



The United States Army Functional Concept for Fires

2016-2028

13 October 2010



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Foreword

From the Director U.S. Army Capabilities Integration Center

The U.S. Army continues to answer the Nation's call, as it has since its inception over 235 years ago. As we look to the future, our Army faces a complex and uncertain operational environment that will challenge our Soldiers, leaders, and organizations in many ways. Future enemies are likely to emulate the adaptations of recent opponents while taking advantage of emerging technologies and growing instability to pursue their objectives and avoid what they perceive as U.S. military strengths. The challenges of future armed conflict make it an imperative for our Army to produce leaders and forces that exhibit a high degree of operational adaptability.

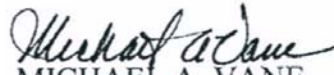
TRADOC Pam 525-3-4, *The United States Army Functional Concept for Fires 2016-2028*, builds upon the ideas presented in TRADOC Pam 525-3-0, the ACC and TRADOC Pam 525-3-1, the AOC. It expands the fires warfighting function to include indirect fires, air and missile defense, electronic attack, and joint fires as elements of the fires warfighting function. It emphasizes the need for operationally adaptable offensive and defensive fires and focuses on developing a versatile set of capabilities that future Army forces will employ with increased discrimination to defeat a wide range of threats in the future operational environment. In support of this approach, TRADOC Pam 525-3-4 serves as a foundation for future force development pertaining to fires and the fires warfighting function.

In addition to the warfighting challenges of the future, the Army also faces a number of institutional challenges. The rapid pace of technological change, prolonged acquisition timelines, and growing resource constraints make it necessary for the Army to adopt a more responsive approach to capabilities development. Accordingly, TRADOC is shifting from a 5-year to a 2-year cycle for concept development and revision. As a result, the Army Capabilities Integration Center will update and revise the entire Army Concept Framework every 2 years. This significant change will enable more effective input into the major budget and programming decisions across our Army.

Concepts lead change for the Army and drive the development and integration of future capabilities. They provide a framework for analysis, readiness assessments, prioritization, and feedback. In addition, they serve as a foundation to help the Army maximize effectiveness and minimize risk through both materiel and nonmateriel capability trades. Thus, they enable the Army to identify redundancies and determine which capabilities to pursue, both within and across its warfighting functions, with a better understanding of how such decisions will impact the overall combat effectiveness of the future force.

TRADOC Pam 525-3-4 makes an important contribution to realizing the broad vision outlined in both the ACC and AOC. As it describes, future Army forces will capitalize on rapid target identification, advanced engagement techniques, sensor fusion, and faster data exchange to employ operationally adaptable fires capabilities as part of future full-spectrum operations.

This concept also serves as a point of departure for wide-ranging discussions, wargames, and other experimentation. It represents a significant step forward in an ongoing campaign of learning and contributes directly to achieving greater institutional adaptation across our Army.



MICHAEL A. VANE

Lieutenant General, U.S. Army

Director, Army Capabilities

Integration Center

Department of the Army
Headquarters, United States Army
Training and Doctrine Command
Fort Monroe, VA 23651-1047

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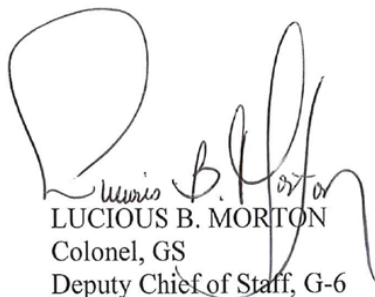
Military Operations

U.S. ARMY FUNCTIONAL CONCEPT FOR FIRES 2016-2028

FOR THE COMMANDER:

OFFICIAL:

JOHN E. STERLING, JR.
Lieutenant General, U.S. Army
Deputy Commanding General/
Chief of Staff



LUCIOUS B. MORTON
Colonel, GS
Deputy Chief of Staff, G-6

History. This pamphlet is a revision and replaces TRADOC Pam 525-3-4, *The Army Functional Concept for Strike 2015-2024*. The portions affected by this revision are listed in the summary of changes. This revision changes the conceptual and operating focus of Army fires from major combat operations to that of operational adaptability and fires for full-spectrum operations under conditions of uncertainty and complexity.

Summary. TRADOC Pam 525-3-4 describes the broad fires capabilities future Army forces will require in 2016-2028. It establishes the overarching fires solutions and required capabilities resources to enable the Army to overcome adaptive enemies and succeed in a wide range of contingencies. This concept will lead future fires force development and modernization efforts by establishing a common framework for fires capabilities in future full-spectrum operations.

Applicability. TRADOC Pam 525-3-4 is the foundation for future force fires development and the base for subsequent development of supporting concepts, concept capability plans, and the Joint Capabilities Integration and Development System process. It supports experimentation described in the Army Capabilities Integration Center (ARCIC) Campaign Plan and functions as the conceptual basis for developing solutions related to the future force within the doctrine, organization, training, materiel, leader development and education, personnel, and facilities (DOTMLPF) domains. This concept applies to all TRADOC, Department of the Army (DA), and Army Reserve component activities that develop DOTMLPF requirements.

This pamphlet supersedes TRADOC Pam 525-3-4, dated 30 April 2007.

Proponent and supplementation authority. The proponent of this pamphlet is the TRADOC Headquarters, Director, ARCIC. The proponent has the authority to approve exceptions or waivers to this pamphlet that are consistent with controlling law and regulations. Do not supplement this pamphlet without prior approval from Director, TRADOC ARCIC (ATFC-ED), 33 Ingalls Road, Fort Monroe, VA 23651-1061.

Suggested improvements. Users are invited to submit comments and suggested improvements via The Army Suggestion Program online at <https://armysuggestions.army.mil> (Army Knowledge Online account required) or via DA form 2028 (Recommended Changes to Publications and Blank Forms) to Director, TRADOC ARCIC (ATFC-ED), 20 Whistler Lane, Fort Monroe, Virginia 23651-1046. Suggested improvements may also be submitted using DA Form 1045 (Army Ideas for Excellence Program Proposal).

Summary of Change

TRADOC Pamphlet 525-3-4
Army Functional Concept for Fires, 2016-2028

This revision, dated 13 October 2010-

- o Renames the functional title from *Strike* to *Fires* and changes the applicable date to *2016-2028*.
 - o Incorporates air and missile defense in the Army fires warfighting function.
 - o Places uncertainty and complexity at the forefront of future full-spectrum operations.
 - o Updates or establishes definitions for specific terms.
 - o Places less emphasis on technology's ability to provide situational awareness and understanding.
 - o Places more emphasis on a wide range of conventional to precision capabilities, and less reliance on precision capabilities alone.
 - o Updates required capabilities.
 - o Reflects the replacement of the Army command and control warfighting function with mission command warfighting function.
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Chapter 1

Introduction

1-1. Purpose

TRADOC Pam 525-3-4, *The Army Functional Concept for Fires*, provides the overarching conceptual framework for fires in future full-spectrum operations across the spectrum of conflict. It expands on the fires contributions to ideas expressed in TRADOC Pam 525-3-0 (the ACC), and TRADOC Pam 525-3-1, (the AOC).

1-2. Background

a. Future adversaries and their capabilities, the future operational environment (OE), and future operations described in the ACC and the AOC, and joint concepts establish the context for employing fires capabilities in an environment characterized by complexity and uncertainty.

b. Future adversaries.

(1) Future enemies include state and nonstate adversaries. They will conduct irregular warfare to major combat operations, or combinations along the spectrum of conflict, including attacks against the Homeland. They will be adaptive, learning from both their operations and ours, and change their operational approach and methods.¹ They will seek to deny United States (U.S.) access to the joint operations area, negate U.S. technological superiority, and threaten U.S. and multinational forces and populations from multiple directions and domains.

(2) Future adversaries will utilize a wide range of capabilities to attempt to counter or interrupt U.S. advantages in communications, surveillance, long-range precision fires, armor protection, and mobility. These capabilities will vary from sophisticated technological means to simple means used in new, creative ways. Future adversaries will also employ rockets, mortars, longer range ballistic and cruise missiles, and unmanned aircraft systems (UAS) with advanced capabilities supported from space, enabling them to target U.S. and multinational forces and civilian population centers from greater ranges and with improved accuracy.

(3) Future adversaries will conduct operations in areas ranging from remote regions to urban areas. Adversaries will use complex terrain and protected places (operating from or near religious sites, cultural sites, hospitals, and others) to increase the operational challenges U.S. forces will face. They will operate among the populace, using them for support, cover, and concealment. Adversaries may be indistinguishable from the populations. Future adversaries may also threaten populations to coerce them or discredit the host nation government and U.S. and multinational operations. Future adversaries may also seek to threaten the U.S. directly through multiple domains.

(4) Adversaries will use the media to portray U.S. and multinational operations in a negative light, to erode support for host nation governments, and gain support for their operations. Perceptions are paramount in this contest.

c. Operational conditions.

(1) In the land domain, the Army will conduct full-spectrum operations with joint and coalition partners in populated areas. When security conditions permit, intergovernmental and interagency partners will act in concert with nongovernmental and private organizations and military forces in stability operations abroad. Within this context, future adversaries will employ a wide range of threats directed at U.S. and multinational forces and populations centers in the area of operations (AO). Because adversaries may be indistinguishable from populations, technological sensors may not provide the fidelity of information required for intelligence and targeting. Physical reconnaissance and surveillance, and developing the situation through action, will play a greater role in reducing uncertainty and complexity.

(2) The air and space domains will also be complex. Future operations will closely integrate joint, Army, and coalition air-to-ground, air-to-air, and ground-to-air capabilities. The continued fielding of joint, Army, and multinational UAS will further add complexity to the airspace. Our future adversaries continue to develop and field threats that function in and through the air and space domains. These threats include simple to sophisticated rockets, artillery, mortars, ballistic and cruise missiles, manned and unmanned aircraft, and satellite-based capabilities with advanced countermeasures. Emerging threats, such as high altitude airships used for intelligence, surveillance, and reconnaissance, will pose complex dilemmas for operations. In some areas of operations, friendly and threat forces will intermingle in the air domain with civilian aircraft, adding more to an already complex environment.

(3) The cyberspace domain and electromagnetic spectrum will be contested areas. They will become increasingly more congested with friendly forces, adversaries, and civilians occupying the same “space” at the same time; uncertainty and complexity will also characterize this space. Adversaries will use the electromagnetic spectrum and computer networks for command and control of their forces and capabilities. Adversaries will also use electronic warfare (EW) and active and passive techniques to attack computer networks to disrupt or degrade joint and multinational command and control and sensor capabilities. They will also use EW to target friendly positioning, navigation, and timing (PNT), environmental monitoring, and missile warning capabilities to disrupt operations.

(4) The future Army will conduct operations under the scrutiny of domestic and international media. Tactical actions may have strategic consequences. Again, perceptions are paramount. Army forces’ actions must be consistent with their message.

d. Future Army operations.

(1) Future Army forces must closely integrate with all partners to achieve unity of effort.

(2) The Army will employ fires in expanded combined arms, joint, and multinational full-spectrum operations across the spectrum of conflict. “Army forces conduct combined arms maneuver to gain physical, temporal, and psychological advantages over enemy organizations. Army forces conduct security operations to consolidate gains and ensure freedom of movement and action. Army forces combine maneuver and wide area security operations to seize, retain, and exploit the initiative.”² While the spectrum of conflict depicts a continuum of combat and

noncombat actions, all or multiple points along the spectrum may occur simultaneously in a given AO. During stable peace, where the operational theme is peacetime military engagement, the OE is more restrictive for fires. At this end of the spectrum, the Army must also be prepared to provide scalable fires capabilities to protect joint, Army, and multinational partners and populations residing in the AO. Transitioning through the spectrum of conflict to general war, the environment for fires becomes more permissive. At this end of the spectrum, where the operational theme is major combat operations, the Army will employ predominately lethal capabilities in combination with nonlethal capabilities to achieve tactical, operational, and strategic objectives.

(3) Future Army forces will conduct civil support and homeland defense operations with interagency partners in the homeland. This includes saving lives, restoring essential services, maintaining and restoring civil order, and disaster relief. Future Army forces will also conduct stability operations with joint, interagency, intergovernmental, multinational, and nongovernmental organization partners abroad. These operations may include security force assistance, strategic engagement and assurance missions, disaster relief, and humanitarian assistance.

(4) To prevail in the future OE and succeed in a wide range of contingencies, future Army forces will operate with greater decentralization³ in full-spectrum operations. Greater decentralization means future operations conducted by increasingly lower tactical echelons with the authority and resources to accomplish assigned missions. Future Army forces must also be prepared to conduct decentralized full-spectrum operations simultaneously across wide areas.

1-3. Assumptions

a. The assumptions from the ACC and the AOC apply to TRADOC Pam 525-3-4. These assumptions concerning the character of future armed conflict are based, in large measure, on the complexity and uncertainty of the future OE, as well as an assessment of anticipated future enemy and U.S. capabilities. The list of these assumptions is found in [appendix E](#) of this concept.

b. Assumptions for TRADOC Pam 525-3-4. The assumptions below apply specifically to this concept, and build on or clarify the assumptions listed in the capstone and operating concepts.

(1) The Army will change the current Army fires warfighting function definition in FM 3-0 to include air and missile defense (AMD) to maintain consistency with joint functions.

(2) The Army will continue to rely on joint interdependencies for fire support and AMD, even when redundant capabilities exist between services.

(3) Mission command capabilities will exist to extend communications over wide areas to enable both the mission command of forces and fire control of dispersed firing elements.

(4) Indirect fire weapons system digitization programs will be complete in the 2016 – 2028 timeframe, thereby creating the capability for all cannon, rocket, and missile weapon systems

and 120 millimeter (mm) and 81 mm mortars to compute technical fire direction data at the weapon system.

(5) Beginning in 2016, the Army will field the Army Integrated Air and Missile Defense System of System Increment 2, Integrated Battle Command System to selected AMD battalions, providing a common integrated battle command capability. AMD forcewide fielding will not be complete until after 2032.

(6) The Defense Support Program, Space-based Infrared System constellation will remain viable for transmission of launch warnings.

1-4. Linkage to the ACC

a. The ACC envisions an Army that has the ability to gain, sustain, and exploit physical control over people, land, and resources and exert psychological influence over people. Future Army forces must be able to both persuade and coerce. As part of a joint force, the Army will face adaptive adversaries fielded and resourced by both peer and near-peer state actors and by nonstate actors with varying motivations. To defeat future adversaries with access to diverse capabilities, the Army must field forces capable of prompt and sustained combat operations and skilled in operational adaptability.

b. The ACC describes six supporting ideas that contribute to the future force's ability to apply operational adaptability. The supporting ideas are: develop the situation through action, conduct combined arms operations, employ a combination of defeat and stability mechanisms, integrate joint capabilities, cooperate with partners, and exert psychological and technical influence.⁴ Each supporting idea addresses specific implications derived from the analysis of the future OE shown in [chapter 2](#) of the ACC.

c. The ACC establishes seven core operational actions the Army must perform to meet future security challenges. The seven core operational actions are conduct security force assistance, shaping and entry operations, intertheater and intratheater operational maneuver, full-spectrum operations, conduct overlapping protection operations, distributed support and sustainment, and network-enabled mission command.

1-5. Linkage to the AOC

a. The AOC describes the future Army with the capabilities to conduct combined arms maneuver and wide area security operations within the context of joint, interagency, intergovernmental, and multinational efforts.⁵ "Army forces achieve speed of action through the application of mission command and apply an expanded concept of combined arms to identify and exploit opportunities and protect against unexpected dangers. Leaders of Army operations rely on prompt decisionmaking by subordinates to maintain freedom of action."⁶

b. The AOC identifies seven supporting ideas: operate decentralized, conduct continuous reconnaissance, conduct air-ground operations, expand capabilities at tactical levels, inform and influence populations, conduct effective transitions, and enhance unit cohesion.

c. The AOC further describes operations the future force must conduct that support performing the core operational actions. These operations are full-spectrum operations, homeland defense and civil support, sustained engagement, entry operations, prevent proliferation, and combat weapons of mass destruction, cyberspace operations, space operations, and foreign humanitarian assistance. Additionally, the concept describes the implications for the institutional Army and training and leader development.

1-6. Linkage to the human dimension

TRADOC Pam 525-3-7, *The U.S. Army Concept for the Human Dimension in Full-Spectrum Operations 2015-2024*, emphasizes optimization of the cognitive, physical, and social components of every Soldier with the objective to improve the acquisition and selection of personnel; maximize leader and organizational development; establish the ability to rapidly adjust, deliver, and provide accessibility of training and education ultimately balancing Soldier knowledge, skills, and abilities with full-spectrum operation mission requirements.

1-7. References

Required and related publications are listed in [appendix A](#).

1-8. Explanation of abbreviations and terms

Abbreviations and special terms used in this pamphlet are explained in the [glossary](#).

Chapter 2

Fires Military Problem and Fires Components of the Solution

2-1. The military problem

How will fires demonstrate operational adaptability? What fires capabilities must the Army have to respond to uncertainty and complexity? What capabilities does the Army require to employ fires across the spectrum of conflict? How do fires enable future decentralized combined arms action in full-spectrum operations from the tactical to strategic levels? How does the Army achieve timely and responsive offensive and defensive fires over wide areas to defeat the full range of threats and contribute to providing protection? How will the Army enable joint, Army, and multinational fires on the ground and through the airspace in decentralized operations? Each of these questions addresses different aspects of the application of fires in support of combined arms maneuver and wide area security.

2-2. Solution synopsis

a. To prevail in the future OE and succeed in a wide range of contingencies, the Army requires *operationally adaptable fires* capabilities. Operationally adaptable fires match a wide range of targets with the right sensor and the right effects to achieve timely, effective, and efficient fires in a wide range of environmental and operational conditions, including homeland defense. Success in a wide range of contingencies is dependent upon operationally adaptable fire's Soldiers, leaders, and organizations that are capable of full-spectrum operations.

b. Operationally adaptable fires provide the Army with versatile capabilities to respond to uncertainty and complexity; enable the defeat of a wide range of threats; provide timely and responsive fires in environmental and operational conditions; provide a range of precision to conventional scalable capabilities to engage ground targets and aerial threats, prevent fratricide and minimize collateral damage; provide access to and integrate joint, Army, and multinational fires capabilities at the lowest appropriate levels.

c. The reference in the paragraph above to “scalable capabilities” is a new term. In the past, fires have been referred to as being lethal or nonlethal. In TRADOC Pam 525-3-4, lethal and nonlethal fires will be referred to as a range of scalable capabilities, from lethal to nonlethal, to provide a wide range of effects. It is still acknowledged that the effects of fires still have lethal and nonlethal characteristics.

d. Five components of the solution categorize the required capabilities to achieve operationally adaptable fires in the future OE. These components are: expand the Army fires warfighting function; employ versatile Army fires capabilities; identify, locate, target, and engage threats with increased discrimination; integrate joint, Army, and multinational capabilities; and distribute fires for decentralized operations. These components are interrelated; together, they achieve synergies in capabilities to deliver the right type of fires required by mission, enemy, terrain and weather, troops and support available, time and civil considerations (METT-TC) conditions.

e. Soldiers and units accomplish missions and tasks, not a function. When this concept states the fires warfighting function performs, provides, or does a mission, task, or function, it refers to the Soldiers (enlisted, noncommissioned officers, warrant officers, and commissioned officers) and organizations that are part of capabilities covered by the fires function.

2-3. Expand the Army fires warfighting function⁷

a. An expanded view of fires -- integrating indirect fires, AMD, and electronic attack (EA) capabilities -- enables the Army to gain synergies that effectively and efficiently counter future threats, and improve air-ground integration. In addition, the expanded view of the fires warfighting function better aligns the Army’s functional definition with the joint definition. The future OE and range of threats provide the context for the Army to expand its view of fires. The proliferation of simple to sophisticated threats to joint, Army, and multinational forces, population centers, and critical infrastructure pose myriad challenges to joint, Army, and multinational forces. To defeat these threats, the Army must take a broader view that includes defeating systems before employment, destroying systems at the point of origin, intercepting the threat before it reaches its target, and warning affected friendly forces and populations to mitigate enemy effects.

b. Current doctrinal underpinnings.

(1) Joint doctrine defines fires as the use of weapons systems to create a specific lethal or nonlethal effect on a target.⁸ The Army defines fires as “the effects of lethal and nonlethal weapons.”⁹

(2) Joint doctrine defines a function as “related capabilities and activities grouped together to help joint force commanders (JFC) integrate, synchronize, and direct joint operations.”¹⁰ Army doctrine further defines a warfighting function as a “group of tasks and systems (people, organizations, information, and processes) united by a common purpose that commanders use to accomplish missions and training objectives...The Army’s warfighting functions are fundamentally linked to the joint functions.”¹¹

c. The Army fires warfighting function.

(1) The Army fires warfighting function expanded definition incorporates Army indirect fires (field artillery and mortars), AMD, joint fires, and EA capabilities as fires.¹² The revised definition is, the related set of tasks and systems that provide the collective and coordinated use of Army indirect fires, air and missile defense fires, EA, and joint fires capabilities, integrated through the targeting and defense design processes.

(2) The revised task list for an expanded fires warfighting function includes conduct targeting and defense design; provide fire support; counter air, missile, rocket, artillery, mortars, and UAS threats; conduct EA; integrate joint and multinational fires; and assess the effectiveness of fires.¹³ This list represents the core tasks the fires function must accomplish to complement and reinforce the other warfighting functions in combined arms operations.

d. Offensive and defensive fires.

(1) Under an expanded fires warfighting function, fires are broadly categorized as *offensive and defensive fires* as set forth in the key required capabilities for fires found in the ACC. Offensive and defensive fires are distinguished by their purposes.

(a) *Offensive fires* preempt enemy actions. Examples of offensive fires include preparatory fires, shaping fires, close supporting fires, interdiction, support to offensive counterair operations, offensive EA, and counterfire.

(b) *Defensive fires* protect friendly forces, population centers, and critical infrastructure. Examples of defensive fires include ballistic missile defense; support to defensive counterair operations; AMD; counter rocket, artillery, and mortars (RAM); counterfire; support of space control operations; and final protective fires.

(2) Offensive and defensive fires apply from tactical to strategic levels, and are employed in decisive, shaping, and sustaining operations.

(3) In joint and Army doctrine, the effects of fires may be lethal or nonlethal on a target. Lethal fires have permanent destructive effects. Nonlethal effects neutralize or incapacitate a target without causing permanent injury, death, or gross physical destruction.¹⁴ To differentiate nonlethal actions from nonlethal fires, nonlethal fires must have a weapon associated with them that create the desired effects. The nature of the target or threat, the METT-TC conditions, and desired outcomes determine whether fires need to be lethal or nonlethal in their effects.

e. To achieve synergies in fires capabilities, the Army requires the ability to accurately target and defeat future threats. The echelons indicated by METT-TC must have the authority to clear, and authorize joint, Army, and multinational fires on the ground, in and through the airspace, and within the electromagnetic spectrum. Situational understanding of the air, land, and space domains, and the electromagnetic spectrum, obtained through multiple sensors and procedures will enable integrated air, land, and space domains and the electromagnetic spectrum where offensive and defensive fires are delivered effectively and efficiently in combined arms maneuver and wide area security operations.

2-4. Employ versatile fires capabilities

a. This component addresses the requirements for adaptable offensive and defensive fires for combined arms, joint, and multinational full-spectrum operations. A wide range of precision to conventional scalable capabilities provides the means for the employment of fires across the spectrum of conflict under a wide range of conditions. This component also addresses how fires organizations, leaders, and Soldiers contribute to full-spectrum operations when not conducting fires-related missions and tasks.

b. The foundation for employing versatile Army fires capabilities are leaders and Soldiers skilled in core competencies and nonfires missions. Fires leaders and Soldiers must be experts in their respective warfighting function tasks. Through training, education, leader development programs, and operational experience, fires leaders and Soldiers must also possess the skills required to perform a broad range of missions and tasks required by METT-TC. Given the vast capabilities at their disposal, fires leaders and Soldiers need to be agile enough to not only exploit those capabilities, but understand how to apply them as they transition through full-spectrum operations. These requirements emphasize the need to train and certify fires organizations and personnel at all echelons.

c. Versatile fires capabilities provide multiple means to achieve the right effects and minimize or eliminate unintended consequences and residual hazards. A wide range of scalable capabilities provides the versatility to employ fires across the spectrum of conflict. Army fires must also be all-weather capable to be effective under any environmental condition.

d. A wide range of conventional to precision capabilities will provide effects from precision, to near-precision, and area effects. Currently, precision capabilities have a circular error probable (CEP) of less than 10 meters. Near-precision capabilities have a CEP between 10 and 50 meters. Area capabilities have a CEP greater than 50 meters. Indirect fires capabilities will deliver these wide ranges of capabilities, including multispectral obscurants and illumination, at extended ranges and in close proximity to friendly forces.

e. Future indirect fires must also be capable of massing in space and time on single or multiple targets with precision, near-precision and area effects, and to shift those fires throughout the AO. Indirect fires must retain the capability to mass fires with battery and battalion-sized firing units. However, the future OE will require smaller firing elements (platoons or smaller) to mass in space and to mass in time against multiple targets simultaneously in the AO. The ability for smaller firing elements to mass in space and time is enabled by system range capabilities, the

mission command network, weapon platform capabilities (like on-board navigation and technical and tactical fire control), and extended range communications. Indirect fires and fire support capabilities must also be agile enough to execute planned and unplanned fires. Massing in space and time and shifting fires are key elements of mutually supporting, overlapping, agile, and adaptable fires.

f. The fires from EA capabilities provide the future force a scalable capability to disrupt adversary command and control and sensors, with little risk to personnel. At the general war end of the spectrum, EA capabilities will complement other fires capabilities by providing alternate means for achieving required effects. As the employment of lethal effects becomes more restrictive in operations short of general war, EA may become the predominate means to disrupt enemy command and control and sensor capabilities. EA capabilities will provide not only precise effects, but also area effects as required by METT-TC.

g. Fires organizations will demonstrate versatility by the capability to task organize to meet METT-TC requirements. In the future, indirect fires and AMD units may be comprised of a mix of fires capabilities through capabilities organic, assigned, attached, or placed under operational control of a fires headquarters (HQ). Mission command systems with fire support and AMD functions will be key enablers for task organizing into temporary or permanent composite organizational structures. If the structures are temporary for a given mission, habitual relationships between task organized elements and with the supported force will ensure cohesion and confidence in the capabilities.

h. Versatile indirect fires capabilities are comprised of organizations with ability to task organize fires units to provide the right composition of indirect fires for a given METT-TC situation. The right composition comprises an appropriate mix of cannons, rockets, mortars, and sensors in field artillery and combined arms maneuver formations. In the past, task organization was done primarily at the field artillery brigade-level or through assignment of field artillery tactical missions to brigades and battalions. The future will require indirect fires units to task organize at battalion and battery levels to create composite units with multiple capabilities, producing artillery battalion task forces and battery teams. Mission command systems must enable the mission command and technical and tactical control of composite units, joint and multinational organizations, and smaller, widely dispersed firing elements. The mission command system must ensure interoperability, especially in fire control, for unlike systems.

i. Composite air defense artillery (ADA) battalions, or task organized units, will provide versatility to AMD forces. A modular open system approach will enable integrating sensors and weapons through “plug and fight” functionality – the ability for an AMD sensor, weapon, or mission command node, not a complete AMD system, to immediately establish communications and automatically integrate into AMD architecture.

j. Army ADA units will task organize units adding sensors and or weapons that allow ADA commanders to tailor forces as required by METT-TC factors. Commanders will also have the capability to establish AMD protection rapidly through the employment of minimal engagement packages, comprised of as little as one sensor and one weapon with a mission command node. Through the integration of disparate sensors, shooters, and mission command nodes, and the

employment of multimission capabilities, AMD forces execute simultaneous missions, provide asset protection, counter aerial intelligence, surveillance, and reconnaissance, and defeat RAM, ballistic and cruise missiles, manned and unmanned aircraft systems with advanced countermeasures, and support space control operations.

k. Future stability and support operations may require fires units to have the versatility to conduct other missions not requiring the delivery of offensive and defensive fires. Units, enabled by a common mission command system and doctrine, can provide the forces and mission command necessary to conduct other missions as METT-TC dictates. Fires organizations must have the capability to accept and employ attachments of nonfires units and enablers necessary for these other missions.

2-5. Identify, locate, target, and engage threats with increased discrimination

a. Amid the complexity and uncertainty in the future OE, the ability to discriminate between friendly forces rapidly, neutrals, enemy, and noncombatants in multiple domains is critical. Moreover, the future force must be capable of employing fires with greater discrimination in the land, air, and space domains. Accurate threat identification and location enables matching the target with appropriate effects, proportional to the situation. Once a threat is identified and located, future Army forces must be able to achieve the exact effects required (that is, destruction or suppression), prevent fratricide, and minimize collateral damage. With capabilities that achieve more discriminate effects in a shared operational environment, future Army forces can employ fires in a disciplined manner with the proportionality required by METT-TC.

b. The Army requires capabilities across the force and at all echelons to accurately and precisely identify, classify, locate, and track threats to increase the Army's capabilities to reduce uncertainty and complexity, rapidly discriminate friend from foe, and enable effective coordination. Previous concepts were predicated on the future force's ability to accomplish these tasks through reliance on advanced technologies. In the future OE, physical reconnaissance and surveillance will be enabled and complemented by advanced technological sensors. Human and materiel sensors must quickly make the friend-neutral-enemy distinction and contribute to creating the context of friendly force operations, combat identification, and situational awareness. The capability to fuse data from multiple sensors produces not only better intelligence but better and more reliable target-quality and fire control quality (FCQ) data.

c. Future Army ADA forces will integrate with joint and multinational air defense forces via an integrated fire control capability to counter evolving threats.¹⁵ Integrated AMD sensors will provide a common air picture and FCQ data to enable timely battle management decisions, high-confidence weapon – target pairing, and prevent fratricide. Fire control data will be of sufficient accuracy and update rate to enable the AMD systems to compute an engagement fire control solution and engage the threat with the optimum weapon. Networked sensors will enable accurate identification of aerial objects using positive and procedural means.

d. Automated AMD battle management aids, which recommend the best weapon to engage a target, will enhance engagements within a defense. The best weapon may not always be the weapon with the longest range or highest probability of kill. Conditions may dictate the use of

less optimal weapons, thereby conserving longer range weapons for more stressing threats. Access to data from space-based assets will further enable the engagement process by enhancing the ability to distinguish between threats, friendly, and neutral aerial objects and increasing early warning time. Rapidly determining and sharing real-time hit and kill assessments will prevent the re-engagement of threats that have already been defeated.

e. To apply indirect fires with discrimination, fire support capabilities must increase certainty in target identification, and decrease target location error (TLE). The future force will require the capability to locate targets accurately with sufficiently low TLE to employ joint and Army munitions effectively. Accurate target location increases the effectiveness and efficiency of all types of indirect and joint fires by minimizing the number of munitions required to achieve the desired effects. These capabilities include lightweight sensors for dismounted operations, sensors for ground combat and aerial platforms, 360 degree weapons locating sensors for offensive and defensive fires, fusion of sensors, and precision targeting software and imagery.

f. Based on METT-TC, area effects may be appropriate such as suppression and area denial. In most cases in the future OE, Army indirect fires will need to achieve discrete effects. Scalable capabilities create discrete effects proportional to the target or threat type and situation, and prevent or minimize collateral damage, unintended consequences, and residual hazards.

g. Discriminate EA capabilities must provide discrete effects to minimize collateral damage, prevent disruption of friendly force operations, and prevent unnecessary disruption of civilian electromagnetic infrastructure. Close coordination with electromagnetic spectrum management capabilities ensures friendly EA does not disrupt friendly force operations and communications. Additionally, close coordination with electromagnetic support capabilities allows discriminate targeting of specific portions of the electromagnetic spectrum with scalable EA capabilities. An example of scalable EA capabilities is jamming one frequency within a band of frequencies. EA also provides the combined arms leader another option to achieve desired effects in environments with high potential for fratricide and collateral damage.

h. The future force will also require redundant capabilities to determine the effects of weather and terrain on weapons, sensors, and munitions. Space, aerial, and ground-based systems provide accurate weather information for ballistic computations. This information must be shared through the mission command network to widely dispersed firing elements. Combinations of space and ground based weather sensors allow for redundancy when the network is degraded.

i. Discriminate target engagements also require determining accurate locations of firing units and sensors. Accurate firing element and observer locations are also essential to effective offensive and defensive fires. The future force also requires redundant capabilities. Global positioning systems (GPS) provide accurate locations for weapons platforms and sensors; retaining traditional survey methods allow for redundancy when the GPS system is degraded or denied.

2-6. Integrate joint, Army, and multinational capabilities

a. The future OE requires the integration of Army offensive and defensive indirect fires (cannons, rockets, and mortars) capabilities with the capabilities of other Army warfighting functions, special operations forces (SOF), joint services, interagency, and multinational partners. Future Army forces will integrate the fires capabilities (sensors, weapons, effects) of joint, interagency, and multinational partners into the concept of operations to achieve synergy, develop a common operational picture (COP), and enable joint interdependencies from the tactical to strategic levels. Additionally, complementary and reinforcing joint and multinational capabilities provide redundancy to mitigate environmental and operational restrictions, resource shortfalls, as well as gaps in coverage from a particular asset.

b. As the Army service component commander's (ASCC) and joint force commander's (JFC) fires experts, fires organizations and leaders at all echelons must be skilled integrators of joint, Army, and multinational fires capabilities. Integration requires a thorough understanding of the type of operations conducted and the fires capabilities available. Integration also requires rapid and timely coordination and clearance of fires on the ground and through the airspace from surface-to-surface, surface-to-air, and air-to-surface means. Interoperability will be a key enabler for the integration of Army fires with other functions, SOF, services, and nations. The Army will be capable of attacking targets and engaging threats identified and located by organic and nonorganic sensors. The Army must also be capable of coordinating and employing the fires from joint and multinational weapons systems.

c. Field artillery commanders, assisted by fire support officers, noncommissioned officers, and fires cells at all echelons integrate joint, Army, interagency and multinational fires capabilities during the operations and targeting processes. These leaders will perform the integration function for the maneuver commanders, including SOF, providing access to joint, Army, interagency, and multinational capabilities. Offensive and defensive indirect fires must be integrated into combined arms maneuver and wide area security operations. Offensive and defensive fires from air-to-surface and surface-to-surface assets must be coordinated and cleared on the ground and through the airspace to enable the rapid and timely delivery of fires and to prevent fratricide. Network-enabled mission command systems facilitate access, integration, coordination, clearance, and maintaining a relevant common operational picture.

d. ADA commanders, supported by air defense artillery fire control officer elements, tactical directors, fire control officers, and air defense airspace management cells at all Army echelons, will integrate joint, coalition, and Army AMD for maneuver commanders and the area air defense commander (AADC). These leaders will perform the integration function for maneuver commanders, providing access to joint and coalition AMD, situational awareness and understanding, and airspace management. AMD fires, while under the control of the AADC will be apportioned accordingly to critical asset list priority and will be integrated with the joint force commander's and maneuver commander's concept of operations. AMD fires will be coordinated and cleared on the ground and through the airspace to enable the rapid and timely engagement of threats while preventing fratricide.

e. To gain full advantage of joint and multinational interdependencies, the Army must have the capability to share information between joint, Army, and multinational sensors. The Army must also be capable of attacking targets identified and located by joint, Army, SOF, and multinational sensors with offensive and defensive indirect fires. This includes the capability to determine mensurated coordinates as required.

f. The future OE will increasingly require Army AMD capabilities to integrate and be interoperable with the capabilities of other Army warfighting functions, joint and coalition integrated air and missile defense (IAMD), and interagency partners. In addition, integration, interoperability, and interdependencies will expand a joint and coalition air picture and enhance early warning across a widely dispersed operating force in multiple geographic combatant commanders' areas of operations.

g. While able to operate independently, Army ADA forces will routinely deploy and operate as a joint or coalition partner as part of IAMD. Army ADA forces integrate with joint and multinational ADA forces to extend protection of friendly forces, population centers, and critical assets. IAMD and joint integrated fire control (IFC) will enable capabilities, such as precision cue, launch on remote, engage on remote, forward pass and preferred shooter determination. Integrated sensors will enable a joint and coalition integrated air picture across the force, improve combat identification, permit earlier engagements, and prevent fratricide. Host nation integration will include sharing civilian air traffic information with Army airspace operations to eliminate fratricide, enable identification of aerial objects, and enable the rapid employment of offensive and defensive fires. Army AMD Soldiers and leaders will have a thorough understanding of joint, Army, and multinational operations and the capabilities of other services and partners to enable operations across a widely dispersed AO.

h. Network-enabled joint, Army, and multinational ADA forces will allow the coordination of AMD effects and extend support to wider areas and maneuvering forces. Joint, Army, or multinational defense designs and planning will consider the operations of maneuver forces in the AO and orient weapon systems to extend AMD coverage over projected routes and assets.

i. The integration of joint, Army, and multinational EA capabilities occurs during the targeting and defense design processes. Joint services and multinational partners will provide additional EA capabilities that complement and reinforce Army capabilities. The Army must have the capability to integrate these additional resources into combined arms maneuver and wide area security operations.

2-7. Distribute fires capabilities for decentralized operations

a. This component describes how fires capabilities will enable decentralized full-spectrum operations across wide areas through the access to, availability of, and authorities to employ joint, Army, and multinational fires capabilities at all echelons. The goal of distributed fires is to ensure joint, Army, and multinational forces always have timely and responsive fires for combined arms maneuver and wide area security operations.

b. Future concepts envision developing the situation through action across the depth and breadth of the AO by combined arms and joint operations at increasingly lower tactical echelons. Fires capabilities must provide mutually supporting, overlapping fires for these combined arms and joint actions. This requires fires capabilities distributed throughout the AO to engage targets and threats with either “one system, one round,” or to combine the capabilities of multiple systems against single or multiple targets. These capabilities must also be fielded in sufficient quantities to support decentralized operations conducted by lower tactical levels over wide areas. Weapon system range is a key enabler. Redundancies in capabilities provide multiple means to achieve desired effects. To increase the options available to commanders at all echelons, joint and multinational capabilities must be available through either the physical presence of an asset in the AO, or access to the asset through the mission command network. Lower echelons must also have the authority to employ the assets delegated to them.

c. The network must enable both centralized as well as decentralized execution of fires tasks.¹⁶ While the intent is to decentralize fires to the extent METT-TC indicates, there are certain conditions that may require centralization of fires capabilities. These conditions are, but are not limited to the following:

(1) Fires capabilities are limited in quantity, such as the result of forces caps in a theater of operations.

(2) Fires are operationally restricted due to the rules of engagement withholding authority to employ fires to a higher echelon.

(3) Massing of multiple firing elements on targets to support operations must be conducted in an aggregated manner.

d. To provide fire support to joint, Army, SOF, and multinational forces conducting decentralized full-spectrum operations over wide AOs, indirect fires must be immediately responsive and available at all echelons. Furthermore, indirect fires will be employed at increasing lower echelons in combined arms and joint maneuver and security operations.

e. Indirect fires organizations may be task organized into firing elements smaller than a platoon, including single weapon or weapon pairs distributed across wide areas. Each of these smaller firing elements will require both technical and tactical fire control capabilities to deliver fires. When the requirements for fires exceed the organic capabilities of an echelon of command, the future force requires the capability to augment those organic capabilities from other organizations. Smaller firing elements distributed across wide areas may require security from organic assets, attached forces, or positioning with other forces for mutual support.

f. As the future force conducts maneuver and security operations across wider AOs, ADA forces will reposition and or extend protection, aerial situational awareness and understanding, airspace management and early warning to the maneuver commander and the joint force. Supporting increasingly decentralized Army operations requires the distribution of AMD capabilities across the AO. Army AMD distribution will not only provide improved early warning of aerial threats, but it will increase engagement opportunities and facilitate continuity

of operations. The ability to distribute and integrate any AMD sensor and shooter will provide commanders extended protection.

g. The distribution of AMD capabilities is enabled by two future advanced engagement concepts: *engage off the network*, the ability of a surface or airborne weapon system to engage a target using nonorganic FCQ sensor data, and *forward pass*, the ability of a weapon system to hand-off its engagement by “passing” control of the interceptor to another system. These techniques will greatly improve AMD coverage in the AO. They will use sensor data from the best sensor(s), and through an integrated AMD fire control network, match the best weapon with the target, regardless of its location. The capability to share FCQ sensor data through an integrated fire control network, without the constraint of its origin, will eliminate the need for organic sensor data for advanced engagements, and enable distributed fires across wide areas.

h. The authority to employ fires assets must also be decentralized to the lowest appropriate level according to METT-TC. Commanders at the point of decision will require the capability to clear fires on the ground and through the airspace, enabled by situational awareness and understanding. Improved distribution of AMD capabilities, advanced engagement concepts and a common integrated air picture will not inherently equate to decentralized operations for AMD, but may enable decentralized operations when warranted. To prevent fratricide of manned and unmanned aerial systems and to ensure optimum combat identification of all aerial objects, identification authority will remain at designated levels established by the AADC. Joint identification authorities may decentralize identification to lower levels when specific threats are expected, during early phases of operations, and or during minimal airspace congestion.

i. As with identification, engagement authority will also remain at these levels. A centralized engagement authority ensures that throughout the joint IAMD AO, the best sensors and shooters are paired with the right targets, that proper missile conservation is maintained to alleviate the affects of saturation attacks and adversary advanced countermeasures, and to optimize engagements in highly congested airspace. When appropriate, the decentralization of EA may be allowed during specific operations. Examples include early entry operations with high cruise and ballistic missile threats and limited controlling centers, or during self-defense against pending tactical ballistic missile attacks.

j. The mission command network enables distributed fires by providing extended communications for mission command, technical and tactical control of fires assets, and access to the COP. For indirect fires, mission command systems must enable both centralized and decentralized mission command and technical control from moving and stationary platforms. Common mission command capabilities at all AMD echelons will enable not only the advanced engagement concepts, but also the development of an integrated joint and coalition air picture. The ability to develop a common air picture increases both the maneuver and joint commander’s aerial situational awareness and understanding and airspace management. The development of a common air picture will improve combat identification early warning and provide commanders redundancies in the engagement of threats.

k. Future Army forces conducting decentralized operations will require the availability of and authority to employ EA at lower tactical echelons. When not organic to these lower echelons,

EA capabilities must be available through task organization or support relationships. Habitual relationships foster understanding of EA capabilities, effective integration, and confidence between supporting and supported organizations. Commanders will require the capability to integrate EA and authorize its employment, consistent with mission command.

Chapter 3

Core Operational Actions

3-1. Introduction

Operationally adaptable fires, through the components of the solution and their associated required capabilities, provide the means for the fires warfighting function to conduct or support the seven Army core operational actions.

3-2. Security force assistance

a. Fires forces provide a range of options in support of combatant commanders' theater security cooperation plans and the overall national engagement strategy. Fires forces enable security force assistance by providing subject matter experts and trainers for host nation security forces; integrating joint, interagency, intergovernmental and host nation partner capabilities to improve partner capacity; and enabling and delivering offensive and defensive fires through the airspace and on the ground when required to support host nation, joint and Army forces.

b. In cooperation with host nation forces, fires leaders must be able to assess the threats to the partner nations, the current state of partner capabilities and their constraints and limitations. Fires leaders assist in developing and executing plans to improve their offensive and defensive fires capabilities commensurate with partner and U.S. goals.

c. Training partner nations occurs with individual trainers or training teams embedded with partner nation forces, training teams, and small to large scale multinational training exercises.

d. In the best case, the Army partners' capabilities are developed and compatible with U.S. capabilities. In the worst case, partner capabilities do not exist or are incompatible. Foreign military sales enable partner nations to possess their own fires capabilities, promote the interoperability essential for multinational operations, and decrease partner nation reliance on U.S. capabilities. The ultimate goal is for the partner nation to provide its own offensive and defensive fires.

e. If the partner nation does not have fires capabilities, future Army forces must be able to provide the offensive and defensive fires for U.S. and host nation forces until partner capabilities develop. Where host nation forces are in the lead, fires tasks may be accomplished by, with, and through, or in concert with host nation forces and systems and a sovereign, host nation government. This is also true for situations where future Army forces are conducting security force assistance simultaneously with offensive, defensive, and other stability operations.

3-3. Shaping and entry operations

a. Shaping operations begin during strategic deterrence and conflict prevention and may transition to shaping the AO if commitment of forces is required. Offensive and defensive fires support all facets of deterrence and conflict prevention and all phases of opposed and unopposed entry operations.

b. ADA forces will continue to be deployed in support of strategic assurance and deterrence missions around the world. ADA forces may be the first enduring U.S. AMD capability on-station in the AO. These forces will provide defensive fires for joint forces arriving in response to an escalating crisis. Given the increased vulnerability of joint forces and coalition partners during the early stages of crisis escalation, adversaries will likely use aerial capabilities, ranging from tactical ballistic missiles to RAM, to deny access and prevent or delay a build-up of friendly combat capabilities. AMD will provide protection for joint, Army, and multinational forces and assets against the increased risk of long range pre-emption, antiaccess, or interdiction that threaten shaping and entry operations.

c. Long range offensive and defensive fires support strategic assurance and deterrence missions by providing a capability to strike ground targets at extended distances. These fires contribute to shaping operations and defeating or denying enemy capabilities that threaten deploying joint and multinational forces.

d. When future Army forces conduct opposed entry operations, fires enable the establishment of the lodgment area, expansion of the lodgment area, and transition to subsequent operations. Offensive and defensive fires supporting shaping the AO, support forces in close combat, strike to deny adversaries the capabilities of operational exclusion and tactical denial, and protect joint and Army forces.

e. Entry forces initially rely on joint and multinational fires capabilities until Army forces are established in the lodgment area, and must have the capabilities to integrate and employ these capabilities at the lowest echelons. Army forces may also be required to establish capabilities in the lodgment area to support early entry joint forces. Upon deployment, ADA forces will protect entry forces and sites, as well as other designated military and civilian critical assets, in concert with other deployed joint and multinational ADA units, through IAMD. ADA forces will limit or deny aerial intelligence gathering and counter threats that would delay or degrade decisive military operations. In addition, AMD sensors will provide supported forces with air and space situational awareness, facilitating timely early warning and initiation of passive defense measures. As situations permit, ADA forces may be positioned in forward locations, to defeat incoming threats.

3-4. Intertheater and intratheater operational maneuver

a. To conduct and support intertheater and intratheater operational maneuver requires fires capabilities that are as deployable and agile as the force they support, rapidly reconfigurable into combat configurations, and capable of integrating joint and multinational capabilities. Offensive

and defensive fires are employed to protect maneuvering forces, maintain freedom of maneuver, shape the AO, and attack enemy capabilities in support of full-spectrum operations.

b. Future fires weapons, sensors, mission command, and support platforms must be as deployable, mobile, survivable, and protected as the force they support. Strategically, this means the ability to deploy worldwide as part of the force within the constraints of strategic lift availability. Operationally, this requires fires capabilities to reposition within or between theaters as part of the force. Tactically, fires capabilities must be able to keep pace with the force. Once fires systems arrive in an AO, they must be rapidly reconfigurable into combat configurations to provide immediate offensive and defensive fires. These same platforms must also retain the capability to rapidly emplace and displace to support mobile operations.

c. Offensive fires capabilities must deploy with maneuvering forces to place enemy capabilities within range of indirect fire systems. This provides a complementary capability to ground and air maneuver and causes the enemy multiple dilemmas, places enemy capabilities in a vulnerable position by exposing them to the effects of offensive and defensive fires, and supports combined arms actions against enemy capabilities throughout the depth and breadth of the AO.

d. Defensive fires capabilities provide aerial situational awareness and understanding and contribute to the joint force and maneuver commander's ability to plan, integrate, coordinate, and execute operational maneuver effectively. In addition, these capabilities provide protection against the full spectrum of aerial threats that an adversary may employ to interdict or impede efforts to gain a positional advantage. In coordination with joint and multinational forces, Army ADA forces will provide coverage throughout the entirety of intertheater and intratheater operations, beginning at deployment nodes. Army ADA forces deploy with early entry forces to provide protection to forces entering ports of debarkation or at landing sites. Army ADA forces will assist in the airspace coordination vital to preventing fratricide and enabling air and ground maneuver throughout the AO. Air and missile protection will continue through bounding overwatch, movement with the supported force, and extended coverage from fixed sites. ADA forces will continue protection throughout the operation and move as part of the last redeploying forces.

3-5. Full-spectrum operations

a. Fires are an indispensable component of combined arms, joint, and multinational full-spectrum operations. Fires capabilities complement and reinforce other warfighting functions and contribute to defeat and stability mechanisms. Fires enable combined arms full-spectrum operations by planning, preparing, executing, and assessing offensive and defensive fires against enemy capabilities. Fires organizations and systems integrate, synchronize, and coordinate joint, interagency, intergovernmental, and multinational capabilities throughout the depth and breadth of the AO, including the airspace, with the supported maneuver force. Fires organizations deliver fires throughout the AO to support and protect forces in contact and shape the operating environment.

b. The Army employs offensive and defensive fires in offensive, defensive, stability, and civil support operations. In offensive operations, the balance of fires is weighted to offensive fires. In defensive operations, the weight shifts to defensive fires. In stability and civil support operations, the Army primarily employs nonlethal actions. When future Army forces require fires in these operations, fires are either offensive or defensive in their purpose.

c. Offensive fires strike enemy capabilities before they come in contact with or are employed against U.S. forces or populations, enabling commanders to seize, retain, and exploit the initiative. These fires present the enemy with multiple dilemmas, limit options, and destroy or degrade capabilities. Offensive fires capabilities also include illumination, obscuration, screening, and target marking.¹⁷ ADA units will assist in AMD defense design development and target nomination prior to offensive counterair to preempt the use of enemy air and missile threats.

d. Providing access to and integrating joint, Army, and multinational fires enables maneuver commanders to attack the enemy throughout the depth and breadth of the AO in combined arms maneuver and wide area security operations. Decentralization of authorities to plan, prepare, execute, and assess indirect fires from all sources further enables combined arms and joint operations at the lowest practical echelon.

e. Defensive fires will support a broad range of operations, extending from homeland defense to major combat operations in deployed theaters, and will often require the integration of joint, interagency, intergovernmental, and multinational partners. Defensive fires capabilities provide persistent, 360-degree protection, early warning, and support of airspace management. ADA forces will provide defensive fires in support of critical military assets such as points of entry, lodgment areas, logistical bases, and forward operating bases as designated by the JFC or ASCC. Protection will also generally encompass civilian population centers and critical infrastructure, assets vital to gaining and maintaining indigenous support of U.S. strategic objectives. This protection will be particularly significant during stability operations. However, as there are generally more assets to protect than there are available forces; maneuver and other forces may be required to use organic weapons to defend themselves against aerial threats.

f. During all operations, defensive, offensive, or stability, ADA forces will contribute to the aerial situational awareness and understanding that commanders rely on to plan and execute operations over wide areas. Continuous, accurate, and timely situational awareness is especially important because of the ever changing OE and the threat's potential to change tactics as U.S. operations prolong.

g. Fires will incorporate space-based capabilities to further expand sensor coverage, extend protection capabilities, and contribute to a ballistic missile defense system.

h. AMD, in support of homeland defense, requires an increased level of coordination with U.S. government agencies, from Federal through local levels. Emplacement of sensors and launchers, transportation of hazardous munitions, and the impact of electromagnetic emissions, with the potential disruption of highways, civil aviation, and radio frequencies, will require close coordination with government agencies, such as the National Transportation Safety Board and

the Federal Aviation Administration. Security of Soldiers and equipment, as well as ensuring the safety of local populations, will require coordination with state and local authorities. The National Guard may be required to provide support to active Army units operating within a state, and coordination with local law enforcement will be necessary to provide security and facilitate movement operations. The relationship between Army AMD and government agencies at all levels in the human dimension mission is fairly new and will continue to mature.

3-6. Conduct overlapping protection operations

a. Fires. Fires organizations support overlapping protection by providing 360 degree overlapping fires against enemy threats to protect friendly forces, both stationary and moving, at all echelons, infrastructure, and populations.

b. Offensive fires seek to degrade or destroy enemy capabilities before their effects can be brought to bear on their intended targets, denying the enemy the capability to strike friendly forces, populations, and critical infrastructure. Fires capabilities must provide mutual, overlapping support throughout the AO through positioning and extended range capabilities. Commanders, assisted by fires cells at all echelons, integrate other joint, Army, interagency, and multinational capabilities when available into the overall defense design to mitigate gaps in coverage, range limitations, and operational restrictions.

c. Overlapping defensive fires encompass a series of overlapping capabilities that extend from those used to defend individual vehicles to the traditional protection afforded to an asset or force by fires units. Protective systems in combat and support vehicles allow defense against some aerial threats via small and crew served arms for air defense. Similarly, maneuver and support units will use their organic weapons, when not under the protection of an AMD capability, to defend themselves. This protection will be limited to small and crew served arms for air defense to protect against low altitude, slow threats. Counterfire protects moving and stationary friendly forces, fixed sites, and population centers in response to indirect fires attacks through destroying threat systems located by integrated sensors.

d. Future ADA forces will provide 360-degree, persistent aerial coverage and protection of forces and other designated military and civilian assets, against the full spectrum of aerial threats, operating from very low to exoatmospheric (nearby region of space outside the Earth's atmosphere) altitudes. Future Army forces integrate multimission capable AMD weapons and sensors, with different ranges and effects, into multilayered joint and multinational defenses to ensure redundant, complementary fires. Shorter range AMD capabilities, to include indirect fire protection capabilities, integrated into fires organizations, may support lower echelon tactical formations. Longer range AMD capabilities, focused on defeating tactical ballistic missiles and cruise missiles, provide coverage over forces in accordance with the JFC's priorities. Weapons positioning will optimize protection against projected threats and will overlap each other in range and altitude, as required, to ensure continuity of operations. Joint, Army, national, and multinational sensors will conduct airspace surveillance; combining the sensor air pictures will form a single, real-time aerial picture. AMD will support integrated joint and Army space control operations when directed.

3-7. Distributed support and sustainment

a. Fires units must be capable of sustaining themselves and will rely on a combination of technological innovations to reduce demand characteristics and increase the ability to conduct internal distributed support and sustainment operations in an austere OE. These efforts will improve the quality of sustainment and reduce exposure to enemy lethal effects. Distributed support and sustainment will require an increased ability to provide sustainment internally as fires organizations are distributed over wide areas for extended periods of time. Fires also support distributed sustainment and support through the integration of offensive and defensive fires into operations.

b. Technological advances will enable the distributed support and sustainment of widely dispersed fires organizations. Advances in areas such as robotics, multi-option fuses, precision munitions, fuel efficiency, power, water, reliability, availability, and maintainability of equipment and the reduction of demand characteristics produce a force capable of being sustained far more effectively and efficiently. Access to the sustainment portion of the COP will not only enable real-time logistics status and visibility, but also reduce reactive actions and the need for operational pauses. These advancements will reduce the burden on the supply system as a result of the gained effectiveness and efficiency.

c. Fires organizations and systems must also be able to regenerate combat power rapidly after enemy contact and during transitions to provide continuous support to the maneuver force. This includes the capability to replace high demand, low density systems, subsystems, components, and parts requiring long lead times to obtain.

d. Fires units must be able to conduct or receive sustainment support by ground or air using internal and external assets. This may be achieved by capabilities organic, assigned, attached, or under operational control to fires units. Tailoring support capabilities for the unit and type of operation allows for effective and efficient sustainment.

e. Common systems – multimission sensors, shooters, and mission command capabilities with common repair parts will reduce the logistical footprint of the future force. Commonality of equipment with joint and multinational AMD elements and the supported force will be paramount. This may also be a secondary benefit of foreign military sales for multinational operations.

f. Advanced engagement capabilities achieved through joint IFC and remote launchers will reduce the number of required movements and the sustainment demands associated with relocating units on the battlefield. Improvements to AMD system designs will facilitate ease of maintenance and operations, improve human factors engineering, and reduce power demands. Prognosis and diagnosis capabilities will be designed to enhance system operational availability.

g. Near-precision and precision capabilities reduce the number of munitions required to achieve the required effects, making indirect fires more efficient, and thereby reducing Class V sustainment demands.

h. Fires capabilities will provide the force with the freedom to conduct distributed support and sustainment operations by providing offensive and defensive fires for sustainment and support operations, situational awareness, and early warning. Fires provide protection with defensive fires for aerial and sea ports of debarkation, sustainment convoys, and logistics sites to facilitate the unimpeded flow of forces and equipment in an AO.

3-8. Network-enabled mission command

a. The network must enable both the centralized control of units as well as decentralized execution of fires tasks in accordance with the commander's intent. Mission command capabilities must provide the assured communications, capacity, and timeliness to expedite the clearance and execution of offensive and defensive fires from moving and stationary platforms.

b. Relevant information from a variety of sensors must be fused to form ground and aerial situational awareness, accurate intelligence assessments, and produce targetable and fire control quality data. Once a target is detected, and the decision to engage made, the target's information must be rapidly paired with a weapon system for engagement by lethal and or nonlethal means.

c. Mission command systems must enable fires through airspace and on the ground by contributing and having access to the COP. Fires organizations contribute to the COP by providing fires-related friendly and enemy information and aerial situational awareness through the network. These contributions enable leaders at all echelons to make timely decisions during full-spectrum operations.

d. To enable decentralized operations, mission command systems must be capable of integrating joint, interagency, and multinational partner capabilities at the lowest tactical echelons. When the network is degraded, redundancies in mission command systems and functions, as well as well-trained leaders, maintain continuity of operations and continuous support to joint, combined arms, and multinational operations.

e. Cooperating with joint, intergovernmental, interagency, and multinational partners requires the ability to share information through military and non-military networks, without compromising information security. While some partners may have the ability to access Army systems directly, others rely upon unclassified or commercial networks. The force must strive to integrate partners to facilitate situational understanding and unity of effort.

f. In decentralized operations, mission command and communication systems must enable technical and tactical fire control of widely dispersed firing units. This control must enable target engagement with one platform and one round or massing multiple firing units in time, space, and purpose on all types of ground and aerial targets.

g. AMD mission control – engagement authority – will require optimal aerial situational awareness, near-perfect knowledge of the locations and identities of manned and unmanned aircraft in the airspace. The lowest command echelon that has complete aerial situational understanding (and can ensure that the right hostile target is engaged) will execute control except in homeland defense missions where engagement authority will likely remain at a higher level

than is common in forward theaters. All ADA units will generally have the right to self-defense for their defended assets and can conduct engagements at the lowest practical level.

h. ADA forces will be enabled by a single, common command and control capability across AMD battle command systems which integrate with LandWarNet and enable mission command. The AMD common mission command capability will extend across all AMD command nodes, including interfaces to sensors and weapons. It will provide ADA forces the ability to integrate AMD engagement and force operations, and present AMD decisionmakers at all levels with tools to manage the aerial fight. Communication capabilities will enable line of sight, non-line of sight and beyond line of sight mission command at all levels and provide access to the global information grid. These communication assets will be redundant at all mission command echelons, thereby eliminating single points of failure when operating in high stress environments or during instances of degradation to the network.

Chapter 4

Conclusion

a. Fires face significant challenges in the future OE. State and nonstate actors employing a mix of conventional and unconventional tactics while fighting in complex terrain (both urban and rural) will attempt to offset U.S. technological advantages. Future fires capabilities must adapt and develop to enable future Army forces to seize and retain the initiative, prevent and deter conflict, defeat adaptive adversaries, prevail in war, and succeed in a wide range of contingencies. These requirements dictate the need for operationally adaptable fires for decentralized full-spectrum operations. TRADOC Pam 525-3-4 addresses these characteristics and identifies solutions to the military problem of employing fires as part of a war winning future Army force for an increasingly complex OE.

b. The components of the solution outlined in this pamphlet establish the foundation for operationally adaptable fires. Collectively, the components of the solution represent operational adaptability at the strategic, operational, and tactical levels.

c. The refinement of these concepts will be on-going. However, the ideas introduced in the ACC, the AOC, and further refined in TRADOC Pam 525-3-4 must drive the development of the future fires capabilities across all doctrine, organizations, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) domains.

Appendix A References

Section I Required References

ARs, DA Pams, field manuals (FM), and DA forms are available at Army Publishing Directorate (APD) <http://www.usapa.army.mil>. TRADOC publications and forms are available at TRADOC Publications at <http://www.tradoc.army.mil>.

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TRADOC Pam 525-3-0

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Appendix B Required Capabilities

B-1. Refined ACC fires required capabilities

- a. The ACC lists three key required capabilities for the fires warfighting function. These capabilities are listed below.¹⁸
- b. Decentralize access to joint fires. Future Army forces require access to and direction of joint fires at lower tactical elements (company and possibly below based on the situation), including forces operating in support of indigenous forces, to enable effective decentralized operations.
- c. Balance precision and suppressive fires. Future Army forces require organic precision and area fires capabilities and the continued ability to apply both destructive and suppressive effects to support units conducting decentralized combined arms operations dispersed over wide areas.
- d. Offensive and defensive fires. The future force requires offensive fires that preempt enemy actions by interdicting, degrading, defeating, and destroying enemy capabilities and defensive fires that defeat enemy capabilities and protect friendly forces, population centers, and critical infrastructure, to preserve combat power and freedom of movement and action, protect the force, and allow friendly forces to gain, maintain, and exploit the initiative.

B-2. AOC fires required capabilities

- a. The AOC establishes nine required capabilities for the fires warfighting function. Each of these statements represents aggregated capabilities required to implement the fires capabilities from the ACC. The nine aggregated capabilities are below. (Order does not indicate priority.)¹⁹
- b. Locate ground threats. Future Army forces require the capability to locate ground threats at sufficient ranges and accuracy to permit precision and area engagements of targets in offensive and defensive fires.

c. Detect air threats. Future Army forces require the capability to detect aircraft, rockets, artillery, mortars, UAS, and ballistic and cruise missiles, at sufficient ranges and accuracy to interdict these capabilities, warn friendly forces and populations, mitigate effects, and provide defensive fires.

d. Defeat ground threats. Future Army forces require a wide range of precision to conventional capabilities to defeat ground threats under all operational and environmental conditions to provide effective and efficient offensive and defensive fires.

e. Intercept aerial threats. Future Army forces require the capability to intercept aircraft, ballistic and cruise missiles, UAS, rockets, artillery, mortars, including weapons of mass destruction, at sufficient ranges and altitudes to provide effective defensive fires.

f. Employ joint and multinational fires. Future Army forces require the capability to employ joint and multinational fires capabilities to enable decentralized access to these capabilities across wide areas.

g. Enable fires on the ground and through airspace. Future Army forces require the capability to rapidly clear joint, Army, and multinational fires, on the ground and through the airspace to provide offensive and defensive fires.

h. Task organize at lower echelons. Future Army forces require operationally adaptable fires organizations with the capability to task organize at lower levels to support decentralized operations across wide areas.

i. Task organize for full-spectrum operations. Future Army forces require operationally adaptable fires organizations with the capability to task organize with nonfires capabilities to conduct a wide range of missions in full-spectrum operations.

j. Future Army forces require the capability to provide, synchronize, and deconflict fires with Army special operations forces (ARSOF) units to provide force protection.

B-3. TRADOC Pam 525-3-4 required capabilities

a. TRADOC Pam 525-3-4 establishes the required capabilities for the fires warfighting function to achieve the broad capabilities listed in the ACC and the AOC.

b. The Army fires warfighting function is defined in this concept as the related set of tasks and systems that provide the collective and coordinated use of Army indirect fires, air and missile defense fires, joint fires, and EA integrated through the targeting and defense design processes.

c. To achieve operationally adaptable fires, the fires warfighting function requires the capabilities listed below to implement the ideas outlined in this concept. The numbering system indicates a common reference and does not indicate the required capability's priority.

B-4. Fires common and integrating capabilities

- a. Future Army forces require fires leaders and Soldiers skilled in core competencies and non-fires missions to rapidly transition between missions during full-spectrum operations.
- b. Future Army forces require fires with the capability for weapons, sensors, and mission command nodes at lower levels to be interoperable and support integrated processes in full-spectrum operations to support decentralized operations over wide areas.
- c. Future Army forces require fires with the capabilities to operate across wide areas, while maintaining the capability to mass fires and engage threats to support decentralized operations over wide areas.
- d. Future Army forces require the capability to determine the effects of the environment (terrain and weather) across wide areas on weapons, sensors, and munitions to enable the effective and efficient delivery of fires.
- e. Future Army forces require the capabilities to determine weapons and sensors locations under fully operational and degraded conditions to deliver effective precision and area fires and integrate fire control during full-spectrum operations over wide areas.
- f. Future Army forces require the capability to clear, authorize, and employ joint, Army, and multinational fires, on the ground and in the airspace, to provide offensive and defensive fires.
- g. Future Army forces require the capability to engage targets detected by organic and non-organic linked sensors to employ joint, Army, and multinational fires capabilities across wide areas in centralized and decentralized operations.
- h. Future Army forces require fires weapons, sensors, mission command, and support platforms with the same mobility, survivability, and protection as the supported force to conduct intertheater and intratheater movement and maneuver.
- i. Future Army forces require fires weapons, sensors, mission command, and support platforms with rapid emplace and displace capabilities to provide continuous support to maneuver forces during mobile operations.
- j. Future Army forces require the ability to target threat systems accurately, to include mission command nodes to prevent their employment or re-employment during full-spectrum operations to deliver effective offensive and defensive fires.
- k. Future Army forces require a mission command system with fire support and air and missile defense fire control functions to task organize, plan, coordinate, and integrate fires capabilities for decentralized, full-spectrum operations.

l. Future Army forces require the capability for fires organizations to defend themselves against ground, aerial, and electronic warfare threats during full-spectrum operations to provide continuous support to maneuver forces.

m. Future Army forces require the capability to degrade or destroy enemy command, control, and sensor systems in the land, air, and space domains during full-spectrum operations.

B-5. Indirect fires and fire support

a. Future Army forces require the capability of interoperable and redundant tactical and technical fire direction systems to coordinate and synchronize fires with joint and multinational partners and to enable task organizing into smaller firing elements.

b. Future Army forces require the capability of joint and multinational interoperability in providing fire support from the component to the platoon level to coordinate and synchronize fires with joint and multinational partners.

c. Future Army forces require the capability to locate ground targets accurately to employ the range of conventional to precision capabilities necessary for effective and efficient offensive and defensive fires.

d. Future Army forces require indirect fires capabilities in full-spectrum operations that provide the desired effects proportional to the target and situation, to prevent fratricide, and to minimize collateral damage.

e. Future Army forces require the capability to employ multispectral obscurants and illumination to limit enemy freedom of action and support combined arms operations.

f. Future Army forces require 360 degree capability to locate threat indirect fires systems and determine points of origin and impact to provide defensive fires during full-spectrum operations.

g. Future Army forces require fires with a wide range of precision to conventional capabilities to provide effective and efficient offensive and defensive fires under a wide range of conditions.

h. Future Army forces require the capability to reinforce the indirect fire capabilities organic to brigade combat teams and provide direct support to functional and multifunctional brigades during full-spectrum operations to provide offensive and defensive fires across wide areas.

i. Future Army forces require the capability to command joint, Army, and multinational indirect fires capabilities above the brigade combat team-level during full-spectrum operations to achieve unity of effort in joint and multinational operations.

j. Future Army forces require surface-to-surface fires to attack tactical to strategic targets with scalable effects at extended ranges to increase the depth and breadth of the AO, and provide support for decentralized full-spectrum operations over wide areas.

k. Future Army forces require the capability to plan, prepare, execute, and assess offensive and defensive joint, Army, interagency, and multinational fires from theater to maneuver platoon-level to support full-spectrum operations over wide areas.

l. Future Army forces require indirect fires capabilities to mass in time and space on point, area, and distributed targets over wide areas to support decentralized full-spectrum operations.

m. Future Army forces require the capability to conduct liaison with the component designated by the joint force commander to assist in planning, coordinating, and integrating air operations during full-spectrum operations.

n. Future Army forces require the capability to fuse sensor data to increase target location accuracy to enable the effective and efficient delivery of conventional and precision munitions.

B-6. Air and missile defense

a. Future Army forces require the capability, from tactical to strategic levels, to plan, prepare, execute, and assess joint, Army, and multinational AMD capabilities to provide defensive fires at all echelons in full-spectrum operations.

b. Future Army forces require the capability of a common air picture provided by data from organic and nonorganic sensors to enhance aerial situational awareness and understanding during full-spectrum operations.

c. Future Army forces require the capability to classify, identify, and discriminate friendly, neutral, unknown, and hostile aerial objects in full-spectrum operations to enhance aerial track confidence, enable rapid engagements, and protect friendly forces.

d. Future Army forces require a globally and rapidly deployable Army air and missile defense capability to support strategic deterrence missions in cooperation with joint and multinational partners.

e. Future Army force units, bases, and installations require the 360 degree capability to intercept in flight threat rockets, artillery, mortars, ballistic and cruise missiles, manned and unmanned aircraft in full-spectrum operations, to prevent threat surveillance, targeting, and attacks on friendly forces, populations centers, and critical infrastructure.

f. Future Army forces require a shoot-on-the-move capability to intercept in flight threat rockets, artillery, mortars, cruise missiles, and manned and unmanned aircraft in full-spectrum operations to prevent surveillance, targeting, and attacks against friendly maneuvering units and to support movement and maneuver operations.

g. Future Army forces require the capability to access air and space surveillance data from joint, interagency, intergovernmental, and multinational partners while conducting full-spectrum operations to defeat aerial attacks and negate adversary freedom of action in the space domain.

h. Future Army forces require integrated battle management capabilities in full-spectrum operations that rapidly determine and disseminate real time hit and miss assessments to preserve interceptors and facilitate re-engagement of targets.

i. Future Army forces require the capability to acquire, receive, and disseminate regional warnings of air and missile attacks during full-spectrum operations to protect friendly forces and enhance joint and Army engagement capabilities.

j. Future Army forces require the capability to defeat sophisticated missile attacks, which may consist of a combination of cruise and ballistic missiles with advanced capabilities, maneuverable re-entry vehicles, early release submunitions, hypersonic, and other advanced countermeasures), in full-spectrum operations to prevent effects against friendly forces, population centers, and critical infrastructure.

k. Future Army forces require the capability to command joint, Army, and multinational air and missile defense capabilities at the brigade-level and above during full-spectrum operations to achieve unity of effort in joint and multinational operations.

l. Future Army forces require the capability to employ fires to support space control and negate adversary space systems and services to defeat space threats during full-spectrum operations.

B-7. What the Army fires function requires from other functions

a. Mission command.

(1) Future Army forces require the capability of reliable communications networks to transmit timely mission command information and fire control data over extended ranges to provide offensive and defensive fires in support of widely dispersed, full-spectrum operations.

(2) Future Army forces require the capability to maintain an accurate and complete common operational picture including fires information to enable commanders to make informed decisions to coordinate and clear fires on the ground and through the airspace during the conduct of full-spectrum operations.

(3) Future Army forces require redundant and survivable communications systems to mitigate the effects of enemy attacks and to provide offensive and defensive fires during full-spectrum operations.

(4) Future Army forces require a fires net that provides assured communications, capacity, and timeliness to expedite the clearance and execution of offensive and defensive fires.

(5) Future Army forces require the capability to communicate with joint, interagency, intergovernmental, and multinational partners across classified and unclassified networks to conduct full-spectrum operations.

(6) Future Army forces require an organic mission command capability that seamlessly provides line of sight, non-line of sight and beyond line of sight access to a secure Internet Protocol router, a non-secure Internet Protocol router and other global information grid services at all Army ADA echelons to enable planning, coordination, and executions of IAMD and enable decentralized and centralized AMD operations during full-spectrum operations from the tactical to strategic level.

b. Intelligence.

(1) Future Army forces require intelligence collection and analysis capabilities to support targeting and defense design, to provide effective and efficient offensive and defensive fires.

(2) Future Army forces require the capability to integrate intelligence collection capabilities with fires capabilities to produce targetable data for offensive and defensive fires.

c. Movement and maneuver.

(1) Future Army forces require the capability to integrate mortars with other indirect fires systems through the network to provide offensive and defensive fires for decentralized operations across wide areas.

(2) Future Army forces require the capability to integrate mounted and dismounted maneuver sensors to locate targets and provide offensive and defensive fires for decentralized operations across wide areas.

(3) Future Army forces require the capability to determine friend-foe-neutral combat identification to prevent fratricide and protect populations

d. Protection. Future Army forces require the capability to provide early warnings, warnings of rocket, artillery, mortar, manned and unmanned aircraft, and missile threats to friendly forces and populations to prevent or reduce casualties in full-spectrum operations.

e. Sustainment.

(1) Future Army forces require the capability to provide continuous sustainment of all classes of supply to firing elements dispersed across wide areas in austere areas of operations to provide uninterrupted offensive and defensive fires during decentralized full-spectrum operations.

(2) Future Army forces require the capability to manage indirect fires and air and missile defense Class V requirements to provide uninterrupted offensive and defensive fires during decentralized full-spectrum operations.

B-8. Fires capabilities required by other functions

a. Mission command. Mission command has no fires requirements.

b. Intelligence.

(1) Future Army forces require the capability to integrate target acquisition sensors with intelligence collection, planning, and analysis to enhance operations and intelligence integration and provide intelligence that supports all levels of decisionmaking.

(2) Future Army forces require the capability to integrate high value targets and high payoff target lists to the intelligence collection, planning, and analysis to enhance operations and intelligence integration and provide intelligence that supports all levels of decisionmaking.

(3) Future Army forces require the capability to integrate every Soldier as sensor information with intelligence collection, planning and analysis to enhance operations and intelligence integration and provide intelligence that supports all levels of decisionmaking.

c. Movement and maneuver.

(1) Future Army forces require the capability to employ precision indirect fires (lethal and nonlethal effects) to prevent collateral damage and fight within the rules of engagement.

(2) Future Army forces require the capability to employ networked joint fires that link sensors to shooters with scalable capabilities to achieve the desired effects to support the close fight and commander's maneuver.

(3) Maneuver forces require the capability to provide indirect fire support to widely dispersed subordinate units to support decentralized operations.

(4) Future Army forces require the capability to perform precision target location during operations to employ precision munitions.

d. Protection.

(1) Future Army forces require the capability to detect rockets, artillery, and mortar projectiles and provide early warning to protect personnel and vital physical assets during full-spectrum operations.

(2) Future Army forces require the capability to provide offensive and defensive fires to preempt enemy actions and protect personnel and vital physical assets.

(3) Future Army forces require the capability to intercept threat rockets, artillery, and mortar projectiles to protect personnel and vital physical assets.

(4) Future Army forces require the capability to employ scalable fires capabilities that minimize casualties and reduce collateral damage to protect personnel and vital physical assets.

e. Sustainment. Future Army forces require the capability to provide sustainment convoys and sites with rapid defensive fires to maintain freedom of action in full-spectrum operations in the future operating environment.

B-9. What the Army fires function capabilities provide joint partners

a. Future Army forces provide all-weather, 24-hour, land-based fire support for full-spectrum operations.

b. Future Army forces provide the land component of joint IAMD, specifically for ballistic and cruise missile threats; RAM and UAS intercept; and joint and coalition integrated air picture development.

B-10. What the Army fires function requires from joint partners

a. Where threats exceed the range or effects capabilities of Army indirect fires, joint fires become the means to engage these threat targets.

b. The fires warfighting function will be reliant on GPS and other space-based system capabilities to deliver precision fires and effects.

c. Future Army forces will rely on the interoperability of joint sensors with Army sensors to effectively fuse sensor data to ensure accurate target identification, location, and tracking.

d. The Army will rely on a joint and multinational combat identification capability that enables the rapid determination of friend, foe, and neutral.

Appendix C Organizing Fires Capabilities for Army Operations

C-1. Introduction

This appendix describes how fires capabilities are organized by echelon to provide offensive and defensive fires in support of Army operations. Fires organizations exist from the lowest tactical echelon through the theater army level. These organizations span from cannon and missile delivery units to staff elements to plan, synchronize, employ, and assess joint and Army fires.

C-2. Theater Army

a. The theater army fires cell plans, coordinates, integrates, and synchronizes the employment and assessment of strategic theater fires in support of current and future theater-wide operations. The fires cell establishes theater targeting guidance and develops theater high-payoff, high-value targets, time-sensitive targets, and selects theater strategic targets for attack. The cell coordinates, integrates, and assigns joint, interagency, and multinational firepower to targets and target systems. It synchronizes theater level fires to include joint, Army, interagency, and multinational component air assets, special operations forces, attack helicopters, maritime gun

and missiles, Army rockets and missiles, and command and control warfare (physical attack, EW, and computer network operations against the enemy). The cell coordinates and conducts theater electronic attack; conducts theater combat assessments (battle damage, munitions effects, reattack requirements); develops planning guidance and coordinates precision engagement counter countermeasures; provides target intelligence for theater planning and execution and coordinates with the battlefield coordination detachment (BCD) collocated with the respective air operations center. The fires cell allocates its subordinate sections and elements between participating in theater army planning sessions, preparing or conducting working groups, boards and cells, and supporting the contingency command post when deployed. In addition to the operations process, the fires cell employs the structured targeting process.

b. Army theater level air and missile defense commands (AAMDCs) are regionally aligned to combatant commanders and support a joint force commander by contributing to joint force AMD planning. The joint force commander assigns an AADC who is overall responsible for AMD. The AAMDC commander supports the AADC as the deputy. The AAMDC is the Army's operational lead for Army AMD operations and has responsibility to coordinate with joint and multinational partners for theater air and missile defense. The AAMDC provides air defense artillery fire control officer liaisons to the air operations center, or sector air defense commander/regional air defense commander to support fire/engagement coordination with ADA task force elements. Contributions include air intelligence preparation of the operational environment and planning during the targeting process to enable air superiority during offensive counter-air operations. The AAMDCs use capability-based planning to determine which Army AMD assets will protect the force and defended assets during defensive counter air operations.

c. Army AMD brigades provide the predominance of ground based defense against air and missile threats for the joint IAMD System. Army AMD contributions to joint capabilities, such as combat identification, integrated fire control, and a single integrated air picture, enable the joint IAMD System to achieve sensor, shooter integration - greatly expanding defended areas, opportunities for engagements, and level of control for integrated air and missile defense. Army air and missile defense joint interdependencies include integration and interoperability with long range air- and sea-based sensors, such as queuing satellites, airborne sensors, fighter aircraft, and Aegis air and missile defense systems to destroy aerial threats, and joint electronic warfare capabilities to deny adversary jamming and electronic attack against friendly air and missile defense systems.

d. At the theater level, battlefield coordination detachments function as the Army force commander's or land component commander's liaison to the air component commander. The battlefield coordination detachment physically resides within the joint or combined air operations center. A battlefield coordination detachment exchanges current intelligence and operational data, support requirements, coordinates Army forces' requirements for airspace coordinating measures, fire support coordination measures, and theater airlift.

e. The ground liaison detachment conducts liaison with United States Air Force numbered air force, fighter, theater air control, reconnaissance, and airlift units as they advise air commanders on Army organization, operations, tactics, and equipment. During joint operations, they assist

the commander by coordinating with Army units. Ground liaison detachments may be placed under the operational control of the battlefield coordination detachment commander.

C-3. Corps

a. Corps fires cell. The descriptions of the corps main command post (CP) and tactical command post (TAC CP) fires cell duties and responsibilities assume that the corps HQ will be the joint task force HQ. The corps main CP fires cell contains fires, field artillery intelligence, and EW elements. These elements are broadly responsible for conducting deliberate fire support planning for the corps, leading the joint targeting process (including key targeting-related boards), providing target management for the joint operations area, interfacing with other joint boards and cells, providing input to the air tasking order, interfacing with the BCD and joint force land component commander, and coordinating requirements with other components.

b. The corps TAC CP fires cell's general responsibilities include providing feedback to the main CP fires cell, interfacing with the BCD and air support operations center, providing the fire support input to the common operational picture, and conducting time sensitive targeting. Normally, the tactical CP fires cell executes fires activities for a specific operation or for short durations. The fires cell may require additional augmentation from the main CP fires cell, depending on mission requirements. The deputy chief of fires, who may locate elsewhere as the situation requires, leads the tactical CP fires cell. The TAC CP may be deployed in an AO separate from the main CP. When not controlling operations, the TAC CP will normally collocate with the main command post and perform functions designated by the commander.

c. Fires brigades (FIB) may be assigned, attached, or placed under the operational control of a corps, joint force land component, joint task force (including joint special operations task force), or other command. While operating under the control of the joint force commander or another service, the Army service component command commander exercises administrative control over the FIB. The commander of the organization to which the FIB has been assigned, attached, or placed under the operational control of, will assign the fires brigade its mission and area of operations, and coordinate actions with brigade combat teams and other support brigades assigned to the command. Fires brigades are task-organized to accomplish assigned tasks. The FIB provides the supported commander a HQ to plan, prepare, execute, and assess fires. The fires brigade is capable of employing or coordinating joint fires. The fires brigade also has the necessary mission command structure to integrate ground and aviation forces under its operational control and function as a force HQ for limited operations. If so designated by the commander of the FIB's controlling HQ, a FIB can be designated a force field artillery HQ which could mean, for example, taking full operational control of all field artillery units organic, assigned, attached, or placed operational control (OPCON) by the commander of that command. The FIB may be organized with a tactical air control party to facilitate air-ground integration and the coordination of joint fires employment.

d. ADA brigades support corps operations through IAMD capabilities assigned based on METT-TC. These capabilities include liaisons for planning and coordination with higher and lower echelon units and sensors and air defense airspace management (ADAM) assets to enable aerial situational awareness and situational understanding and early warning for the corps

commander. Aerial situational awareness and situational understanding enables the corps commander to control below coordinating altitude airspace for missions such as aviation operations, airspace clearance, and medical evacuation. In addition, support at the corps level may include the assignment of ADA units to protect designated corps critical assets, such as HQ and key supply and tactical staging areas

C-4. Division

a. The fires cell in the division main CP includes fires, field artillery intelligence, combat operations and intelligence center, and EW elements. These elements are broadly responsible for conducting deliberate fire support planning for the division, leading the division targeting process, providing target management for the division AO, interfacing with other division integrating and functional cells, coordinating with the Air Support Operations Center, coordinating use of airspace with maneuver and air support, and interfacing with the corps main and TAC CP fires cells. The TAC CP has a small fires cell formed from the main CP fires cell. When the TAC CP is not deployed, these personnel augment the fires cell within the division's main CP. When deployed, the division TAC CP fires cell functions include—

- (1) Executing the division fire support plan.
- (2) Requesting and coordinating close air support and air interdiction.
- (3) Synchronizing a range of scalable capabilities (lethal/nonlethal) and joint fire support.
- (4) Conducting assessments and recommending re-attack.
- (5) Recommending fire support coordination measures.

b. The fires brigade is normally assigned or attached to a division HQ, however, as discussed earlier, they may be assigned, attached, or placed OPCON to a corps, joint force land component commander, joint task force, or other command. As the FIB is the only Army field artillery command above the brigade combat team level, it is likely that it will execute missions for any joint, service, or functional HQ. The fires brigade is not organic to any Army organization or echelon, nor is it focused on any specific region or geographic combatant commander's area of responsibility. It is expected that a FIB will be attached or OPCON to a division as it is organized into a force package. If the supported commander were to direct a habitual relationship of a fires brigade with a division, it could be beneficial to assist brigade combat team commanders in training and preparing their fires battalions. Training readiness oversight of all field artillery-specific training by fires brigades to fires battalions within a brigade combat team could help ensure fires units are trained and ready for deployment in support of the mission. For example, an early commandwide inspection and training program could provide the division HQ and its subordinate brigade combat team (BCT) commanders an estimate on the level of proficiency of BCT organic field artillery assets for conducting counterfire and coordinate any necessary training prior to their deployment. Additionally, a FIB assigned or attached to a division can be designated a force field artillery HQ, control the full complement of joint and Army fires, and provide a wide range of offensive and defensive fires.

c. At the division level, AMD liaison officers coordinate and synchronize AMD support to maneuver operations with higher echelon AMD planners at the corps and theater (AAMDC) level. ADAM cells at the division and BCT level provide aerial situational awareness and situational understanding, airspace management, establish connectivity with joint, and multinational sensors, and early warning at the appropriate levels to support division and brigade operations. The ADAM cell may also act as the liaison between division or brigade with adjacent AMD elements operating within the area of responsibility. ADA battalions, task organized based on METT-TC, provide defensive fires to protect against air and missile threats during division and BCT shaping and entry operations, intertheater and intratheater operational maneuver, full-spectrum operations.

C-5. Ground based midcourse defense (GMD) brigade

The GMD brigade provides fires by interception of adversary offensive missile in the mid-course phase of flight. This capability provides protection of the U.S. homeland from world-wide threats. The GMD brigade has the ability to expand its capabilities from its current structure to include interceptor sites in other U.S. locations or overseas, as directed by U.S. command authority. The brigade requires the ability to coordinate defensive fires with other U.S. joint partners and multinational missile defense providers. The brigade uses a robust command, control, and communication system to operate in a degraded environment. The brigade requires full integration of land, sea, and space sensors to detect threats at the earliest possible moment and provide high quality data resolution to engage and destroy enemy missiles in a timely and efficient manner. As future technology develops, the brigade may participate in related space control activities.

C-6. ARSOF

a. ARSOF combat units enhance their effectiveness through the planning, coordination, synchronization, and execution of lethal and nonlethal joint fires to achieve desired effects and mission success. ARSOF units may require long-range, air or ground-based joint fires support while operating in either a joint special operations area (JSOA) or while supporting a specified conventional ground force unit and operating within that unit's designated AO. Within a JSOA, joint fires support will be coordinated by the joint special operations task force (JSOTF), or special operations task force (SOTF) SOF joint fires element (SOFJFE), and the special operations liaison element (SOLE), which is located at the joint air operations center. Joint fires support for ARSOF units operating within a ground force AO will be coordinated by either the special operations command and control element (SOCCE), or the special forces liaison element (SFLE) which are located at the corps or division HQ, respectively. The SOCCE and SFLE will coordinate support with the fires cell located within the corps or division HQ, using that HQ's designated joint fires request procedures.

b. Integrated joint fires support planning, between ARSOF units and the JSOTF and SOTF or the supported ground force HQ, will facilitate rapid, responsive, accurate, and deconflicted joint fires mission execution. When functioning as a separate Task Force, ARSOF ranger units will coordinate joint fires support with the Ranger Regimental Fires Support Element. Within the JSOTF and SOTF, the SOFJFE is the focal point for joint fires and targeting activities and

provides recommendations to the J-3 to accomplish joint fires planning and synchronized fire support execution. The SOFJFE consists of permanently assigned aviation officers, field artillery officers, warrant officers, and NCOs. Air liaison officers and other LNOs from any unit from another service or government agency that provides dedicated, lethal or nonlethal fire support to the JSOTF or SOTF will also augment the SOFJFE. The SOFJFE is task-organized to integrate seamlessly with intelligence collection, current operations, and future plans.

Appendix D

Crosswalk of Required Capabilities to Components of the Fires Solution

D-1. Linkage

To illustrate the linkage between capabilities and the fires solution, the section below lists the fires required capabilities organized by the components of the fires solution.

D-2. Expand the Army fires warfighting function

a. Future Army forces require the capability to clear, authorize, and employ joint, Army, and multinational fires, on the ground and in the airspace, to provide offensive and defensive fires.

b. Future Army forces require the ability to target threat systems accurately, to include mission command nodes to prevent their employment or re-employment during full-spectrum operations to deliver effective offensive and defensive fires.

c. Future Army forces require a mission command system with fire support and air and missile defense fire control functions to task organize, plan, coordinate, and integrate fires capabilities for decentralized, full-spectrum operations.

d. Future Army forces require the capability of a common air picture provided by data from organic and nonorganic sensors to enhance aerial situational awareness and understanding during full-spectrum operations.

e. Future Army forces require the capability to degrade or destroy enemy command, control and sensor systems in the land, air, and space domains during full-spectrum operations.

f. Future Army forces require the capability to maintain an accurate and complete common operational picture including fires information to enable commanders to make informed decisions to coordinate and clear fires on the ground and through the airspace during the conduct of full-spectrum operations.

g. Future Army forces require redundant and survivable communications systems to mitigate the effects of enemy attacks and to provide offensive and defensive fires during full-spectrum operations.

D-3. Employ versatile fires capabilities

- a. Future Army forces require fires leaders and Soldiers skilled in core competencies and non-fires missions to rapidly transition between missions during full-spectrum operations.
- b. Future Army forces require fires weapons, sensors, mission control, and support platforms with the same mobility, survivability, and protection as the supported force to conduct intertheater and intratheater movement and maneuver in support of full-spectrum operations.
- c. Future Army forces require fires weapons, sensors, mission command, and support platforms with rapid emplace and displace capabilities to provide continuous support to maneuver forces during mobile operations in support of full-spectrum operations.
- d. Future Army forces require the capability for fires organizations to defend themselves against ground, aerial, and electronic warfare threats to provide continuous support to maneuver forces in support of full-spectrum operations.
- e. Future Army forces require fires with a wide range of conventional to precision capabilities to provide effective and efficient offensive and defensive fires under a wide range of conditions in support of full-spectrum operations.
- f. Future Army forces require the capability to employ multispectral obscurants and illumination to limit enemy freedom of action and support combined arms operations in support of full-spectrum operations.
- g. Future Army forces require the capability to plan, prepare, execute, and assess offensive and defensive joint, Army, interagency, and multinational fires from maneuver platoon to theater-level over wide areas to support full-spectrum operations.
- h. Future Army forces require the capability to plan, prepare, execute, and assess joint, Army, and multinational AMD capabilities from tactical to strategic levels to provide offensive and defensive fires at all echelons in full-spectrum operations.
- i. Future Army forces require a globally and rapidly deployable Army air and missile defense capability to support strategic deterrence missions in cooperation with joint and multinational partners in support of full-spectrum operations.
- j. Future Army force units, bases, and installations require the 360 degree capability to intercept in flight threat rockets, artillery, mortars, ballistic and cruise missiles, manned and unmanned aircraft to prevent threat surveillance, targeting, and attacks on friendly forces, population's centers, and critical infrastructure in support of full-spectrum operations.
- k. Future Army forces require a shoot-on-the-move capability to intercept in flight threat rockets, artillery, mortars, cruise missiles and manned and unmanned aircraft to prevent surveillance, targeting, and attacks against friendly maneuvering units and to support movement and maneuver operations in support of full-spectrum operations.

l. Future Army forces require the capability to acquire, receive, and disseminate regional warnings of air and missile attacks to protect friendly forces and enhance joint and Army engagement capabilities in support of full-spectrum operations.

m. Future Army forces require the capability to defeat sophisticated missile attacks, which may consist of a combination of cruise and ballistic missiles with advanced capabilities (maneuverable reentry vehicles, early release submunitions, hypersonic, and other advanced countermeasures), to prevent effects against friendly forces, population centers, and critical infrastructure in support of full-spectrum operations.

n. Future Army forces require the capability to employ fires to support space control and negate adversary space systems and services to defeat space threats during full-spectrum operations.

o. Future Army forces require the capability to provide early warnings and warnings of rocket, artillery, mortar, manned and unmanned aircraft, and missile threats to friendly forces and populations to prevent or reduce casualties in full-spectrum operations.

p. Future Army forces require the capability to provide continuous sustainment of all classes of supply to firing elements dispersed across wide areas in austere AOs to provide uninterrupted offensive and defensive fires during decentralized full-spectrum operations.

q. Future Army forces require the capability to manage indirect fires and air and missile defense Class V requirements to provide uninterrupted offensive and defensive fires during decentralized full-spectrum operations.

D-4. Identify, locate, target, and engage threats with increased discrimination

a. Future Army forces require the capability to determine the effects of the environment (terrain and weather) across wide areas on weapons, sensors, and munitions to enable the effective and efficient delivery of fires in support of full-spectrum operations.

b. Future Army forces require the capabilities to determine weapons and sensors locations under fully operational and degraded conditions to deliver effective precision and area fires and integrate fire control over wide areas during full-spectrum operations.

c. Future Army forces require the capability to locate ground targets accurately to employ the range of precision to conventional capabilities necessary for effective and efficient offensive and defensive fires in support of full-spectrum operations.

d. The future force requires scalable indirect fires capabilities to provide the desired effects proportional to the target and situation, prevent fratricide, and minimize collateral damage in support of full-spectrum operations.

e. Future Army forces require 360 degree capability to locate threat indirect fires systems and determine points of origin and impact to provide defensive fires during full-spectrum operations.

f. Future Army forces require the capability to fuse sensor data to increase target location accuracy to enable the effective and efficient delivery of precision and conventional munitions in support of full-spectrum operations.

g. Future Army forces require the capability to classify, identify, and discriminate friendly, neutral, unknown, and hostile aerial objects to enhance aerial track confidence, enable rapid engagements, and protect friendly forces in support of full-spectrum operations.

h. Future Army forces require integrated battle management capabilities that rapidly determine and disseminate real time hit and kill assessments to preserve interceptors and facilitate re-engagement of targets in support of full-spectrum operations.

i. Future Army forces require intelligence collection and analysis capabilities to support targeting and defense design to provide effective and efficient offensive and defensive fires in support of full-spectrum operations.

j. Future Army forces require the capability to determine friend-foe-neutral combat identification to prevent fratricide, protect populations in support of full-spectrum operations.

D-5. Integrate joint, Army, and multinational capabilities

a. Future Army forces require the capability to engage targets detected by organic and non-organic linked sensors to employ joint, Army, and multinational fires capabilities across wide areas in centralized and decentralized operations in support of full-spectrum operations.

b. Future Army forces require the capability of interoperable and redundant tactical and technical fire direction systems to coordinate and synchronize fires with joint and multinational partners and to enable task organizing into smaller firing elements in support of full-spectrum operations.

c. Future Army forces require the capability of joint and multinational interoperability in providing fire support from the component to the platoon level to coordinate and synchronize fires with joint and multinational partners in support of full-spectrum operations.

d. Future Army forces require the capability to conduct liaison with the component designated by the joint force commander to assist in planning, coordinating, and integrating air operations during full-spectrum operations.

e. Future Army forces require the capability to access air and space surveillance data from joint interagency, intergovernmental, and multinational partners to defeat aerial attacks negate adversary freedom of action in the space domain in support of full-spectrum operations.

f. The future Army forces require an organic mission command capability that seamlessly provides line of sight, non-line of sight and beyond line of sight access to secure Internet Protocol router, non-secure Internet Protocol router, and other global information grid services at all Army AMD echelons to enable planning, coordination, and executions of IAMD and enable decentralized and centralized AMD operations during full-spectrum operations from the tactical to strategic level.

g. Future Army forces require the capability to integrate mortars with other indirect fires systems through the network to provide offensive and defensive fires for decentralized operations across wide areas.

h. Future Army forces require the capability to integrate mounted and dismounted maneuver sensors to locate targets and provide offensive and defensive fires for decentralized operations across wide areas.

i. Future Army forces require the capability to integrate intelligence collection capabilities with fires capabilities to produce targetable data for offensive and defensive fires.

D-6. Distributed fires for decentralized operations

a. Future Army forces require fires with the capability for weapons, sensors, and mission command nodes at lower levels to be interoperable and support integrated processes in full-spectrum operations to support decentralized operations over wide areas.

b. Future Army forces require fires with the capabilities to operate across wide areas, while maintaining the capability to mass fires and engage threats to support decentralized operations over wide areas.

c. Future Army forces require the capability to reinforce the indirect fire capabilities organic to brigade combat teams and provide direct support to functional and multifunctional brigades during full-spectrum operations to provide offensive and defensive fires across wide areas.

d. Future Army forces require the capability to mission command joint, Army, and multinational indirect fires capabilities above the BCT-level during full-spectrum operations to achieve unity of effort in joint and multinational operations.

e. Future Army forces require the capability to mission command joint, Army, and multinational air and missile defense capabilities at the brigade-level and above during full-spectrum operations to achieve unity of effort in joint and multinational operations.

f. Future Army forces require surface-to-surface fires to attack tactical to strategic targets with scalable effects at extended ranges, to increase the depth and breadth of the AO, and provide support for decentralized full-spectrum operations over wide areas.²⁰

g. Future Army forces require indirect fires capabilities to mass in time and space on point, area, and distributed targets over wide areas to support decentralized full-spectrum operations.

h. Future Army forces require the capability of reliable communications networks to transmit timely mission command information and fire control data over extended ranges to provide offensive and defensive fires in support of widely dispersed, full-spectrum operations.

Appendix E

Assumptions from the ACC and AOC

a. Assumptions from the ACC.²¹

(1) The network (to include global information grid, LandWarNet, collection platforms, and fusion and dissemination capabilities) cannot in and of itself deliver information superiority.

(2) Future enemies will combine conventional and unconventional tactics while fighting in complex terrain (both urban and rural) to limit U.S. forces' ability to develop the situation out of contact and achieve overmatch with long range weapons.

(3) Future enemies will attempt to counter or interrupt U.S. advantages in communications, surveillance, long-range precision fires, armor protection, and mobility.

(4) Future enemies will seek weapons of mass destruction and ways to employ them.

(5) Future enemies will attempt to influence the will of the American people and key allies, through propaganda, disinformation, and attacks on U.S. and allies' assets at home or abroad.

(6) Advanced air and sealift capabilities that permit intertheater and intratheater operational maneuver from strategic distances, mounted vertical maneuver, and the use of unimproved ports of debarkation, will not be fielded in the quantities required in the concept timeframe (2016-2028).

(7) The U.S. will continue to employ an all-volunteer force.

b. Assumptions from the ACC.²²

(1) Uncertainty in the future operational environment will continue to increase as political, economic, informational, and cultural systems become more complex and interconnected.

(2) Adversaries will be able to achieve tactical, operational, and strategic surprise based on rapid application of available and emerging technologies in both manned and unmanned systems.

(3) U.S. forces will operate in environments where land, air, space, maritime and cyberspace superiority is increasingly contested by an ever widening set of state and nonstate actors with sophisticated capabilities.

(4) U.S. forces will face increasing antiaccess and area denial challenges due to strategic preclusion, operational denial, and tactical overmatch.

(5) U.S. forces will have limited ability to overcome antiaccess and area denial capabilities, deploy into austere locations, and sustain operations in immature theaters.

(6) The Army will continue to employ the Army National Guard and Army Reserve on a routine basis as part of its operational forces.

(7) The Army will continue to use a force management model that relies on unit replacement and cyclical readiness to govern the training, deployment, and reset of its operational forces.

(8) Army modernization efforts will provide incremental, brigade-based capability improvements to the force.

Appendix F Training and Leader Development

F-1. Introduction

a. The ability of the Army of to employ fires across full spectrum of operations will inherently be dependent on the abilities of leaders across the Army. Within the context of the fires warfighting function, fires leaders are responsible for planning and executing operationally adaptive fires in support of full-spectrum operations. The competitive advantage of U.S. Army's fires force is directly related to the ability of the Soldiers and leaders of the fires warfighting function to learn faster and adapt more quickly than our adversaries. Accordingly, there will be increased emphasis on training, education, and developing a generation of fires leaders who are able to succeed in the face of uncertainty.

b. Fires leaders must be expert in their core and functional competencies. They must also be critical thinkers, effective communicators, and confident operators across the full spectrum of operations. Fires leaders will continue to be called upon to manage complexity for extended periods of time in expeditionary campaigns. They must be culturally astute, courageous, and innovative in thought and action. They must anticipate and manage operational transitions to see and exploit opportunities in the operating environment. Our fires leaders must possess a strong character that is grounded in the Army values and the Warrior Ethos.

c. Junior leaders will be called upon to conduct operations guided by mission orders at the ends of extended lines of communications in noncontiguous areas of operations. They must demonstrate a willingness to accept a degree of risk in their decisions with the knowledge that their senior leaders will provide the resources and authorities required to support their choices. Senior fires leaders demonstrate tactical and operational patience by allowing junior leaders the time and space needed to develop the situation through action in accordance with their abilities and the intent of higher HQ. In addition, our fires leaders at higher echelons work through ambiguity, anticipate change, create opportunities, and manage transitions to ensure freedom of

action for their subordinates. Operating together in such a manner, Army leaders exhibit the necessary level of operational adaptability to adjust rapidly to changing situations.

F-2. Training

a. Success in future operations depends in great measure upon effective, realistic training to build the necessary competence and confidence in Soldiers, units, and fires leaders. The Army's fires force individual, collective, and leader training programs must not only transmit the required knowledge, skills, and abilities, they must do so in a manner that is suited to the learning style and preferences of a new technology savvy generation of young Americans.

b. Institutional and home station training programs take advantage of embedded and mobile technologies to link Soldiers and units to centralized sources of information and training support. Combat training centers develop high-end collective proficiency to ensure unit readiness for deployment. Deployed fires forces will benefit from new sources of training support and reach-back to sustain critical skills while away from home station regardless of the mission. Institutional training will provide operationally relevant scenarios that guide training and leader development across the fires force.

c. Because of the inherent joint nature of fires, fires training will incorporate increased levels of joint and interagency participation to broaden both Army and partner understanding and expertise in the planning and application of fires across the spectrum of operations.

F-3. Education

a. One of the best countermeasures against the uncertainty of the future operational environment is a well educated cadre of fires leaders. Learning is a continuous and lifelong process that builds upon formal professional military education, experience, and personal self-study. Fires leaders will emphasize lifelong learning and provide officers and noncommissioned officers educational opportunities that broaden and deepen their understanding of the complexities of operating environment to enable their successful management of uncertainty. Army learning must create leaders who are instinctively analytical in their approach to and use of information. In support of this end, personnel practices will promote the value of service as instructors for all junior and senior fires force leaders.

b. Our fires curriculum will clarify and reinforce the standards of moral and ethical behavior for both leaders and Soldiers. To defeat enemies whose primary sources of strength are coercion, brutality, and the stoking of hatreds based on ignorance, the Army must provide its members a clear set of expectations. Ignorance, uncertainty, fear, and combat trauma can lead to breakdowns in discipline and conduct that often result in violations of the Uniform Code of Military Justice, the Law of War, and the Geneva Conventions. Against such challenges, fires leaders must strive to reduce uncertainty through tough, realistic training that builds cohesion, confidence, and mutual trust. Our fires Soldiers and leaders must recognize their special role in the judicious use of lethal effects ensuring that innocents are protected while providing needed fires in support of combined arms operations.

c. Training, education, and leader development across the institutional, operational, and self-development domains are the glue that holds Army units together and produces the cohesion and combat effectiveness required for decentralized combined arms maneuver and security operations. An emphasis on training and continuous learning sustains the ability of Army leaders and units in challenging and difficult missions. By taking explicit steps to promote the value of education and lifelong learning, the Army assures its leaders and Soldiers possess the ability to think critically, operate in uncertainty, and adapt as needed. Our training, education, and leader development initiatives will develop strategic fires leaders who embody the highest standards of moral and ethical conduct and ensure the continued professionalism of the Army. It will be training, education, and leader development that ensure our fires force is prepared to provide operationally adaptive fires in support of full-spectrum operations.

F-4. The Joint and Combined Fires University

a. To that end, the Fires Center of Excellence (CoE) will establish the Joint and Combined Fires University (JCFU). Central to the JCFU is providing a fires curriculum that is the right content, at the right time, and the right place to our Army, our joint partners, our interagency partners, and our international partners. Foundational to our JCFU strategy is the notion of excellence in training and education and support of learner lifelong-learning.

b. A combination of the “best and brightest” military and civilian instructors, will make-up the faculty of the JCFU. These instructors will not be the “sage-on-the-stage,” rather they will be mentors and coaches who facilitate learning in a learner-centric training and education system.

c. The curriculum will be “blended,” supporting not only the traditional institutional “schoolhouse,” but also the operational and self-development domains as well. Our joint fires curriculum will be rich in context and learning will occur through an immersion in scenarios that match what the fires Soldier and leader will actually experience in the operating environment.

d. The JCFU will provide world-class joint and combined fires training and education through a joint integrated training environment (JITE) that links the institutional, operational, and self-development training domains utilizing live, virtual, constructive, gaming, and mission command applications. The Fires CoE, in support of the JCFU and the operating forces, will develop this environment by integrating the separate live, virtual, constructive, and gaming training environments with its mission command systems to create one seamless JITE. The Fires CoE will establish the conditions that enable it to develop mission-ready Soldiers, leaders, and units capable of providing operationally adaptable fires across the full spectrum of fires.

Appendix G Space Control

G-1. Purpose

This appendix provides the conceptual relationship between space control and the fires AFC. It also describes possible fires support for joint and Army space control efforts during future operations. Although a detailed discussion of space control may be classified, this unclassified

appendix will describe the key ideas that frame the environment and define the military problem for the Army fires warfighting function. It conceptualizes overarching components of the solution and associated required capabilities. This concept describes how fires and associated capabilities support the Army's core operational actions.

G-2. Background

a. Space is an increasingly contested environment for the U.S. and its allies. U.S. future adversaries will attempt to use space for purposes hostile to U.S. national interests. Nation states are continuing to invest in military space capabilities. Domestic and international commercial space organizations are expanding our capabilities, as well as those of our adversaries. The majority of new satellites will be communication systems, but new and increasingly more sophisticated imaging satellites are also proliferating. Nations that previously showed little interest in space ventures are now purchasing satellites and paying other nations to launch these satellites into orbit. Adversaries will be able to buy militarily significant space products or services. Commercially available space-based intelligence, surveillance, and reconnaissance could be significant enhancement to any adversary's antiaccess campaign. For example, 1-meter or better resolution imagery, sufficient for tactical targeting (if timely) is commercially available today. The ability of adversaries to have access to overhead real-time observation capabilities and telecommunications satellites, capable of supporting operations in remote or undeveloped areas, as well as in urban environments, could have a significant impact on our future operations.²³

b. It has been known for years that countries had the ability to use a ground-based space launch vehicle as an antisatellite weapon for space control. For example, on January 11, 2007, the People's Republic of China successfully destroyed a defunct Chinese weather satellite, FY-1C. An SC-19 antisatellite weapon missile with a kinetic kill warhead reportedly carried out the destruction. Prior to 2008, antisatellite weapon was the purview of specialized space launch vehicles. This fundamentally changed during Operation Burnt Frost. On February 21, 2008, 03:26 GMT, a ballistic missile defense standard missile-3 (SM-3) was fired from the *Ticonderoga* class missile cruiser USS *Lake Erie*, and intercepted USA-193, a failed and de-orbiting U.S. satellite, about 133 nautical miles (247 kilometers) above the Pacific Ocean.

G-3. Terminology²⁴

a. Space control mission area: Operations to ensure freedom of action in space for the United States and its allies, and when directed, deny an adversary freedom of action in space. It includes: surveillance of space, protection of U.S. and friendly space systems; prevention of an adversary's ability to use space systems and services for purposes hostile to U.S. national security interests; negation of space systems and services for purposes hostile to U.S. national security interests, and directly supporting battle management, command, control, communications, computers, and intelligence.

(1) Deceive. Measures designed to mislead the adversary by manipulation, distortion, or falsification of evidence to induce an adversary to react in a manner prejudicial to their interests.

(2) **Disrupt.** Temporary impairment (diminished value or strength) of the utility of space systems, usually without physical damage to the space system. These operations include the delaying of critical, perishable data to an adversary.

(3) **Deny.** The temporary elimination of the utility of space systems, usually without physical damage.

(4) **Degrade.** The permanent partial or total impairment of the utility of space systems, usually with physical damage.

(5) **Destroy.** Permanent elimination of the utility of space systems. This last option includes attack of critical ground nodes; destruction of uplink and downlink facilities, electrical power stations, and telecommunications facilities; and attacks against mobile space elements and on-orbit assets.

(6) **Negation.** Measures to deceive, disrupt, deny, or destroy an adversary's space systems and services or any other space system or service used by an adversary that is hostile to U.S. national interests.

b. **Space force application.** Combat operations in, through, and from space to influence the course and outcome of conflict. The space force application mission area includes ballistic missile defense and force projection.

G-4. Future operations

a. As the operating environment becomes more and more complex, and nation states and other actors have routine access to space-based systems and capabilities, the Army will use all necessary means to ensure our freedom of action in all domains. This includes the conduct of space force application missions and space control missions.

b. Army ballistic missile operations typically take place through space. To provide ballistic missile defense and protect forces, the Army will use all necessary means, to include fires, to support space force application.

c. The Army will operate and maintain space control capabilities to ensure freedom of action in space, and if directed, deny such freedom to adversaries. Fires' support of space control could include operations to disrupt, degrade, or destroy adversary space systems and services. These could include fires attacks on the adversary's critical space system ground support assets (field artillery) or their on-orbit assets (missile defense) as defined above. It could also include operations for disruption or degradation of an adversary's ability to use space (electronic warfare).

d. The Army could also use appropriate fires sensors in support of space surveillance to detect, track, identify, categorize, monitor, and characterize threats to U.S. and allied space systems.

G-5. Linkage to the ACC

a. The ACC states that to defeat future adversaries with access to diverse capabilities, the Army must field forces capable of prompt and sustained combat operations skilled in operational adaptability. The Army must be able to employ a combination of defeat mechanisms to produce complementary and reinforcing results.

b. The negation of a threat ability to use space assets to communicate, navigate, and precision target U.S. forces supports the seven core operational actions: conduct security force assistance, shaping and entry operations, intertheater and intratheater operational maneuver, full-spectrum operations, conduct overlapping protection operations, distributed support and sustainment, and network-enabled mission command.

Glossary

Section I

Abbreviations

AADC	area air defense commander
AAMDC	Army theater level air and missile defense commands
ACC	Army Capstone Concept
ADA	air defense artillery
ADAM	air defense airspace management
AMD	air and missile defense
AO	area of operations
AOC	Army Operating Concept
ARCIC	Army Capabilities Integration Center
ARSOF	Army special operations forces
ASCC	Army Service component commander
BCD	battlefield coordination detachment
BCT	brigade combat team
CEP	circular error probable
CoE	center of excellence
COP	common operational picture
CP	command post
DOTMLPF	doctrine, organizations, training, material, leadership and education, personnel, and facilities
EA	electronic attack
EW	electronic warfare
FBM	forward-based mode
FCQ	fire control quality
FIB	fires brigade
FM	field manual
GMD	ground-based midcourse defense
GPS	global positioning system
HQ	headquarters
IAMD	integrated air and missile defense
IFC	integrated fire control
JFACC	Joint Force Air Component Commander
JFC	Joint Force Commander
METT-TC	mission, enemy, terrain and weather, troops and support available, time available and civil considerations
OE	operational environment
OPCON	operational control
Pam	pamphlet
PNT	positioning, navigation, and timing
RAM	rocket, artillery, and mortars
SFLE	Special Forces Liaison Element

SOCCE	Special Operations Command and Control Element
SOF	special operations forces
SOFJFE	SOF joint fires element
TAC CP	tactical command post
TLE	target location error
U.S.	United States
UAS	unmanned aircraft system

Section II

Terms

active air defense

(DOD) Direct defensive action taken to destroy, nullify, or reduce the effectiveness of hostile air and missile threats against friendly forces and assets. It includes the use of aircraft, air defense weapons, EW, and other available weapons (FM 1-02).

aerial port of debarkation

An airfield for sustained air movement at which personnel and materiel are discharged from aircraft. Aerial ports of debarkation normally serve as ports of embarkation for return passengers and retrograde cargo shipments (FM 55-1).

air defense

(DOD) All defensive measures designed to destroy attacking enemy aircraft or missiles in the Earth's envelope of atmosphere, or to nullify or reduce the effectiveness of such attack (FM 3-01).

area of operations

(DOD) An operational area defined by the joint force commander for land and naval forces. Areas of operations do not typically encompass the entire operational area of the joint force commander, but should be large enough for component commanders to accomplish their missions and protect their forces (FM 3-0).

Army service component command

Senior Army echelon in a theater and the Army component of a unified command. Includes the service component commander and all Army personnel, organizations, units, and installations that have been assigned to the unified command (FM 100-7).

ballistic missile

(DOD, NATO) Any missile which does not rely upon aerodynamic surfaces to produce lift and consequently follows a ballistic trajectory when thrust is terminated (FM 1-02).

call for fire

(DOD, NATO) A request for fire containing data necessary for obtaining the required fire on a target (FM 6-30).

circular error probable

(DOD) An indicator of the delivery accuracy of a weapon system, used as a factor in determining probable damage to a target. The radius of a circle within which half of a missile's projectiles are expected to fall. (Army) Error in location of a system or vehicle based on the on-board navigational system and the distance from the last survey control point (FM 6-30).

civil support

DOD support to U.S. civil authorities for domestic emergencies, and for designated law enforcement and other activities (JP 1-02).

clearance of fires

The process of approving or obtaining approval to attack targets with indirect fires within and outside the boundaries of the maneuver unit for which the fires are provided. (FM 6-30)

computer network attack

(DOD) Operations to disrupt, deny, degrade, or destroy information resident in computers and computer networks, or the computers and networks themselves. EA can be used against a computer, but it is not computer network attack. Computer network attack relies on the data stream to execute the attack while EA relies on the electromagnetic spectrum. An example of the two operations is the following: sending a code or instruction to a central processing unit that causes the computer to short out the power supply is computer network attack. Using an electromagnetic pulse device to destroy a computer's electronics and causing the same result is EA (FM 3-13).

counterair

(DOD) A mission that integrates offensive and defensive operations to attain and maintain a desired degree of air superiority. Counterair missions are designed to destroy or negate enemy aircraft and missiles, both before and after launch (FM 3-01).

cruise missile

(DOD) Guided missile, the major portion of whose flight path to its target is conducted at approximately constant velocity; depends on the dynamic reaction of air for lift and upon propulsion forces to balance drag (FM 3-01).

decentralized operations

The delegation of authority and capabilities to design, plan, prepare, execute, and adapt military action within the intended purpose of higher headquarters' mission.

defensive counterair

(DOD) All defensive measures designed to detect, identify, intercept, and destroy or negate enemy forces attempting to attack or penetrate the friendly air environment (FM 3-01).

defense design

The implementation of AMD plans; the detailed positioning of the ADA systems, radar, launchers, and communications to maximize the defense of defended assets (FM 3-01).

early warning

(DOD, NATO) Early notification of the launch or approach of unknown weapons or weapon carriers (FM 3-01).

electronic attack

(DOD) That division of EW involving the use of electromagnetic energy, directed energy, or antiradiation weapons to attack personnel, facilities, or equipment with the intent of degrading, neutralizing, or destroying enemy combat capability and is considered a form of fires. Includes: actions taken to prevent or reduce an enemy's effective use of the electromagnetic spectrum, such as jamming and electromagnetic deception, and employment of weapons that use either electromagnetic or directed energy as their primary destructive mechanism (lasers, radio frequency weapons, particle beams), or antiradiation weapons (FM 34-1).

final protective fire

(DOD, NATO) An immediately available prearranged barrier of fire designed to impede enemy movement across defensive lines or areas (FM 3-90).

fire control

Control of all operations in connection with the application of fire on a target (JP 1-02).

fire mission

(DOD, NATO) Specific assignment given to a fire unit as part of a definite plan. Order used to alert the weapon and battery area, and indicate that the message following is a call for fire (FM 6-30).

fire support

(DOD) Fires that directly support land, maritime, amphibious, and special operations forces to engage enemy forces, combat formations, and facilities in pursuit of tactical and operational objectives (FM 3-0).

full-spectrum operations

The range of operations Army forces conduct in war and military operations other than war (FM 3-0).

global positioning system

(DOD) A satellite constellation that provides highly accurate position, velocity, and time navigation information to users (FM 3-25.26).

homeland

The physical region that includes the continental U.S., Alaska, Hawaii, and U.S. territories and possessions, and surrounding territorial waters and airspace (JP 1-02).

homeland defense

The protection of United States sovereignty, territory, domestic population, and critical defense infrastructure against external threats and aggression or other threats as directed by the President (JP 3-0).

homeland security

A concerted national effort to prevent terrorist attacks within the U.S.; reduce America's vulnerability to terrorism, major disasters, and other emergencies; and minimize the damage and recover from attacks, major disasters, and other emergencies that occur (JP 3-28).

indirect fire

(DOD) Fire delivered on a target that is not itself used as a point of aim for the weapon or the director (FM 6-30).

interoperability

(DOD, NATO) Ability of systems, units, or forces to provide services to and accept services from other systems, units, or forces and to use the exchanged services to enable them to operate effectively together (FM 3-0).

joint force air component commander

(DOD) The commander within a unified command, subordinate unified command, or joint task force responsible to the establishing commander for making recommendations on the proper employment of assigned, attached, and or made available for employment air forces; planning and coordinating air operations; or accomplishing such operational missions as may be assigned. The joint force air component commander is given the authority necessary to accomplish missions and tasks assigned by the establishing commander (FM 100-7).

joint force commander

(DOD) A general term applied to a combatant commander, subunified commander, or joint task force commander authorized to exercise combatant command (command authority) or operational control over a joint force (FM 3-0).

mass

(DOD, NATO) Concentration of combat power. Military formation in which units are spaced at less than normal distances and intervals. (Army) One of the nine principles of war: concentrate the effects of combat power at the decisive place and time (FM 3-0).

METT-TC

A memory aid used in two contexts: In the context of information management, the major subject categories into which relevant information is grouped for military operations: mission, enemy, terrain and weather, troops and support available, time available, civil considerations. In the context of tactics, the major factors considered during mission analysis (FM 6-0).

mobility

(DOD, NATO) A quality or capability of military forces which permits them to move from place to place while retaining the ability to fulfill their primary mission. Those activities that

enable a force to move personnel and equipment on the battlefield without delays due to terrain or obstacles (FM 5-100).

offensive counterair

(DOD) Offensive operations to destroy, disrupt, or neutralize enemy aircraft, missiles, launch platforms, and their supporting structures and systems both before and after launch, but as close to their source as possible. Offensive counterair operations range throughout the enemy territory and are generally conducted at the initiative of friendly forces. These operations include attack operations, fighter sweep, escort, and suppression of enemy air defenses (FM 3-01).

operational environment

(DOD) A composite of the conditions, circumstances, and influences which affect the employment of military forces and bear on the decisions of the unit commander. Some examples are as follows: permissive environment—operational environment in which host country military and law enforcement agencies have control as well as the intent and capability to assist operations that a unit intends to conduct; uncertain environment—operational environment in which host government forces, whether opposed or receptive to operations that a unit intends to conduct, do not have totally effective control of the territory and population in the intended operational area; hostile environment—operational environment in which hostile forces have control and the intent and capability to effectively oppose or react to the operations a unit intends to conduct (FM 3-07).

sea port of debarkation

A marine terminal for sustained port operations at which personnel and materiel are discharged from ships. Sea ports of debarkation normally act as ports of embarkation on return passenger and retrograde cargo shipments (FM 4-01.30).

suppressive fire

(DOD) Fires on or about a weapons system to degrade its performance below the level needed to fulfill its mission objectives, during the conduct of the fire mission. Any engagement that does not have a definite or visible target. Firing in the general direction of a known or suspected enemy location (FM 3-22.9).

survivability

(DOD) Concept which includes all aspects of protecting personnel, weapons, and supplies while simultaneously deceiving the enemy. Survivability tactics include building a good defense; employing frequent movement; using concealment, deception, and camouflage; and constructing fighting and protective positions for both individuals and equipment (FM 5-103).

targeting

The process of selecting and prioritizing targets and matching the appropriate response to them, considering operational requirements and capabilities (JP 3-0).

task organization

(DOD) A temporary grouping of forces designed to accomplish a particular mission (FM 3-0).

weapons of mass destruction

(DOD) Weapons that are capable of a high order of destruction and or of being used in such a manner as to destroy large numbers of people. Weapons of mass destruction can be high explosives or nuclear, biological, chemical, and radiological weapons, but exclude the means of transporting or propelling the weapon where such means is a separable and divisible part of the weapon (FM 3-11.21).

**Section III
Special Terms****co-creation of context**

A continuous process in which commanders direct intelligence priorities to drive operations, and the intelligence that these operations produce causes commanders to refine operations based on an improved understanding of the situation.

combined arms

The combination of the elements of combat power with the integration and sequencing of all actions, activities, and programs necessary to seize, retain, and exploit the initiative in the context of full-spectrum operations.

combined arms maneuver

The application of the elements of combat power in a complementary and reinforcing manner to achieve physical, temporal, or psychological advantages over the enemy, preserve freedom of action, and exploit success.

defensive fires

Fires whose purpose is to protect friendly forces, population centers, and critical infrastructure.

fire control quality data (AMD)

Targeting data of sufficient accuracy and update rate to enable a weapon system to compute an engagement fire control solution.

mission command

The exercise of authority and direction by commanders, supported by their staffs, using the art of command and the science of control to integrate warfighting functions in the conduct of full-spectrum operations. Mission command uses mission orders to ensure disciplined initiative within the commander's intent, enabling agile and adaptive commanders, leaders, and organizations.

network

A single, secure, standards-based, versatile infrastructure linked by networked, redundant transport systems, sensors, warfighting and business applications, and services that provide Soldiers and civilians timely and accurate information in any environment, to manage the Army enterprise and enable full-spectrum operations with joint, allied, and interagency partners.

offensive fires

Fires whose purpose is to preempt enemy actions.

operating decentralized

A manner of conducting military operations which enables subordinates to act aggressively and independently with 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.

operational adaptability

A quality that Army leaders and forces exhibit based on critical thinking, comfort with ambiguity and decentralization, a willingness to accept prudent risk, and ability to make rapid adjustments based on a continuous assessment of the situation.

target quality data (indirect fires)

Information about the type and location of a target with sufficient accuracy to enable its attack with indirect fires.

wide area security

The application of the elements of combat power in coordination with other military and civilian capabilities to deny the enemy positions of advantage; protect forces, populations, infrastructure, and activities; and consolidate tactical and operational gains to set conditions for achieving strategic and policy goals.

Endnotes

¹ *Quadrennial Defense Review Report (QDRR)* (2010): Washington, D.C.: US Department of Defense, 8. "...our current adversaries have shown that they will tailor their strategies and employ their capabilities in sophisticated ways."

² *Ibid.*, 13.

³ *Ibid.*, 16. "Operate decentralized" is one of the AOC supporting ideas.

⁴ TRADOC Pam 525-3-0, 17.

⁵ TRADOC Pam 525-3-1, 13.

⁶ *Ibid.*, 13.

⁷ FM 3-0. The current version of FM 3-0 defines the fires warfighting function as "the related tasks and systems that provide collective use of Army indirect fires, joint fires, and command and control warfare, including nonlethal fires, through the targeting process." FM 3-0 further lists five tasks for the warfighting function: decide surface targets; detect and locate surface targets; provide fire support; assess effectiveness; and integrate command and control warfare, including nonlethal fires.

⁸ JP 1-02, 204.

⁹ FM 1-02, 1-79.

¹⁰ JP 3-0, xvi.

¹¹ FM 3-0, 4-3.

¹² JP 3-13.1, I-2. EA is the subdivision of EW involving the use of EM energy, DE, or antiradiation weapons to attack personnel facilities, or equipment with the intent of degrading, neutralizing, or destroying enemy combat capability and is considered a form of fires."

¹³ Under this revised set of tasks, air and missile defense tasks are added to the fires warfighting function. The task "air and missile defense" would also remain part of the protection warfighting function as listed in the current edition of FM 3-0. Listing air and missile defense in both warfighting functions would also reflect current joint doctrine.

¹⁴ Memorandum, Subject: Nonlethal Weapons Definition, 1 June 2010.

¹⁵ Air defense artillery refers to organizations; Air and mission defense refers to the mission conducted by ADA forces.

¹⁶ Unified Quest Issue Paper, Decentralization: Learning to Operate under Uncertainty, Volume 1, Number 1 (August 2009) states: "The theory (Perrow's Quadrants) implies that the *sweet spot* along the centralization-decentralization continuum will differ depending on the nature of the task at hand, its conditions, and the character of the organization performing the task. We can infer that the *sweet spot* is likely to change, sometimes dramatically, over the course of an operation or campaign. Finally, we can imagine differing *sweet spots* for functional subsystems within an organization."

¹⁷ Derived from Field Artillery Capabilities White Paper.

¹⁸ TRADOC Pam 525-3-1, 50.

¹⁹ *Ibid.*, 56-7.

²⁰ The February 2010 QDR lists "expand future long-range strike capabilities" as one of the enhancements to U.S. forces and capabilities for "Deter and Defeat Aggression in Anti-Access Environments." The services specifically mentioned are the Air Force and Navy.

²¹ TRADOC Pam 525-3-0, 7.

²² TRADOC Pam 525-3-1, 8.

²³ TRADOC Pam 525-7-4, 2-2c.

²⁴ Terms are unclassified in accordance with JP 3-14.