United States Army-Marine Corps White Paper

Multi-Domain Battle:
Combined Arms for the 21st Century

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Purpose and **Scope**

This *Multi-Domain Battle: Combined Arms for the 21st Century* white paper describes a coordinated Army and Marine Corps approach for ground combat operations against a sophisticated peer enemy threat in the 2025-2040 timeframe. It is intended to promote thought and discussion concerning the methods and capabilities required to confront sophisticated threats. It offers specific hypotheses to inform further concept development, wargaming, experimentation, and capability development. This paper encompasses the views of the Army and Marine Corps regarding an endeavor that involves the entire joint team. It is therefore published with the expectation that the ideas herein will, in concert with the other Services, be refined and expanded into appropriate joint concepts.[1]

Background

To address challenges of defeating a numerically superior adversary, the U.S. Army and U.S. Air Force began development of the AirLand Battle concept in the late 1970s. Approved as doctrine in 1982, AirLand Battle defined the manner in which large-scale ground combat operations would be conducted against a peer adversary. Among its key characteristics were the notions of Integrated Battle and the Extended Battlefield. Integrated Battle necessitated that every asset at a commander's disposal be employed to achieve defeat of the enemy while the Extended Battlefield embraced the concept of the 'deep battle.'[2] The concept propelled military advances through the end of the Cold War.

When the Cold War ended, U.S. defense policy postulated that a new era had dawned in which conflict against a peer adversary was unlikely. This hypothesis was supported by operations throughout the 1990s in which the U.S. military applied the relative conventional superiority it developed in competition with the Warsaw pact to dominate a larger conventionally armed opponent and subsequently conducted a number of low-intensity or limited-commitment conflicts. The loss of a clear strategic peer adversary, combined with the resultant shift in operational commitments and budgetary considerations, triggered a reduction in military capacity that was, at the time, justified by the nature of ongoing operations.

The limited operations of the 1990s realized an expansion in the reliance on systems that enabled precision standoff strike capability, while the capacity and capabilities required for the close fight, such as maneuver forces and counter-IED, atrophied. Technologically advanced deep-strike systems underpinning the standoff approach were seen as cheaper alternatives to even more expensive personnel and organizations, so capacity in ground combat organizations was reduced. Although assets for the close fight were periodically updated to extend service life, there was little innovation in close fight capabilities during this period. Entering a new century, defense planners envisioned future conflict in which the ground combat forces played a reduced role in destroying enemy combat forces.

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[1] The Joint Operational Access Concept (JOAC) identifies the problem of projecting military force into an operational area and sustaining it in the face of armed opposition by increasingly capable enemies and within contested domains. The JOAC proposes employing cross-domain synergy – the complementary vice merely additive employment of capabilities in different domains such that each enhances the effectiveness and compensates for the vulnerabilities of the others— to establish superiority in some combination of domains that will provide the freedom of action required by the mission.

[2] John Romjue, *From Active Defense to AirLand Battle: The Development of Army Doctrine, 1973-1982, pp*. 23-44. Douglas Skinner, *AirLand Battle Doctrine*. Professional Paper 463 September 1988, Center For Naval Analysis pp 17-20.

However, soon after the 21st Century began, the U.S. conducted two decisive, offensive joint campaigns, extending into unanticipated counterinsurgency campaigns. These campaigns did not necessitate the procurement of advanced ground combat platforms because the adversary employed capabilities that placed a premium on U.S. protective adaptations. The focus of training and equipping the force shifted from defeating a peer adversary to defeating an asymmetrical and terrorist threat. A decade and a half of counterinsurgency campaigns, coupled with the drawdown and repositioning of forward deployed forces to CONUS, and the continued stagnation of close fight capabilities further eroded the ability of the U.S. military to confront a peer adversary.

Concurrent with the decline of U.S. conventional capabilities for the close fight, potential adversaries were analyzing the manner in which U.S. armed forces deployed combat power and executed operations to develop methods for countering American advantages in all domains. Adversary developments, as will be discussed, challenge U.S. abilities to conduct decisive operations and necessitate a reexamination of the method for executing operations against a peer adversary.

Whereas AirLand Battle focused primarily on two domains, the modern operating environment calls for new concepts to counter adversary adaptations by fighting in a coherent manner across five domains. Today and into the future, the U.S. will have to confront adversaries contesting the physical domains of air, land, sea, and space, the 'abstract' domain of cyberspace, as well as the electromagnetic spectrum (EMS), the information environment, and the cognitive dimension of warfare.[3] As a result, U.S. forces must evolve the way they are organized, trained, equipped, and postured in order to deter and, if necessary, defeat potential adversaries.

The emerging operational environment

Studies of the emerging operational environment describe a future of contested norms and persistent disorder.[4] Revisionist states, operating under the threshold that would trigger decisive U.S. response, seek to alter the post-Cold War security order by coercing neutrals, U.S. partners, and allies through economic pressure, disinformation, and the threat of military force. Potential enemies will use deception, surprise, speed, and all elements of national power to exploit seams within established U.S. operating methods. Moreover,

Highlights of Emerging Operational Environment

- *Aggressive revisionist peer states challenge U.S. and allied interests*
- *U.S. comparative military advantage has diminished*
  - *U.S. forces are challenged in all domains, the EMS, and the cognitive dimension of warfare*
  - *Presumptive loss of air supremacy*
- *Ground combat capabilities and capacities are out of balance for conflict with peer adversaries*
- *U.S. forces are ill postured to deter conflict*

[3] The Joint services recognize five domains – air, land, maritime, space and cyberspace. This paper highlights the EMS, information environment and cognitive dimension of warfare as additional contested areas that must be addressed by U.S. forces.

[4] Contested norms involves increasingly powerful revisionist states and select non-state actors using any and all elements of power to establish their own set of rules unfavorable to the United States and its interests. Persistent disorder is characterized by an array of weak states that become increasingly incapable of maintaining domestic order or good governance. Publications supporting this assessment include the Joint Operating Environment 2035; Worldwide Threat Assessment of the U.S. Intelligence Community, Senate Select Committee on Intelligence, Feb 2016; Military and Security Developments Involving the People's Republic of China 2015, Annual Report to Congress; RAND, The Challenges of the "Now" and Their Implications for the U.S. Army.

these adversaries may manipulate the risks of escalation by threatening use of weapons of mass destruction or disruption.[5] These actions exploit perceived U.S. weaknesses such as time and distance for force deployment, sustainment, and vulnerable bases, ports, and command and control networks. By operating in this manner, adversaries achieve their objectives by creating a fait accompli before U.S. forces can adequately respond.[6]

Adversaries have studied the manner in which the U.S. coordinates technical reconnaissance, satellite-based communications, and air and maritime power to enable ground freedom of maneuver and overmatch.[7] Highly advanced potential adversaries are developing methods to counter U.S. strengths in the air and maritime domain as well as degrading key capabilities by disrupting access to land, space, cyberspace, and the EMS. Adversaries will also use information warfare to influence U.S. decision makers and domestic and international sentiment. These methods conceivably turn long-presumed strengths into potential weaknesses. As a result, the current U.S. comparative military advantage and the ability to conduct uncontested operations against a sophisticated enemy have diminished.

U.S. forces can no longer assume continuous superiority in any domain because potential adversaries have made strides to disrupt the effectiveness, or deny the use of U.S. combat capabilities. Increasingly complex air, land, sea, space, and cyber capabilities allow adversaries to potentially contest U.S. force dominance.[8] This situation is exacerbated by the optimization of ground and air forces towards counterinsurgency operations which further reduces the ability to effectively counter sophisticated threats. In contrast to counterinsurgency operations, future U.S. forces will likely confront the sensor-rich militaries of peer states that employ both massed and precision-guided munitions across the depth and breadth of highly lethal battlefields. U.S. forces must anticipate being contested in all domains across a vastly extended area of operations by enemies that possess systems that match or exceed existing U.S. ground combat capabilities.

A critical concern for future U.S. operations is the loss of presumptive air superiority resulting from adversary advancements. The difficulty in achieving air supremacy, or even localized air superiority, against sophisticated adversaries has significant implications under current operational constructs.[9] Forces designed for, and accustomed to, air supremacy will face significant challenges in executing effective and efficient operations such as close air support for ground combat, air reconnaissance, and air mobility. Thus, the emerging operational environment is significantly different from the recent past as adversaries challenge U.S. air supremacy.

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[5] Weapons of mass disruption potentially include cyber-attack or wide area electromagnetic pulse (EMP) attack.
[6] A fait accompli is a thing accomplished and presumably irreversible. (Merriam-Webster Dictionary).
[7] Overmatch is defined as the application of capabilities or unique tactics either directly or indirectly, with the intent to prevent or mitigate opposing forces from using their current or projected equipment or tactics.
[8] Joint Vision 2020 called for full spectrum dominance wherein that U.S. forces [would be] able to conduct prompt, sustained, and synchronized operations with combinations of forces tailored to specific situations and with access to and freedom to operate in all domains; space, sea, land, air, and information. A key enabler to this was the ability to achieve superiority in all domains and the information environment.
[9] Air supremacy is defined as that degree of air superiority wherein the opposing force is incapable of effective interference within the operational area using air and missile threats. Air superiority is that degree of dominance in the air battle by one force that permits the conduct of its operations at a given time and place without prohibitive interference from air and missile threats. (JP 3-01).

More specifically, adversaries can contest U.S. air supremacy through the development of complex integrated air defense networks, missile capabilities, electronic warfare capabilities, and highly sophisticated 4th and 5th generation aircraft. In strategically important regions, the density of complex integrated air defense networks enables adversaries to contest or deny friendly air superiority from the ground, and the resilience and density of these systems means that even major strike operations against these networks may only achieve localized and temporary results.[10] Unless countered, these integrated air defense networks further complicate friendly ground combat operations by providing protection under which adversary ground forces can operate relatively free from the effects of airpower. Provided the dispersion, deception, and camouflage inherent in their employment, current integrated air defense networks can inhibit effective targeting and prevent joint fires from striking throughout the depth of enemy formations.

Enemy missile capabilities provide another significant challenge to friendly forces by enabling deep strike without reliance on manned aircraft. Peer adversaries possess numerous, modernized ballistic and cruise missiles with ever increasing precision and speed threatening command and control nodes as well as maneuver and support forces and infrastructure. Complementing enemy missile capability are offensive electronic warfare capabilities, a fleet of fourth and fifth generation aircraft and the full range of armed and unarmed unmanned aerial vehicles, which provide additional highly capable methods for long-range strike and targeting, especially when facing limited U.S. ground-based air defenses. Designed under the presumption of friendly air and maritime supremacy, current U.S. ground forces require large-signature sustainment facilities and command nodes that are vulnerable to long-range missile and rocket attacks. Similarly, adversary coastal defense cruise missile capabilities increase hazards to maritime maneuver by placing naval assets at risk. The extended range and increasing number of these adversary missiles, coupled with significant reductions in friendly air defense capabilities, place large and fixed airbases at risk and limits the ability to project air power. Adversary missiles, protected by an effective air defense network and sophisticated aircraft, compel U.S. forces to operate at greater ranges and in a more dispersed manner, placing a premium on command and control to effectively coordinate operations and provide persistent sustainment.

U.S. forces cannot assume unhindered access to any domain or the EMS required for current reconnaissance and command and control systems to function effectively. Adversaries are developing capabilities specifically designed to attack U.S. platforms, systems, and networks. U.S. forces currently possess limited countermeasures to such attacks that could severely limit friendly battlespace awareness by degrading reconnaissance; command and control systems; position, navigation, and timing (PNT); and disrupt force deployment activities and other logistics operations. The loss of assumed superiority in the air, maritime, space, and cyberspace domains severely inhibits the effectiveness of stand-off targeting and strikes. A lack of situational understanding, when coupled with adversary advances that threaten disruption of supporting fires, diminishes U.S. forces' ability to win major ground combat operations.

[10] As an example, Russia has effectively used these systems to achieve air superiority from the ground in the Ukraine.

When coupled with the loss of assured superiority in other domains and more than a decade focusing on counterinsurgency, U.S. ground combat capabilities and capacities are out of balance to effectively confront emerging conditions presented by potential adversaries. Aging ground combat assets and the limited procurement of technologically advanced systems have created a situation in which adversary ground formations now have parity or overmatch with U.S. forces in capability and capacity. The U.S. is now at a marked disadvantage in the range, lethality, protection, and mobility of many ground-based weapons systems. For example, the latest generation of adversary combat vehicles offer equivalent, and in some cases, superior protection and lethality to U.S. tanks, fighting vehicles, and amphibious vehicles. Furthermore, potential enemies have artillery systems with greater ranges and in greater quantity than comparable U.S. systems, as well as munitions with greater lethality. Some nations have demonstrated the ability to locate and identify targets with UAS and mass long range fires with devastating effects.[11] Absent a modernized U.S. tactical air defense network as well as the ability to provide effective counterfire, adversaries may create overmatch by using their UAS to locate, track, and target exposed U.S. forces and facilities, and then employ massed direct and indirect fires to destroy vital assets and formations.

Current adversary capability developments present an expanded battlefield that can contest U.S. forces from deployment to employment. Not only do U.S. ground combat forces lack sufficient capacity of capabilities, but they are also out of position to deter adversaries, assure allies, and deny or defeat enemies if hostilities start. The time required to deploy U.S. forces from distant locations forfeits the initiative to adversary conventional and unconventional forces. Complex defensive networks can disrupt flexible deterrent options and subsequent build-up of U.S. and allied combat power should deterrence fail. Given these conditions, forward-positioned air, ground, and maritime forces capable of persisting within the arc of enemy long range fires are a decisive factor in deterring adversary aggression.[12] These forces provide both a political deterrent as well as the ability to contest aggression until additional combat power can be deployed.

Implications of the operational environment

Over the last 25 years, assumptions of air, land, maritime, space, and cyberspace domain superiority drove the doctrine, equipment, and posture of U.S. forces. These assumptions are proving to be invalid in light of recent changes to adversary capabilities, capacities, and approaches. Potential adversaries now possess capabilities that allow them to contest both the deployment and employment of U.S. forces in greatly expanded areas of operation, interest, and influence. U.S. forces are not organized, trained, equipped, and postured to properly contest emerging and potential threats. As a result, the freedom of action required to support U.S. policy, by deterring, and if necessary, defeating potential enemies is at risk.

[11] Russia recently exhibited an effective tactical-level linkage of UAS reconnaissance capability with long range artillery fires in Ukraine.

[12] Maritime forces are those forces that operate on, under, or above the sea to gain or exploit command of the sea, sea control, or sea denial and/or to project power from the sea. (DoDD 5100.01: The Navy and Marine Corps comprise the Nation's principal maritime force.)

Military problem

U.S. ground combat forces, operating as part of a joint, interorganizational, and multinational teams, are currently not sufficiently trained, organized, equipped, nor postured to deter or defeat highly-capable peer enemies to win in future war.[13]

Solution synopsis

Multi-Domain Battle: Combined Arms for the 21st Century requires *ready and resilient Army and Marine Corps combat forces capable of outmaneuvering adversaries physically and cognitively through the extension of combined arms across all domains.*[14] *Through credible forward presence and resilient battle formations, future Army and Marine Corps forces integrate and synchronize capabilities as part of a joint team to create temporary windows of superiority across multiple domains and throughout the depth of the battlefield in order to seize, retain, and exploit the initiative; defeat enemies; and achieve military objectives.*

Multi-Domain Battle: Combined Arms for the 21st Century evolves combined arms methodology to include not only those capabilities of the physical domains, but also greater emphasis on space, cyberspace, and other contested areas such as the EMS, the information environment, and the cognitive dimension of warfare. Combined arms integrates capabilities in such a way that to counteract one, the adversary must become more vulnerable to another.[15] Application of combined arms from the air, land, sea, and space has proven to be a combat tested method for success. The incorporation of other domains and contested areas is necessary to confront the realities of the modern battlefield and to generate advantages not possible through the application of combined arms solely in the air, land, or maritime domains. Multi-domain combined arms provide commanders numerous options for executing simultaneous and sequential operations using surprise and speed of action to present multiple dilemmas to an adversary in order to gain physical and psychological advantages, influence and control over the multi-domain operational environment. In executing this concept, air, ground and maritime forces project power outward from land and sea into other domains and contested spaces to support U.S. freedom of action. Thus, U.S. forces strive to affect an adversary in both the physical and abstract domains creating dilemmas too numerous to counter.

To generate and exploit psychological, technological, temporal and spatial advantages over an adversary, ground combat forces must physically and cognitively outmaneuver enemies. This is achieved by holistically employing reconnaissance, movement, fires, and information to avoid surfaces, identify gaps, and create and exploit windows of advantage.[16] U.S. forces must simultaneously use signature control, defensive systems, and over-watch fires to establish temporary zones of protection for friendly forces to operate. The exploitation of gaps and seams in enemy intelligence, surveillance, reconnaissance, protection, and strike systems should be synchronized with the establishment of temporary protective zones for friendly forces. This

[13] Interorganizational refers to elements of U.S. government agencies; state, territorial, local, and tribal agencies; foreign government agencies; intergovernmental, nongovernmental and commercial organizations. (Does not include forces). (Derived from JP 3-08).
[14] Outmaneuvering adversaries in the cognitive dimension is the use of information to confound the enemy's situational understanding and decision making, thereby creating advantage for the joint force.
[15] Combined arms is the synchronized and simultaneous application of arms to achieve effect greater than if each arm was used separately or sequentially.
[16] Surfaces are hard spots—enemy strengths—and gaps are soft spots—enemy weaknesses. (MCDP 1),

should allow maneuver elements to sequence opportunistic action to exploit enemy vulnerabilities and seize positions of relative advantage.

The Army and Marine Corps will meet the demands of future conflict by task-organizing units that are empowered with decentralized, multi-domain combined arms capabilities. Respective of distinct Army and Marine Corps characteristics and responsibilities, these will be Marine Air-Ground Task Forces (MAGTF) for the USMC and multifunctional battle teams for the Army.[17] These units must be flexible and resilient, with the ability to operate in degraded conditions and with sufficient endurance and redundancy to sustain losses and continue operating for extended periods and across wide areas. These formations may be task-organized at multiple echelons, depending on the situation and nature of the mission. *The guiding principle is that they must be able to employ multi-domain combined arms capabilities at the lowest practical echelons to enable dispersed operations, thereby reducing vulnerabilities to enemy massed fires while maintaining the ability to rapidly aggregate to mass at decisive points to create overmatch.* Mutually supporting dispersed tactical formations must possess organic capabilities to generate levels of localized *domain superiority* in the form of temporary zones of protection. The generated areas of control and periods of superiority are not sanctuaries; control is temporary and dynamic requiring ground combat forces to achieve surprise and sustain high tempo operations to open and exploit windows of advantage.

Components of the solution

Executing *Multi-Domain Battle: Combined Arms for the 21st Century* has three key components: create and exploit temporary windows of advantage, restore capability balance and build resilient battle formations, and alter force posture to enhance deterrence. Creating and exploiting temporary windows of advantage provides a means to achieve positions of advantage in or across domains, the EMS, and information environment to seize, retain, and exploit the initiative to defeat the enemy. Restoring capability balance and building resilient battle formations is essential to developing credible future forces capable of fighting and winning against adept and elusive enemies. Altering the force posture prevents conflict by providing a credible deterrence through the introduction of ground and maritime maneuver forces with multi-domain fires capabilities into positions of advantage that disrupt potential fait accompli strategies.

Components of the Solution

- Create and exploit temporary windows of advantage
- Restore capability balance and build resilient battle formations
- Alter force posture to enhance deterrence

Create and exploit temporary windows of advantage

Future operational and tactical commanders will use cross-domain fires, using both kinetic and information warfare means, to enable the opening of successive and/or simultaneous windows of advantage in the physical and abstract domains. As such, the fundamentals of maneuver warfare remain valid with this concept. In cases where overmatch in troop strength or

[17] A multifunctional battle team is a temporarily task organized combined arms element that possesses multi-domain combined arms capabilities and is optimally structured to accomplish a specific mission. The Army envisions multifunctional teams at several echelons with composition and formal naming to be determined

combat power is not possible, U.S. forces will create and exploit temporary windows of advantage in domains that provide the most decisive method for rapidly defeating an enemy. Such windows of advantage may facilitate maneuver to achieve positions of relative advantage in a physical domain or enable suppression of a capability in an abstract domain that is critical to enemy success. As adversaries contest joint forces in physical and/or abstract domains, U.S. forces will possess the ability to rapidly refocus effort and capitalize on successive and/or simultaneous windows of advantage.

Opening a domain window may require combinations of integrated, synchronized, and sequenced capabilities, to include capabilities provided by other U.S. agencies, other military components, or foreign partners. The timing of cross-domain fires and maneuver is predicated on the duration the window of advantage is required to achieve the desired objective. Friendly forces may exploit windows of advantage to disrupt or dislocate the enemy by using simultaneous ground and sea-based maneuver along with other multi-domain capabilities. U.S. forces may employ multi-domain capabilities to attack the enemy's critical capabilities through the most vulnerable physical or abstract domain. Capitalizing on these windows of advantage, ground and maritime forces use speed and surprise to seize, retain, and exploit the initiative. The mission dictates how future combat forces will apply these capabilities as there is no default approach; every mission requires reevaluation of where vulnerabilities exist or can be created because adversaries are adaptive.

Fire and maneuver forces coordinate, plan, and execute fire support tasks to defend the force from attack and surveillance, and create exploitable lethal and nonlethal effects in support of a scheme of maneuver. Fire and maneuver places enemy high value assets at risk compelling him to either increase his vulnerability by remaining in range or abandon his position, losing any advantage. When enemy countermeasures to air power and precision fires (such as dispersion, concealment, deception, and intermingling with civilian populations) limit the effectiveness of stand-off fires capabilities, ground-based fires and maneuver augment other joint capabilities providing the commander with additional options.

This concept calls for the integration of physical fire and maneuver with the abstract capability of information warfare. Information warfare spans several capabilities and functions such as: military information support operations, military deception, operations security, EW, physical attack, special technical operations, information assurance, computer network operations, public affairs, and civil-military operations. Information warfare capabilities provide the opportunity to compete with adversaries early, below the threshold of armed conflict. When information warfare is integrated with kinetic fire and maneuver, commanders will be better equipped to outmaneuver an adversary by degrading his command and control, disrupting weapons and intelligence, surveillance, and reconnaissance systems' functionality, and impacting key audience perception and activities beyond the application of physical power.

Ground-based fires and information warfare, integrated with air and maritime power, support the achievement of localized sea and air control. Deep fires, including long-range precision fires, cyber and electronic warfare capabilities, and counter-fire capabilities help create windows of advantage across all domains. These windows of advantage enable the joint force to seize the

initiative and dominate enemy forces through the execution of opportunistic maneuver in contested and highly competitive peer/near peer environments.

Army and Marine Corps forces, whether employing ground, air, or sea-based maneuver, seek to exploit windows of advantage to close with the enemy, overcome enemy countermeasures, compel outcomes, and consolidate gains. These forces provide lasting effects because they offer endurance and are difficult to displace once in position. Combat units offer many options. One option is to conduct turning movements behind the enemy's main line of defenses to attack critical targets.[18] Another option is when enemy communications and reconnaissance are degraded by multi-domain operations, ground and maritime forces can infiltrate through dispersed enemy positions to attack from unexpected directions, emplace multi-domain fires in positions of advantage and destroy vital facilities to disrupt the enemy's defenses by attacking enemy fire support, air defense, sustainment, and command and control systems.[19] While this concept reinforces the fundamentals of maneuver warfare by advocating attacking where the enemy is weak, forces must possess the capability to create advantage through the application of combined arms in the physical and abstract domains to defeat enemy forces with equivalent combat power. The multitude of methods of creating and exploiting temporary windows of advantage highlight the capabilities necessary for future Army and Marine forces to conduct Multi-Domain Battle: Combined Arms for the 21st Century.

Restore capability balance and build resilient battle formations

Empowering U.S. ground combat forces to fight effectively against sophisticated enemies demands restoring parity or providing capacity overmatch in critical capabilities. Attaining parity entails restoring, at a minimum, equivalency of warfighting capabilities. Achieving parity also requires improving survivability against attack, resiliency, and the endurance to not only survive, but to execute operations post-attack. Improving survivability, resiliency, and endurance will inevitably require capabilities to operate more dispersed over diverse operational environments. Employing the capabilities described here is anticipated to restore overmatch in critical areas to provide the depth, resiliency, and endurance needed for success. With these capabilities, ground and maritime forces ashore will be able to operate in the physical and abstract domains to sense, close with, and destroy enemy elements, influence and protect populations, and seize and occupy or control terrain to consolidate gains.

Ultimately, Army formations and MAGTFs will be task organized to the lowest practical level with capabilities that enable multi-domain distributed or semi-independent operations minimizing the need for enablers from higher echelons of command. Dispersed operations necessitate leaders, Soldiers and Marines capable of using mission command tenets such as initiative to exploit opportunities or respond to unexpected threats within the commander's intent. Army formations and MAGTFs will conduct distributed maneuver with the ability to

[18] A turning movement is a form of maneuver in which the attacking force seeks to avoid the enemy's principle defensive positions by seizing objectives behind the enemy's current positions thereby causing the enemy force to move out of their current positions or divert major forces to meet the threat. FM 3-90-1.

[19] An infiltration is a form of maneuver in which an attacking force conducts undetected movement through or into an area occupied by enemy forces to occupy a position of advantage behind those enemy positions while exposing only small elements to enemy defensive fires. FM 3-90-1. Infiltration of a large unit likely will not go entirely undetected. Employing advanced counter-intelligence, reconnaissance and intelligence capabilities, deception measures, camouflage, concealment and related techniques are critical to success to limit detection and targeting by the enemy.

aggregate and disaggregate combat power to respond in time and space to defeat enemy elements.

Improvements in protection, mobility, range, and lethality of key systems will help create advantages allowing ground combat forces to maneuver in close proximity to civilian populations and defeat enemy forces in close combat. Active protection, advanced armor, and hardened electronic systems will improve units' ability to absorb and survive first strikes of enemy fires. Maneuver units will also increase survivability and capacity by employing manned-unmanned teaming (MUM-T).[20] MUM-T will provide personnel protection by using autonomous or robotic systems to detect, identify, and penetrate high risk areas and may increase capacity to degrade, deny, and destroy enemy systems.

To prevent adversary aviation, UAS, artillery, and missile assets from striking with impunity, forces will employ a highly mobile and robust air and missile defense systems to counter long range fires in both forward and rear areas. These systems will provide early warning, identification, and strike capability and require adequate capacity to counter multiple air sorties or repetitive missile salvo fire to provide defense in depth. Mounted and dismounted friendly elements will have organic capabilities to counter adversary UAS, aircraft, rocket, artillery, and mortar capabilities providing increased survivability and allowing varying levels of freedom of maneuver.

Army formations and MAGTFs will possess a family of UAS for reconnaissance, surveillance and attack missions, often teamed with fifth generation aircraft, possessing the range, endurance, protection, low observability, EW resistance, and lethality necessary to operate across the area of operations. As part of the future formations, vertical lift will support reconnaissance, attack, air assault, medical evacuation, and utility roles. Future vertical lift will provide increased speed, range and survivability to support dispersed forces over wider areas, better operability in degraded visual environments, and the capability for employing precision munitions to include air to air capabilities. Improved aviation protection and countermeasures including infrared and radar frequency gun and missile system detect and defeat, and EW detection, jamming, and attack will enhance survivability in highly contested airspace. Employing future vertical lift with MUM-T also will increase capacity, reach, and survivability.

Conceptually, maneuver formations will capitalize on the increased capability of multi-domain fires systems. Army formations and MAGTFs will have an expanded spectrum of organic and attached lethal and nonlethal fires, some with extended range systems as the mission dictates. Multi-domain and counter-fire sensors improve the commander's situational understanding, and enable rapid neutralization or destruction of enemy systems or forces. Organic cyberspace and EMS sensors, EW attack and jamming capabilities, and automated electromagnetic battle management capabilities allow tactical formations to attack or disrupt enemy systems while minimizing vulnerabilities of friendly systems. Such capabilities will generate tempo by creating temporary windows of advantage in physical and abstract domains.

[20] In the future OE, U.S. forces will often be outnumbered. Use of robotic and autonomous systems helps improve capabilities offsetting enemy numerical advantages.

A renewed degree of emphasis must be placed on electronic emissions control and other measures of signature management. In future conflicts, every force should expect to be quickly and precisely targeted if unable to manage its signatures. Unmanaged signatures will be a critical vulnerability as peer competitors experiment with emerging technologies such as advanced detection methods, hypersonic platforms and directed energy weapons. Minimizing or masking system signatures through concealment and deception will complicate enemy targeting and build resiliency and endurance of U.S. forces. These capabilities are reinforced through counter-intelligence capabilities, social media discipline, covered networks, low-profile basing, and a stealthy logistics infrastructure.

Headquarters and subordinate units alike must be capable of operating effectively despite severe degradation of command and control networks to include disrupted or blocked access to space, cyberspace, and the EMS. Optimized command and control systems in redundant, survivable, and highly mobile command posts allow forces to operate despite enemy attempts to attack, disrupt or degrade command and control infrastructure. Automated decision tools resident in command and control systems will analyze, filter, and report information helping commanders make informed decisions faster. Future units will maintain communications and PNT through an internal communication network for maneuver, fires, and sensors that is resilient and self-healing, i.e. able to re-route data and communications to the intended recipient, to minimize disruptions and support command and control while moving.[21] This internal network will limit susceptibility to detection and countermeasures, potentially using line of sight transmissions such as laser and other hard to detect frequencies supported by high altitude retransmission assets. Integrated and optimized command and control systems will support external connectivity to global support networks that will allow dynamic partnering between Army and Marine forces and other mission partners.

Reducing vulnerabilities inherent in deployment and sustainment activities also supports resiliency of U.S. forces. Dispersed, distributed, and resilient force deployment and sustainment using multiple lines of communications will reduce vulnerability to interdiction. Shallow draft transport vessels, amphibious transport capabilities, short take-off and landing aircraft, and future vertical lift capable of intertheater transit allow entry into austere locations and expeditionary advanced bases providing the commander more options. Autonomous sustainment tools will perform predictive analysis allowing supplies to be pushed forward to units. Using unmanned aerial resupply systems augments the capacity of limited manned systems allowing faster supply operations over dispersed areas and increasing combat capability of engaged units.

Sustainment forces will conduct convoy operations employing MUM-T techniques with ground transport vehicles. Demand reduction efforts will create units that need less fuel, energy, water, and other supplies. Additive manufacturing capabilities will allow units to make repair parts in forward areas.[22] Simplified maintenance (such as line replaceable units) allows repairs at forward locations by the operators, reducing the need to move equipment to higher echelons for repairs. Additionally, forces will have enhanced prolonged care capability at the point of

[21] An internal network refers to systems for communication internal to a unit. An external network is for communication outside of the unit, such as higher echelons, adjacent units or other partners.
[22] Additive Manufacturing (aka 3D printing) describes the technologies that build 3D objects by adding layer-upon-layer of material.

injury to increase personnel survivability because of potential higher casualty numbers against peer threats and possible delays in medical evacuation due to force dispersion.

Alter force posture to enhance deterrence

U.S. forces are not adequately postured or equipped to effectively deter peer competitors from acts of aggression. This deficiency requires deliberate examination of the forward stationed, rotational, and sea-based expeditionary forces. While long-range strikes or nuclear weapons offer strategic deterrence, adversaries often employ methods to achieve objectives that operate below the thresholds for employing these weapons. Robust enemy defensive networks impose limitations on the effectiveness of stand-off strike capabilities. Ground and maritime forces provide multiple options. Army forces stationed overseas and Marine Corps forces forward deployed afloat can deter enemy actions and reassure partners providing commanders with the capability to challenge enemy networks, in an effort to prevent enemies from achieving their objectives. Ground and maritime forces are also expeditionary and strategically mobile, able to rapidly aggregate to contingencies or reinforce forward deployed formations.

Ground forces communicate U.S. commitment prior to and during conflict. In the future, Army and Marine forces working with partners will strengthen forward defenses by bolstering partner capacity and resolve to resist aggression and dissuading adversaries who employ methods below the threshold for war. When possible, Army forces may be permanently stationed in identified high risk areas, or move uncontested into allied or partner nations prior to the outbreak of hostilities through exercises or regular rotations. Army forward stationed forces and Marine sea-based forward presence are complementary. Using the sea as maneuver space and expeditionary advance bases, Marine forces will distribute for activities with partners and rapidly aggregate to deter adversary escalatory actions. Security cooperation activities assure partner states, build relationships and interoperability, enhance situational awareness, and set favorable conditions for inserting follow-on expeditionary forces if diplomacy and deterrence fail.

Having a ground and maritime combat capability in theater prior to hostilities disrupts enemy defensive networks, turning denied areas into contested spaces. Forward-positioned Army and Marine forces that can persist in the arc of enemy fires deter adversary aggression by restricting adversarial freedom of action and influencing the enemy in all domains and contested areas. Forward-positioned and resilient multi-domain fires capabilities provide additional deterrent value by holding at risk enemy centers of gravity. Should deterrence fail, these resilient forward-positioned forces can conduct delaying action to enable maneuver of additional forces into theater.

Conclusion

This paper is intended to promote discussion on solutions to overcome the problems of future conflict in 2025-2040, inform the development of a future warfighting concept, and drive experimentation and refinement of these solutions. Building on current service and joint doctrine, *Multi-Domain Battle: Combined Arms for the 21st Century* evolves the combined arms methodology to include not only those capabilities of the physical domains, but also those of abstract domains such as cyberspace, the EMS, the information environment, and the cognitive dimension of warfare. It provides not only recommendations towards suggested capabilities to be at a commander's disposal to defeat an enemy, but also a new framework for understanding

the expansion of the 21st Century battlefield. Such understanding and capabilities are necessary if U.S. forces are to be successful in future conflict.