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Army Theater Fires Command

Integration and Control of Very Long-Range Army Fires

KEY FINDINGS

- The U.S. Army is developing a new generation of surface-to-surface fires with very long ranges (500–2,000 km), including cannons, missiles, and cruise missiles.
- The Army will face the challenges of integrating these long-range fires, both with its own shorter-range fires and with the very long-range fires of other services, particularly as it lacks its own long-range intelligence, surveillance, and reconnaissance (ISR) capabilities.
- To address these challenges, the Army is proposing a new organization called a Theater Fires Command (TFC).
- The Army is also exploring how TFCs could apply artificial intelligence (AI) techniques to improve and accelerate the employment and support of very long-range systems.
- The number and type of weapons the Army fields will influence a TFC's role in relation to the other services.
- TFCs would face different deployment and employment challenges in the European Command (EUCOM) and Indo-Pacific Command (INDOPACOM) theaters.
- TFCs should be integrated with the capabilities of the other services to the greatest extent possible.
- A TFC should coordinate surface-to-surface fires and other effects for combined joint force land component commanders (JFLCCs) and the joint force commander (JFC) and could provide very long-range Army fires to help meet joint force objectives.

A New Generation of Very Long-Range Fires

One of the central elements of the U.S. Army’s emerging multidomain operations (MDO) capabilities is the deployment of a suite of advanced long-range strike weapons (see Table 1). The Army envisions that these new weapons will be highly responsive and synchronized with other joint capabilities to support operations against near-peer and peer-level adversaries.

Until recently, the longest-range Army surface-to-surface weapon was the Army Tactical Missile System (ATACMS). ATACMS, developed during the Cold War, was first used in combat in the Gulf War of 1991. At that time the longest-range version of ATACMS was 165 km; follow-on versions extended that range to approximately 300 km, albeit with a reduced payload.

In the near term, the Army envisages fielding a ground-launched medium-range cruise missile capability, as well as the service’s program-of-record replacement for ATACMS, the Precision Strike Missile (PrSM). Farther-term future weapon systems include the Long-Range Hypersonic Weapon and the Strategic Long-Range Cannon (SLRC); currently, the SLRC is a technology demonstration program, but a decision will be made in 2023 whether it will become a full developmental program.

The introduction of these types of weapons to the Army represents a generally new capability and raises a number of issues. These new, very long-range Army systems will bring integration and control challenges. Because of the range of these new Army weapons, there will be major implications for joint coordination and planning. The relationship of these new long-range Army systems to existing and future Air Force and Navy deep-attack capabilities must be addressed, in terms of both the roles these Army weapons might fulfill in relation to those of the Air Force and Navy, which already can reach the distances to which

the Army aspires, and what new joint procedures may be required to manage all long-range systems. A number of critical issues require resolution. For example, the Army currently lacks an organic sensor capability to locate and track targets at the distances that these new weapons will be capable of reaching. It will also be necessary to integrate these new Army capabilities with those of other nations. Therefore, including the weapons and associated command-and-control procedures in combined exercises will also be a necessary step.

Abbreviations

A2/AD	antiaccess/area denial
AI	artificial intelligence
ATACMS	Army Tactical Missile System
EUCOM	European Command
INDOPACOM	Indo-Pacific Command
ISR	intelligence, surveillance, and reconnaissance
JFC	joint force commander
JFLCC	joint force land component commander
MDO	multidomain operations
NATO	North Atlantic Treaty Organization
PrSM	Precision Strike Missile
TCT	time critical target
TFC	Theater Fires Command

TABLE 1
The Next Generation of Army Surface-to-Surface Fires Will Have Very Long Ranges

System	Range (unclassified estimate in kilometers)
PrSM	60–499+
Long-Range Hypersonic Weapon	2,000+
Ground Launched Cruise Missile (GLCM)	2,000+

Theater Fires Commands

To help address these integration and control challenges, the Army is concurrently developing a new organization, a TFC. TFCs would function within the joint force construct and would have the ability to provide very long-range Army fires that could contribute to the joint force objectives and could complement the other services' attack assets at their full range of operations. The complexity associated with engaging targets at the joint level is much higher than within the Army, not just because of the physical depth but because of the layers of additional coordination that must take place. A TFC would coordinate surface-to-surface kinetic and non-kinetic fires and other effects for JFLCCs and the JFC.

The U.S. Army's Fires Center of Excellence asked RAND Arroyo Center to examine how a TFC could operate as part of a larger joint force. The research focused on the possible missions the TFC could conduct given the capabilities that the Army envisions including in the organization; possible roles for the TFC in both the EUCOM and INDOPACOM regions were examined. Important differences between the two theaters were identified, and the potential impact those differences could have on TFC operations were examined in detail. The capabilities of the Navy and Air Force were also examined to develop a better understanding of the role the TFC might play within a large joint operation. While the research was in progress, the Army decided to explore acquiring ground-launched medium-range cruise missiles, primarily for use in INDOPACOM. The effect of adding those weapons to the TFC's capabilities was then included in the research.

The research team also considered existing studies on long-range fires and how operations are likely to be conducted in EUCOM and INDOPACOM. Some of those studies were done by the RAND Corporation, whereas some were from other organizations. This research confirmed some of the important conclusions of other studies, particularly regarding issues related to the control of joint fires against distant targets.

The research assumed that the long-range weapons the Army is currently considering fielding during the 2020s will be developed successfully. These include several Army-developed weapons, and the new cruise missile capability mentioned earlier. Data used in the research came from a variety of sources, such as the Army, Navy, and Air Force, as well as nongovernmental organizations that have examined long-range fires and how operations could be conducted in both Europe and the Pacific.

To prevail against a near-peer threat in large-scale combat operations, the JFC must succeed in penetrating and disintegrating the threat's antiaccess/area denial (A2/AD) capability in the operational and strategic deep battlespace to create windows of opportunity for the joint force (per the MDO concept). This would be the primary role of a TFC during conflict. Additionally, the threat could have a significant numerical advantage in terms of long-range fires systems. The JFC could mitigate this in two ways: first, by employing very long-range fires systems and achieving standoff and, second, by engaging in multiple simultaneous multidomain attacks against the threat's integrated fires complex. The new capabilities that the JFC will provide will be the Army's main contribution to that effort.

When considering how the joint targeting process would accommodate new land-based long-range fires associated with the TFC, a key point to consider is the overall campaign context. For example, if the JFC has sizable land forces engaged with the enemy, then this could create additional complications in fire support coordination measures to be sorted out (primarily between the JFLCC and the joint force air component commander) and missions for operational and theater fires in support of those friendly land forces. If the volume of those potential operational and theater fires missions in support of the friendly land forces were large enough, then it is possible that they could exceed the capacity of existing land force organizations. If the long-range kinetic (and nonkinetic) fires need to be coordinated with cyber and space capabilities to support joint combined arms maneuver, then this could also create a requirement for a more robust capability than an existing Army fires cell. The Army's role in developing targets, both prior to and during conflict, would be another important TFC role.

Successful development of the TFC requires the continued identification and assessment of the key capabilities that the TFC would provide the JFLCC and JFC. The relationship of the new TFC with other joint organizations that currently plan, command, and control long-range fires must be understood and refined over time as the services develop and modernize their respective capabilities. The Army has already begun a sustained, multiyear effort to develop and evaluate the TFC in wargames, exercises, and simulations, with current results showing significant potential to increase the options available to the JFC.¹

¹ RAND researchers participated in a number of these events, held by different organizations, including the Maneuver Center of Excellence and TRADOC (U.S. Army Training and Doctrine Command) Analysis Center, since 2020.

Artificial Intelligence Opportunities

The complexity of the tasks associated with very long-range fires required for theater fires coordination in MDO (e.g., mission command, airspace deconfliction, target development, network management, and intelligent munition control) suggests that the TFC will need new capabilities to efficiently and effectively deploy, plan, manage, and employ the full suite of theater-level fires as part of a joint force. Moreover, accelerated coordination timelines are needed to address the physical challenge associated with engaging time critical targets (TCTs) at very long ranges. Although hypersonic speeds would reduce the time of flight, firing from very long ranges would increase the time it will take to get to the TCTs. This may result in a net *increase* in time to reach targets that have variable dwell times, which can be adjusted or shortened as a possible countermeasure.

AI-enabled planning and synchronization software and other technologies may help the TFC to resolve the coordination and timeline issues. Table 2 summarizes opportunities to apply AI to improve joint fires coordination activities. For example, AI technologies could help enable rapid deconfliction of the target area. Other AI opportunities involve expediting the target acquisition process, perhaps providing some level of autonomy, through automated target recognition. Besides reducing time to launch, tech-

nologies in the AI domain could help to improve the synchronization of fires (both kinetic and nonkinetic), improve target-to-weapon matching, and improve the efficiency of logistics and resupply of ammunition.

Although AI may expedite firing process, other technologies can address the need to adjust the attack of very long-range systems after launch—e.g., due to threat actions. Other key technologies that should be explored include the ability to update the delivery vehicle after launch, equipping the delivery vehicle with end-game sensors, and using smart or brilliant munitions.

AI planning and coordination tools need to be identified and validated early on, so that the TFC force design can be shaped to harness their full potential. Through the Army Research Laboratory and now through the Army AI Task Force, the Army has developed such infrastructure-based AI capabilities; however, these capabilities may have to be applied to other service or joint (or higher-level) assets, particularly because the Army ISR capability in the deep battle is currently limited. Such capabilities would have to not only expedite the coordination process but also do so within the context of competing processes with inherently different timelines and cycles—e.g., an air tasking order for planning and execution.

TABLE 2
AI Offers Opportunities to Improve Major Joint Fires Capabilities

Capability	AI Opportunity	Improvement
Threat detection, recognition, identification	Apply ATR techniques to locate and identify prospective targets as they are moving into position	Increase targeting options and shorten planning time
Airspace control and deconfliction	Use AI techniques to coordinate assets in a shared airspace without delays or geographic limitations	Reduce timelines to initiate fires missions
Deep-fires mission assignment	Use predictive analytics and machine learning to determine the best weapon and munition for each target, as well as number of rounds, aimpoints, and tactics for engagement	Enable long time-of-flight missions against TCTs with high probabilities of hit and kill
Mission planning and control for very deep attack	Exploit AI technology to synchronize kinetic and nonkinetic joint fires missions in the deep area of the battlefield	Coordinate very long-range “shock and awe” operations involving many systems and weapons
Logistics operations	Apply AI and machine learning to enable predictive resupply and improve supply chain management for long-range weapons and munitions	Ensure a robust and appropriate set of ready weapons

Deployment and Employment of Theater Fires Commands

The two major theaters that are often considered as applicable to a future TFC, EUCOM and INDOPACOM, pose significantly different physical and political challenges for the deployment and employment of a prospective TFC.

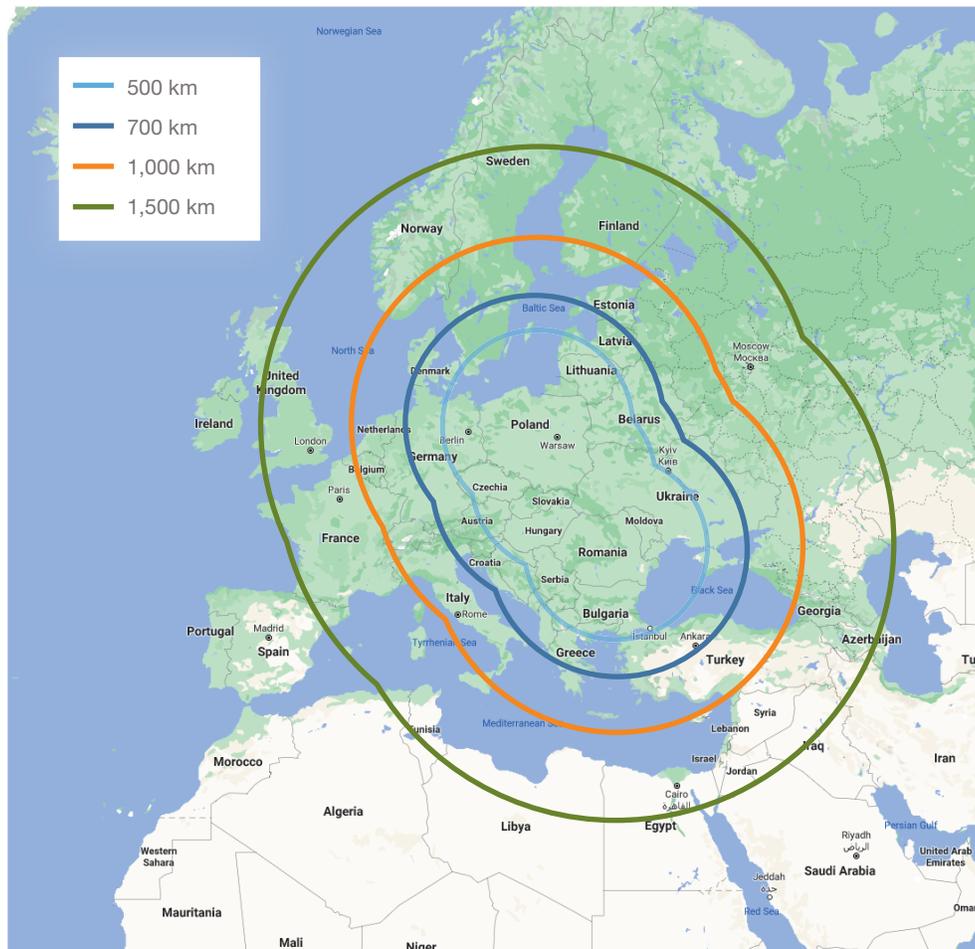
A TFC in EUCOM

Russia has several key strengths that it would be able to leverage in the event of a major conflict with the North Atlantic Treaty Organization (NATO), including its own long-range conventional strike capabilities, long-range strategic surface-to-air missiles that protect its forward-deployed forces from NATO air attack, and the relatively short distances that its ground forces would have to traverse to reach important objectives in NATO's eastern countries. A long-range U.S. Army surface-to-surface strike capability could challenge these Russian advantages.

In the EUCOM scenario, the options for deployment and use of the TFC are similar to the options for

Europe-based U.S. Army forces that have existed in this theater for decades, albeit with some changes, such as a much smaller presence than in the Cold War era. There are several locations in Europe where the TFC could be forward located prior to hostilities, and the additional range associated with both the current programs of record and future weapon system concepts only increase those options relative to existing long-range ground attack systems, such as the Multiple Launch Rocket System (~60–85 km) and ATACMS (~150–300 km). Figure 1 shows illustrative ranges from firing positions in Eastern Europe. The extended range of PrSM (roughly 500 km), for example, provides many options for deployment and employment in this theater. Early use of the TFC could involve reducing the enemy integrated air defense systems, enabling broader use of other joint forces. Other applications could involve complementary deep-attack capabilities, including simultaneity of fires for synergistic effects.

FIGURE 1
EUCOM Provides Many Options for Deployment and Employment of Long-Range Fires



Deployment and Employment of Theater Fires Commands

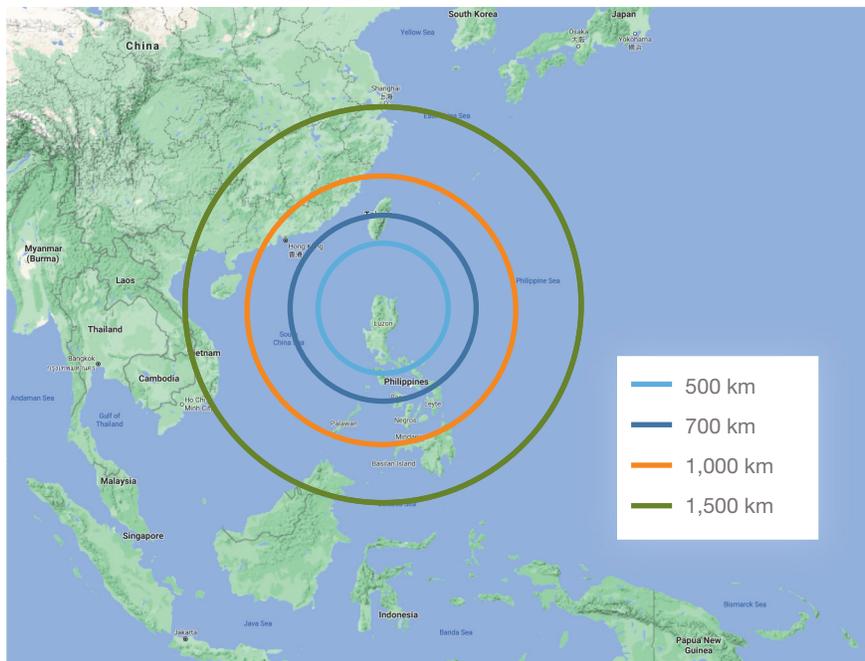
TFC in INDOPACOM

China represents a very formidable opponent. In the past two decades, its military capabilities have improved dramatically in many respects. China's A2/AD capability is the product of significant enhancement of integrated air and missile defenses and long-range fires. The net effect of these systems is to deny the United States the ability to project power into the western Pacific region long enough for China to achieve its objectives in the event of hostilities. The two primary areas where U.S. forces might engage the People's Liberation Army are conflict in the South China Sea or a crisis over Taiwan.

Compared with the EUCOM theater, the INDOPACOM theater presents fewer options for TFC deployment and employment. Even with the longer and extended ranges associated with the TFC, there are relatively few options available to deploy. These limited deployment options are because of the vastness of ocean relative to landmass. A medium-range ground-launched cruise missile may have sufficient range to reach most targets in the region, but the subsonic flight speeds would likely limit its ability to address TCTs. Figure 2 illustrates the ranges to hypothetical fires from the Philippines.

Political constraints may exacerbate the geographic challenge of deploying TFCs to INDOPACOM. An important issue in the Pacific theater is the ability of U.S. joint forces to obtain access ashore in various countries, both in normal peacetime operations and during a crisis. Unlike the situation in Europe in which the NATO alliance provides a clear framework for multinational planning and operations, in the Pacific the United States has a series of bilateral treaties with a number of countries, including Japan, Australia, Thailand, and the Philippines. Each of these countries has its own perspectives on regional stability and security. During normal peacetime operations, these countries have different policies on whether they will allow foreign forces to base on their territory. In the event of a crisis in the region, these nations would probably have different perspectives on how to respond, including the extent to which they would allow U.S. forces to operate from their territory. Unlike in Europe, where there are rather clear agreements on how and under what conditions members of the alliance should respond to a crisis, in the Pacific it is likely that countries could make last-minute decisions regarding the amount of access and support that they would provide U.S. forces. This political reality has major implications for the ability of Army forces to gain access in the region both prior to and during a crisis.

FIGURE 2
Distances in INDOPACOM Limit the Utility of Very Long-Range Fires



Theater Fires Commands Will Increase Options at the Joint Level

The introduction of very long-range weapons to the Army creates an entirely new capability with strategic-level implications. However, the Army lacks an organic sensor capability to locate targets at the distances that these new weapons will be capable of reaching. Integrating the Army's very long-range fires with the joint force could increase the options for conducting deep strike and for attacking deep TCTs, such as enemy air defense sites and command-and-control nodes, whose elimination would in turn improve the effectiveness and survivability of other deep-strike assets at the joint level.

TFCs would provide an organizational solution to integrating the Army's very long-range fires with the joint force. There are many operational and technological challenges associated with bringing strategic-level fires from an organization such as the TFC. Increasing the range or flyout speed of the weapons is a critical starting point; streamlining the joint fires process to ensure timely arrival to engage

TCTs would require significant change to existing processes, especially given the different timelines for planning across the many existing and future joint level assets.

As described above, different theaters will pose different challenges to a future TFC. Depending on the particular circumstances within a theater of operation, the TFC may have to take on a different shape and size to maximize its utility and potential contribution. For example, in the INDOPACOM theater, emphasis would have to be placed on longer-range weapons within units that have relatively smaller footprints; whereas in EUCOM, emphasis might best be placed on high volumes of shorter-range systems, where footprint might be less of a concern. In the former, the Army unit might be considered the supporting force; in the latter, it would be the supported force. If these challenges can be overcome, and if appropriate operating locations can be established, the TFC will provide a unique and complementary ground-attack capability at the JFC level.

RAND Arroyo Center Recommendations to the Army

- *Conduct a joint assessment of Army TFC and other service long-range systems for Europe and the Pacific.* The unprecedented range of the new Army weapons envisioned for the TFC would require close integration with the Air Force and Navy. Joint and combined exercises and wargames could be particularly useful in this regard. Such exercises would help refine the role of the TFC in relation to the current and future capabilities of the other services and allies.
- *Continue to take a modular approach to the TFC organization.* There could be a need to tailor the TFC organization for Europe and the Pacific because of the role the TFC would have in relation to the other services, basing options, and other factors.
- *Continue to explore possible technology options for the TFC, including AI, sensors, and weapons.*

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About This Report

This report documents research and analysis conducted as part of a project entitled *Army Theater Fires Integration and Control*, sponsored by U.S. Army Training and Doctrine Command. The purpose of the project was to inform the development of an organizational capability to plan, integrate, and execute theater fires in MDO in 2028.

The research was conducted within RAND Arroyo Center's Forces and Logistics Program. RAND Arroyo Center, part of the RAND Corporation, is a federally funded research and development center (FFRDC) sponsored by the United States Army.

RAND Arroyo Center

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Acknowledgments

The authors would like to thank the sponsor, U.S. Army Training and Doctrine Command.

The authors wish to acknowledge several RAND colleagues: Jacob Heim's contribution on the joint targeting procedures, Sherrill Lingell's contribution on U.S. Air Force and Navy weapons, Scott Boston's contribution on Army weapons and EUCOM data, and Brandon Corbin for attending wargaming activities and contributing INDOPACOM data.

The authors wish to thank the reviewers who provided useful comments on the draft. David Orletsky at RAND and Major General (ret.) Al Shoffner both sent useful comments.

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