrate.³⁶ Future sustainment commanders conduct decentralized operations routinely to support MDB and prevent pauses. Subordinate sustainment leaders proactively use their commander's intent to guide decision-making and action. Empowering subordinates enables operational adaptability in uncertain, complex, and dynamic environments. Army sustainment leaders establish the minimum necessary control measures and take prudent risk to exploit opportunities.³⁷

(2) Future sustainment forces use mission command information systems which allow efficient information flow vertically and horizontally with joint, interorganizational, and multinational partners to enable integrated sustainment operations. Uncertainty places increased pressure on mission command information systems to obtain, process, and disseminate critical sustainment information requirements within the supported commander's required decision cycle. Future sustainment commanders act on situational understanding delivered by integrated mission command information and sustainment information systems to ensure mission success.

c. The sustainment COP.

(1) The future Army integrates mission command systems and sustainment information systems to generate an inherent sustainment COP that allows decision support from the strategic level agency to the tactical level consumer.³⁸ Sustainment planning and execution activities are supported across the future OE in near real time on the future Army information network that enables multiform collaboration and integration with operations, intelligence, and other warfighting functions. The Army maintains the sustainment COP through improved information technology that delivers asset visibility, location, movement, supply inventory, personnel, retrograde, funding availability, contract support, and distribution flows from strategic to tactical levels of war. Future Army forces protect sustainment information and associated communications systems from cyberspace threats to ensure high availability and integrity of sustainment information and decision support tools.

(2) Sustainment forces anticipate needs and provide a high degree of responsiveness and reliability in the supply chain. Sustainment forces use business intelligence and predictive analytics for decision support to empower dispersed sustainment commanders and staff. Timely, accurate, and authoritative data, information, and intelligence are required to enable informed and quick decisions necessary to provide accurate and precise sustainment support. Additionally, the Army sustainment system responds and provides the supported commander near real time visibility information on demands within the supply chain.

(3) The sustainment COP integrates personnel services support information that assists commanders in optimizing unit and personnel readiness through enhanced visibility and accurate reporting and enables matching skills to requirements, better utilization of specialist skills, and talent management. The sustainment COP integrates financial management information to satisfy audit requirements and improve fiscal transparency.

d. Fundamental demand reduction.

(1) The future Army fundamentally reduces the demand characteristics of the force and optimizes the sustainment footprint to become more expeditionary and to enable semi-independent operations. The most significant demand characteristic of the force is fuel, ammunition, and water consumption. This demand drives the size of the sustainment footprint for supply, storage, and distribution directly. Other characteristics that drive demand include the number of supported personnel; the type, production, and distribution of food and ammunition; the reliability, availability, and maintainability of aviation platforms, combat vehicles and support equipment; energy consumption; personnel and health service support requirements. The Army continues to use and improve a conditions-based maintenance strategy to enhance life cycle system readiness and materiel availability while reducing operating and support costs.³⁹ Future materiel systems monitor condition autonomously, predict and diagnose faults, and integrate with the sustainment COP to reduce overall demand for maintenance and optimize the sustainment footprint. Future Army forces simplify maintenance and enhance their ability to sustain aviation and other complex systems in austere environments for extended durations.

(2) The Army continues to pursue technologies to both reduce and satisfy demand; to enable smaller and more flexible forces; to meet demand at the point of need; to develop intelligent and advanced power systems; to manage water, energy, and waste; and to develop unmanned systems.

These technologies enable increased efficiency and reduced demand through lower fuel consumption; decreased waste generation; efficient energy storage and generation; timely and agile logistics; and precision resupply. The future Army continues to align science and technology efforts to identify emerging technologies that assist in reducing demand (see appendix C). Reduced demand characteristics of the supported force create opportunities for sustainment footprint optimization and enable cross-domain maneuver.

(3) The Army optimizes the sustainment footprint across the ROMO to deliver sustainment effects without undue burden on the JFCs resources and the supply chain. The future sustainment force is deployable, survivable, and sustainable. Furthermore, the Army investigates force projection capabilities that mitigate the need for deliberate RSOI operations with a reduced reliance on intermediate staging bases. The future Army task organizes forces dynamically resulting in highly agile and adaptive organizations that distribute and concentrate as required, at any scale. Commensurate with the threat, sustainment forces minimize the footprint by optimizing the use of partner and host nation capability, and contract support from commercial sources available globally. Future force elements are more self-sufficient without reducing their lethality or mobility. A key element of reducing the sustainment footprint is managing operational energy requirements.

e. Operational energy.

(1) Operational energy is the energy required for training, moving, and sustaining military forces and weapons platforms for military operation. It includes energy used by tactical power systems and generators, weapons platforms, and at non-enduring bases. Future Army forces supplement and eventually replace petroleum energy sources (fossil based fuels) with innovative energy sources to reduce markedly petroleum supply and distribution. The future Army uses energy more effectively, increases the energy efficiency of its platforms, devices and equipment, and increases its use of renewable and alternative energy to supplement or replace traditional fuels. The future Army considers energy as a key enabler and energy security a requirement for future operations. The ability to optimize energy consumption and leverage alternative energy sources increases the endurance and resilience of the joint force while reducing the energy distribution and protection requirements of the sustainment footprint and minimizes the environmental impact while extending operational reach and endurance.

(2) The future Army institutionalizes operational energy management, improves and expands conservation training programs and power and energy efficiency, and uses energy management plans at all levels. All energy production, distribution, storage, and management systems generate, monitor, control, store, and analyze energy production, distribution, and consumption intelligently. The Army integrates energy control and accountability systems with mission command systems. Soldiers operate for increased periods, over greater distances, and at a high operational tempo, with decreased load. Future manned and unmanned air, land, and maritime systems use energy efficient propulsion systems, improved and alternative fuels, and energy storage systems to increase performance and loiter time while reducing aggregate fuel consumption.

f. Rapid global response.

(1) Future sustainment forces deploy rapidly with reduced reliance on improved aerial and sea ports of debarkation. When possible, deploying forces are mission configured and require minimal RSOI.⁴⁰ Currently, almost 80 percent of the Army's sustainment force structure is in the USAR and ARNG including medical, logistics, and personnel services capabilities which are critical to early entry operations across air, land, and maritime domains. The future Army manages readiness to ensure forces required for rapid deployment, early entry, and setting the theater tasks mobilize and deploy within the necessary timeframes. Future sustainment forces use mission command information systems and the sustainment COP on the move to mitigate a rapidly changing situation, including unforeseen changes to infrastructure, strategic lift, and host nation support during the deployment process.

(2) The future Army uses forward positioned, rotational forces, Army pre-positioned stocks (APS), and activity sets to assist in reducing strategic response time. The DOD positions APS strategically for rapid response with available strategic sea and air lift. APS accelerates the Army's response across the ROMO. Engagement with partners and allies facilitates access and rapid deployment of task organized forces.

g. Joint, interorganizational, and multinational partner integration.

(1) Future sustainment forces exploit opportunities arising from joint, interorganizational, and multinational interdependencies and interoperability. Individual services retain responsibility for sustainment, but combining complementary service capabilities purposefully creates joint interdependent forces, the most effective and efficient means by which to sustain a joint force.⁴¹ These interdependencies are paramount to overcoming the challenges associated with conducting dispersed operations over extended distances. This approach embodies centralized planning and decentralized execution required to mitigate the uncertainties of the future OE.

(2) The JCL describes how the JLEnt supports future joint operations characterized by increasing requirements with constrained resources.⁴² The JCL introduces globally integrated logistics (GIL) as the future joint capability to allocate and adjudicate logistics support on a global scale to maximize effectiveness and responsiveness, and to reconcile competing demands for limited logistics resources based on strategic priorities.⁴³ Future Army sustainment integrates with the JLEnt, a multi-tiered matrix of key global logistic providers and their aggregate capabilities which are critical to achieving global agility.⁴⁴ Sustainment forces leverage interdependencies to improve operational efficiency by using common supplies, standards, and procedures. This includes common capabilities such as strategic lift, operational contract support (OCS), and the provision of common-user logistics. Joint, interorganizational, and multinational partners engage and integrate with Army forces to deliver the best sustainment effect to the supported force. Future forces use a collaborative planning, execution, and control capability that delivers, governs, and tracks the location, movement, configuration, and condition of people, supplies, equipment, and unit information to sustain MDB.

(3) The sustainment COP facilitates planning, capturing, and anticipating joint sustainment requirements supported by an improved JLEnt. This system integrates with joint, interorganizational, and multinational partner systems and other select system components

transition to the host nation when closing a theater of operations. Joint logistics capabilities are interoperable across programs, systems, and forces, providing shared knowledge concerning force readiness; decreased operational footprint in theater; increased force agility and survivability; decreased logistics demand; a better understanding of the cost of employing the force; improved data management and data integrity; increased asset visibility and property accountability; improved logistics pipeline management; increased force projection and sustainment; and increased speed and effectiveness of theater opening tasks. Army forces build partner sustainment capacity with support from across the JLEnt.

(4) Future Army sustainment forces access service, joint, interorganizational, and multinational capabilities including fires, intelligence, surveillance, reconnaissance, cyberspace, and mission command systems to protect and enable effective sustainment operations to support MDB. Army conventional sustainment forces continue to develop interdependence with Army special operations sustainment forces to support widely dispersed formations, including joint, interorganizational, and multinational partners, during all joint operational phases. Future sustainment forces understand the unique needs of special forces and support planning, coordination, integration, and execution of special operations and activities.⁴⁵

h. Integrated security and protection.

(1) Sustainment forces (excluding medical and religious) require increased organic lethality and advanced protection to generate security and provide overmatch for units both on the move and at the halt. Extended and contested lines of communication through unoccupied areas that emerge between semi-independent units increases risk to sustainment operations. Sustainment forces conduct dispersed support operations across domains with smaller, mobile, concealable platforms using counter-unmanned aerial systems capabilities to remain undetected and avoid enemy targeting. Echelon above brigade forces create windows of domain superiority to set conditions for distribution and emergency resupply to combat forces including coordination of maneuver support, fires, and cyberspace operations to enable distribution along multiple routes, across multiple domains. Multimode sustainment distribution platforms are survivable to ensure supplies arrive on time and in the required condition, regardless of platform autonomy. Defensive cyberspace operations capabilities are paramount to maintaining the integrity of sustainment information systems. The Army continues to use technology to reduce the risk to Soldiers lives through better personal protection, lethal and nonlethal weapons systems, threat detection systems, hardened and defensible networks, and automated unmanned systems. Sustainment forces integrate armed private security within the overall force protection plan, where appropriate. Army sustainment forces evacuate, triage, and treat people to save lives and preserve the force.

(2) Future sustainment forces neutralize explosive threats and hazards, including unexploded ordnance, improvised explosive devices, and WMD, in the land, maritime, and air domains, along all lines of communication to support MDB within a theater of operation and in the homeland to protect personnel and supplies with minimal disruption. Army explosive ordnance disposal (EOD) forces provide mission command for joint EOD forces and integrate with other warfighting functions for exploitation and intelligence gathering. Sustainment operations support joint, interorganizational, and multinational partners to mitigate the consequences from WMD employment to save lives and minimize human suffering through health service support and other

support and services. Sustainment forces are prepared to conduct sustainment operations under contaminated conditions for extended periods to prolong endurance. Future Army forces recover, package, handle, transport, store, and dispose of contaminated material to support MDB.

i. Viable industrial base.

(1) The future Army maintains a strong, technologically advanced, and viable industrial base able to develop, produce, and support advanced military systems, materiel, ordnance, and services in a cost-effective manner.⁴⁶ Industry researches and develops innovative capabilities or enhances existing capabilities to support military adaptation in response to emerging threats and the changing OE within the technology lifecycle reducing overhead and the acquisition timeline. The Army fosters an industrial base that is a modern, highly responsive, and collaborative enterprise. It provides and maintains the resources, skills, manufacturing, and maintenance support competencies necessary to sustain the life-cycle readiness of systems and materiel worldwide in a reliable and efficient manner and can surge to meet the demands of contingency operations. The Army develops strong commercial relationships with industry where appropriate, feasible, and affordable during peace time to be ready for times of conflict. Army and DOD ensure the industrial base remains ready to produce and/or increase military materiel, ordnance, and other services production.

(2) Army forces optimize OCS use to provide services, facilities, and sustainment to support a globally responsive Army. OCS assists in providing force shaping options by procuring foreign and local capabilities through prompt and sustained commercial support to achieve operational objectives responsively, effectively, and economically. OCS includes combinations of theater support contracting from local commercial sources, larger scale reach-back contracts, and preplanned external support contracts like the Logistics Civil Augmentation Program to sustain the force and prolong endurance in all joint phases. The sustainment COP integrates OCS information to support management of materiel and supplies from the point of manufacture to the point of consumption. This includes visibility of industrial base activity, OCS, and the ability to adapt rapidly to emerging threats and conditions to support the JFC.

Chapter 4
Army Sustainment Key Tasks

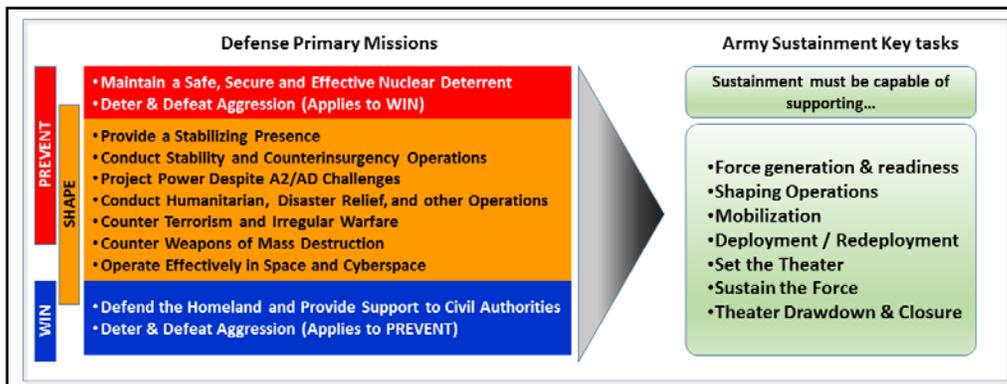


Figure 4-1. Army sustainment key tasks

4-1. Force generation and readiness

a. Analysis of the DOD primary missions against the future OE and the AOC derived seven key sustainment tasks illustrated in figure 4-1 above.⁴⁷ The Army improves its force generation and readiness to meet JFC requirements for planned and contingency operations. The Army mans, trains, organizes, sustains, equips, and employs to support JFC requirements as force packages tailored to achieve specific objectives. Army sustainment forces are agile and resourced as first responders to contingency missions to enable freedom of action with increased dependency on the USAR and ARNG for prolonged endurance.

b. The Army executes the force generation process with command relationships that are restructured over time to produce trained, ready, and cohesive units prepared for operational deployment in support of the JFC. The future sustainment force balances personnel, materiel and supplies, equipment readiness, and training to enable a ready and modern force that can deploy rapidly and maintain the deterrent and coercive value of the Army effectively. Readiness remains scalable based on available resources and emerging threats to facilitate responsiveness, while managing training risk.

c. The future integrated training environment enables commanders to plan, prepare, execute, and assess training when and where required. Scalable, tailorable, and realistic future training provides capabilities at home station that enables leaders to meet force generation and readiness requirements while linking institutions, combat training centers and deployed forces for mission specific training. Sustainment forces conduct challenging and realistic command post exercises with mission command and sustainment information systems, functional training, and combat training center rotations that enable sustainment leaders to adapt to a wide range of missions and scenarios. Sustainment information systems operate during periods of intermittent connectivity in a degraded communications environment using a hardened and redundant Army information network. During periods of limited connectivity, critical sustainment processes continue uninterrupted. Sustainment leaders conduct readiness exercises proactively as a means of testing, developing, and maintaining critical skills while maintaining effective home station sustainment support. The future training environment provides leaders, Soldiers, and teams greater proficiency at lower cost using an improved human capital management system that can assess, integrate, and synchronize activities across DOTMLPF-P.

4-2. Shaping operations

a. Army sustainment forces shape the area of operations in advance of conflict through a variety of security and engagement activities, including multinational exercises, access and support agreements, establishing and improving overseas bases, pre-positioning supplies, establishing local banking relationships, and deploying forces forward. Shaping comprises a wide range of actions designed to strengthen regional partnerships and partners, which include foreign militaries and other agencies and nongovernmental organizations. Army sustainment is the backbone of the joint force's versatility across the ROMO.⁴⁸ JLEnt components collaborate to establish responsibility and accountability to operate, shape, and leverage partner resources, processes, and capabilities. Army sustainment forces support entry operations using established or austere ports

of debarkation. Entry operations, whether forcible or otherwise, are heavily dependent on the relationships made prior to conflict with host-nation governments and militaries to enable access.⁴⁹

b. The future Army prepares the area of operations in advance to facilitate operational access that allows for rapid reaction and escalation if required. Operationally, this may require intermediate and forward staging bases to facilitate rapid deployment and sustained build-up of combat power. Activities at these bases, such as training, rehearsals, and building relationships, complement and enable rapid response should a crisis occur and provide forces capable of cross-domain maneuver on arrival. Army forces use seabasing as a staging capability to enable rapid deployment, assembly, command, projection, reconstitution, and re-employment of joint combat power from the sea, while providing continuous support, sustainment, and protection to selected expeditionary joint forces without reliance on land bases within the area of operations.

c. Future Army sustainment forces support and conduct engagement activities including bilateral and multinational exercises to shape the environment. Sustainment forces conduct key leader engagements, train, advise, and equip missions, negotiations to secure basing, expedited transit and foreign customs agreements, support agreements, freedom-of-navigation exercises, negotiations of grants and contracts to improve relationships, and multinational planning conferences to facilitate regional access and strengthen host-nation support. This effort also includes establishing, improving, and hardening forward and intermediate bases critical to military force projection into the region as well as pre-positioning supplies and equipment.⁵⁰

4-3. Mobilization

a. Future Army forces project national power from the U.S. or other theaters in response to national requirements for military operations.⁵¹ Power projection provides strategic reach enabled by Army sustainment operations.⁵² The Army projects power from installations supported by Logistics Readiness Centers and Medical Command that deploy high priority active component brigades or larger strategically and/or mobilize and deploy high priority reserve component units and their equipment to air- and sea- ports of embarkation for strategic movement. Installation resourcing is one of the primary means required in the balancing of strategic ends, ways, and means to project power.⁵³ Installation responsibilities include training, provisioning, and deploying a tactical unit as well as acting as a CONUS support base. They facilitate the movement of forces to and from ports using rail and highways. Rail provides the critical capability required to move Army equipment, especially tanks and outsized equipment, while minimizing congestion along the nation's highways.

4-4. Deployment and redeployment

a. Future Army forces operating as part of joint teams will conduct expeditionary maneuver through rapid deployment and transition to operations.⁵⁴ Army forces rapidly deploy to a theater of operations, overcoming anti-access and area denial challenges and lack of strategic access through other nation states by establishing and using intermediate staging bases where required. The Army further develops force projection capabilities that mitigate the need for lengthy and deliberate RSOI operations.⁵⁵ Close coordination between the joint and Army theater staff ensure that personnel flow matches the arrival of materiel into theater and that accountability is

maintained. Recent conflicts highlight strategic lift capability and capacity limitations, which is not expected to change significantly in the future. The Army continues to partner with the transportation industry to augment lift capability when required. The future Army maximizes available lift utilization through improvements in packaging, weight and cube reductions, and improved deployment planning.

b. The Army deploys combat configured units to transition rapidly to operations and shorten RSOI requirements. Combat configured units' requirements for increased strategic airlift due to volume, weight, and hazardous material restrictions must be weighed against the relative advantages of speed and force protection. Although deploying combat configured units potentially reduces time required for RSOI, it will still be essential for all expeditionary operations. Sustainment force packages will be mission configured to support combat configured units, however, these mission configured loads will require additional strategic airlift with increased reception and staging time.

c. The future Army conducts terminal operations and theater reception to enable deployment and redeployment. This includes the Army's contribution to joint logistics over the shore operations, particularly for operations in the Asia-Pacific region, to assist in overcoming austere locations and facilities.

4-5. Set the theater

a. The Army develops, maintains, and operates the theater sustainment architecture to establish and maintain the conditions necessary to retain joint force freedom of action.⁵⁶ Sustainment forces establish the theater architecture using multiple lines of communication including roads, railways, waterways, and air to move supplies, materiel, and equipment in order to establish and reinforce units in their forward areas of operation. The more formidable the enemy, the more robust the sustainment architecture must be; both in homeland and in theaters of operation. Along with strategic sea- and air- lift, APS provides the JFC prompt access to theater stocks for major combat operations, enables rapid response to humanitarian crises, and allows engagement with partners and allies. All capabilities required to deploy, receive, and sustain the force in the first rotation should be capable (without constraint) of meeting strategic guidance.

b. Future Army forces centralize coordination and employ expanded mutual support arrangements to facilitate smooth, timely, responsive, and effective early entry sustainment operations. This includes negotiation of host nation support and agreements relating to border crossings, customs and duty fees, medical support, engineering, operational contract support, movement control, provision of common user logistics supplies, such as bulk petroleum, and financial management including banking support, cash management, U.S. currency support, military operations, and liaison with host nation banking officials to strengthen local financial institutions.

c. While all services have some capability for theater opening, the Army provides much of the capability within the Joint Force. Army forces deploy some of this capability from outside the region while Army logistics, transportation, contracting, and financial management experts manage, coordinate, and conduct contract-related activities as soon as conditions permit. Human

resource professionals provide personnel accountability and facilitate casualty reporting. Army sustainment forces employ rapid theater opening capabilities including early entry petroleum, ammunition, movement control, contracting, personnel accountability, and casualty reporting capabilities that enable specific missions, such as intermediate staging on both land and at sea, which must meet strategic notice to move guidance.⁵⁷

4-6. Sustain the force

a. Army sustainment forces provide agile and flexible support to all missions across the ROMO to include cross-domain maneuver, semi-independent operations, and integrated security operations. Sustainment forces enable Army operations by providing endurance, which is essential to retaining and exploiting the initiative. The Army improves the BCTs endurance to operate semi-independently for ample duration.⁵⁸ The BCT enhances organic sustainment capability to operate with greater endurance and range using supporting sustainment capabilities at echelon. Future sustainment forces task organize dynamically to supplement BCT sustainment capability to meet mission specific endurance requirements. Future sustainment forces provide the necessary support and services, including Army support to other services, to sustain operations in sufficient scale and for ample duration for JFCs to achieve objectives. Sustainment forces do the following:

(1) Conduct logistics to move and support the force. This includes those aspects of military operations that conduct: design and development, acquisition, storage, movement, distribution, maintenance, and disposition of materiel; acquisition or construction, maintenance, operation, and disposition of facilities; and acquisition or furnishing of services. Logistics operations include OCS as a means to obtain supplies, services, and construction from commercial means.

(2) Provide personnel services to man and fund the force, maintain Soldier and family readiness, promote the moral and ethical values of the nation, and enable the fighting qualities of the Army.⁵⁹ Personnel services provide economic power at the operational and tactical levels and enable the planning and coordination of efforts that sustain personnel. Sustainment forces conduct financial operations including timely and accurate cost accounting, central funding, vendor and contract payments, banking services, military pay and entitlements, disbursing services, and banking services to ensure requirements are responsibly resourced.

(3) Provide health service support to promote, improve, conserve, or restore the mental and physical wellbeing of personnel in the Army and other services as directed, agencies, and organizations. Future Army medical forces provide combat casualty care from the point of injury through the continuum of care to improve medical outcomes for Soldiers in the future OE against all threats, especially when operating outside the range of medical evacuation coverage. BCTs operate with enhanced medical capability and provide medical care at the point of injury using advanced trauma and resuscitation skills combined with prolonged patient holding capabilities. The Army captures, processes, and disseminates near real-time medical information on the sustainment COP with appropriate access control for visibility of patient status during MDB and semi-independent operations. The Army evacuates casualties in multiple domains from the point of injury to an appropriate medical treatment facility while providing en route medical care.

b. Sustainment planners develop multiple options and identify risks to MDB execution. Future Army sustainment forces require the capability to task organize dynamically including combining, distributing, and recombining multifunctional capabilities to conduct decentralized, mission tailored sustainment operations to support semi-independent operations during MDB. Sustainment forces provide agile and flexible support through multifunctional logistics: supply, field services, maintenance, transportation, petroleum, and port and terminal operations. Other specialized sustainment capabilities also include aerial delivery, human resources, OCS, detention operations, financial management, band support, and legal services support operational requirements. Army chaplains provide religious support to joint, interorganizational, and multinational partners. They also advise commanders on complex religious issues, contributing significantly to engagement and influence activities to provide freedom of action and build partnerships. Army mortuary affairs provide joint expeditionary mortuary affairs capability to include the repatriation of all human remains.

c. Future Army forces require the capability to understand fully the international, national, and host nation authorities and caveats to include, formal and informal legal practices of the specific operating environment to execute legitimate operations, including rule of law and governance missions. Legitimacy is critical in gaining and maintaining international community and host nation support to enable access and freedom of movement and action. Future Army forces will require the ability to provide legal support in military justice, international and operational law, administrative and civil law, contract and fiscal law, legal assistance, and claims. Staff Judge Advocates promote justice and assist in maintaining good order and discipline in the force. Future Army forces require the capability to understand fully applicable international and operational law issues and the effect on MDB, including international agreements, U.S. and foreign law, and customs. Sustainment operations will also require specialized legal support to OCS.

d. Additionally, sustainment forces support initial military government establishment and subsequent civil authority, including restoring essential services, supporting governance and rule of law, and supporting economic and infrastructure growth according to JFC objectives.⁶⁰ Sustainment commanders maintain operational focus, set the tempo of operations to prevent exhaustion, and replace ineffective units to prolong endurance and extend operational reach.⁶¹ Future Army sustainment forces conduct in-theater reconstitution operations when required and prior to theater drawdown and closure.

4-7. Theater drawdown and closure

a. Theater closure begins with the termination of joint operations. Future Army forces drawdown and close the theater, redeploy joint forces and equipment, and remove or dispose of Army non-unit equipment and materiel. Sustainment forces transition materiel and facilities to host nation or civil authorities. Supported commanders optimize force movement and sustainment by configuring and redeploying integrated, modular, and scalable joint forces in a manner that will minimize requirements for time-intensive theater joint RSOI. Close coordination between the joint and Army theater staff ensures that personnel flow matches the departure of materiel out of theater while maintaining accountability. This expedites redeployment, retrograde, and reset of joint force capability.⁶²

b. The theater Army G-4, in coordination with the Theater Sustainment Command, U.S. Army Materiel Command, Office of The Surgeon General, and Medical Command, monitors equipment disposition and drawdown activities to ensure equipment is processed out of the theater properly, including establishing inspection programs to perform U.S. customs clearance. The Army redistributes specific equipment to CONUS, or moves it to another theater. Supporting contracting organizations and financial management units terminate and close out existing contracts, treasury and local accounts, and orders. The Surface Deployment and Distribution Command (SDDC) closes ports and U.S. Transportation Command (through SDDC) provides and manages strategic common user sealift and terminal services to support the JFC's drawdown or termination plan. The theater Army G-1 monitors personnel drawdown activities to ensure the Army meets force management levels.

Chapter 5

Conclusion

a. The future OE is ambiguous and complex with a diverse range of threats challenging the Army around the globe. Industry continues to lead sustainment development with social, business, financial, and technology solutions that the Army must develop to sustain MDB and dispersed land forces conducting semi-independent operations. As the Army becomes more expeditionary, regionally aligned, and globally responsive, sustainment forces must adapt to sustain MDB in sufficient scale, for ample duration, with joint, interorganizational, and multinational partners, to achieve JFC objectives. This concept proposes that the Army develops a scalable, global sustainment architecture consisting of multiple routes, multiple modes, multiple nodes, and multiple suppliers that provide multiple options to the supported commander, and presents multiple dilemmas to threats. The sustainment COP using an improved Army information network, supports sustainment decision making at every echelon.

b. Future Army sustainment forces produce adaptive and innovative sustainment leaders and Soldiers capable of conducting operations in complex environments with constrained resources applied to priority tasks. Sustainment leaders exercise mission command to empower leaders at lower echelons to take disciplined initiative. Sustainment forces form joint, interorganizational, and multinational teams to support shaping operations, conduct force generation and readiness, mobilize and deploy the force, set and expand the theater rapidly, sustain high tempo operations, and conduct theater drawdown and closure. The Army integrates tactical, operational, and strategic sustainment operations to provide the foundational support framework to the force that provides multiple options to the JFC. Army sustainment forces remain the backbone of not only the Army, but also the Joint Force's operational reach to conduct military operations to prevent, shape, and win.

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TP 350-70-1
Training Development in Support of the Operational Domain

TP 525-2-1
The U.S. Army Functional Concept for Intelligence

TP 525-3-4
The U.S. Army Functional Concept for Fires

TP 525-3-5

The U.S. Army Functional Concept for Maneuver Support

TP 525-3-6

The U.S. Army Functional Concept for Movement and Maneuver

TP 525-3-7

The U.S. Army Human Dimension Concept

TP 525-8-2

The Army Learning Concept Training and Education

TRADOC Regulation 700-90

Army Industrial Base Process

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Appendix B Required Capabilities

B-1. Introduction

This appendix reflects required capabilities (RCs) both inherited and those generated from the components of the solution in this concept.

B-2. Linking Army Operating Concept (AOC) RCs to sustainment

a. The AOC describes 20 required capabilities, derived from the AWFCs, which are enduring first order problems, the solutions to which improve the combat effectiveness of the current and future force.⁶³ Army sustainment provides support and services to generate Army capability from homeland institutions to the theater.

b. Each AOC required capability is listed below, followed by a description of the sustainment contribution to overcoming each challenge.

(1) Develop and sustain a high degree of situational understanding while operating in complex environments against determined, adaptive enemy organizations. Sustainment forces simultaneously contribute to and require situational understanding. Sustainment forces observe and interact with adversaries and the operational environment in both physical and cyberspace domains. This interaction generates information required by the intelligence enterprise including threat activity, route conditions, infrastructure status, civilian population disposition, governance performance, and partner capabilities. Successful sustainment operations in any operational environment demands timely and effective decisions based upon available information to make sound judgments. Sustainment commanders and staffs seek knowledge to build and maintain situational understanding, a clear understanding of the force's current state with relation to the threat and relevant aspects of the operational environment, throughout the operational process and across the ROMO.

(2) Shape and influence security environments, engage key actors, and consolidate gains to achieve sustainable security outcomes. Army sustainment forces assist in shaping the security environment through security cooperation activities that enable global combatant commanders to assure partners and deter adversaries. These operations establish trust, foster mutual understanding, assist partners build capacity, and ensure access when required for operations. Sustainment forces contribute to military-to-military and military-government engagements, SFA, security assistance, and exercises through a wide range of support capabilities and service options, which is critical to shaping the security environment.

(3) Provide SFA to support policy goals and increase local, regional, and host nation security force capability, capacity, and effectiveness. Army sustainment forces conduct and support SFA missions. Army forces exert influence to convince those partners that undertaking necessary reforms and strengthening critical institutions are in their interest. Influence is a fundamental campaign design component that enables success and achieves favorable outcomes in the shortest time.⁶⁴ Sustainment forces conduct missions that contribute to MDB to support the development of sustainment capability and capacity of foreign security forces and supporting institutions. All Joint Force elements conducting SFA require sustainment for the duration of the mission from tactical to strategic support and services including combined operations, exercises, education, information sharing, and foreign military sales across the ROMO.

(4) Maintain an agile institutional Army that ensures combat effectiveness, supports other services, fulfills DOD and other government agencies' requirements, ensures quality of life for Soldiers and Families, and possesses the capability to surge (mobilize) or expand (strategic reserve) the active Army. Sustainment forces, as part of the institutional Army, must revolutionize the capability development and delivery processes across DOTMLPF-P activities to create the flexibility and agility required to build a force that can overcome the challenges of the future OE. Sustainment force modernization must develop a rapid, effective, and fiscally responsible path from concepts to capability solutions across the portfolio to deliver technology within an appropriate timeframe to ensure overmatch. This process must critically consider sustainment capability in the USAR and ARNG from a readiness and deployment perspective that optimizes performance of the Army through a force mix to accentuate relative strengths and mitigate weaknesses.⁶⁵ Sustainment forces require leaders and Soldiers that are tactically and technically proficient; regionally and culturally aware, in the context of MDB with operational partners to adapt force modernization and the institutional Army.

(5) Prevent, reduce, eliminate, and mitigate the use and effects of WMD and chemical, biological, radiological, nuclear, and high yield explosives (CBRNE) threats and hazards on friendly forces and civilian populations. Army sustainment forces provide support and services to Army forces that prepare for, prevent the acquisition or employment of, protect from the use of, and when necessary respond to, and recover from adversary employment of WMD. Sustainment forces execute CBRNE defense by implementing CBRNE passive defense measures on order. CBRNE consequence management operations support joint, interorganizational, and multinational partners to mitigate the consequences from WMD employment to save lives and minimize human suffering through health service support and support and services provisions.

(6) Conduct homeland operations to defend the Nation against emerging threats. Army sustainment provides support and services to forces operating in the forward regions, the approaches, and the homeland. Sustainment forces also mitigate the impact of attacks or disasters in the homeland through anticipation, disposition of supplies, and rapid response. The Army coordinates with joint, interorganizational, and multinational partners to protect homeland sustainment infrastructure, including the industrial base, depots, ports, routes, lines of communication, cyberspace assets, and forces. Army sustainment forces support civil authorities and the homeland population to save lives and minimize human suffering through health service support and provision of support and services.

(7) Assure uninterrupted access to critical communications and information links (satellite communications; position, navigation, timing; intelligence, surveillance, and reconnaissance) when operating in a contested, congested, and competitive environment. Future sustainment forces have uninterrupted access to critical communications and information links across a multi-domain architecture when operating in a contested, congested, and competitive operating environment to ensure access to mission command information systems and sustainment information systems that form the sustainment COP. Future Army forces protect sustainment information and communications systems from cyberspace threats including electronic attack to ensure high availability of sustainment decision support tools.

(8) Train Soldiers and leaders to ensure they are prepared to accomplish the mission across the ROMO while operating in complex environments against determined, adaptive enemy organizations. Army sustainment forces develop adaptive and innovative leaders and Soldiers in a holistic training environment that uses a mix of live and synthetic methods to replicate OE conditions effectively, while improving unit training management and readiness reporting. Future army sustainment forces use integrated and exportable individual and collective training support materials, information, and enablers to conduct tough, realistic individual and multi-level collective force-on-force training, with the institutional agility to assess and adapt.

(9) Develop resilient Soldiers, adaptive leaders, and cohesive teams committed to the Army professional ethics that are capable of accomplishing the mission in environments of uncertainty and persistent danger. Future leader development and training provides resilient Soldiers, adaptive leaders, and cohesive teams committed to the Army professional ethics that are capable of accomplishing the mission in environments of uncertainty and persistent danger. Sustainment forces use enhanced capabilities derived from cognitive, social, and physical skills and attributes

of its Soldiers, leaders, and teams to improve and optimize performance. An improved human capital management system assesses, integrates, and synchronizes activities across DOTMLPF-P.

(10) Develop agile, adaptive, and innovative leaders who thrive in conditions of uncertainty and chaos, and are capable of visualizing, describing, directing, leading, and assessing operations in complex environments and against adaptive enemies. Army sustainment forces develop agile, adaptive, and innovative leaders who thrive in conditions of uncertainty and chaos and are capable of visualizing, describing, directing, leading, and assessing operations in complex environments and against adaptive enemies. Sustainment leaders at all levels possess the capabilities necessary to work effectively within culturally diverse environments, make decisions, adapt readily, and respond appropriately in complex and dynamic situations.

(11) Conduct effective air-ground combined arms reconnaissance to develop the situation in close contact with the enemy and civilian populations. Future sustainment forces sustain continuous reconnaissance operations in close contact with the enemy and civilian populations by providing direct support and services; sustainment forces have protection and survivability platforms and capabilities commensurate with the supported force. Well-forward and dispersed sustainment nodes connect to echelon above brigade sustainment capabilities through the sustainment COP and a multimode theater distribution system that enables commanders to predict requirements and provide agile support. Synchronized air-land-maritime sustainment operations provide effective use of scarce resources and optimize the sustainment footprint. Sustainment forces access fires, route clearance, intelligence, surveillance, and reconnaissance, and other capabilities to enable uninterrupted sustainment flow. Sustainment forces provide health service support to conventional and special operations forces.

(12) Project forces, conduct forcible and early entry, and transition rapidly to offensive operations to ensure access and seize the initiative. Sustainment forces support rapid, scalable force projection for forcible and early entry from force generation, readiness, mobilization, deployment, and setting the theater. Sustainment forces enable rapid transition to offensive operations through minimal but effective RSOI including access to appropriately configured APS. Army sustainment forces must maintain the capability to support expeditionary maneuver to austere locations through theater opening capabilities and prepare to expand the lodgment through theater sustainment framework development. Sustainment forces conduct multimode distribution operations to support mobile early entry forces using combinations of manned and unmanned aerial delivery, aerial resupply, ground resupply, maritime resupply, host nation, and contracted support when available.

(13) Establish and maintain security across wide areas (wide area security) to protect forces, populations, infrastructure, and activities necessary to shape security environments, consolidate gains, and set conditions for achieving policy goals. Army sustainment supports forces distributed across wide areas conducting security operations through unit and echelon sustainment with joint, interorganizational, and multinational partners. Army sustainment forces must support the establishment of civil authority (including conducting SFA), support establishment of civil control, restoration of essential services, and support governance, rule of law, economic, and infrastructure growth. Future sustainment forces maintain mobile and static sustainment nodes security,

including route coordination and synchronization security with the battlespace owner and other maneuver support and protection forces.

(14) Integrate joint, interorganizational, and multinational partner capabilities and campaigns to ensure unity of effort and accomplish missions across the ROMO. Future Army sustainment forces integrate joint, interorganizational, and multinational partner capabilities into sustainment operations to ensure unity of effort and effective MDB sustainment across the ROMO. This integration covers tactical interoperability of sustainment systems and procedures, collaborative operational sustainment planning using the sustainment COP, visibility of partner strategic readiness, and the surge capability of the industrial base.

(15) Conduct combined arms air-ground maneuver to defeat enemy organizations and accomplish missions in complex operational environments. Army sustainment forces support combined arms air-ground maneuver to defeat hybrid enemies and accomplish missions in the future OE. Army conducts precise and responsive sustainment operations through unit and echelon sustainment nodes with joint, interorganizational, and multinational partners to ensure uninterrupted support and services.

(16) Set the theater, provide strategic agility to the joint force, and maintain freedom of movement and action during sustained and high tempo operations at the end of extended lines of communication in austere environments. Army sustainment forces establish the theater framework using multiple lines of communication including roads, railways, waterways and the air to move supplies, materiel, and equipment to establish and reinforce units in their forward operation areas. All capabilities required to deploy, receive, and sustain the force in the first rotation should be capable (without constraint) of meeting strategic guidance.

(17) Coordinate and integrate Army and joint, interorganizational, and multinational fires and conduct targeting across all domains to defeat the enemy and preserve freedom of maneuver and action across the ROMO. Sustainment forces and infrastructure occupy battle space and provide input into coordination of fires to avoid fratricide and degradation of sustainment capability and capacity. Future sustainment forces operate air and ground unmanned aerial systems, which require additional coordination of ground routes and airspace.

(18) Deliver fires to defeat the enemy and preserve freedom of maneuver and action across the ROMO. Sustainment forces access fires including illumination and obscuration to prevent enemy and adversary interdiction and disruption of static and mobile sustainment operations. Static sustainment operations require early warning and protection from indirect fire. Sustainment forces provide support and services to fires units including Class V to support delivery of fires. Future improvements in the reduction of packaging, storage, handling, distribution requirements, and improvement of overall safety of Class V contribute to demand reduction and optimizing the sustainment footprint. Sustainment forces respond to ammunition and explosive incidents; safely handle munitions in the supply chain; and identify, diagnose, evaluate, render safe, recover and dispose of unexploded explosive ordnance. Future sustainment forces use camouflage and deception along with a low electromagnetic signature to avoid enemy fires and counter fires.

(19) Understand, visualize, describe, direct, lead, and assess operations consistent with the philosophy of mission command to seize the initiative over the adversary and accomplish the mission across the ROMO. Mission command is a philosophy based on trust and empowerment, and a warfighting function with an enabling system. Sustainment leaders and Soldiers must live the mission command philosophy in both their tactical and technical execution of sustainment operations. The Army implements mission command through the continuum of education, training, exercises, and operations from the individual and team level through senior leadership at the organizational level. Sustainment commanders exercise mission command with decision support from the sustainment COP by integrating mission command and sustainment information systems. Future sustainment organizations organize to employ the mission command system to integrate and synchronize sustainment with all other warfighting functions during MDB.

(20) Design Army formations capable of deploying rapidly and operating to achieve missions across the ROMO. Army sustainment forces are capable of deploying rapidly and operating to achieve missions across the ROMO. The Army focuses on optimizing reliability, availability, and maintainability factors during materiel development to reduce demand and overall lifecycle sustainment requirements while developing rapid technology insertion and innovation. Sustainment planners design units that possess sufficient capability to meet enduring and statutory requirements including contingency mission demands. Statutory and enduring requirements include Army support to other services, theater-level logistics, human resources, and maintenance support; and Title 10 U.S. Code requirements such as organizing, training, and equipping the force. Sustainment forces continue to provide a range of services including financial management, health service support, legal, chaplain, and band to meet Army requirements. Sustainment forces retain the capacity necessary to sustain readiness and provide depth and endurance to accomplish missions in support of national objectives; build or expand innovative capabilities to seize opportunities and defeat emerging threats; retain organizations and capabilities that are the most difficult to train and regenerate; and enable integration with joint, interorganizational, and multinational partners.

B-3. Sustainment functional RCs

a. Future Army sustainment forces require adaptive and innovative leaders and Soldiers who thrive in conditions of uncertainty, are tactically and technically proficient in sustainment operations, and can plan, manage, and execute support to MDB (AFC-S 3-5.a; AOC B-2.a.(4), (8), (9), (10), and (16); and ACC B-6.c).

b. Future Army forces require the capability to produce supplies at the point of need to extend operational reach, prolong endurance, and sustain MDB (AFC-S 3-5.d.(2); AOC B-2.a.(12), (13), (15), and (16); ACC B-6.b., and B-6.e.; and JCL-GIL-23).

c. Future Army forces require the capability to conduct precision supply operations to extend operational reach and prolong endurance of MDB (AFC-S 3-4.a.(4), 3-5.d.(2), and 4-6.a.(1); AOC B-2.a.(11-16); and ACC B-6.b, and B-6.c).

d. Future Army forces require a functional sustainment component of a tailorable common operating picture which enables decision support, sustainment planning, management, and

execution of sustainment operations from the strategic to tactical levels (AFC-S 3-5.b.; AFC for Mission Command (AFC-MC) B-2.a. and B-2.e.; AOC B-2.a.(1), (7), (16) and (19); ACC B-6.b., and B-6.c.; and JCL-GIL-03, 04, 05, 06, 07, and 08).

e. Future Army forces require the capability to monitor and protect the integrity of sustainment information using cyberspace operations to enable MDB (AFC-S 3-5.c.(1); AOC B-2.a.(1), (7), (16) and (19); and ACC B-6.c).

f. Future Army forces require enhanced medical capability at the point of injury with advanced trauma and resuscitation and prolonged patient holding forward to support MDB and semi-independent operations (AFC-S 4-6.a(3); AFC for Movement and Maneuver (AFC-MM) 3-6.f.(5); AOC B-2.a.(12), (14), and (16); and MDB p.12).

g. The future Army requires the capability to sustain multiple BCTs for up to 7 days without periodic resupply to support semi-independent operations (AFC-S 4-6; AFC-MM 3-4.g.; AOC B-2.a.(16) and (19)).

h. Future Army sustainment forces require the capability and capacity to support rapid mobilization, deployment of combat configured forces, and entry operations from multiple locations into austere, complex environments to sustain MDB (AFC-S 3-5.f. and 4-4; AOC B-2.a.(1), (2), (4), (12), (14), and (16); ACC B-6.a.; JOAC RC-013 and 024; JCL-GIL-01, 02, 11, 12, 13 and 14; and MDB p.12).

i. Future Army forces require the capability to conduct OCS activities at all echelons down to BCT to provide prompt and sustained commercial support to MDB and semi-independent BCT operations (AFC-S 3-5.i.(2); AOC B-2.a.(2), (3), (4), (14), and (16); ACC B-6.b. and B-6.d.; and JCL-GIL-21).

j. Future Army forces require the capability to rapidly open theaters of operations and establish the theater sustainment framework across the ROMO to support MDB (AFC-S 4-5, AOC B-2.a.(12), (14), and (16); ACC B-6.a., and B-6.b.; JCL-GIL-15, 16, 17, and 18; and MDB p.8).

k. Future Army sustainment forces require the capability to conduct multimode distribution in all domains with manned and unmanned systems for delivery of supplies and personnel to all echelons to sustain MDB (AFC-S 4-6.b.; AOC B-2.a.(1), (5), (15), and (16); ACC B-6.b., and B-6.d.; JCL-GIL-23; and MDB p.12)

l. Future Army EOD forces require the capability to deploy a scalable, expeditionary force in support of conventional and special operations to detect, locate, access, identify, diagnose, render safe / neutralize, recover, exploit, and dispose of explosives, ordnance and weapon systems to include improvised explosive devices, and WMDs to support MDB in theaters of operation and in the homeland (AFC-S 3-5.h.(2); AOC B-2.a.(5), (6), (13), and (16); and ACC B-6.b.).

m. Future Army EOD forces require a capability that provides an integrated means for mission command of Army, Joint, interorganizational and multinational forces with the ability to process, exploit, develop, and disseminate weapons technical intelligence to facilitate situational

understanding of the operational environment, force protection, and maneuver to support MDB (AFC-S 3-3.; AOC B-2.a.(1), (6), (14), (16), and (18)).

n. Future Army forces require the capability to provide expeditionary mortuary affairs including repatriation of contaminated human remains to sustain MDB (AFC-S 4-6.b.; AOC B-2.a.(6), (14), and (16); and ACC B-6.d.)

o. Future Army forces require an expeditionary Army health service support capability to provide combat casualty care from the point of injury through the continuum of care to improve medical outcomes for Soldiers during MDB (AFC-S 4-6.a.(3); AOC B-2.a.(5), (12), (14), and (16); and ACC B-6.b.).

p. Future Army forces require the capability to capture, process, and disseminate real-time medical information from the point of injury through the continuum of care to improve visibility of patient status during MDB (AFC-S 4-6.a.(3); AOC B-2.a.(1) and (16); and ACC B-6.b.).

q. Future Army forces require an integrated capability to accurately assess, predict, and improve Soldier health, fitness, and readiness to optimize human performance and fill manpower requirements to support MDB (AFC-S 3-5.a.(1), and 2-3; AOC B-2.a.(9), and (16); and ACC B-6.b.).

r. Future Army forces require a viable and innovative industrial base that can produce materiel, supplies, and services with the capacity to surge when required to sustain MDB (AFC-S 3-5.i., AOC B-2.a.(1), (4), (6), (14), and (16); ACC B-6.a, and B-6.e.)

s. Future Army forces require the capability to incorporate and coordinate JLEnt providers into sustainment plans and operations including training, supplies, services, and sustainment information to sustain MDB (AFC-S 3-4.b., and 3-5.g.(2); AFC-MC B-2.b.; AOC B-2.a.(1), (4), (8), (14), and (16); ACC B-6.b., and B-6.d.; JCL-GIL-22, and 24).

t. Future Army forces require the capability to diagnose and resolve equipment faults rapidly, perform recovery at the point of failure, and for materiel systems to monitor and report condition autonomously through integration with the sustainment common operating picture to achieve and maintain high operational readiness during MDB (AFC-S 3-5.c.(1), AOC B-2.a.(16); ACC B-6.b., B-6.c., and B-6.e.; and JCL-GIL-05).

u. Future Army forces require the capability to produce and manage operational energy through the use of energy efficient, renewable, and intelligent power management technologies in the context of expeditionary and base camp operations to prolong endurance and sustain MDB (AFC-S 3-5.d.; AOC B-2.a.(16); ACC B-6.b, and B-6.c; and JCL-GIL-23).

v. Future Army sustainment forces (excluding medical and chaplain) require the capability to provide security through increased organic lethality and advanced self-protection of sustainment platforms to include detecting and mitigating threats to sustain MDB (AFC-S 3-4.c., and 3-5.h.; AFC-MM 3-6.f.(2); AFC for Maneuver Support (AFC-MS) 3-5.c.(1); AOC B-2.a.(1), (4), (13), and (16); ACC B-6.b.; and JCL-GIL-20).

w. Future Army forces require the capability to provide religious, moral, and ethical advisement and religious support to joint, interorganizational, and multinational partners during MDB to provide freedom of action and build partnerships (AFC-S 4-6.b; AOC B-2.a.(3), (9), and (16); and ACC B-6.b).

x. Future Army forces require the capability to integrate conventional and special operations sustainment to rapidly support special operations and activities to provide effective sustainment of MDB (AFC-S 3-5.g.(4), and 4-2; AOC B-2.a.(14), (15), and (16); ACC B-6.b., and B-6.c.).

y. Future Army sustainment forces require the capability to task organize dynamically including combine, distribute, and recombine multi-functional capabilities, and conduct decentralized, mission tailored sustainment operations to support semi-independent operations during MDB (AFC-S 4-6.b.; AOC B-2.a.(15) and (16); ACC B-6.c.; and JCL-GIL-10 and 19).

z. Future Army forces require the capability to provide financial management support, using integrated systems, during joint combined arms operations to ensure commander's requirements are responsibly resourced and accounted for to support MDB and home station operations (AFC-S 3-5.b.(3), and 4-6.a.(2); AOC B-2.a.(1), (3), (4), (14), and (16); and ACC B-6.b).

aa. Future Army forces require the capability to provide human resources support, with integrated systems, to man and account for the force to support MDB and home station operations (AFC-S 3-5.b.(3); AOC B-2.a.(1), (14), and (16); ACC B-6.b., and B-6.c.).

bb. Future Army forces require the capability to provide legal support to commanders, Soldiers, Army civilians, and families to enable freedom of movement and action to support MDB and home station operations (AFC-S 4-6.a.(4), AOC B-2.a.(4), (6), (14), (16), (17), and (18); and ACC B-6.b.).

cc. Future Army forces require the capability to conduct force health protection to protect the force from health hazards across the ROMO (Linkage to FEB 2016. v0.9 DRAFT AFC-MS).

Appendix C

Science and Technology

C-1. Sustainment application of technology

a. The U.S. Army, with DOD, national research and development communities, industry, academia, and international partners uses science and technology to identify and develop advancements in current and future capabilities to overmatch adversaries. The AOC identifies technology focus areas that have direct application to sustainment functions including logistics optimization, human performance optimization, information-to-decision, medical sciences, and autonomy-enabled systems.⁶⁶ Ongoing sustainment science and technology efforts have led to the development of key sustainment science and technology focus areas to meet demand at the point of need and automate Soldier tasks. The objective is to change the force fundamentally by providing optimized capabilities to support MDB.

C-2. Sustainment science and technology focus areas to support logistics optimization

a. Autonomous aerial resupply. Future sustainment forces use autonomous aerial resupply vehicles and unmanned platforms designed to conduct distribution operations. Cargo unmanned aerial systems provide capabilities to move containerized and packaged loads autonomously between sustainment nodes including delivery to forward areas. Systems integrate into the sustainment COP and allow enroute mission changes. This technology enables increased resupply throughput, reduced reliance on manned rotary wing support, and more effective sustainment support. This technology supports autonomy-enabled systems, enhanced visibility and improved precision, information to decision, reduced demand characteristics, optimized sustainment footprint, mission command, improved personnel protection, and improved asset survivability.

b. Autonomous ground resupply. Future sustainment forces use autonomous ground resupply vehicles and unmanned platforms designed to conduct distribution operations. Driver assist and leader-follower capabilities use sensors, computers and decision support tools to manage several vehicle attributes, including speed, convoy interval, obstacle avoidance, near zero visibility operations, and threat mitigation. Systems integrate into the sustainment COP and allow enroute mission changes. This technology enables increased resupply throughput, reduces number of required drivers, increases force protection by reducing risk to Soldiers, and provides more effective sustainment support. This technology supports autonomy-enabled systems, human performance optimization, enhanced visibility, improved precision, reduced demand characteristics, optimized sustainment footprint, enabled mission command, improved personnel protection, and improved asset survivability.

c. Alternative sources of water. Alternative sources of water include technologies that reduce demand for water through point of need water production, reuse, and efficiencies. Future sustainment forces use water from air technology to provide mobile and dispersed water production as far forward as required while mitigating risk associated with current tactical water purification systems. Trailer mounted systems produce potable water directly from the air to meet demand at the point of need to reduce transportation requirements and sustainment footprint while increasing expeditionary sustainment capability. This technology supports reduced demand characteristics, optimized sustainment footprint, improved personnel protection, and improved asset survivability.

d. Additive manufacturing (AM). AM is a process used to make objects from digital models. AM produces items out of various materials, such as metals, plastics, and ceramics, and by different means, such as 3D printing and cold spray technology. 3D printing uses an additive process where successive slices of a material are layered and bonded to form a simple or complex solid object, in different shapes and sizes. Cold spray involves introducing a heated high-pressure gas together with particles of a metal, ceramic and/or polymer into a gun designed for the particles to exit at supersonic velocities and consolidate upon impact on a suitable surface to form a coating or free-standing structure. AM is currently being used in the medical community and further AM development can enhance future medical sciences. Future sustainment forces use AM processes in the homeland and operational areas to meet demand at the point of need with reduced delivery times, distribution requirements, Army stockage list requirements, and sustainment footprint. This technology supports improved personnel protection and asset visibility.

e. Advanced power generation. Future sustainment forces use advanced power generation that provides greater energy output with increased fuel efficiency. Combining fuel cells with intelligent power management and distribution systems deliver reductions in operational energy demands through a combination of hardware and software upgrades that optimizes electrical power production, distribution, and use. Advanced power generation enables expeditionary sustainment to forces operating in remote areas, and allows for self-sufficient power generation capable of operating separate from existing power grids. Future fuel cells require minimal maintenance and provide a clean, continuous source of power while reducing convoy requirements and the logistics footprint associated with fuel distribution. This technology supports reduced demand characteristics, optimized sustainment footprint, improved personnel protection, and improved asset survivability.

f. Medical sciences. Advancements in medical sciences benefit not just Soldiers and the military, but the world as well. For example, innovations in prosthetics technology increase the quality of life for Soldiers and civilians, often returning them to pre-injury activity levels. Improved medical evacuation and treatment at the point of injury increase the number of 'golden hour' survivors to unprecedented levels. Research in preventive medicine moves the world towards cures for viruses previously untreatable. Traumatic brain injury is at the forefront of both military and civilian medical efforts, with both entities sharing research and technological discoveries. Continued investment in the medical sciences allows improved Soldier resiliency, quicker physical and mental healing, smoother integration back into society, and improved quality of life for the Soldier.

C-3. Sustainment research and development principles

- a. The following list of principles should be applied when researching future sustainment capabilities.
- b. Emphasize integration of technology with Soldiers and teams.
- c. Simplify systems and integrate Soldier training into design.
- d. Maximize reliability, availability, maintainability, and reduce life cycle cost.
- e. Design redundant systems that improve effectiveness under conditions of uncertainty.
- f. Develop systems that degrade gracefully.
- g. Maintain foundational knowledge to reduce the opportunity for surprise.
- h. Reduce total Army demand and meet more demand at the point of need.
- i. Anticipate enemy countermeasures.
- j. Ensure interoperability.

k. Consider scale and organizational implications.

l. Extend endurance.

Appendix D

Risk and Mitigation

D-1. Introduction

The risks and mitigation from appendix D in the AOC apply to the AFC-S.⁶⁷ The following additional and expanded risks apply.

D-2. Areas of risk and mitigation

a. Expeditionary sustainment. There is a risk that DOD will lack sufficient strategic lift necessary to project forces and effectively sustain MDB over long and contested lines of communications. This limited capacity also affects the speed at which forces can transition from deployment to cross-domain maneuver. Sustainment depends on Title 10 functions executed by joint partners to sustain operations.⁶⁸ The Army must improve the expeditionary quality of the force through fundamental demand reduction including the overall weight and size of the force while improving overall capability. The Army must maintain a viable OCS capability and a strong relationship with commercial providers of strategic lift to offset military strategic lift shortfalls.

b. Sustainment footprint. There is a risk that the concept of multiples will initially require greater force structure, resources, and DOTMLPF-P changes that will impact the sustainment footprint. Additionally, multiple options may require greater support from other warfighting functions for security, intelligence, fires, and other essential enablers. The sustainment footprint is largely demand driven. There is a risk that a reduced sustainment footprint will lack the capacity to support the future institutional Army and sustain MDB in sufficient scale and for the required duration unless the demand characteristics of the force are also reduced. Reductions in fuel and water storage, handling, and transportation requirements are essential to reducing the sustainment footprint. Many sustainment force occupational specialties require extended periods for force generation due to the training time required to develop qualified personnel. As acquired materiel systems become more complex, offsets in reliability and maintainability are required to avoid personnel growth. Implementation of advanced technologies, including automated systems and robotics not resident in the current force on a wide scale, will require particular attention to DOTMLPF-P products integrating innovative leaders, skilled Soldiers and trained teams for best application of the capability. OCS and reserve component capacity may mitigate some of this risk.

c. Sustainment COP. There is a risk that integration of mission command and sustainment information systems as part of the Army information network will not be technically feasible within the timeframe of this concept. When implemented, there is a risk that sustainment becomes too reliant on business intelligence from the COP and related decision support tools that sustainment operations pause when access is limited. Additionally, the sustainment COP and associated data may be vulnerable to cyberspace attack. The future Army must ensure that globally

robust communication and information architecture enable responsive sustainment operations. Sustainment forces must develop appropriate tactics, techniques, and procedures to conduct sustainment operations when access to mission command and sustainment information systems is degraded or denied. The Army must protect the sustainment COP from cyberspace threats to avoid disruption of sustainment operations.

d. Industrial base.⁶⁹ There is a risk that the industrial base will not support military requirements to develop and produce military adaptation in response to emerging threats and the changing OE within the technology lifecycle. The Army must foster an industrial base that maintains the resources, skills, maintenance, and manufacturing competencies necessary to sustain the life-cycle readiness of systems and materiel in a reliable and efficient manner and can surge to meet contingency operations demands. The Army must continue to develop strong relationships with industry during peacetime to be ready for times of conflict. Enhanced integration with the industrial base and OCS activities into the sustainment COP enables required visibility and effective materiel management to adapt to emerging threats.

Glossary

Section I

Abbreviations

ACC	Army Capstone Concept
ACF	Army Concept Framework
ADP	Army doctrine publication
ADRP	Army Doctrine Reference Publication
AFC	Army functional concept
AFC-S	Army Functional Concept for Sustainment
AFC-MC	Army Functional Concept for Mission Command
AFC-MM	Army Functional Concept for Movement and Maneuver
AFC-MS	Army Functional Concept for Maneuver Support
AM	additive manufacturing
AOC	Army Operating Concept
APS	Army pre-positioned stocks
ARNG	Army National Guard
AWFC	Army warfighting challenge
BCT	brigade combat team
CASCOM	Combined Arms Support Command
CBRNE	chemical, biological, radiological, nuclear, and high yield explosives
CONUS	continental United States
COP	common operating picture
DOD	Department of Defense
DOTMLPF-P	doctrine, organizations, training, materiel, leadership and education, personnel, facilities, and policy
GIL	globally integrated logistics
JCL	Joint Concept for Logistics

JFC	joint force commander
JLEnt	joint logistics enterprise
JOAC	Joint Operational Access Concept
JP	joint publication
MDB	multi-domain battle
OCS	operational contract support
OE	operational environment
RC	required capability
ROMO	range of military operations
RSOI	reception, staging, onward movement, and integration
SDDC	Surface Deployment and Distribution Command
SFA	security force assistance
TP	TRADOC Pamphlet
TRADOC	Training and Doctrine Command
U.S.	United States
USAR	United States Army Reserve
V2PI	visibility, velocity, precision, and integration
WMD	weapons of mass destruction

Section II

Terms

agility

Ability of friendly forces to react faster than the enemy.

anti-access

Actions and capabilities, usually long-range, designed to prevent an opposing force from entering an operational area (JOAC).

area denial

Actions and capabilities, usually of shorter range, designed to limit an opposing force's freedom of action within an operational area (JOAC).

capabilities development

Identifying, assessing, and documenting changes in DOTMLPF-P that collectively produce the force capabilities and attributes prescribed in approved concepts, concept of operations, or other authoritative sources.

collaborative planning

Commanders, subordinate commanders, staffs, and other partners sharing information, knowledge, perceptions, ideas, and concepts regardless of physical location throughout the planning process.

command and control

Exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission.

common operating environment

Computing technologies and standards that enable secure and interoperable applications to be developed and executed rapidly across a variety of computing environments.

common operational picture

Single display of relevant information within a commander's area of interest tailored to the user's requirements and based on common data and information shared by more than one command.

common-user logistics

Materiel or service support shared with or provided by two or more services, DOD agencies, or multinational partners to another Service, DOD agency, non-DOD agency, and/or multinational partner in an operation.

complex terrain

Geographic area consisting of an urban center larger than a village and/or of two or more types of restrictive terrain or environmental conditions occupying the same space.

cyber-electromagnetic activities

Activities leveraged to seize, retain, and exploit an advantage over adversaries and enemies in both cyberspace and the electromagnetic spectrum, while simultaneously denying and degrading adversary and enemy use of the same, and protecting the movement and maneuver system.

decentralized

Delegation of authority to subordinates which enables aggressive, independent, and disciplined initiative to develop the situation; seize, retain, and exploit the initiative; and cope with uncertainty to accomplish the mission within the commander's intent (TP 525-3-3).

direct support

Support relationship requiring a force to support another specific force and authorizing it to answer directly to the supported force's request for assistance.

force generation

Army rotational readiness model, which allows for a steady, predictable flow of ready forces to meet requirements across the spectrum of conflict.

force tailoring

Process of determining the right mix of forces and the sequence of their deployment to support a joint force commander.

human dimension

Cognitive, physical, and social components of Soldier, Army Civilian, leader, and organizational development and performance essential to raise, prepare, and employ the Army. (TP 525-3-7)

hybrid threat

Diverse and dynamic combination of regular forces, irregular forces, terrorist forces, and/or criminal elements unified to achieve mutually benefitting effects.

interdependence

Deliberate and mutual reliance by one force on another's inherent capabilities designed to provide complementary and reinforcing effects. (TP 525-3-0)

intergovernmental organization

Organization created by a formal agreement between two or more governments on a global, regional, or functional basis to protect and promote national interests shared by member states.

joint deployment and distribution enterprise

Complex of equipment, procedures, doctrine, leaders, technical connectivity, information, shared knowledge, organizations, facilities, training, and materiel necessary to conduct joint distribution operations. (JP 4-0)

joint information environment

Shared information technology infrastructure, enterprise services, and a single security architecture.

joint logistics enterprise

Multi-tiered matrix of key global logistics providers cooperatively engaged or structured to achieve a common purpose without jeopardizing the integrity of their own organizational missions and goals. (JP 1-02)

knowledge management

Process of enabling knowledge flow to enhance shared understanding, learning, and decision-making.

knowledge transfer

Movement of knowledge, including knowledge based on expertise or skilled judgment, from one person to another; how knowledge passes between individuals and groups.

land power

Ability—by threat, force, or occupation—to gain, sustain, and exploit control over land, resources, and people.

operational contract support

Process of planning for and obtaining supplies, services, and construction from commercial sources in support of joint operations. (JP 4-10)

operational energy

The energy required for training, moving, and sustaining military forces and weapons platforms for military operations. This term includes energy used by tactical power systems and generators, as well as by weapon platforms. (2016 DOD Operational Energy Strategy)

operational reach

Distance and duration across which a joint force can successfully employ military capabilities.

organic industrial base

Government-owned industrial capability and capacity available for manufacture, maintenance, modification, overhaul, and/or repair of items required by the U.S. and selected allies, including both the production and maintenance base.

regionally aligned forces

Forces that provide a combatant commander with up to JTF capable headquarters with scalable, tailorable capabilities to enable the combatant commander to shape the environment.; forces assigned to combatant commands, allocated to a combatant command, and Army capabilities distributed and prepared by the Army for combatant command regional missions.

seabasing

Deployment, assembly, command, projection, reconstitution, sustainment, and re-employment of joint power from the sea without reliance on land bases within the operational area. (JP 3-02)

security cooperation

DOD interactions with foreign defense establishments to build defense relationships that promote specific U.S. security interests, develop allied and friendly military capabilities for self-defense and multinational operations, and provide U.S. forces with peacetime and contingency access to a host nation.

shaping operation

Operation that establishes conditions for the decisive operation through the effects on the enemy, other actors, and the terrain.

situational understanding

Product of applying analysis and judgment to relevant information to determine the relationships among the operational and mission variables to facilitate decision making.

strategic environment

Set of global conditions, circumstances, and influences that affect the employment of all elements of national power, contains multiple potential OEs from a village to the entire globe.

survivability

Quality or capability of military forces which permits them to avoid or withstand hostile actions or environmental conditions while retaining the ability to fulfill their primary mission.

synchronization

Arrangement of military actions in time, space, and purpose to produce maximum relative combat power at a decisive place and time.

theater closing

Process of redeploying Army forces and equipment from a theater, the drawdown and removal or disposition of Army non-unit equipment and materiel, and the transition of materiel and facilities back to host nation or civil authorities.

partners

Military forces, governmental and nongovernmental organizations, and elements of the private sector with whom Army forces plan, coordinate, synchronize, and integrate during the conduct of operations.

Section III
Special Terms

Army information network

Army's portion of the DOD information networks. (TP 525-3-3)

big data

Broad term for advanced methods to extract value from data sets so large or complex that traditional data processing applications are inadequate.

business intelligence

Set of techniques and tools for the transformation of data into meaningful and useful information for analysis purposes.

expeditionary maneuver

Rapid deployment of task-organized combined arms forces able to transition quickly and conduct operations of sufficient scale and ample duration to achieve strategic objectives. (AOC)

influence

Change, affect, or alter attitudes or behavior.

integrated training environment

Linkage of selected training aids, devices, simulators, simulations, gaming technologies, infrastructure, mission command, and knowledge management systems, and a training framework to approximate the conditions of an operational environment for training and education for decisive action in any of its training domains: operational, institutional, and self-development.

internet of things

Network of physical objects or "things" embedded with electronics, software, sensors, and connectivity to enable it to achieve greater value and service by exchanging data with the manufacturer, operator, and/or other connected devices.

interorganizational

Elements of U.S. government agencies; state, territorial, local, and tribal agencies; foreign government agencies; intergovernmental, nongovernmental, and commercial organizations. (Does not include forces.) (AOC)

institutional Army

Army organizations whose primary mission is to generate and sustain the operating forces of the Army.

mission command philosophy

Leaders convey a clear intent and empower subordinates to take disciplined initiative.

mission command system

Responsive arrangement of people, the operations process, the Army information network, and command posts integrated and organized through knowledge management to facilitate the exercise of command. (TP 525-3-3)

multi-domain battle

Integration and synchronization of capabilities to create temporary windows of superiority across multiple domains and contested areas throughout the depth of the battlefield to seize, retain, and exploit the initiative; defeat enemies; and achieve military objectives

multiform collaboration

Sharing of thoughts and thought processes between superiors, subordinates, and peers in the form of sketching, highlighting, talking, listening and gesturing through voice and voice recognition, text, chat, data, video, white boarding, map boarding, messages, and shared applications.

near real time

Denoting or relating to a data-processing system that is slightly slower than real-time.

operational adaptability

Ability to shape conditions and respond effectively to changing threats and situations with appropriate, flexible, and timely actions.

optimizing human performance

Result of establishing cognitive dominance, executing realistic training, and driving institutional agility through education, training, leader development, talent management, holistic health and fitness, research and experimentation. (Human dimension white paper)

prudent risk

Deliberate exposure to potential injury or loss when the outcome in terms of mission accomplishment is judged as worth the cost.

semi-independent operations

Army units operating dispersed for extended periods without continuous or contiguous support from higher echelons with the ability to concentrate combat power rapidly at decisive points, and in spaces (domains) to achieve operational objectives.

set the theater

Actions taken to establish and maintain the conditions necessary to seize the initiative and retain freedom of action. (AOC 2014)

shared understanding

Collaboratively-developed and shared mental model of the operational environment, problems, and approaches to solving them.

sustainment value chain

Set of activities that sustainment forces perform to provide support and services.

Endnotes

¹ Force 2025 Maneuvers, p.2. AWFCs are the 20 enduring first order problems, the solutions to which improve the combat effectiveness of the current and future force. See AOC Appendix B, p. 31

² ADRP 4-0. p. 1-1.

³ ADP 3-0. p. 14.

⁴ ACC, p. 5, and AOC, p. 6. ACC. 2012. p. 5, and GRS. 2013. p. 8.

⁵ Force 2025.

⁶ ACC. 2012. p. 5, and GRS. 2013. p. 8.

⁷ ACC. 2012. p. 5. GRS 2013. p. 8.

⁸ AOC, p. 24.

⁹ GRS 2013. p.29. ASPG 2013.

¹⁰ GRS 2013. p. 21. CCJO 2012

¹¹ GRS 2013. p. 8.

¹² AOC. p. iv.

¹³ GRS 2013. p. 8.

¹⁴ AOC, p.20 and GRS 2013. p. 8.

¹⁵ AOC, p. iii., and AFC-MM p.32

¹⁶ Sustaining MDB WP p.5, and AFC-MM p.32

¹⁷ Sustaining MDB WP p.13

¹⁸ ACC, p. 12 and 25.

¹⁹ Force 2025.

²⁰ AOC, p. i.

²¹ MDB p.1

²² JOE2035 p.4

²³ AOC. p.10-12.

²⁴ MDB WP p.2

²⁵ MDB WP p.2

²⁶ HD WP 2014. p. iii.

²⁷ The Principles of sustainment are: integration, anticipation, responsiveness, simplicity, economy, survivability, continuity, and improvisation. See ADRP 4-0. p.1-2.

²⁸ TP 525-3-7.

²⁹ GRS 2013. p.23.

³⁰ ALDS 2013. p.7; CASCOM Sustainment Leader Development Implementation Plan (SLDIP), p. 3.

³¹ GRS 2013. p. 15.

³² TP 525-3-7-01.

³³ TP 525-3-7-01, 103. Joint Mobility Seminar, December 2008, Sustainment Battle Lab, p. 76. Modular Force Logistics Concept (MFLC), September 2006.

³⁴ GRS 2013. p. 15.

³⁵ GRS 2013. p. 15.

³⁶ AOC, p. iii.

³⁷ AFC-MC.

³⁸ GRS 2013. p. 19.

³⁹ DODI 4151.22

⁴⁰ The unit must be able to roll off of the ramp of a ship ready to fight. This requires that the ship is loaded to support the ground tactical plan; vehicles must be fully fueled, armed, supplied and be able to communicate. Mission configuration of platforms increases weight and cube, and hence the requirement for strategic lift.

⁴¹ Title 10 remains largely unchanged.

⁴² JCL v2.0, Foreword, p. i

⁴³ JCL v2.0, Solution, p. vi

⁴⁴ JCL p. 10.

⁴⁵ ARSOF Operating Concept 2022, p. 27.

⁴⁶ Army Organic Industrial Base strategic plan 2012-2022.

⁴⁷ The publication Sustaining U.S. Global Leadership: Priorities for 21st Century Defense, Jan 12, identifies 10 primary missions. Army Strategic Planning Guidance, 2013, has specified 11 primary missions. This paper will use 10 primary missions in order to keep consistency with strategic guidance.

⁴⁸ ASPG 2014. p. 7.

⁴⁹ ASPG 2014. p. 7.

⁵⁰ JOAC 2012. p. 19.

⁵¹ JP 5-0.

⁵² FM 4-95 (2014). p. 2-17.

⁵³ FM 4-95 (2014). p. 2-17.

- ⁵⁴ AOC, p. iii.
- ⁵⁵ GRS 2013, p. 18.
- ⁵⁶ AOC p. iv. and 23.
- ⁵⁷ GRS 2013, p. 17.
- ⁵⁸ AFC-MM p.23
- ⁵⁹ ADP 4-0.
- ⁶⁰ AOC para 2-2(c).
- ⁶¹ ADRP 4-0, p. 3.
- ⁶² JCL
- ⁶³ AOC B-2.
- ⁶⁴ AOC, p. 19.
- ⁶⁵ AOC, p. 35.
- ⁶⁶ AOC Appendix C-2, p. 36-40.
- ⁶⁷ AOC, D-2, p. 41-43.
- ⁶⁷ ACC 2012, p. 5, and GRS 2013. p. 8.
- ⁶⁸ AOC, p. 42.
- ⁶⁹ AOC, p. 42.