



*Key Issues Relevant to
U.S. Army Fires and the Warfighter*



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Preface

Not long ago, three former combat commanders of maneuver brigade combat teams (BCTs) collaborated on a “white paper” that highlighted several trends. While reinforcing the importance of integrating fires with maneuver, they decried the “identity crisis” (their words) of the field artillery branch as a result of, among other factors, force structure changes within the Army and nonstandard manpower demands of Operations Iraqi Freedom and Enduring Freedom. They believed fire support was fast becoming a lost art and, most disturbing, the branch was “losing the very talent it needed to fix itself.”*

At the same time, another, more positive trend was developing. The Air Defense Artillery community, with its critical function of providing force protection, was on the cusp of fielding three, potentially four, weapon systems within the next four to seven years, beginning a new era of unprecedented fires capabilities. Efforts to harness and capture emerging lessons learned into the development, testing and training each system requires were daunting, especially in the relatively short period of time available.

It became clear to senior Army and Fires community leaders that, in a hybrid threat environment, there were capability gaps in the areas of target location, networked lethality and precision engagement. Current institutional processes and programs derived from a different focus and an outdated strategic concept needed to change, and change quickly. The Army requires a decisive Fires Force that provides responsive, scalable and accurate lethal and nonlethal fires for the joint commanders at the times and places of their choosing, using systems with integrated capabilities that leverage commonalities and provide unprecedented reach and mobility by incorporating space assets. The Fires community has developed a visionary new strategy to meet those challenges.

The new Fires Strategy provides a framework for the evolution and synergy of the Air Defense and Field Artillery branches. It will be implemented by a campaign plan with five lines of effort during the next 12 to 15 years. Foundational to the plan is the establishment of a Fires Center of Excellence (FCoE) at Fort Sill, Oklahoma, as a world-class learning organization. The Fires Force is adapting itself with a focus on agility, mobility, precision and integration. This includes new beginnings for both the Air Defense Artillery and Field Artillery branches that together will focus on effectiveness and efficiency as an integrated Fires Force team.

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This Torchbearer National Security Report outlines the way ahead for the Fires Force, including changes in doctrine, infrastructure, systems and processes to maximize the synergies shared by Air Defense and Field Artillery. Each one of the issue papers details a critical component of the plan. **The goal is to continuously adapt to a versatile mix of tailorable and networked organizations, operating on a rotational cycle, to provide a sustained flow of trained and ready forces for full-spectrum operations and to hedge against unexpected contingencies—at a tempo that is predictable and sustainable for the all-volunteer force.**

The foundation is laid; timely and predictable funding in the Army’s base budget is the next step in reconstructing this critical battlefield function.

* Sean McFarland, Michael Shields and Jeffrey Snow, “The King and I: The Impending Crisis in Field Artillery’s Ability to Provide Fire Support to Maneuver Commanders,” <http://www.npr.org/documents/2008/may/artillerywhitepaper.pdf>



Implications for Fires within the New Operational Environment

Introduction

The current global security environment is more ambiguous and unpredictable than in the past. Global terrorism and extremist movements such as al Qaeda threaten personal freedom and national interests. Ruthless adversaries exploit technological, informational and cultural differences to attract the disaffected to their various causes. Future operations in this dynamic environment will likely span the spectrum of conflict from peacekeeping operations to counterinsurgency to major combat.

Operational Environment

The operational environment of the future will include unfamiliar cultures and intricate networks in heavily-populated urban areas as well as ungoverned rural locales that may provide safe havens for extremist organizations. The following trends will continue to have a significant impact on the operational environment over the next decade or longer:

- globalization;
- proliferation and use of weapons of mass destruction (WMD);
- failed and fragile states;
- technology and information proliferation;
- shifting demographics;
- climate changes;
- scarcity of natural resources;
- domestic economic policy and budget constraints.

The collective effect of these trends is an operational environment characterized by



complexity, uncertainty, rapid change and persistent conflict (protracted hostility among any combination of state, non-state and individual actors) for the next several decades. These conflicts will occur in all domains—land, sea, air, space and cyberspace—and will present numerous, continual challenges for the Fires Force as it supports joint and coalition force operations.

Potential adversaries will be multidimensional, intelligent and adaptive, using a wide array of tactics. They will conduct agile and sophisticated information operations in which the global media will be used as a weapon to achieve their objectives. In addition, future threats will employ emerging technologies such as cruise missiles, unmanned aerial vehicles and long-range rockets, all purchased commercially. **Effectively responding to these challenges will require versatility and innovation by Soldiers and units, not only to quickly react to such threats but also to anticipate them, seize the initiative and dominate the operating environment.** These adaptive threats will necessitate constant reassessment and modification as leaders prosecute the fight and accomplish the mission.



Implications for Fires within the New Operational Environment

The effects of one or more of the global trends listed above, combined with poor governance in many states, may foster increased friction with regional neighbors, corruption and transnational criminal activity, as well as provide fertile ground for extremist ideologies and recruiting efforts. U.S. forces can also expect adversaries to rely more on asymmetric means—such as anti-access and area denial strategies, unrestricted warfare, cyberattacks and terrorism—to mitigate their relative disadvantages in firepower, technology, manpower or resources. Accordingly, **the current and future security environments require that Army forces have a full complement of lethal and nonlethal capabilities—and highly trained Fires professionals to integrate and deliver them.**

Increasing urbanization and ideological competition for sovereignty and influence over populations will result in conflicts being waged predominantly “among the people” rather than “around the people.” Adversaries will operate anonymously in civilian neighborhoods to avoid detection and counteraction. Social, economic and political consequences of local conflicts offer increasing potential for spillover, thus creating regionally and globally destabilizing effects. Gaining the support of indigenous populations will be critical in this environment. Successfully creating the conditions for crisis resolution, such as effective governance and rule of law, will continue to require significant time and development. **A premium will be placed on forces that can integrate into, and operate as part of, the joint, interagency, intergovernmental and multinational (JIIM) teams that will facilitate such resolutions.**

Conflicts will continue to take place under the watchful eye of the world populace and in a real-time news cycle. A global media presence and increasing access to information will ensure that details of a conflict are rapidly available through social and cyber networks and mass media. Adversaries now have many venues for disseminating their messages worldwide. The dramatic growth of the Internet and cellular communications has created low-cost, effective means to rapidly move information, transmit instructions, shift resources and shape perceptions

in unprecedented ways. Concerns about collateral damage and public perceptions increase the need for *integrating space and cyberspace capabilities into all military operations* to enable friendly force tracking, geospatial accuracy, beyond-line-of-sight communications and precision targeting capabilities to improve the overall situational awareness of the maneuver commander. A full range of controlled, scalable munitions must provide protection for Fires Forces as well as the populations under the force’s security umbrella.

While the most dangerous threats to the nation’s interests are rogue state and non-state actors with WMD capability, future threats will be as complex as the operating environment. **The most likely threats will be hybrid—those having dynamic combinations of conventional, irregular, terrorist and criminal capabilities.** These hybrid threats will use the full spectrum of options, including every political, economic, informational and military measure at their disposal. In short, they will employ any available means—high- or low-tech—to attack where the force is weakest. Hybrid threats necessitate creative solutions. These solutions require talented Soldiers who are versatile enough to function in complex environments for extended periods.

Implications

Despite its evolving character, conflict continues to be primarily conducted on land; therefore, landpower—the ability to achieve decisive results on land—remains central to any national security strategy. Landpower secures the outcome of conflict through an integrated application of civil and military capabilities, even when landpower is not the decisive instrument. The Army, capable of full-spectrum operations as part of the joint force, continues to transform to provide the prompt, sustainable and dominant effects necessary to ensure America’s security. To prevail, it is imperative that the Fires Force—Soldiers, leaders and their organizations and systems—transform as well to provide significant lethal and nonlethal capabilities.



Transforming U.S. Army Fires Capabilities

Introduction

In an era of persistent conflict, the U.S. Army is the primary enabling and integrating element of landpower. The Army's transformation focuses on distinct qualities that land forces must possess to succeed in the evolving security environment. To face the security challenges ahead, the Army will continue to transform into a land force that is versatile, expeditionary, agile, lethal, sustainable and interoperable.* The Army is modernizing and transforming based on lessons learned from Iraq, Afghanistan and other regions undergoing conflict to build a force that exhibits these six essential qualities. The Fires Force is transforming as an integral part of the Army's overall transformation and modernization.

New Fires Capabilities

The Army is moving from a focus on preparedness for general war to a focus on hybrid warfare encompassing operational themes from peace operations, limited intervention and irregular warfare up to and including major combat operations. Consequently, the Fires community is evolving. Its strategy envisions the evolution of the world's most versatile Fires Force, with agile and adaptive Soldiers and leaders; fielded with integrated and interoperable systems; and capable of delivering accurate and responsive fires in any environment, at any time.

That strategy precipitates the following priorities to support the Army's broader range of operational requirements:

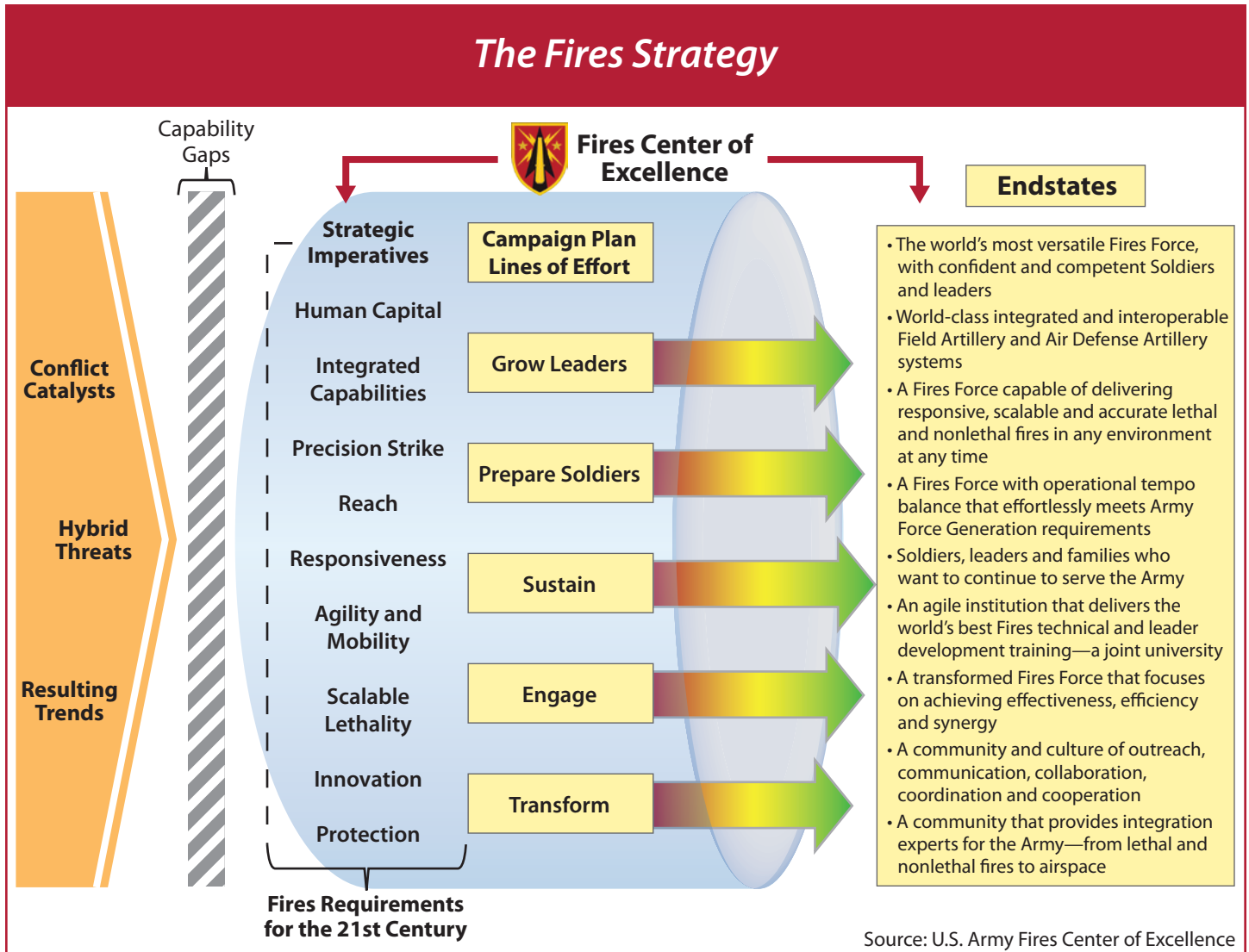
- Develop competent and confident Fires leaders for the Army.
- Support the current fight by providing the Army with a campaign-quality,

expeditionary Fires Force that is able to effectively and efficiently operate with joint, interagency, intergovernmental and multinational (JIIM) partners across the full spectrum of conflict both abroad and at home.

- Transform the force: anticipate JIIM requirements, advocate for resources and integrate force application functions to deliver the optimal combination of lethal and nonlethal Fires capabilities for joint and maneuver commanders.
- Develop a culture of outreach, communication, collaboration and coordination through engagement.
- Sustain the Fires Force by managing resources to support the current fight—reset, retrain and revitalize the Fires Force in support of Army Force Generation (ARFORGEN).
- Establish and sustain the Fires Center of Excellence (FCoE) as a world-class learning organization with the best Soldiers, leaders, civilians, facilities and equipment.

The Fires Campaign Plan (FCP) is designed to implement the strategy by using a comprehensive approach, phased over time and across doctrine, organization, training, materiel, leader development, personnel, facilities, cost and risk (DOTMLPF-CR). It is organized along five lines of effort (LOEs) that correspond to the priorities for the Fires Force. To develop new capabilities in light of these priorities, the Fires Force is focusing on growing leaders, preparing Soldiers and leaders for success in current and future operations, engaging audiences external to the Army and transforming Fires systems and organizations.

* See AUSA Torchbearer National Security Report *Transforming U.S. Army Pacific*, June 2009, http://www.ausa.org/programs/torchbearer/nsr/Documents/TB_Pacific_June09.pdf, pp. 8–9.



The Way Ahead

The Fires Force senior leadership is responding to the conditions of the operational environment and maximizing its resources to enhance capabilities within the entire Fires enterprise. The conditions that best characterize the desired Fires end state are:

- a decisive Fires Force that provides responsive, scalable and accurate lethal and nonlethal fires for the joint commanders at the times and places of their choosing;
- systems with integrated capabilities that leverage commonalities and provide unprecedented reach and mobility by incorporating space assets;
- learning organizations that achieve decision superiority and responsiveness in the information

environment through collaboration, outreach, coordination and communication;

- the Fires Center of Excellence as a Joint and Combined Fires University (JCFU) that is a leader in innovation, providing world-class education and training to develop leaders who are experts in the art and science of the “Fires” and “Protect” warfighting functions;
- confident and competent Soldiers and leaders committed to the all-volunteer force and actively engaged in the Army’s Comprehensive Fitness programs.

To significantly transform the Army’s Fires Forces and reshape them into an effective and efficient enterprise, full, timely and predictable funding within the Department of Defense’s base budget is imperative.



The Growing Importance of Nonlethal Fires

Introduction

Recent U.S. military operations in Iraq, Afghanistan and elsewhere have highlighted the importance of nonlethal actions. Highly destructive lethal actions can be problematic and sometimes even counterproductive in counterinsurgency operations, irregular warfare and other “wars among the people.” In many situations, nonlethal actions provide superior options for the battlefield commander to achieve his objectives. The U.S. Army has long used nonlethal actions such as psychological operations, and some are well-developed and governed by clear doctrine. Others are much newer, evolving and changing rapidly, and their doctrine is still being written.

In the past, nonlethal actions were often separate from lethal actions, handled by different units, under different commanders. But on today’s nonlinear battlefields, lethal and nonlethal actions are often used side-by-side, sometimes by the same Soldiers. To ensure smooth coordination and maximum effectiveness, lethal and nonlethal actions need to be properly integrated. And nonlethal actions need to be well-defined and widely understood.

Nonlethal Fires

The Army has developed the concept of nonlethal fires as a subset of nonlethal actions. There is some confusion surrounding the idea: how can fires be nonlethal? The Army defines nonlethal fires as “any fires that do not directly seek the physical destruction of the intended target and are designated to impair, disrupt, or delay the performance of enemy operational forces, functions, and facilities.”* Nonlethal fires seek not to inflict casualties among the enemy but to achieve battlefield objectives with minimal destruction or loss of life.

The Fires cell coordinates a wide range of lethal fires, such as indirect fire, close air support and attack helicopters. It also coordinates various nonlethal fires such as electronic warfare—jamming that disrupts electronic equipment without causing casualties. Other forms of nonlethal fires—such as computers and computer networks, nonlethal munitions and directed-energy weapons—are being developed and deployed. And older forms of nonlethal fires are being adapted to new uses, such as electronic jamming of the triggers for improvised explosive devices (IEDs).

Lessons Learned

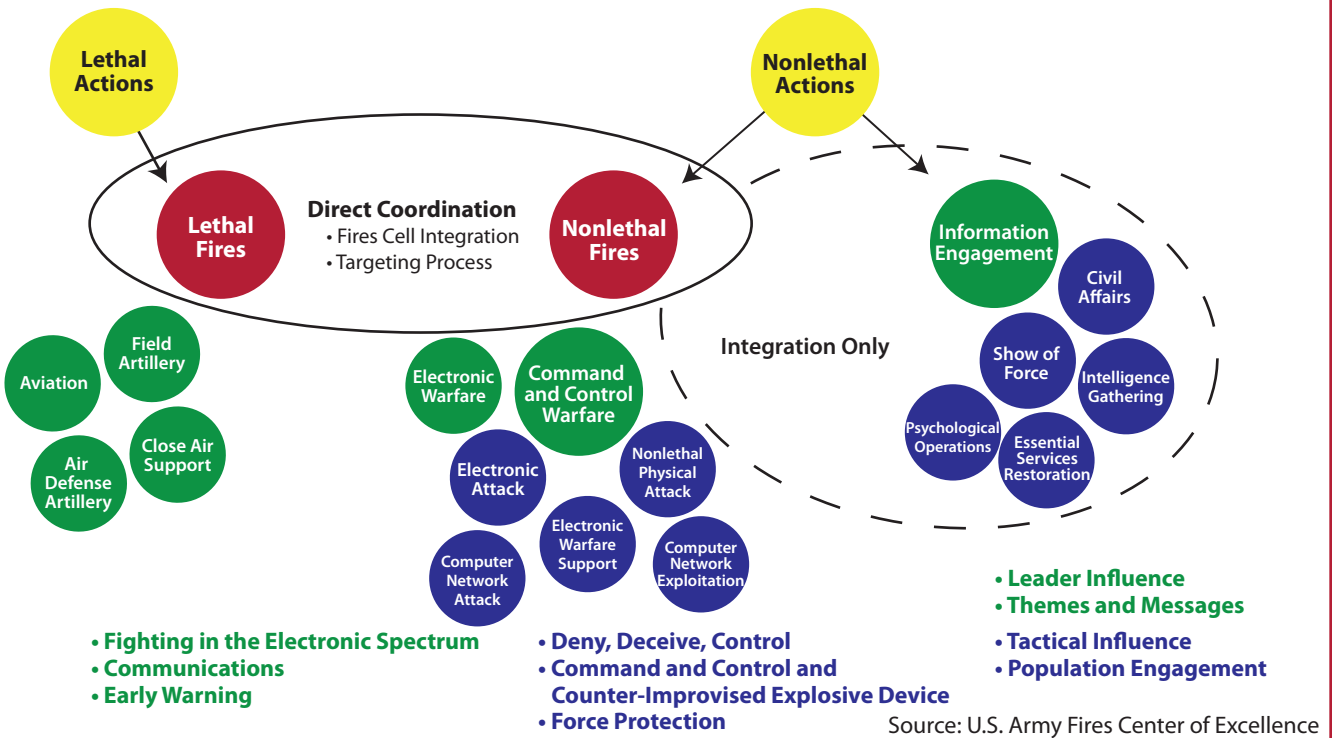
Recent operations have highlighted the value of nonlethal fires, as in command and control warfare, described in Army Field Manual (FM) 3-0, *Operations*. In this type of warfare, electronic warfare, computer network operations and both lethal and nonlethal physical attack are integrated, not to destroy enemy forces but to attack and degrade their command and control systems and reduce their ability to mount organized resistance. This could facilitate their destruction through more precise means (thereby reducing collateral damage), or even induce their surrender directly. Command and control warfare was used in Operation Enduring Freedom and Operation Iraqi Freedom as coalition forces sought to disrupt Taliban and Iraqi command and control nodes by destroying or neutralizing key communication, governmental or military targets. Success rendered enemy forces uncoordinated and ineffective. **Coordinating lethal and nonlethal fires and integrating information operations provides a battlefield commander a wide array of options to achieve his objectives.**

Army doctrine for nonlethal fires is still evolving; current doctrine does not adequately define or provide a hierarchy for nonlethal

* Army Field Manual 1-02, *Operational Terms and Graphics*, September 2004.



Lethal and Nonlethal Fires and Actions



actions. Building on FM 3-0's chapter 7, "Information Superiority," new doctrine is being written to better delineate nonlethal fires, nonlethal actions and nonlethal effects. New editions of FM 3-13, *Information*, and FM 3-09, *Fire Support*, are being drafted; both will address nonlethal effects and how they relate to fires and lethal effects. This emerging doctrine must define the synchronization among the three concepts and establish a coherent framework for the warfighter and battlefield commander.

Challenges

With nonlethal actions becoming an increasingly important part of current operations, improved coordination and a single point of integration for lethal and nonlethal fires is imperative. The many options available to a battlefield commander, and the data needed to support each one, make for a large and complex set of analytical problems. A commander can be quickly overwhelmed by raw data in the absence of a mechanism for bringing all the pieces together into a coherent whole. In the field, commanders at all levels have been tasking the fire support coordinator

(FSCOORD) or Chief of Fires with integrating lethal and nonlethal fires and information engagement through a unified targeting process. **Lessons learned have made it clear that commanders need this single point of integration to assemble data, perform analyses and coordinate activities in the operational environment.**

The Way Ahead

Fires has changed considerably over the past decade, yet it remains a critical part of the operating environment and continues to evolve and adapt to the ever-changing battlefield. The development of nonlethal fires is indicative of Fires' flexibility, adaptability and continuing relevance. The use of Fires personnel to integrate actions through the targeting process highlights the unique abilities they bring to the fight. Nonlethal fires are being further developed, providing additional options to battlefield commanders. And doctrine for nonlethal actions is being further refined to improve clarity and coordination. **Well-trained personnel, skilled in the use and integration of lethal and nonlethal fires and effects, are key to success in any operating environment.**



The Fires Force

Introduction

The U.S. Army's generating force, sometimes referred to as the institutional or functional Army, translates the latent power of America's economy, resources and people into relevant and ready landpower capabilities. The Army is aggressively working to integrate its generating force (institutional/functional Army) with its operating force to provide a broader and more effective range of capabilities to combatant commanders.

Today's Fires Force comprises active and reserve component Soldiers and leaders, as well as Department of the Army civilians, assigned to either the generating or operating forces. While this arrangement has been in effect for decades, it is in need of revision to reflect the integrated nature of the force as a whole, and to implement the mandate to use the most experienced Soldiers and leaders as instructors in the schools that train future warriors.

Fires Force Composition

The Fires generating force provides trained individuals to support the Fires operating force's Army Force Generation (ARFORGEN) requirements. It consists of the Fires Center of Excellence (FCoE), the U.S. Army Air Defense Artillery School (USAADASCH), the U.S. Army Field Artillery School (USAFAS), Initial Military Training (IMT) organizations, the Noncommissioned Officer Academy, Reserve Component Regional Training Institutes, Training Support Brigades, and the instructors and training teams that teach at other Army and service locations within the joint fires community. The generating force supports the operating force and ARFORGEN by providing subject-matter experts as part of individual and collective mobile training teams (MTTs).



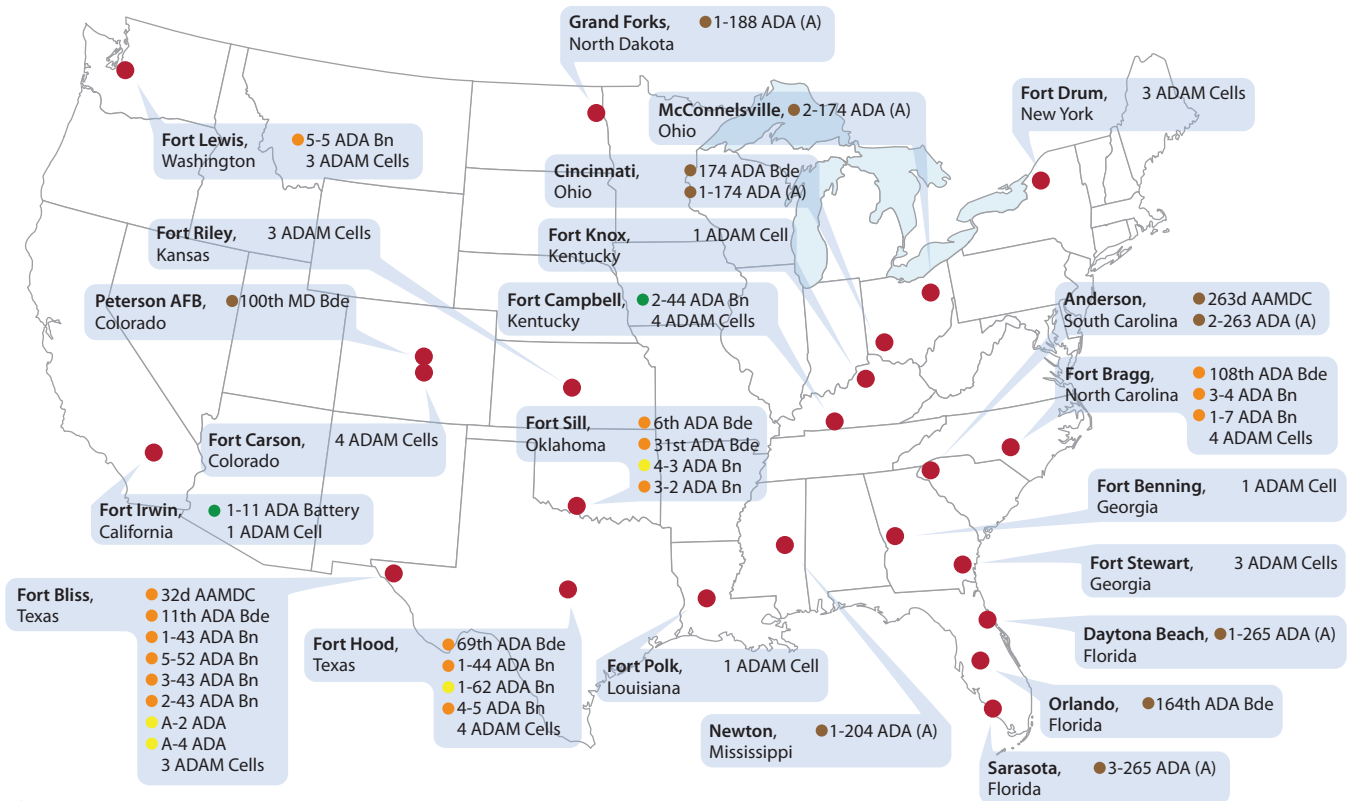
It also designs and teaches functional training courses based on the needs of the Fires Force, while supporting Reserve Component Regional Training Institutes as part of the One Army School initiative.

The Fires operating force provides field artillery and air and missile defense support to maneuver commanders. It is the focal point of all efforts within the Fires Force. The current operating force consists of active Army and Army National Guard Air Defense Artillery, Field Artillery and Missile Defense organizations at various echelons of Army and joint commands. Air Defense Artillery Soldiers serve as fire control personnel at all echelons within maneuver, joint and coalition organizations. They also serve in air defense artillery units up through brigade level, and in Space and Missile Defense Command organizations. Field Artillery Soldiers serve as fire support personnel and integrators in maneuver and special operations units, as well as on various staffs at division, corps, Army and joint organizations. They also serve in field artillery battalions organic to brigade combat teams and fires brigade organizations.

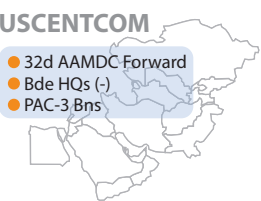
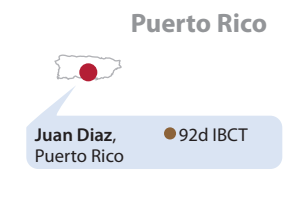
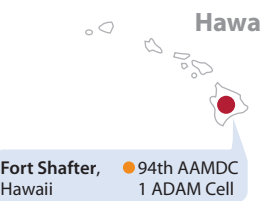
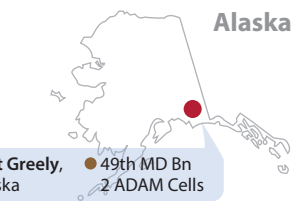
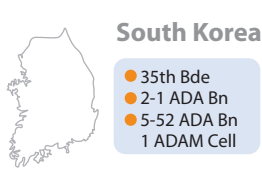
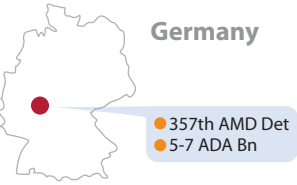


Air Defense Artillery Locations

Continental United States



Overseas



Legend

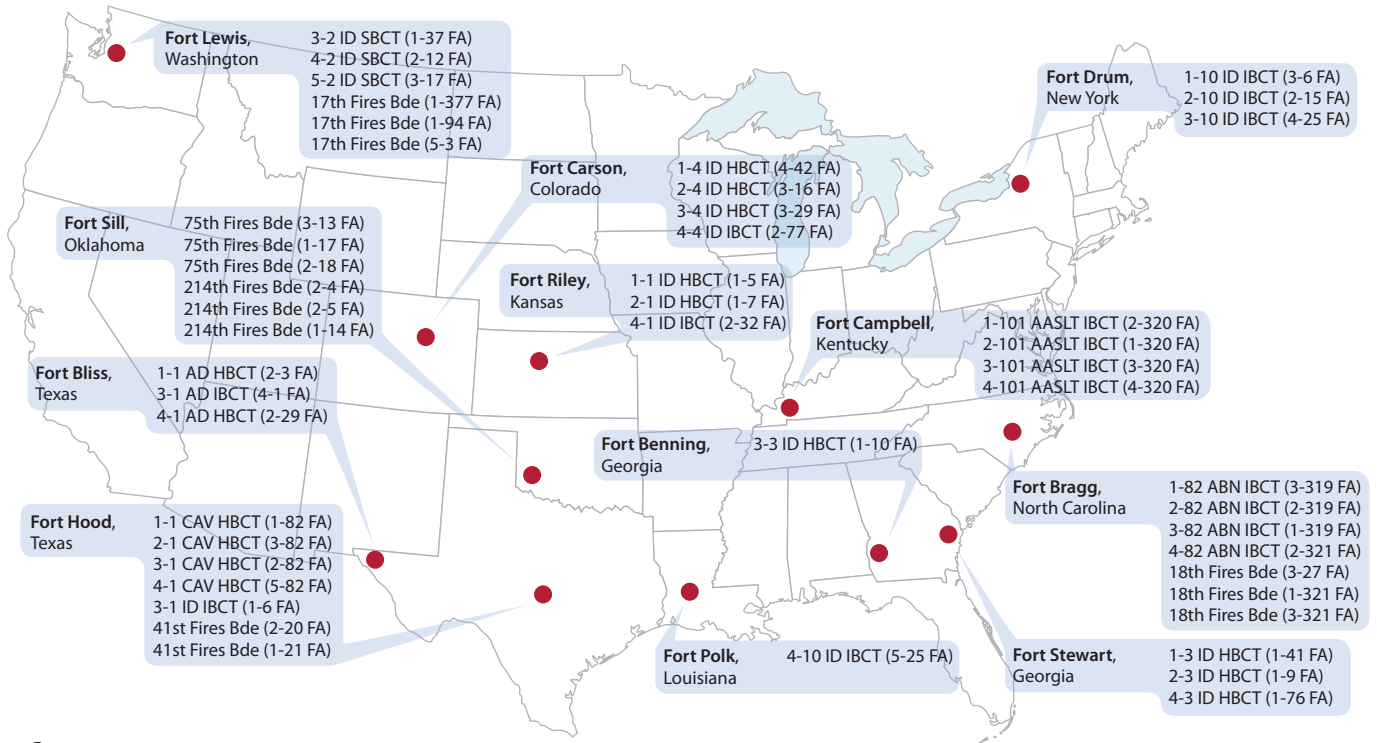
- Active Unit
 - National Guard
 - Inactivating FY11
 - Upcoming Movement
- Upcoming Movements:**
- 2-44 ADA (A) inactivates FY11
 - 4-3 ADA (PAC-3) activates FY11
 - 1-62 ADA (PAC-3) activates FY11
 - A-2 ADA (THAAD) activates FY11
 - A-4 ADA (THAAD) activates FY11
- A – Avenger-equipped unit
 AAMDC – Army Air & Missile Defense Command
 ADA – Air Defense Artillery
 ADAM – Air Defense and Airspace Management
 AMD – Air and Missile Defense
 PAC-3 – Patriot Advanced Capability - 3
 THAAD – Terminal High-Altitude Area Defense
- IBCT – Infantry Brigade Combat Team
 MD – Missile Defense
 Bde – Brigade
 Bn – Battalion

Source: U.S. Army Fires Center of Excellence

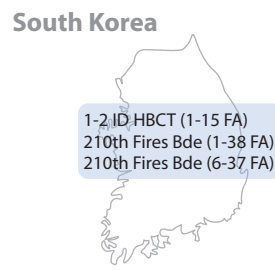
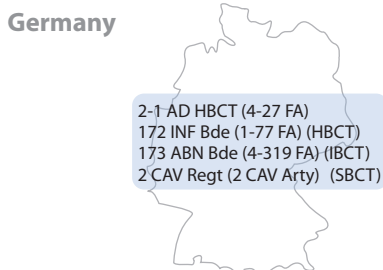
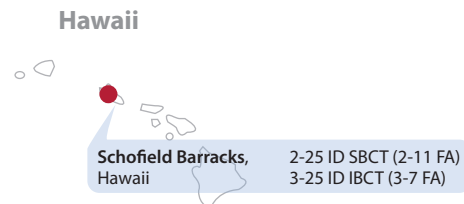
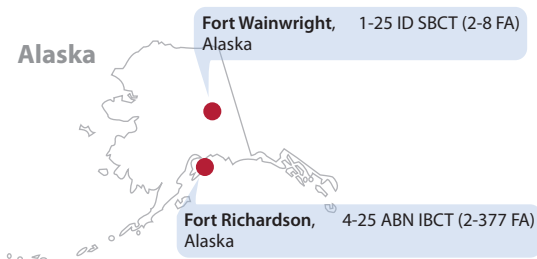


Active Component Fires Brigade and Field Artillery Battalion Locations

Continental United States



Overseas



Legend

IBCT – Infantry Brigade Combat Team
HBCT – Heavy Brigade Combat Team
SBCT – Stryker Brigade Combat Team
BRAC – Base Realignment and Closure

Bde – Brigade
BN – Battalion
ID – Infantry Division
CAV – Cavalry

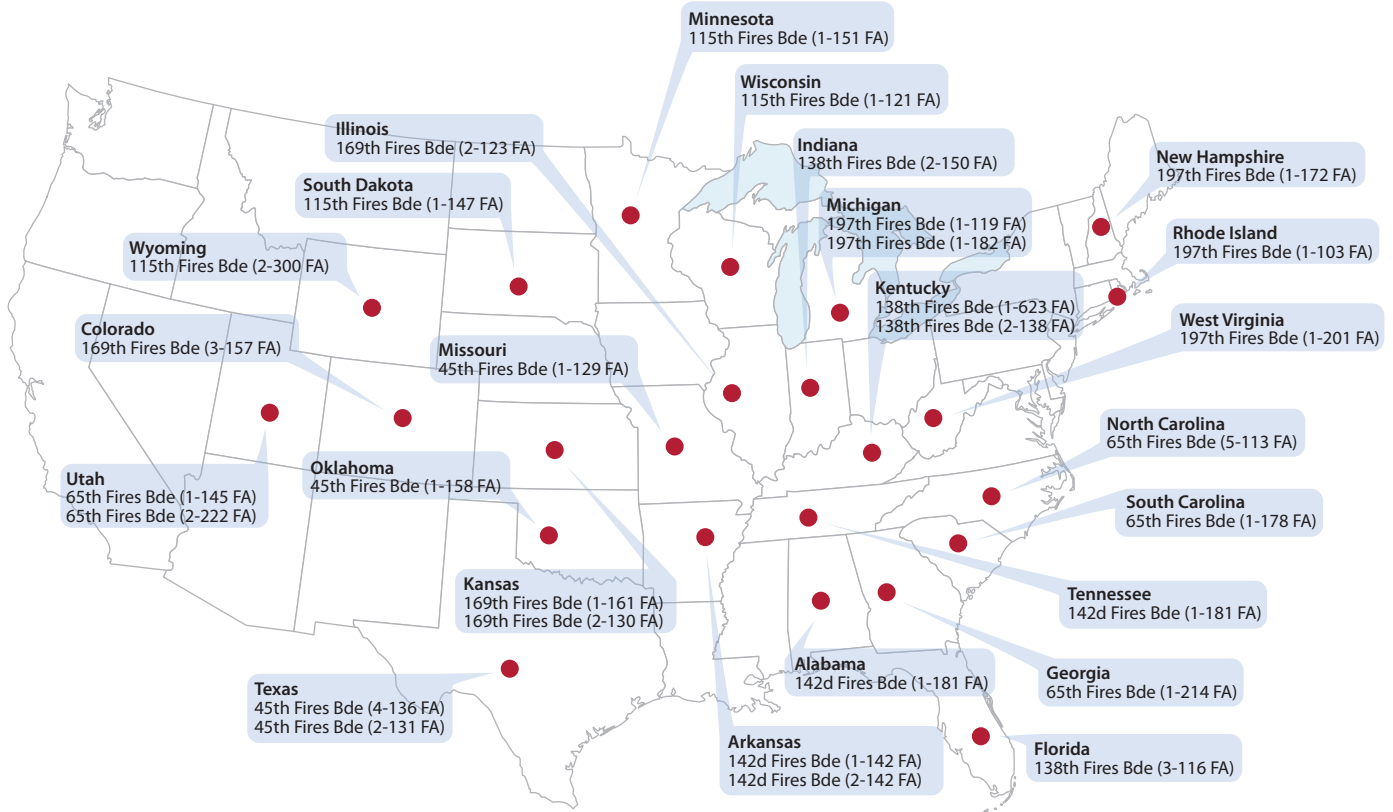
AASLT – Air Assault
ABN – Airborne
AD – Air Defense
TNG – Training

Regt – Regiment

Source: U.S. Army Fires Center of Excellence



Army National Guard Fires Brigade and Subordinate Field Artillery Battalion Locations



Legend

Bde – Brigade
FA – Field Artillery

Source: U.S. Army Fires Center of Excellence

Challenges

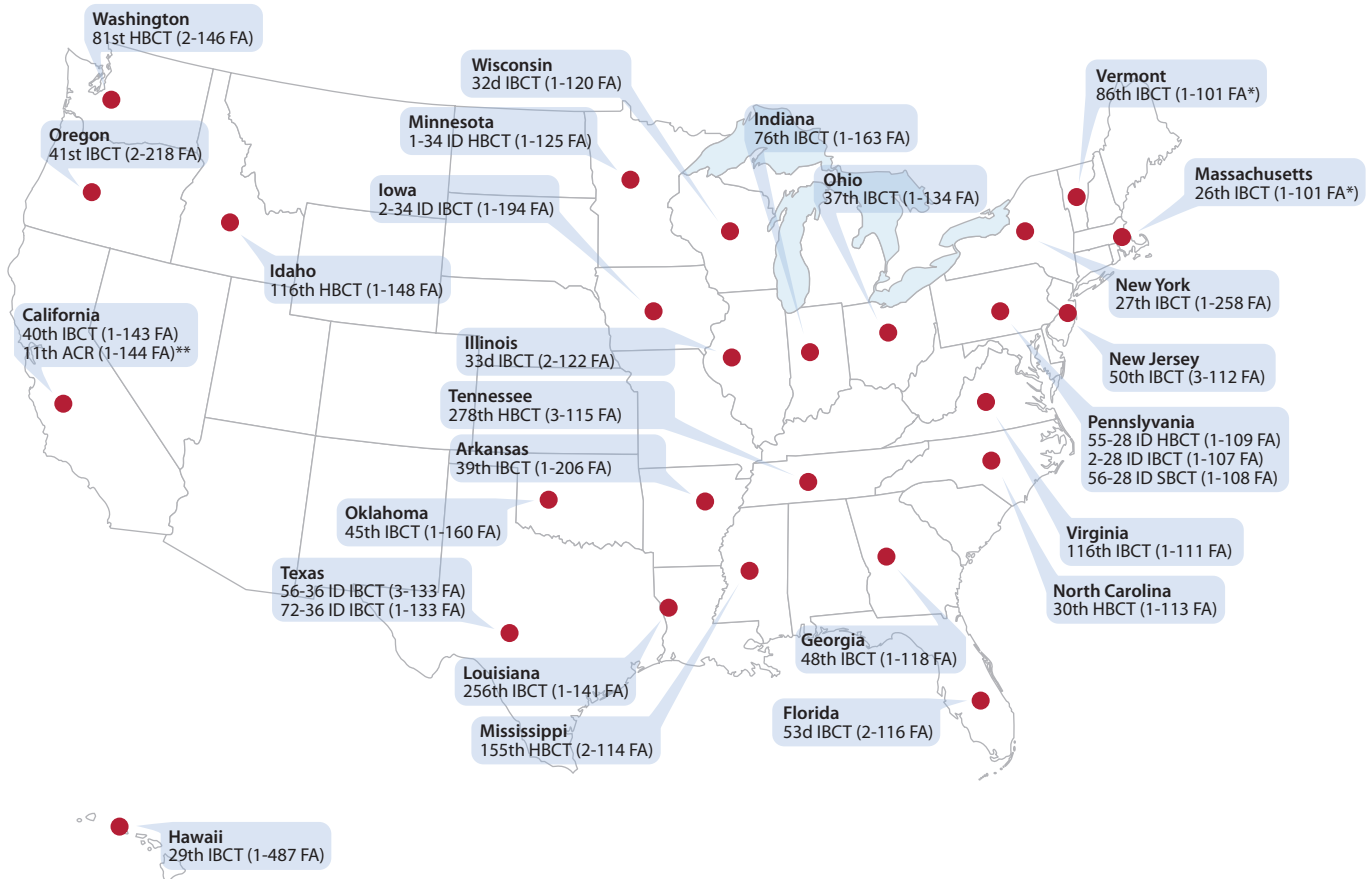
Due to wartime requirements generated by the combatant commanders, most Fires Forces have performed tasks other than core missions for extended periods of time during the past eight years. While they have performed these tasks well, core competencies have eroded, causing proficiency gaps. For the future Fires Force to be fully integrated, decisive and agile, the skills atrophy that exists today

must be eliminated. Innovative solutions must be developed to retrain and refresh Fires Soldiers and leaders and return them to the fight, regardless of the assigned mission.

While the Fires Force has provided the finest Fires support in the world with devastating accuracy, firepower and a wide range of effects, the force must provide capabilities to combat hybrid threats while maintaining conventional superiority. In this era



Army National Guard Brigade Combat Team and Field Artillery Battalion Locations



Legend

ACR – Armored Cavalry Regiment
 HBCT – Heavy Brigade Combat Team
 IBCT – Infantry Brigade Combat Team
 SBCT – Stryker Brigade Combat Team

ID – Infantry Division
 FA – Field Artillery

* Split unit
 ** Multi-component unit

Source: U.S. Army Fires Center of Excellence

of persistent conflict, shortfalls exist in the areas of people, systems and training.

The Army as a whole is stressed from the multiple operational deployments over the past eight years. These deployments have affected all ranks. It is an imperative to achieve balance by reducing personnel operational tempo. Fires Soldiers and leaders must have time to spend with their families and to reflect upon their experiences. Further, because the Fires

Force has been used primarily to fill nonstandard missions, senior leaders must ensure that they have a means to instill competence and confidence in the force as it resets from deployment and refocuses on its core missions. Doing so will enable the Fires Force to maintain a sufficient number of combat-experienced instructors to ensure the long-term health of both branches—Field Artillery (FA) and Air Defense Artillery (ADA).



The Fires Force

Although the Army's Fires systems and capabilities are among the world's best, there are growing capability gaps in the areas of target location, networked lethality and precision engagement. Because collateral damage is a primary concern for maneuver commanders, munitions must provide commanders a range of lethality. **Graduated Fires—both lethal and nonlethal—are necessary to achieve the combatant commander's intent.** Currently, there are shortfalls in the domain of command, control, communications, computers and intelligence (C4I), especially the interoperability with other services and coalition partners. Synchronization and coordination with interagency partners also needs improvement. Today, the Fires Force has multiple sensors cuing multiple command and control systems that manage multiple launch platforms. Networking efforts are further frustrated by proprietary software that complicates effective and efficient integration of joint, interagency, intergovernmental and multinational (JIIM) air and missile defense capabilities to protect the homeland and deployed joint forces. Agility and mobility requirements necessitate a reengineering of some field artillery and air defense artillery command and control as well as launch systems.

The Fires Force needs to maintain state-of-the-art training capabilities to continually reinforce individual and collective core competencies. These capabilities must include, but are not limited to, portable immersive virtual training systems, networked collaborative systems to facilitate joint and interagency training, and distributed full-spectrum simulations that enable Soldiers to train both while deployed and at home station. To ensure the long-term health and development of the Fires Force "bench," the Army needs to quickly fill instructor shortfalls at the branch schools and adopt a philosophy of selecting only the best and brightest to be instructors.

The Next Step

Fires Force leaders face difficult decisions with respect to overseeing and managing distinct yet interdependent branch cultures while supporting the current fight and integrating future capabilities (e.g.,



Indirect Fire Protective Capability). To assist Fires leader efforts to resolve shortfalls and meet future challenges, nine strategic Fires imperatives provide direction to the Fires Force as it moves forward.

- **Human Capital Sustainment.** Maintaining the long-term health of the Fires Force is directly linked to how it manages and balances force structure, professionally develops Soldiers and leaders, cares for families, maintains the appropriate level of personnel readiness and competes for the quality recruit who can fight and win in the operational environment.
- **Integrated Capabilities.** While Fires Force systems are the finest in the world, they are not seamlessly integrated. Data is collected and stored in information silos, available only to the select few with access. Not all sensors and weapon systems share targeting information, and elaborate work-arounds are enthusiastically developed to accomplish assigned tasks. An integrated air-ground picture is required to solve 21st century targeting, airspace management and fire control challenges. Fires Force capabilities must be integrated and interoperable—with one another, combined-arms comrades, other services and coalition nations. Integration is not limited to hardware, C4I systems and airspace. It must also include synchronizing lethal fires, nonlethal fires and space support. In the future, integrating lethal and nonlethal capabilities will become a core



competency for both ADA and FA leaders. Fires leaders will be the premier integrators of lethal and nonlethal effects for the Army.

- **Precision Strike.** The Fires Force will deliver ADA and FA munitions precisely where the maneuver or joint force commander wants them. Precision strike relies on precision targeting and precision engagement technologies. This capability will drive the Fires Force toward developing ever-improving means of target location and promoting closer ties with the Space and Intelligence communities. Precision strike will be required for multiple-point targets and/or individual fleeting targets with limited advance notification. Fleeting targets and the increased use of unmanned aerial vehicles will require improvements in sensor-to-shooter connectivity.
- **Reach.** To both protect joint forces from indirect attack and strike adversaries' critical vulnerabilities, the Fires Force must have tactical, operational, and strategic reach, "from mud to space." It must not only be able to "see first" to anticipate potential requirements, it must also be able to "strike first," in space and time, when adversaries least expect it. Reach will apply not only to weapons and target acquisition systems but also to the capability to project the appropriate Fires Force into an area of operations—anywhere—at any time.



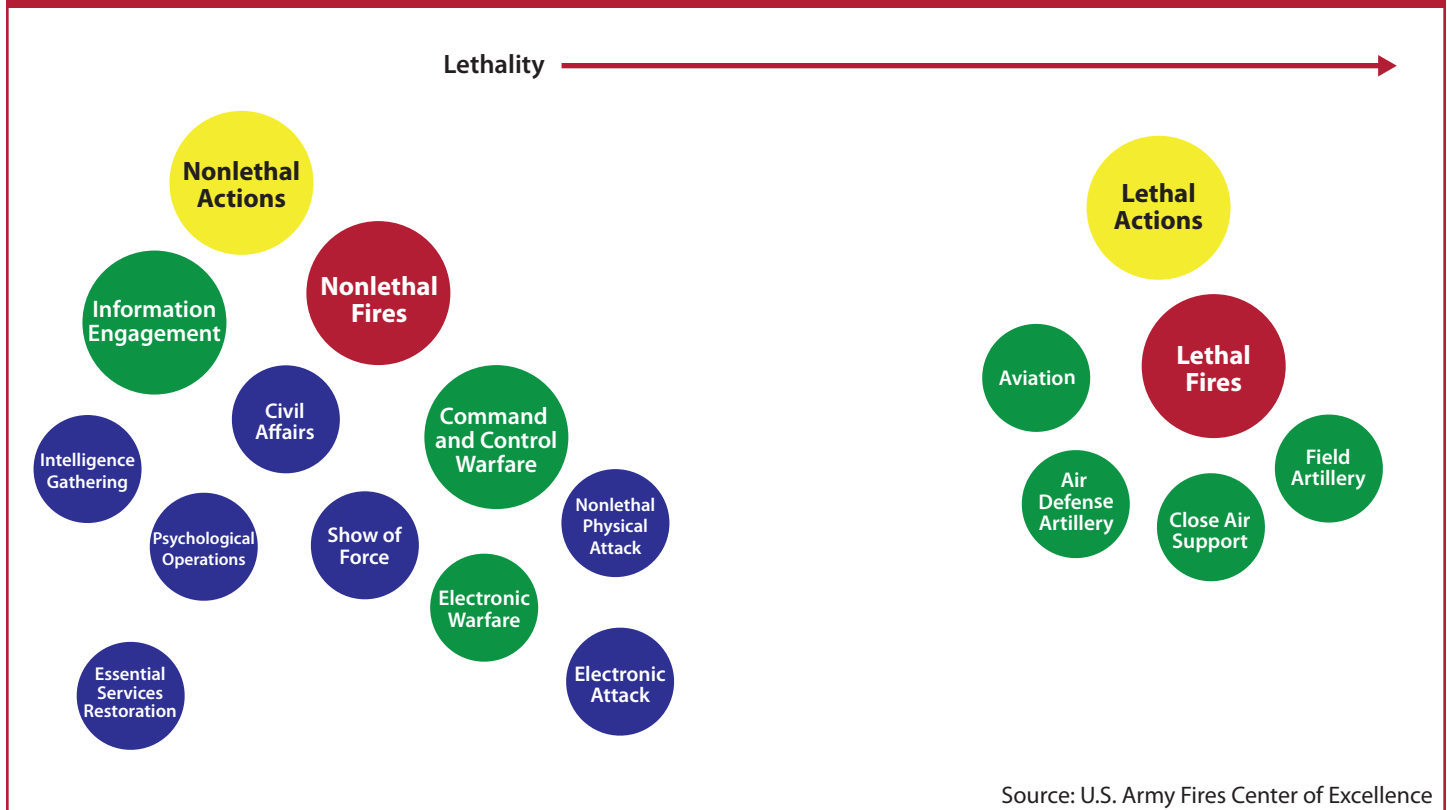
- **Responsiveness.** Responsiveness encompasses the continued improvement of technology, processes and tactics in response to threats from an increasingly capable array of rapidly delivered munitions. Fires Force systems must exploit sensor fusion and precision targeting to proactively support the maneuver commander with accurate and timely fires, whether responsive indirect fires or rapid engagement of ballistic missiles and air-breathing threats.*
- **Agility and Mobility.** Both Fires Force leaders and systems must be agile and mobile. Mental agility is a critical human trait for managing the rapid transitions of the 21st century. The Fires community must aggressively develop leaders with an approach that culls insights and ideas from multiple sources to foster mental agility, versatility, confidence and professional competence. Units and systems must be mobile enough to rapidly deploy to support the needs of joint commanders in ambiguous, complex environments.
- **Scalable Lethality.** The Fires Force must offer, and have access to, a highly integrated network of sensors, systems and munitions with scalable, destructive capability to minimize unwanted effects, including collateral damage. For example, in the course of a battle, a commander may decide not to remove a threat by destroying a building, but rather to use a different munition



* An air-breathing system is one requiring air-intake, such as a cruise missile or jet, versus a missile that uses a solid fuel.



Scalable Lethal and Nonlethal Fires, Actions and Effects



to eliminate the threat inside while preserving the site for intelligence exploitation. An integrated network of scalable, lethal options will enable a commander to quickly adapt to such a change and employ the appropriate lethal or nonlethal munitions to achieve the desired effect.

- **Innovation.** The Fires Force must continually seek out concepts, technologies and procedures to promote effectiveness and efficiency. Streamlined, flattened communication architectures will enable the sharing of creative insights from forces in the field, industry and academic think tanks and the civilian community. Automation systems must be specifically designed to promote interaction and information exchange. The Fires Knowledge Network and Warfighter Forums must become the collection points for new ideas. Finally, there must be an organization to create and sustain a culture of innovation within the Fires Force.

- **Protection.** The Fires Force will protect Army forces and JIIM partners as well as U.S. citizens at home. It will use capabilities to deter aggressors and defend U.S. interests against both asymmetric and conventional threats. Air and missile defense protection must be adaptive and continuous, transforming to meet emerging threats and future challenges. Whether it is through the development of warning systems to alert friendly forces to impending danger, or through the creation of precision-strike capabilities, protection must remain a critical mission in preserving the all-volunteer force.

As the Army addresses force structure and design issues, it must preserve the all-volunteer Fires Force and seamlessly integrate the operating and generating forces into one entity. Given the required resources, the Fires community is well-positioned to do just that.



The Fires Center of Excellence

Introduction

The most visible manifestation of Fires Force transformation is the creation of the Fires Center of Excellence (FCoE). The FCoE acts as a headquarters with oversight of both the Field Artillery (FA) and Air Defense Artillery (ADA) commandants. Its mission is to train, educate and develop Soldiers and leaders; create and develop capabilities; engage, collaborate and partner with stakeholders; sustain and provide a Fires Force to support joint warfighting commanders across the spectrum of operations in the joint, interagency, intergovernmental and multinational (JIIM) environment. To accomplish its mission, the FCoE addresses four broad areas: providing institutional agility; acting as the hub of an influence network; providing governance; and becoming a world-class, joint educational facility.

Institutional Agility

The FCoE serves as a transformation advocate, a change agent whose mission is to closely monitor ongoing operations, anticipate future requirements, and provide a laboratory to test new concepts and innovative joint lethal and nonlethal Fires solutions for the current fight. It is a learning organization that possesses the intellectual resources and ability to analyze the operational environment. It then operationalizes knowledge by rapidly disseminating it to the warfighters through the classroom, the Fires Knowledge Network and warfighter forums.

The Hub of an Influence Network

The FCoE must shape its external environment and influence organizational culture. It does this by educating the Army and building internal and external consensus on the FCoE mission and purpose. The FCoE continu-

ally promotes a culture of engagement through communications, collaboration and coordination. It is the primary nexus of information for the Fires community. Through aggressive outreach to academia, industry, other agencies, other services and other nations, the FCoE ensures that it remains current on Fires practices worldwide.

Governance and Oversight

The FCoE directs policy and strategy for the Fires community. It manages personnel, materiel and operational transitions; oversees the execution of the Fires Campaign Plan and develops metrics to track progress; and acts as the Force Modernization Proponent for the Field Artillery and Air Defense Artillery branches.

As outlined in Army Regulation 5-22, *The Army Force Modernization Proponent System*, the FCoE executes Force Modernization functions for both branches. The FCoE acquires, allocates and manages Fires Force systems and resources. The FA and ADA commandants serve as branch proponents, responsible for leader development and education, the execution of branch-specific training, leveraging and disseminating lessons learned from the field, developing the accessions strategy and providing recommendations to senior Army leaders on the personnel life cycle and career path of branch Soldiers and leaders. Additionally, the commandants provide recommendations and requirements to the FCoE commander regarding force management, training development and modernization. The commandants leverage the expanded capabilities that the center brings to the Fires Force, which provides the Army with the best trained and equipped Soldiers and leaders for the force as a whole.



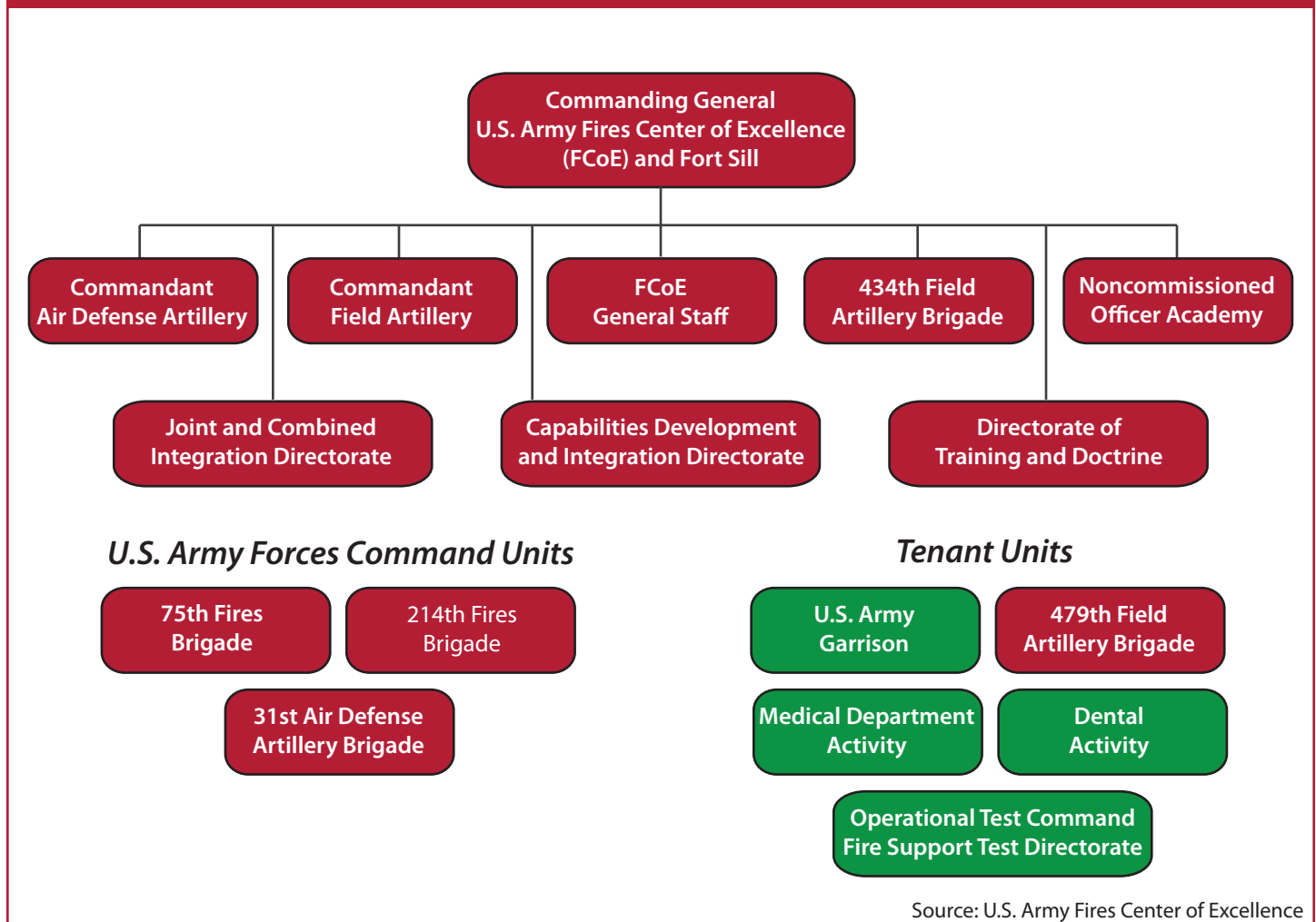
The Fires Center of Excellence

A World-class Joint Educational Facility

The FCoE delivers the world’s best Fires technical and leader development training, providing the appropriate mix of live, virtual and simulated training to officers, warrant officers, noncommissioned officers and Soldiers. It affords servicemembers an opportunity to become a part of a Fires network and take advantage of a robust reach-back capability. Ultimately, the intent is for the FCoE to become the Joint and Combined Fires University, with components similar to those found in a modern university: a research and development function performed by the Capabilities Development and Integration Directorate (CDID); an instructional function performed by

world-class, combat-experienced instructors assigned to the Fires Center; a technical assistance function provided by mobile training teams to export expertise to the operating force as required; and an outreach function to educate audiences about the FCoE and acquire knowledge from experts worldwide. In addition, all services will use the FCoE’s ranges and airspace to train in the delivery of air-to-surface munitions. The intent is to establish a Joint Close Air Support Center of Excellence in the future to enhance readiness and peace-to-war transition. The FCoE has Initial Operating Capability in the fourth quarter of fiscal year (FY) 2009. It will achieve Full Operating Capacity no later than third quarter, FY 2010.

Fires Center of Excellence and Fort Sill





Facilities

The construction of new facilities and the renovation of existing facilities are key to an effective and efficient FCoE. The ability to adapt, modify and reuse more than 14 major administrative and instructional facilities was instrumental in combining the Field Artillery and Air Defense Artillery Schools. Essential to the move of the ADA School from Fort Bliss, Texas, to Fort Sill, Oklahoma, was the reestablishment of the 6th ADA Brigade, charged with the command and control of instructors and students across all military occupational specialties within the ADA community. The renovation of five buildings previously used for support of Drill Sergeant and Active Duty Training (Reserve) provided the brigade contiguous, modern facilities funded by both Base Realignment and Closure (BRAC) and sustainment, restoration and modernization (SRM) sources. The major instructional facilities for Patriot, Stinger/Avenger and command, control, communications, computers and intelligence (C4I) training were built new to the specifications and requirements of the ADA community.

At a total cost of more than \$200 million, the facility utilization plan called for a campus configuration integrating: four Advanced Individual Training (AIT) barracks and new supported Directorate of Training and Development (DOTD) facilities; Joint Fires and Effects Training System (JFETS); the new and expanded Noncommissioned Officer Academy; and the temporary Counter-Rocket and Mortar (C-RAM) training facility. This provided the FCoE a truly master-planned facility network. Moreover, the general instruction, dining and administration facilities were completed on time and within programmed cost. The FCoE mission staff is now located in five renovated facilities, housing the major center directorates within the same complex vice spreading offices among numerous buildings. The cost of these renovations, completed in May 2009, totaled \$22 million.

Funding restrictions under BRAC did not allow for the modernization of the FA School facilities. Foreseeing the need to also upgrade these facilities,





The Fires Center of Excellence

the installation positioned projects and received American Revitalization Recovery Act (ARRA) funding to upgrade three major instruction facilities that support all mission sets within the FCoE. These backlogged maintenance and repair projects will focus on mechanical system upgrades (for both comfort and energy conservation) and functional improvements to allow for Classroom XXI Technology and current teaching techniques. The projects, totaling \$26 million, are under design, with construction scheduled for early FY 2010.

Additionally, the relocation of ADA and FA units from Fort Bliss and elsewhere to Fort Sill has enhanced the FCoE and its mission support to the Army. BRAC authorized the move of the 31st ADA Brigade (active component) to create a combined Armed Forces Reserve Center (AFRC). The ADA brigade complex includes facilities for two battalions, a third deployment rotation unit and the brigade headquarters. The AFRC construction project began in May 2009 at a cost of \$45 million. Ten facilities, at a total cost of \$132 million, will be completed in a phased sequence from March through September 2010. This four-building complex collocates Oklahoma Army National Guard and Army Reserve units, consolidating seven Guard and eight Reserve Centers.

The FCoE will continue to grow in the next four years with the addition of the JFETS facility (\$28 million, FY 2010 project), the Battle Command Training Center (\$23 million, FY 2012 project) and range/deployment facilities programmed for funding. The next generations of ADA weapon systems are coming on line, which has generated requirements for new facilities to provide the instructional base for Terminal High-Altitude Air Defense (THAAD), C-RAM and Joint Land Attack Cruise Missile Defense Elevated Netted Sensor (JLENS) systems. As the development of the Non-Line-of-Sight (NLOS) systems continues, new facilities for the FA School will also be required.

The FCoE also husbands an Initial Entry Training (IET) brigade supporting the overall Training and Doctrine Command (TRADOC) mission set for the Army. The brigade will expand to a five-battalion



configuration using all five of the current battalion complexes, which are undergoing their first major renovation since construction in the 1970s and 1980s. The Training Barracks Upgrade Program (TBUP) will modernize all mechanical, electrical and plumbing systems and will upgrade windows/doors and administrative areas. Renovation of the first building started in September 2009; the last will be completed by FY 2017. Each renovation is expected to cost approximately \$35 million and will extend the life of the building for approximately 15 to 20 years.

The Way Ahead

The Fires Strategy provides a way ahead that is centered on the versatile people and units comprising the Fires operating force, supported by a world-class, combat-experienced Fires generating force led by the FCoE. It uses the Fires Campaign Plan to drive the development and preparation of Soldiers, leaders and systems to achieve the desired end state: the world's most versatile Fires Force, with agile and adaptive Soldiers and leaders; fielded with integrated and interoperable systems; capable of delivering accurate and responsive fires in any environment "from mud to space," at any time.

The FCoE is more than just brick and mortar. It serves as the hub for Fires transformation and is the conduit to organize, equip and train Fires Soldiers and leaders. Properly resourced, it has the potential to revolutionize Army Fires capabilities now and in the future.



Growing Agile and Adaptive Fires Leaders

Introduction

The U.S. Army remains the best led and best trained army in the world. While fully supporting the demands of the nation at war, the Army is also setting conditions for the future to fulfill its strategic role as an integral part of the joint force. The Army's readiness requires that it continue to transform Soldier and leader development to sustain an expeditionary- and campaign-capable force. The Army must develop agile and adaptive military and civilian leaders who can operate effectively in joint, interagency, intergovernmental and multinational (JIIM) environments. As a part of the Fires Strategy to grow leaders, the Fires Center of Excellence (FCoE) is implementing measures to grow agile and adaptive Fires leaders who are prepared for an operational environment of vagueness, ambiguity and complexity.

The “What and How” of Fires Leader Development

Given the current operational environment, hybrid threats—diverse, dynamic combinations of conventional, irregular, terrorist and criminal capabilities—will make pursuit of singular leader development approaches difficult. This threat environment requires innovative leader development solutions that seek to be as adaptive and innovative as the leaders it must produce.

To grow agile and adaptive leaders for success in current and future operations, the “what and how” of Fires leader development efforts focus on professional competence through a combination of training, education and experience within the institutional, self-developmental and operational domains. The method of growing Fires leaders is changing.

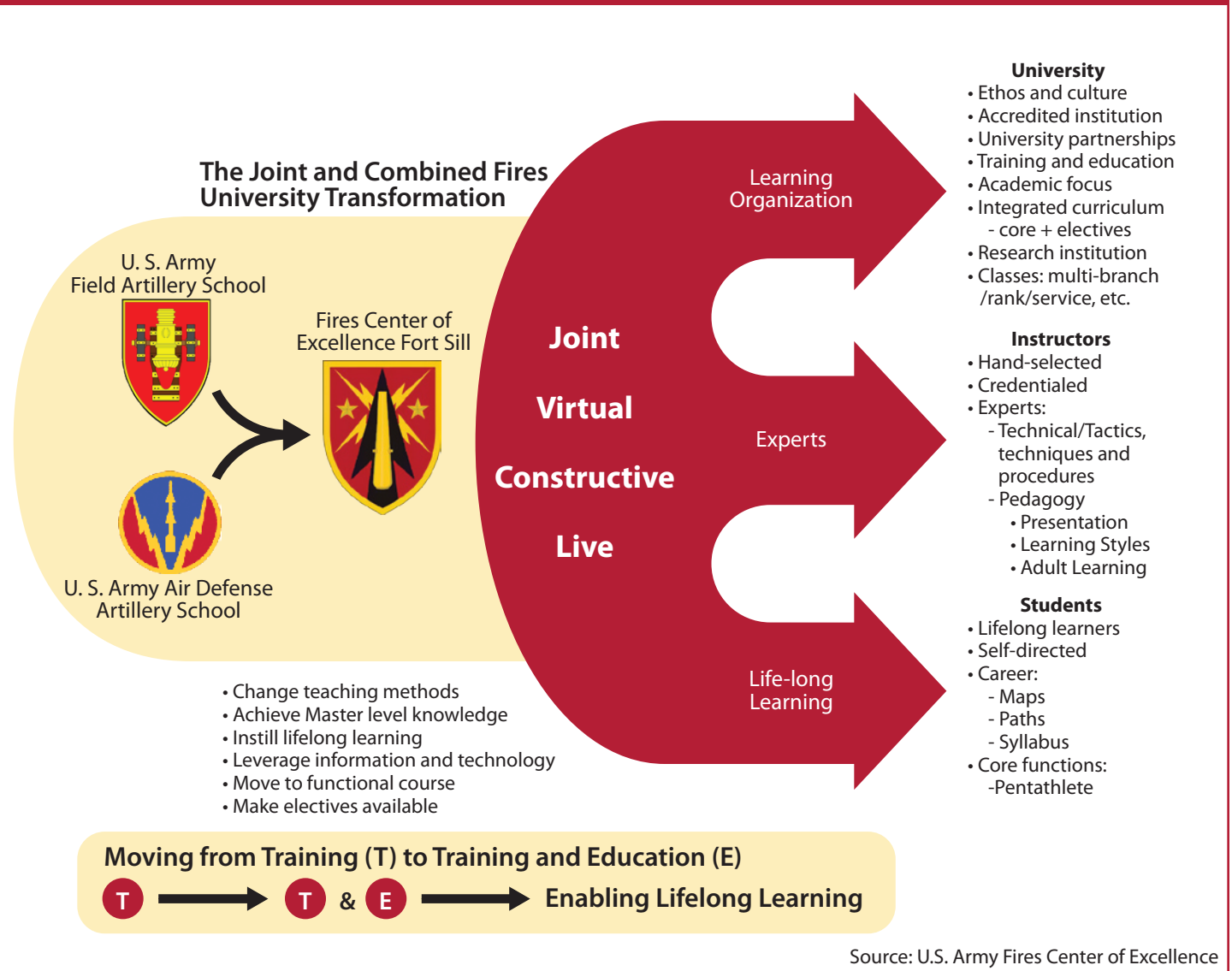


Recognizing that these threats require a full-spectrum Fires capability, wherein Fires leaders are prepared to plan, integrate and execute lethal and nonlethal fires, the FCoE has updated Initial Military Training (IMT), Professional Military Education (PME) and functional courses to reflect emerging precision Fires capabilities, nonlethal Fires capabilities and the joint nature of Fires. The “what” of the FCoE leader development effort is supported by outreach to deploying units, interagency/other services partnerships, joint/coalition institutional training, field artillery reset initiatives to restore atrophied core competencies based on in-lieu/nonstandard missions, lessons-learned collection, warfighter forums (WfFs) via the Fires Knowledge Network, and 24/7 reach-back training opportunities. Leader development changes with respect to “how” focus on the means, methods and processes to achieve agile/adaptive Fires leaders. The major components include the Joint and Combined Fires University (JCFU); outcome-based training and education (OBTE); lifelong learning; technology leveraging; university partnerships; and warfighter forums. Each of these brings unique contributions to developing leaders.

Joint and Combined Fires University. The goal for the Joint and Combined Fires University at Fort Sill, Oklahoma, is to be the



FCoE: Evolution of the Joint and Combined Fires University



world’s center of excellence for joint and combined fires. It will provide the highest quality of training, education and development opportunities for Soldiers and joint and coalition personnel to provide experts in the art and science of lethal and nonlethal fires. The JCFU will change how instructors teach to achieve master-level knowledge via lifelong learning while leveraging information/technology and moving from an exclusive training emphasis to an emphasis on training and education. As a “university without walls,” the JCFU will enable Fires excellence through a blend of classroom courses, distance learning,

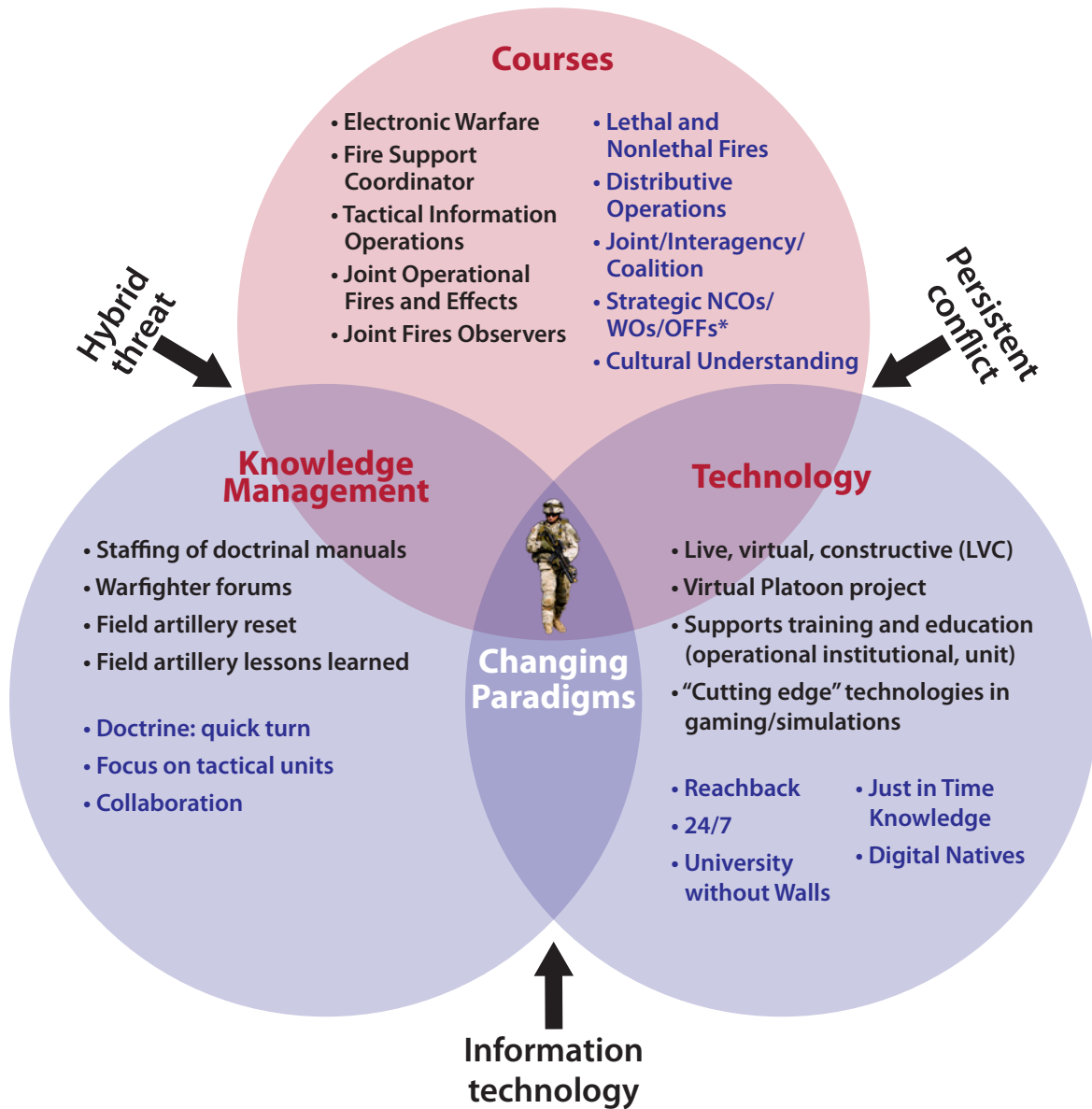
virtual experiences and online forums. Students will be able to access courses from the JCFU, other service schools, civilian universities or even home stations. Whether participating in residence or virtually, Fires students from the Army, other services and civilian agencies will not only have access to experts from the institution, they will be able to share knowledge with each other as well.

The JCFU will provide Fires learners with continuous access to training and education that supports career progression and provides skills and



Fires Center of Excellence Leader Development

What and How



- Agile/adaptive Soldiers and leaders
- Adult Learning Theory
- Learner-centric
- Reset

- Critical thinking
- Culturally astute
- Technologically enabled
- Mastery of core competencies

*Noncommissioned Officers/Warrant Officers/Officers

Source: U.S. Army Fires Center of Excellence



Growing Agile and Adaptive Fires Leaders

knowledge for emerging operational requirements. Through a combination of enabling technologies, the JCFU will feature cutting-edge training and education, quality mentorship and superior learning in the art and science of Fires application and integration.

To reflect the demands of hybrid warfare, the Fires senior leadership has broadened the curriculum of officer, warrant and noncommissioned officer courses to include the planning, integration and application of both joint lethal and nonlethal fires. To provide an even broader educational foundation, the FCoE has further expanded instruction to include such critical topics as cultural awareness, joint and interagency operations, information engagement and stability operations.

Outcome-Based Training and Education. The Fires community has not only broadened the educational content but is also adopting new methods such as outcome-based training and education (OBTE) and the Adaptive Leader Model (ALM). It continues to update and redesign the curriculum to reflect these and similar educational approaches to achieve a master level of knowledge that can only be accomplished through a more comprehensive university approach.

FCoE implementation of outcome-based training and education is an example of changing outdated methods to better leverage educational approaches as training and education are conducted. OBTE is a method that focuses on student outputs and performance while integrating knowledge gained from personal experiences and reflection. OBTE curriculum principles include engagement, information exchange and student empowerment using the learning tenets of exploration, explanation and exhibition. The Headquarters, Department of the Army (HQDA) Asymmetric Warfare Group developed the OBTE effort, which the FCoE adopted starting with the implementation of the Combat Applications Training Course (CATC) at Fort Sill in October 2008. (CATC demonstrates the OBTE approach using an assault rifle marksmanship venue.) More than 600 leaders attended CATC between October 2008 and July 2009. The challenge remains educating new leaders, instructors and training developers on how to implement the approach. New



instructor training now incorporates both the OBTE and ALM approaches. (ALM compliments OBTE by focusing on leader adaptability.) More than 300 FCoE leaders have attended a variety of OBTE and ALM seminars since the summer of 2008. Fires training brigades redesigned several training events (convoy lane, squad live fire, first aid lane, hand grenade lane and basic rifle marksmanship, to name a few) using both OBTE and ALM; initial feedback is promising. The OBTE approach is improving training across the FCoE.

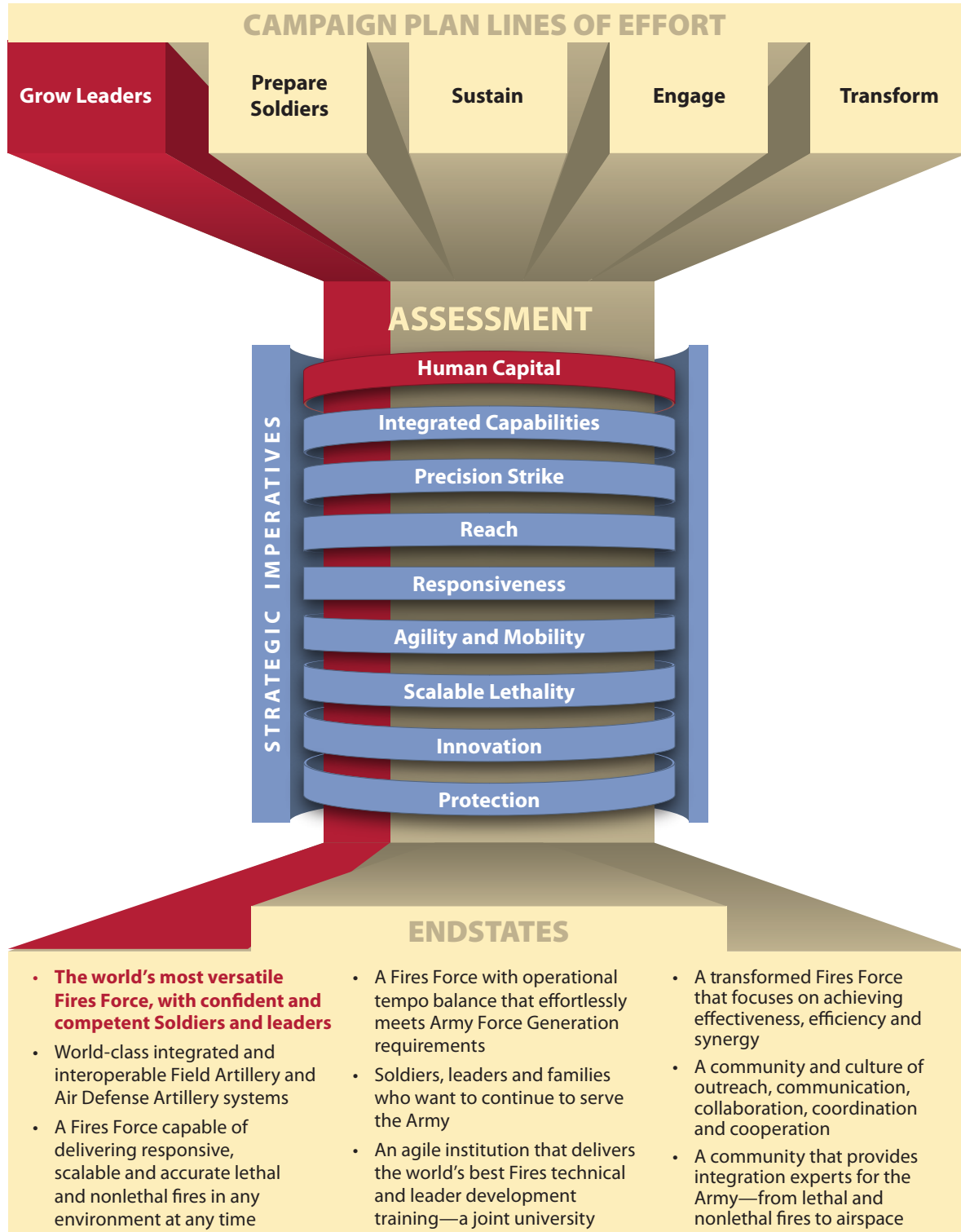
Lifelong Learning. Lifelong learning initiatives provide 24/7 reach-back training opportunities and move from an instructor-centric to a learner-centric organization for training, education and leader development. A variety of delivery methods will be used to include blended learning, warfighter forums and the Fires Knowledge Network while fully supporting the institutional, operational and self-developmental domains.

Technology Leveraging. The FCoE is working with industry, academia and other U.S. Army Training and Doctrine Command (TRADOC) partners to leverage technology that will provide immersive training opportunities for Soldiers and leaders to enhance and accelerate their decisionmaking abilities. Examples of current efforts include:

- **Virtual Experience Immersive Learning Simulation (VEILS®) “Danger Close”:** VEILS® “Danger Close” is a learning simulation that immerses the platoon leadership team in a variety



The Fires Campaign Plan



Source: U.S. Army Fires Center of Excellence



Growing Agile and Adaptive Fires Leaders



of scenarios and prompts that team to make decisions. While these critical decisions are being made, the platoon leader/platoon sergeant relationship is examined and is criticality reinforced.

- **Virtual Platoon:** The FCoE is working with TRADOC's Capabilities Manager for Gaming (TCM-Gaming) and other Centers of Excellence to develop a leader development tool using the power of gaming technology. Virtual Platoon will immerse the platoon leader in both garrison and tactical scenarios, forcing the leader/player to make decisions. The "game" will provide young leaders feedback and outcomes based on their decisions and will provide an after-action review (AAR) by means of a virtual mentor.
- **Joint Fires and Effects Trainer System (JFETS):** The JFETS is an immersive and adaptive virtual environment for the training of joint close air support, close combat attack, airspace deconfliction and Fires synchronization. JFETS leverages significant advancements in display technology and software to provide a robust and dynamic training environment. Leveraging its ability to connect with other training systems significantly expands opportunities for Soldiers and leaders, and provides an experiential foundation to enhance their learning within a fluid environment.

University Partnerships. The FCoE is working with other military and civilian universities to provide Fires

leaders additional self-development opportunities. The FCoE is also working with university partners to tap their expertise in the areas of cultural awareness, international relationships and organizational leadership. The FCoE has partnered with the University of Texas and the University of Oklahoma in educational technology research.

FCoE Warfighter Forums. The WfFs are aligned with the U.S. Army Forces Command (FORSCOM) WfFs and are focused on supporting operational formations. The forums allow for collaboration between operating units and the rapid sharing of knowledge.

The Next Step

Given the hybrid threat, persistent conflict and the explosion of information technology, the FCoE is committed to changing leader training paradigms to provide Soldiers the appropriate leader skills and knowledge. The Fires senior leadership is creating mentally and physically agile and adaptive Fires leaders with an expeditionary mindset who possess the talent—gained through training and education, experience and self-development—to lead and succeed in an era of persistent conflict. Fires leaders must develop expert-level proficiencies in core and functional competencies and must also be critical thinkers, effective communicators and confident operators across the entire spectrum of operations. These leaders must develop their ability to manage complexity, not only for short durations but over extended periods of time in expeditionary campaigns. They must anticipate and manage operational transitions to see and exploit opportunities in the operating environment. They must possess a strong character that is well-grounded in Army Values and the Warrior Ethos.

Fires leaders, embodying the strategic imperative of agility, must anticipate and adapt to asymmetric threats, demonstrate both the tactical and technical competence required to integrate fires and command and control systems, and possess knowledge refined by experience. The next step is the continuation of a well-resourced, innovative and interactive program of focused, lifelong learning which provides a balance of live, virtual and simulated educational opportunities.



Modernization of Fires Capabilities

The way the Army thinks about modernization is no longer about contiguous battlefields and operational phases, but non-contiguous battlefields and transitions over a full spectrum of offensive, defensive and stability operations using lethal and nonlethal equipment.

General Peter W. Chiarelli, Vice Chief of Staff, Army
AUSA ILW Breakfast, 10 September 2009

Introduction

Modernization efforts are essential to ensure technological superiority over a diverse array of current and potential adversaries. Drawing on lessons learned from ongoing conflicts, leveraging emerging technology and continuously adapting, the Army's modernization strategy is building a versatile mix of tailorable and networked organizations operating on a rotational cycle, to provide a sustained flow of trained and ready forces for full-spectrum operations and to hedge against unexpected contingencies—at a tempo that is predictable and sustainable for the all-volunteer force. On today's non-contiguous battlefields, precision fires are more important than ever. Every Soldier must be connected to a data network for maximum situational awareness at all levels. Systems must be highly adaptable and fully interoperable, capable of quickly adjusting to changes in operational needs. The Army's modernization efforts are specifically designed to enhance essential land force qualities—versatile, expeditionary, agile, lethal, sustainable and interoperable—by empowering Soldiers. The Vice Chief of Staff, Army stated on 10 September 2009 that there are three components to the Army Modernization Plan: brigade combat team (BCT) capability packages, network capability sets and the Army Vehicle Strategy. The Army intends to develop and field the BCT capability packages in two-year increments out to 2026. It also plans to reset and modernize the Stryker, the Abrams tank and the Paladin howitzer.

The Fires component of the Army modernization strategy supports the overall strategy by advancing nine Fires Force strategic imperatives (see “The Fires Force,” page 14). The intent of the Fires strategy is to anticipate warfighter requirements and integrate force application and force protection functions to deliver the optimal combination of lethal and nonlethal fires capabilities.

Capabilities Modernization

The desired end state for fires is the development of interoperable, networked and integrated systems capable of executing multiple missions and the education system to support leaders and operators for those systems in the future hybrid threat environment. New opportunities include the integration of:

- information operations, electronic warfare and directed-energy (as nonlethal fires) with . . .
- common sensors, platforms and launch systems (containing multi-mission capabilities that enhance core competencies) with . . .
- organizational and doctrinal changes (that improve responsiveness and extend reach and precision strike, to include space).

Equally important is the human dimension. Transforming education and teaching methods focused on how Soldiers and leaders learn provide the joint commander with adaptive, versatile Soldiers and leaders who know “how to think.” In transforming the learning



Modernization of Fires Capabilities

environment, the Fires community is producing an agile force that is capable of operating in complex and volatile environments.

Fires Systems

The Fires Center of Excellence (FCoE) has a comprehensive strategy for the modernization of both air defense artillery (ADA) and field artillery (FA) systems in support of both current and future requirements.

Air Defense Artillery. The air defense portion focuses on two aspects: air defense artillery systems and air defense artillery command and control. The ADA systems goal is to modernize the Fires Forces with new capabilities through the use of new technologies and also to improve upon the existing systems that have proven reliability. ADA systems include:



- **Patriot Advanced Capability-3 (PAC-3) Configuration 3.** PAC-3 provides capability to defeat airborne threats, cruise missiles, unmanned aerial vehicles (UAVs) and short-range theater ballistic missiles. Surveillance, fire control tracking and missile guidance are performed by the AN/TPQ-65 Radar Set, a “passive electronically scanned array” radar equipped with identification, friend or foe (IFF), electronic counter-countermeasure (ECCM) and track-via-missile (TVM) guidance subsystems. Patriot’s radar is unusual in that it is

a “detection-to-kill” system, meaning that a single unit performs all search, identification, track and engagement functions. This is in contrast to most surface-to-air missile systems, where several different radars are required to perform all functions necessary to detect and engage targets. Engagement operations are performed at the battery-level engagement control station and the battalion-level information coordination center.

- **Counter Rocket, Artillery and Mortar (C-RAM).** C-RAM conducts surveillance and tracking of incoming mortars and rockets, estimating launch and impact points and the danger areas, and providing information to appropriate command and control (C2) nodes and general warning support to the force. The system consists of Battle Management, Command, Control and Intelligence (BMC2I), Air and Missile Defense Work Station (AMDWS), Light-Weight Counter-Mortar Radar (LCMR) and Wireless Audio Visual Emergency System (WAVES). The system can intercept mortars and rockets with a Land-Based Phalanx Weapon System.
- **Indirect Fires Protection Capability (IFPC).** IFPC provides surveillance and tracking of incoming mortars and rockets, estimating launch and impact points and the danger areas, providing information to appropriate C2 nodes and providing general warning support to the force; interceptors engage mortars and rockets aimed at defended areas. The interceptor battalions will contain a weapon system (Land-Based Phalanx), high-energy lasers or a combination.
- **Surface Launched Advanced Medium Range Air-to-Air Missile (SLAMRAAM).** SLAMRAAM possesses the capability to defeat cruise missiles, unmanned aerial vehicles (UAVs) and fixed- and rotary-wing aircraft (FW/RW) with an interceptor range of more than 20 kilometers. SLAMRAAM is designed to integrate with Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS), Sentinel, Patriot and other air and missile defense (AMD) systems; C2 is performed by the Integrated Fire Control System.



Recent Army senior leader guidance indicates that this system will use the High Mobility Artillery Rocket System (HIMARS) platform.

- **Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS).** JLENS provides elevated, persistent, over-the-horizon surveillance and fire control quality data to defeat cruise missiles, aircraft, UAVs, tactical ballistic missiles, large-caliber rockets and surface moving targets. Sensors consist of a surveillance radar and fire control radar mounted on an elevated aerostat. JLENS integrates with other AMD systems.
- **AN/TPY-2 Radar.** This high-resolution, X-band class, phased array radar will acquire, track, discriminate, classify, identify and estimate the trajectory parameters of threat missiles and missile components, and pass this information to other Ballistic Missile Defense Systems (BMDS) tracking, discrimination and fire control radars. The AN/TPY-2 will provide BMDS precise target acquisition and tracking information on ballistic missiles from boost into midcourse, providing the potential for BMDS weapons to extend their effective range beyond local sensors by using more sophisticated engagement strategies. The extended coverage provided by the adjunct radars will further enhance the capability of BMDS to defend the United States and its allies, friends and deployed forces from ballistic missiles of all ranges, in all phases of flight.



- **Terminal High-Altitude Area Defense (THAAD, formerly known as Theater High-Altitude Area Defense)**
 - **THAAD Fire Control and Communications (TFCC).** The C2 cell for THAAD operations, TFCC provides fire control software and joint and Army interfaces. The TFCC contains the three workstations required to perform all engagement and force operations functions. THAAD integrates with Patriot for self-defense against air-breathing threats.*
 - **THAAD Radar, Launcher and Interceptor.** The radar is an X-band radar that provides signal processing, radar timing and control signals, and missile guidance; receives and disseminates information from the TFCC; and contains the consoles required for radar emplacement, initialization and maintenance diagnostics. The launcher is a missile round pallet containing eight interceptors, mounted on a Heavy Expanded Mobility Tactical Truck (HEMTT); there are up to nine launchers per battery. The launcher has fiber optic connectivity with the TFCC, which permits the launcher to operate away from the fire control, based on its mission set. The interceptor provides upper-tier theater ballistic missile (TBM) defense by intercepting short- and medium-range TBMs inside or outside the atmosphere during the terminal phase of flight.

* An air-breathing system is one requiring air-intake, such as a cruise missile or jet, versus a missile that uses a solid fuel.



Modernization of Fires Capabilities

The interceptor is a kinetic killer; the kill vehicle on the interceptor identifies the target and kills it.

- **Air Defense Artillery command and control (ADA C2).** ADA C2 provides the joint commander an integrated, synchronized and layered missile defense system; a future system will provide the Joint Common Operating Picture. The two C2 systems driving this function are the Command, Control, Battle Management and Communications (C2BMC) and the Integrated Air and Missile Defense (IAMD) Battle Command System (BCS), or IBCS.
 - **Command, Control, Battle Management and Communications.** C2BMC links, integrates and globally synchronizes individual missile defense systems and operations to provide an optimized, layered missile defense against threats of all ranges and in all phases of flight, and provides joint interoperability to the Ballistic Missile Defense System.
 - **Integrated Air and Missile Defense Battle Command System.** IBCS is a network-enabled, common battle command and control (CBCC) “plug and fight” architecture to: integrate Patriot and SLAMRAAM weapon system components (launchers and radars) and JLENS into data distribution schema; provide operational integration with the THAAD system; and interoperate with other AMD command and control elements, including those of the Army, joint services and multinational forces. IBCS is the future of air and missile defense command and control.

Field Artillery. Field artillery systems and capabilities focus on tactical and operational support for the maneuver commander. Weapon systems include:

- M109 Family of Vehicles (FOV) Paladin Integrated Management Howitzer;
- M777-Series Lightweight 155mm (LW155) Howitzer (Towed);
- M119A2 Digitization Program;

- M142 High Mobility Artillery Rocket System (HIMARS);
- M270A1 Multiple Launch Rocket System (MLRS); and
- Non-Line-of-Sight Launch System (NLOS-LS).

The Sensor modernization plan uses the Enhanced Q-36 (EQ-36) Indirect Fire Protection Capability (IFPC) Increment 1 (Warn), which feeds into the ADA C-RAM system. Timely and accurate fires are provided through the use of the command and control systems of the Advanced Field Artillery Tactical Data System (AFATDS), Forward Entry Device (FED), Lightweight FED (LFED) and Pocket-sized FED (PFED) and Precision Coordinates. AFATDS continues to be the venue for planning and executing Fires across the battle space; the universal use of precision guided munitions has driven the software systems of Precision Strike Suite for Special Operations Forces (PSS-SOF) and Digital Precision Strike Suite–Scene Matching (DPSS-SM) into the mainstream Army. Field Artillery continues to be a major contributor to the battlefield as Fires Soldiers move from nontraditional roles and skills back to military occupational specialty (MOS)-specific missions.

• FA Delivery Systems



- **The M109 Family of Vehicles Paladin Integrated Management (PIM) Program.** This program was initiated to modernize and upgrade the M109A6 Paladin. The PIM program is part of the Army’s overall heavy force management strategy to ensure the



sustainability of current armored weapon systems capabilities. The M109 FOV consists of two individual platforms—a self-propelled howitzer and a tracked ammunition carrier—sharing a common chassis that together serve as the organic indirect fire platforms within the Heavy Brigade Combat Team (HBCT) and Fires brigade (FiB) units. Production of FOV sets is projected to begin in 2010. The vehicles produced will retain almost all of the original M109 FOV systems requirements. Planned Paladin upgrades to improve power train, suspension, power management and electronic subsystems will support the modernization of fire control, navigation, communications and gun drive systems. All of these improvements will increase Paladin’s performance and reliability, reduce life cycle costs and address electronic obsolescence issues to meet the Army’s needs to 2050.

- **M777A2 Lightweight 155mm (LW155) Howitzer (155mm Towed).** This system is currently fielded to Stryker Brigade Combat Teams (SBCTs) and light cannon battalions in Fires brigades. With current munitions, the system has a range of up to 30 kilometers. This system is also capable of firing the Excalibur precision munitions and the Projectile Guidance Kit (PGK). The system has onboard automated fire control and self-locating capabilities. Future software will add onboard ballistic computation. It is airliftable by the CH-47D Chinook, CH-53D&E Sea Stallion and MV-22 Osprey and capable of low-velocity aerial delivery (LVAD) (heavy drop).
- **M119A2 Digitization Program.** This program was initiated to provide to the M119A2 105mm towed howitzer the same onboard digitization capabilities as the M109A6 Paladin and LW155: self-locating and orienting, onboard ballistics and secure digital communications. These capabilities will bring with them increased accuracy, improved responsiveness and the ability to fire the PGK and future

105mm precision-guided munitions if fielded. First Unit Equipped is projected for the fourth quarter of FY 2012.



- **M142 HIMARS.** HIMARS is based on the Family of Medium Tactical Vehicles (FMTV) five-ton chassis with a single launch pod. HIMARS is C-130 transportable and rapidly deployable worldwide, fully combat loaded. The system can fire the entire family of MLRS rockets and Army Tactical Missile System (ATACMS) munitions. Currently, seven of 17 battalions have fielded HIMARS.



- **M270A1 Launcher.** The M270A1 Launcher is an improved version of the M270 launcher using the M270A1 fire control system (FCS). The FCS replaces maintenance-intensive hardware and software and provides support for the MLRS family of munitions (MFOM) using a global positioning system (GPS) for in-flight trajectory correction. The launcher’s



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GPS supplements the vehicle's existing inertial position-navigation system. The M270A1 FCS modification upgrades the electronic and navigation equipment, reduces operations and sustainment costs, and revises the software architecture. The M270A1 FCS reduces fire mission and reload cycle times and decreases the time from stowed position to worst-case aim-point by approximately 85 percent. The M270A1 FCS also decreases the mechanical system contribution to reload time by 38 percent. The reduced time spent at the launch and reload points increases the survivability of the launcher crew and associated rearm personnel.



- **Non-Line-of-Sight Launch System (NLOS-LS).** A vertical launcher containing 15 canisters (each carrying shaped charge warheads with fragmentation), NLOS-LS is self-contained and not platform dependent. The container launch unit also includes a command and communications module with onboard computer, radio, power and missile flight programming software. The system is designed to engage and destroy moving and stationary point targets. The system supports fire-and-forget and man-in-the-loop engagements. The missile navigates using GPS waypoints. The system's range requirements are from a minimum range of 500 meters to a maximum of 40 kilometers. Engagement modes include laser guidance, infrared acquisition/homing

and grid attack guidance. The Army is conducting a 23-day limited user test at Fort Bliss on the first of the aforementioned BCT capability packages. The NLOS-LS is in this package with delivery beginning in 2011.

- **FA Observer Platforms**

- **M3A3 Bradley Fire Support Team Vehicle (BFIST).** BFIST is the fire support team vehicle for heavy company fire support teams. At five kilometers, the target location error (TLE) is five meters; at 10 kilometers, it is 10 meters. The BFIST is fully digitized and has integrated forward observer software and Force XXI Battle Command Brigade and Below (FBCB2). The BFIST will integrate the Fire Support Sensor System (FS3) in FY 2010.
- **Stryker Fire Support Vehicle (FSV).** The Army is currently fielding three FSVs per infantry battalion, three per reconnaissance, surveillance and target acquisition (RSTA) squadron and one per antitank company in SBCTs. It has the same mission equipment package (MEP) as the BFIST. The system is equipped with an inertial navigation system and Enhanced Lightweight GPS Receiver (EPLGR). The system also provides the fire support team mobility, survivability and signature equal to maneuver units.
- **M1200 Armored Knight Fire Support Vehicle.** Operated by a three-man combat observation lasing team, the Knight contains the same MEP as the BFIST (M7 and M3A3) and Stryker fire support vehicle. The system includes self-location: range, azimuth and vertical angle to target determination; and target designation and night observation capabilities.

- **FA Sensors**

- **Enhanced Q-36 (EQ-36).** This sensor provides a 90-degree or 360-degree search sector and improved detection ranges and clutter mitigation over the AN/TPQ-36 (V)10. In 90-degree mode, the system can



detect rockets out to 60 kilometers, cannons out to 34 kilometers and mortars out to 20 kilometers. In 360-degree mode, the detection ranges are: rockets, 20 kilometers; cannons, 20 kilometers; and mortars, 15 kilometers. The radar supports the C-RAM Warn mission. The program has been accelerated, with First Unit Equipped projected for FY 2010. The EQ-36 will eventually replace both the Q-36 and Q-37.

- **Profiler.** The latest in meteorological (MET) technology, the Profiler provides timely and accurate MET information for the accurate employment of indirect fires. Using its onboard suite of computers, Profiler models the atmosphere in its domain of 250,000 square kilometers and from the surface to 30 kilometers above ground level. On request, Profiler provides a computer MET message that is tailored to the mid-point of the trajectory. This MET message is digitally transmitted through the Single Channel Ground and Airborne Radio (SINCGARS) to the Advanced Field Artillery Tactical Data System (AFATDS). Recent decisions eliminating use of the balloon and radiosonde have allowed a reduction in crew from six to two and reduced the footprint from three vehicles to one. The Profiler is in full rate production and is currently operating in both Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF).
- **Lightweight Countermortar Radar (LCMR) V3 (AN/TPQ-50).** LCMR began as a commercial off-the-shelf (COTS) system developed by the special operations forces (SOF) community. Systems were purchased and fielded as an interim solution to fill the gap for short-range, 360-degree indirect weapon system detection. Advanced Lightweight Counter Mortar Radar (A-LCMR) became an Army program of record (POR) with the approval of the A-LCMR Capabilities Production Document. Program Manager Radar continues to make significant changes to software and hardware on the fielded systems

to support the warfighter until A-LCMR completes developmental testing and goes into production. These improvements include: hardening of system, improved accuracy, reduction of clutter and false locations, and a self-locating system. POR systems will have the ability to operate in vehicle-mounted (High Mobility Multipurpose Wheeled Vehicle, or HMMWV) or stand-alone configuration. They will be able to detect mortars, cannon and rockets in 360 degrees at ranges from .5 to 10 kilometers. First Unit Equipped is expected in the fourth quarter of FY 2010.

- **Indirect Fire Protection Capability (IFPC) Increment 1 (Warn).** This system can initiate warning within one second of a correlated event. The system meets Net Ready requirements. The projected Basis of Issue Plan is one system per Heavy Brigade Combat Team (HBCT), SBCT and Infantry BCT (IBCT). The projected First Unit Equipped is in FY 2011.
- **Field Artillery Munitions**
 - **Cannon Munitions.** Cannon munitions will contribute significantly to the field artillery's ability to conduct precision strike. Cannon-delivered precision munitions are one more tool available to achieve scalable effects for the maneuver commander.
 - **Excalibur.** The XM982 Excalibur 155mm GPS-guided projectile is the Army's first cannon-delivered, extended range, fire-and-forget precision munition. It enables the attack of high payoff and most dangerous targets in all weather and all terrain types to support the close fight, while minimizing collateral damage through concentrated lethality and increased precision. With a demonstrated accuracy of a less-than-10-meter Circular Error Probable (CEP), it has been employed successfully in both OIF and OEF. Follow-on versions (M982 in 2010 and M982A1 in 2013) will provide greater range (to 40 kilometers) and increased reliability at lower cost.



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- **Precision Guidance Kit.** The XM1156 PGK is a GPS guidance kit with fuzing functions that improves the accuracy of conventional 155mm and 105mm artillery projectiles to a less-than-50-meter CEP. PGK's improved accuracy will maximize the effectiveness of the current stockpile of artillery projectiles, reduce the number of rounds to achieve the same effects and significantly reduce the logistics burden, resulting in quicker target kills and reduced collateral damage. It does not match the accuracy or target set of Excalibur (range, less than 10-meter CEP, near vertical angle of fall, and an ability to defeat personnel within individual buildings). Increment I will be compatible with 155mm high-explosive projectiles (M107, M549A1 and M795). Follow-on increments II and III will add compatibility with all 105mm and 155mm projectiles and improve CEP to less than 30 meters.
- **FA Command and Control Systems**
 - **Advanced Field Artillery Tactical Data System.** AFATDS provides Army, Navy and Marine Corps automated fire support command, control and coordination. It automates the planning, coordinating and controlling of all fire support assets (field artillery, mortars, close air support, naval gunfire, attack helicopters and offensive electronic warfare). AFATDS is the digitized sensor-to-shooter link providing automated technical and tactical fire direction solutions, fire asset management tools and decision support functionality. The functionality of AFATDS software will be used in Network Enabled-Command and Control (NE-CC).
 - **Forward Entry Device (FED), Lightweight FED (LFED) and Pocket-sized FED (PFED).** An integral part of the digitized system architecture, the FED is a handheld device used by forward observers and fire support teams to transmit and receive fire support messages over standard military radios. It provides for a digitized connection between the forward

observers and AFATDS and provides a vital sensor-to-shooter link. The FED/LFED hosts the Forward Observer System (FOS) software, which enables users to plan, control and execute fire support operations at maneuver platoon, company, battalion and brigade levels. The PFED is a modified version of FOS software housed on a ruggedized handheld personal digital assistant (PDA) used by dismounted forward observers.

- **Precision Coordinate Software.** Several software tools are available for deriving precision coordinates. Two available in FOS are PSS-SOF and DPSS-SM. The PSS-SOF is available from a forward observer's call-for-fire menu by selecting refinement for the coordinate location. Another method is to use the stereo referenced image and a surveillance image provided from either a surveillance satellite or tactical imagery from an unmanned aerial system's still photo and use the Scene Matching setting. The third means of deriving precision coordinates at the tactical level is to use Precision Fires Imagery (PFI). FOS will have a PFI generator that will highlight a four-kilometers-square bit of imagery, which can then be uploaded on PFED.

Conclusion

Army modernization efforts, and in particular Fires Force modernization, provide a technological edge for Soldiers and leaders in today's fight and are essential to the Army's efforts to empower Soldiers with the land force qualities needed in the 21st century. The Fires community is improving lethal and nonlethal capabilities, including information sharing and Soldier protection, to give Soldiers and their leaders unparalleled force application and force protection. **The Fires Strategy must continue to have timely and predictable resources or the procurement holiday of the 1990s will be repeated and Soldiers in harm's way will make the ultimate sacrifice.**



While the most dangerous threats to the nation's interests are rogue state and non-state actors with weapons of mass destruction (WMD), future threats will most likely be hybrid—those having dynamic combinations of conventional, irregular, terrorist and criminal capabilities. Future operations in this environment will likely span the spectrum of conflict from peacekeeping operations to counterinsurgency to major combat.

Today, the Fires Force has multiple sensors, cuing multiple command and control systems that manage multiple launch platforms. Proprietary software complicates efforts. It is imperative that the Army close capability gaps in the areas of target location, networked lethality and precision engagement.

In an era of persistent conflict, the U.S. Army is the primary enabling and integrating element of landpower. The Army's current and future transformation focuses on distinct qualities that land forces must possess to succeed. To face the security challenges ahead, the Army will continue to transform into a land force that is versatile, expeditionary, agile, lethal, sustainable and interoperable. Using lessons learned from Iraq, Afghanistan and other regions undergoing conflict, it is modernizing and transforming to build a force that exhibits these six essential qualities. The Army's Fires Force—through a visionary strategy and comprehensive campaign plan—is transforming as well.

The most visible manifestation of Fires transformation is the creation of the Fires Center of Excellence (FCoE) at Fort Sill, Oklahoma. It acts as a headquarters with oversight of both the Air Defense Artillery and Field Artillery commandants. Its mission is to train, educate and develop Soldiers and leaders; create and develop capabilities; engage, collaborate and partner with stakeholders; and provide and sustain a Fires Force to support joint warfighting commanders across the spectrum of operations in the joint, interagency, intergovernmental and multinational (JIIM) environment.

The FCoE delivers Fires technical and leader development training, providing the appropriate mix of live, virtual and simulated training to officers, warrant officers, noncommissioned officers and Soldiers. It affords servicemembers an opportunity to become a part of a Fires network and take advantage of a robust reach-back capability. Ultimately, the intent is for the FCoE to become a Joint and Combined Fires University,

with capabilities similar to those found in modern universities: research and development; instruction by world-class, combat-experienced instructors assigned to the Fires Center; technical assistance provided by mobile training teams to export expertise to the operating force as required; and strategic outreach to educate audiences about the FCoE and acquire knowledge from experts worldwide. In addition, the FCoE's ranges and airspace will be used to train all services in the delivery of air-to-surface munitions. The FCoE has an Initial Operating Capability in the fourth quarter of Fiscal Year (FY) 2009. It will achieve Full Operating Capacity no later than third quarter, FY 2010.

Another significant objective of the Fires Strategy is to anticipate warfighter requirements and integrate force application and force protection functions to deliver the optimal combination of lethal and nonlethal fires capabilities. **The desired end state for fires is the development of interoperable, networked and integrated systems capable of executing multiple missions and the education system to support leaders and operators for those systems.** New opportunities include the integration of:

- information operations, electronic warfare and directed-energy (as nonlethal fires) with . . .
- common sensors, platforms and launch systems (containing multi-mission capabilities that enhance core competencies) with . . .
- organizational and doctrinal changes (that improve responsiveness and extend reach and precision-strike, to include space).

Equally important is the human dimension. Transforming education and teaching methods focused on how Soldiers and leaders learn provides the joint commander with adaptive, versatile Soldiers and leaders who know "how to think." By transforming the learning environment, the Fires community is producing an agile force that is capable of operating in complex and volatile environments.

The Army's Fires senior leadership has a thorough, far-reaching plan to enhance the capabilities of the Fires Force by revolutionizing its institutional base into an effective and efficient enterprise. To do this, full, timely and predictable funding within the Department of Defense's base budget is a must.

[T]he Defense Department needs to think about and prepare for war in a profoundly different way than what we have been accustomed to throughout the better part of the last century. What is needed is a portfolio of military capabilities with maximum versatility across the widest possible spectrum of conflict.

Secretary of Defense Robert M. Gates
Economic Club of Chicago, 16 July 2009



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