

# Enabling Convergence: How Engineers Protect the Multidomain Battlespace

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Imagine a battlefield where every domain—land, sea, air, space, and cyberspace—acts as a single, synchronized instrument of power. The architects behind this seamless integration are U.S. Army Engineers, whose expertise enables the integration of capabilities across domains to create decisive advantages. Army Doctrine Publication (ADP) 3-0 describes convergence in multidomain operations as the outcome created from integrating capabilities across all domains, producing overwhelming effects and creating decisive advantages. Convergence is key to multidomain operations, enabling the U.S. Army to overmatch adversaries by presenting multiple dilemmas across multiple domains simultaneously, creating windows of opportunity to seize the initiative and achieve decisive results.<sup>1</sup>

The protection warfighting function forms the foundation of successful multidomain operations. By mitigating risks and preserving combat power, protection enables the freedom of action, operational reach, and convergence necessary to achieve victory in a complex and contested environment. To secure a decisive advantage in multidomain operations, Army engineer units should prioritize the convergence of protection effects to directly enable maneuver, safeguard critical assets, and proactively shape the operational environment.

A key element of achieving convergence is ensuring freedom of maneuver, and engineers play a vital role in providing it. During offensive operations, engineers enhance survivability by facilitating the freedom of movement and maneuver to support convergence in multidomain operations.<sup>2</sup> In future large-scale combat operations, engineers will facilitate this essential interaction through several key tasks that include clearing obstacles and establishing lines of communication. Engineers can support commanders during operations to ensure freedom of movement for forces, essential for maintaining operational tempo.<sup>3</sup>

In future operations, engineers will likely clear obstacles by deploying autonomous systems capable of detecting and neutralizing mines or barriers remotely, ensuring safe and rapid advancement for troops. Engineers can use autonomous drone support to construct temporary modular bridges

as part of a maneuver route to span gaps, enabling swift movement of armored units and logistical vehicles in complex terrains and reducing risks to the operational force. By combining these mobility and protection efforts, engineers prioritize the integration of protection capabilities across land, air, and cyber domains, allowing convergence to amplify the effects of each and achieve decisive outcomes.

Beyond facilitating physical maneuver, engineers also enhance protection in the electromagnetic spectrum, which is increasingly crucial in contested environments. Specifically, engineers support electromagnetic protection by assessing vulnerabilities and focusing their efforts on hardening key infrastructure and safeguarding essential information, enabling uninterrupted command and control for converged operations. These efforts are tailored to the unique demands of each operation.<sup>4</sup>

These engineer efforts directly support the survivability and functionality of the assets required for cross-domain effects, safeguarding access to the electromagnetic spectrum in contested environments. For instance, engineers can design and implement electrical shielding and grounding systems to protect critical electronics and infrastructure from electromagnetic pulse (EMP) attacks, ensuring the continued operation of essential communication and control systems.<sup>5</sup>

Furthermore, engineers collaborate with cybersecurity specialists to physically harden and secure network infrastructure, server rooms, and other critical nodes, protecting information and preventing unauthorized physical access and tampering. Prioritizing these engineering efforts directly enables convergence by protecting vital command and control (C2) assets, ensuring cross-domain coordination, enhancing system resilience, and maintaining situational awareness. The timely emplacement of these protection capabilities sustains operational tempo and momentum, which is integral to achieving synchronized multidomain operations.

In addition to enabling mobility and enhancing protection, Army engineers take a proactive approach to shaping the operational environment. Through deliberate engineering

tasks, they create robust infrastructure and flexible terrain that directly support synchronized operations across all domains. Developing well-fortified infrastructure, including ports, airfields, logistical hubs, communication networks, and transportation systems, is essential for strategic mobility and supports multiple domains.<sup>6</sup>

Engineers are crucial in establishing and enhancing these elements. For example, rapidly emplacing new, lighter airfield matting quickly expands operational reach and flexibility by bridging the land and air domains, enabling integrated operations.<sup>7</sup> Additionally, constructing expedient protective structures enhances the survivability of personnel and critical assets in built-up areas,<sup>8</sup> enabling protected hubs for command, control, communications, and sensors, facilitating multidomain integration and synchronization.

Prioritizing these efforts facilitates the rapid deployment and maneuvering of forces across domains, enabling swift power projection and flexible responses. By skillfully manipulating the physical terrain and enhancing security through these engineering tasks, commanders can effectively integrate and synchronize capabilities across all domains to achieve decisive effects in multidomain operations. This proactive shaping of the operational environment, grounded in fundamental engineering tasks, is crucial for gaining and maintaining the initiative against adversaries.

The convergence of capabilities in multidomain operations demands a robust protection warfighting function, and Army engineers are essential to providing it. By enabling maneuver through obstacle reduction and the construction of avenues of approach, hardening critical infrastructure against physical and electromagnetic threats, and proactively shaping the operational environment, engineers create the conditions for effective cross-domain coordination.

Engineer contributions to protection are integral, not merely supportive, to achieving convergence and creating windows of opportunity for the all-domain force. Through their expertise in mobility, protection, and proactive battlefield preparation, engineers create the conditions necessary for seamless integration, amplifying the effects of combined forces and ensuring operational success. This indispensable role underscores their status as the architects of convergence, integral to achieving dominance in the complex and contested operational environments of tomorrow.

#### Endnotes:

<sup>1</sup>Department of the Army, *Operations* (ADP 3-0) (Washington, D.C.: U.S. Government Publishing Office, 2025).

<sup>2</sup>Department of the Army, *Protection* (ADP 3-37) (Washington, D.C.: U.S. Government Publishing Office, 2024).

<sup>3</sup>Army Futures Command, *Army Futures Command Concept for Maneuver in Multi-Domain Operations 2028* (AFC Pamphlet 71-20-1) (Fort Cavazos, TX: Army Futures Command, 2020).

<sup>4</sup>Department of the Army, *Protection* (ADP 3-37) (Washington, D.C.: U.S. Government Publishing Office, 2024).

<sup>5</sup>Smith, D. A., and S. Tourangeau, "Electronic protective measures: It's about protecting access, not aircraft," *Joint Air*

*Power Competence Centre* (May 2021).

<sup>6</sup>Fasching, J., "Strategic mobility: The essential enabler of military operations in great-power competition," *The Heritage Foundation* (November 17, 2020).

<sup>7</sup>Jones, A., "From the Ground Up," *University of Alabama* (December 10, 2021).

<sup>8</sup>Edney, M., "Playing defense: ERDC innovations safeguard Super Bowl LIX," *Engineer Research and Development Center* (February 25, 2025).

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