Strategy Research Project

Coordinating Long-Range Fires: A Need for New Joint Doctrine?

by

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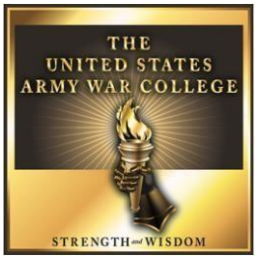

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The development of long-range weapons is increasing the need for deconfliction within the joint force and challenging the traditional methods of integrating fires. At the same time, the concepts of Mission Command and cross-domain synergy create tensions on how best to manage such assets. In order to quickly and effectively field new weapon systems, simulations that focus on integrating emerging capabilities should be conducted during materiel solution development and acquisition. These simulations should not be service-specific exercises that validate Key Performance Parameters or inform requirements, rather they should focus on how these systems would be used in future conflict with an eye toward gaining enough experience that joint doctrine can be tested and either validated or revised. Current simulations using the Army Tactical Missile System and potential counter-unmanned aerial systems are provided as examples of how early simulation would have allowed for quicker, more effective integration of long range fires into the joint fight.

Coordinating Long-Range Fires: A Need for New Joint Doctrine?

> Coming together is a beginning; keeping together is progress; working together is success.
>
> —Henry Ford[1]

The Deep Fight

Over the past fifteen years, the U.S. Army has been developing new capabilities and refining existing systems that have given ground units an operational reach heretofore unseen on the field of battle.[2] This development comes at a time when the joint community is further developing the philosophy of Mission Command within maneuver units, and when current joint doctrine allows commanders who are assigned an Area of Operations to set priorities for operations within their boundaries.[3] Mission Command seeks to decentralize decision making and grants subordinates significant freedom of action, thereby creating a system of decentralized control and decentralized execution. Mission Command is based upon a thorough understanding of the Joint Force Commander's intent as well as the intent of other superior commanders.[4] At the same time, the U.S. military is seeking to enhance cross-domain synergies through initiatives such as the Joint Operational Access Concept.[5] Cross-domain synergy seeks to effectively neutralize the enemy through deliberately integrating land, sea, and air fires, and by leveraging other capabilities such as cyber. The military will have to wrestle with the tensions created by these two efforts; specifically, giving subordinate commanders greater freedom of action while simultaneously providing them with new weapon systems which will reach farther than ever before. This will present new challenges and increase the need for deconfliction and integration with other components and forces. Doctrine needs to be reviewed and possibly revised to ensure

effects are rapidly brought to bear on the enemy without undue disruption to other commanders' operations.

According to joint doctrine, land and maritime force commanders are the supported commanders within their Areas of Operations (AOs) and, "have the authority to designate target priority, effects, and timing of fires within their AOs" in order to facilitate integration and synchronization of effects.[6] Of course, the Joint Force Commander (JFC) is also responsible for coordinating fires in the Joint Operations Area (JOA) while the Air Component Commander directs air operations across the entire theater. Joint doctrine delineates these authorities as follows:

> … synchronization of efforts within land or maritime AOs with theater and/or JOA-wide operations is of particular importance. To facilitate synchronization, the JFC establishes priorities that will guide or inform execution decisions throughout the theater and/or JOA, including within the land and maritime force commander's AOs. The JFACC is normally the supported commander for the JFC's overall air interdiction effort, while JFLCCs and JFMCCs are supported commanders for interdiction in their AOs.[7]

Joint doctrine should help define how large a ground force commander's AO should be, and whether weapons such as the Army Tactical Missile System (ATACMS), and Unmanned Aerial Systems (UAS) such as Grey Eagle, should be regarded as organic assets for use under the philosophy of Mission Command, or if these resources should be doctrinally considered as joint resources. If these systems, each of which can range hundreds of kilometers, are integrated into the joint force, then control of these fires should reside above the maneuver units.

As with any period of developing new military capabilities, one is faced with the question of how to integrate those capabilities into the existing system. There are, in effect, two options. The first is to maintain the current tactics, techniques, procedures

(TTPs) and doctrine for the conduct of battle. This may have the effect of limiting the full use of emerging technologies, but is often simpler than the prospect of needing to redesign the way the military has been training its forces to fight and win its nation's wars. The second option is to take a holistic look at how new technologies and capabilities may require a change in the way one does business in order to fully leverage new systems. The art lies in finding the balance between continuity of effort and maximizing effects in new and evolving situations. This struggle is, of course, nothing new.

Methodology

This project will investigate whether the nexus of new organic capabilities and the concept of Mission Command has brought the Department of Defense to a time when new joint doctrine is needed to ensure the cohesive efforts and synergistic effects on the battlefields of tomorrow. In order to analyze how the joint force has arrived at this point, this paper will discuss the evolution of selected American weapon systems available to military commanders in both range and effect, and how they were utilized within commanders' AOs. Next, this paper will present how joint force exercises have allocated responsibilities and available effects to functional commanders in order to carry out JFC directed priorities in the deep fight, and how those exercises have exposed possible shortcomings in the way new capabilities are projected to be integrated into the joint fight. Lastly, possible areas of investigation will be presented to assist the crafters of joint doctrine in providing greater clarity to better support joint operations on the battlefield. At the core is addressing the dilemma of how to balance the desire for mission command at the tactical and lower operational levels of war with the desire to effectively coordinate the joint fight at the operational and strategic levels.

The Expanding Need for Deconfliction

Span of control has always determined the need to have a hierarchical relationship of various commands on the battlefield. Effective military operations have revolved around the need to coordinate fires and maneuver forces in the face of the enemy. Over time, militaries have developed various techniques for coordinating and deconflicting actions during battle to ensure that their troops could mass effects at the proper place and time in order to achieve decisive results. Often these forces have been deconflicted by the distance between units and the limited reach of the weapons they employed. As the range of weapons increases, so does the need for coordination and deconfliction. Artillery is the long arm of the U.S. Army on the battlefield and has always had to deconflict its fires with more mobile arms of the army such as cavalry and advancing infantry. In order to more effectively employ artillery, the army has sought to find ways to observe the effects of its long range fires and report back to the battery for corrections to firing solutions.

Evolution of Joint Capabilities

Starting in the 1800s, artillery units began to employ balloons in order to gain a vantage point that would allow commanders an overview of enemy formations.[8] As balloons were deployed on the battlefield, they were kept close to the artillery batteries to ensure ease of communications between the observers and firing units. At the same time, being so far behind friendly lines complicated enemy targeting of the observers while protecting the balloons from inadvertent hits from friendly fire. Ranges of fire were relatively short with “Napoleon” style cannons able to fire around 1600 yards and rifled Parrot Guns able to reach 1850 yards.[9] This kept the task of deconflicting and

coordinating fires relatively simple as most targets were visually identified by the firing units or nearby observers.

Until 1914, artillery was deployed en masse and as close to the enemy as possible to allow for direct fires.[10] By the time World War One (WWI) began, airplanes provided militaries with the capability of ranging far behind the front lines. Such mobility, unrestricted by topographical features, provided commanders with better situational awareness of the disposition of enemy forces, and allowed for the more effective use of long range artillery. Doctrine for the employment of deep fires and considerations of how to prevent fratricide did not, however, keep up with technology. Planners and tacticians now needed to consider not only how far fires could reach, but indeed how high they would arc as friendly airplanes were dispatched behind enemy lines and in front of friendly artillery. As a rule of thumb, at maximum range an artillery projectile's maximum altitude is approximately half its range.[11] Therefore, if a cannon has a range of 12,000 meters, the altitude reached would be approximately 6,000 meters or over 18,000 feet. While the linear nature of WWI battlefields in Europe and the proximity of opposing forces did not necessitate adaptation in the close fight, artillery ranges had increased significantly, thus increasing the amount of airspace shared between pilots and projectiles. Unfortunately, deconfliction of fires with friendly aircraft was not widely utilized and this led to aircrews being downed by friendly artillery fire.[12] It is difficult to determine how many planes were brought down by friendly artillery fire, but it was significant enough to develop deconfliction procedures for future conflicts.

During the interwar years, the specter of trench warfare led military planners in the Army to focus on direct fires and maneuver. In the U.S., ground forces developed

motorized artillery that was expected to maneuver into positions where it could directly engage enemy forces.[13] Ground based fires traveled with troops, and aircraft were not widely considered beyond an observation role when operating near friendly forces.[14] The preferred range of fires was short and artillery ballistics provided for flatter trajectories rather than high, arcing fires. This had the added, if unintended, advantage of allowing aircraft to fly above the trajectory of artillery, and prevented fratricide of friendly aircraft. At the same time, airpower theorists were focusing in a different direction entirely. Air war theorists such as Douhet rejected the protracted force-on-force battles of WWI, and contemplated the possibility of strategic bombardment of cities and other vital centers in order to avoid the use of ground troops altogether.[15] There was one country that, perhaps more than any other, considered how to effectively use air and ground forces in synchrony. Germany used the time between the world wars to gain experience and refine tactics, and in November of 1936 Hitler deployed the Condor Legion of more than 3700 personnel and 92 planes to aid the fascists in Spain.[16]

Between the end of WWI and the start of World War Two (WWII), the capabilities of aircraft increased greatly. Range, speed and firepower were a quantum leap beyond that available over Flanders Fields before the 1920s. For example, the Sopwith Camel F.1 was equipped with a 130 horsepower rotary engine that could propel it to a maximum speed of 112 miles per hour and a maximum altitude of 19K feet.[17] By 1939, the Bell P-39 Airacobra was equipped with a 1200 horsepower motor that allowed the aircraft to reach a maximum speed of 376 miles per hour and a maximum altitude of 35K feet.[18] Militaries needed to decide the best way to utilize these capabilities. Intra-

service rivalries coupled with a desire to retain control of organic resources tended to promote stovepiped doctrine instead of helping the military be more effective through cross-domain synergy. The result of such service specific thinking is exemplified by the Royal Air Force's debate over whether to use their limited supply of bomber aircraft strictly for traditional, strategic bombing, or to acquiesce to the Royal Navy's request to use some aircraft in a counter-sea role during the Battle of Britain.[19]

Circumstances such as these left a dearth of thinking on how airpower could best support ground and naval forces within the U.S. Army Air Force as well, and many painful lessons were learned on and above the fields of North Africa and the Atlantic. It was U.S. doctrine at the time to marry, but not subordinate, air units to specific ground units, leading to some very unfortunate effects.[20] Army field manuals closely tied air and ground units by specifically allocating aircraft to the support of assigned ground units, and contained statements such as, "…the most important target at a particular time will usually be that target which constitutes the most serious threat to the operations of the supported ground force."[21] Commanders who had air assets allocated to them would not release "their" assets to conduct missions outside of their Area of Operations. For example, the U.S. II Corps disapproved reconnaissance in another sector because II Corps had, "no responsibilities or interest in that area."[22] Ground commanders wanted "air umbrellas" to protect their troops, but this led Gen James Doolittle to declare such actions would have left little or no air forces to act offensively.[23] The strategic bombing theorists set aside little time to contemplate how air forces would support ground commanders, and once the fighting began, ground commanders wanted airpower to be restricted to either providing top cover for their people or airborne artillery for their close-

in fight. Considering how to leverage capabilities and prevent fratricide was given short shrift; U.S. commanders had more pressing issues. However, things were different for the German Luftwaffe.

The Germans had developed their philosophy of how to prevent fratricide on the battlefields of Spain. This would be achieved by assigning the near fight to ground forces and direct that the deep fight be fought from the air. The Germans carried these tactics into WWII with stunning effect. *Blitzkrieg* (Lightning War) utilized aircraft for strikes to the enemy's rear areas while mechanized infantry and armored forces teamed with direct fire from artillery to rapidly overwhelm the enemy.[24] German air forces were able to mount attacks with little warning and disrupt attempts to reinforce troops on the front lines who were being mauled by highly maneuverable forces supported by mobile artillery. The division of the battlefield into the deep and the near fight has influenced planning to this day.[25] By the end of WWII, The U.S. military had effectively learned how to deal with the linear battlefields of Europe, but unfortunately, future battlefields would not necessarily mirror the geometry or terrain of Europe.

During Vietnam, the U.S. was confronted with a non-linear, often jungle filled battlefield where air cavalry was used to maneuver troops into areas where they would engage pockets of enemy forces. The use of lighter, air mobile forces necessitated either the use of man portable mortars when troops ventured beyond the range of artillery fire bases, or reliance on close air support that could provide heavy fires when and where needed across the Vietnamese countryside.[26] This led to an increased need to coordinate between air and land forces, but artillery ranges were still relatively limited. So, while there was a focus on preventing fratricide from close air support, there was

not a perceived need to refine deconfliction doctrine as a whole. Procedures for air and ground deconfliction tended to focus more on the need for air forces to coordinate the release of weapons in close proximity of friendly ground forces than on deconflicting artillery and aircraft. The effects of this lack of effort resulted in the C-7 incident in Ha Thahn shown in Figure 1.[27] Additionally, when artillery was used in Vietnam, it was seldom coordinated with other services, synergy was not achieved, and in fact the enemy grew contemptuous.[28] A modern democracy can rarely afford to engage in a drawn out campaign. Public opinion will wane and enemies will be emboldened. Identifying early how to effectively integrate joint fires and bring effects to bear on the targeted assets is a lesson from the U.S. experience in Vietnam that must be taken to heart.

Figure 1: US Air Force C-7 Caribou Tail Number 62-4161 hit by 155mm Howitzer at Ha Thahn, Vietnam, August 1967.[29]

During the Cold War, the U.S. prepared for a return to the linear battlefield, this time in Europe. The AirLand Battle concept called for a deep strike capability that would prevent the Warsaw Pact's second echelon forces from being effectively brought to bear

against NATO militaries. This interdiction effort was named Deep Attack and relied upon both Air Force weapon systems and Army units to attack behind enemy lines to disrupt the flow of forces and materiel to the battlefield.[30] The US Army developed several new systems to contribute to this effort, but chief among them were the AH-64 Apache and the Multiple Launch Rocket System (MLRS).[31]

Procedures were established in the 1980s to ensure that the Apache could maximize its flexibility and effectiveness in the close support role while deconflicting their operations with the larger air war.[32] These attack aviation assets could range hundreds of kilometers behind enemy lines, but were normally utilized in support of the anti-armor fight and interdiction closer to the Forward Line of Own Troops (FLOT).[33] Procedures were also established to deconflict the MLRS with aviation assets and the Air Forces' Close Air Support and Battlefield Air Interdiction (BAI) effort.[34] The MLRS could blanket a target area with bomblets from over 30 kilometers away, and sanitized corridors were established to prevent fratricide of forces flying at or below the maximum altitude of the rockets being fired. The linear battlefield and relatively short range of the artillery systems being used led to a comfortable partnership between air and land forces where areas of responsibility were clearly laid out and optimum effects on the enemy were expected to be achieved.

Today, joint terminology has changed; there is no more BAI, and in modern battlefields Killboxes have often replaced a FLOT on the theater maps. More importantly, the capabilities of modern weapons have vastly increased. The MLRS is no longer limited to firing the unguided M270 rocket with a mere 32,000 meter range. Now the same launch vehicle can be fitted with the ATACMS guided missile with unclassified

ranges and apogees of over 300,000 meters and over 90,000 feet above ground level, respectively.[35] This altitude is well above that of the fixed wing assets, and flying above fires to avoid fratricide is no longer possible. Additionally, in the past ten years, the Army has been developing an organic fleet of aircraft, both manned and unmanned, to provide a more responsive Intelligence, Surveillance, and Reconnaissance (ISR) capability. Maneuver unit commanders have been reticent about shooting through the orbits of these high value assets.[36]

So, while terminology has changed and capabilities have evolved, joint doctrine may have some catching up to do. Commanders at the Brigade and Division levels now have organic weapon systems that can reach well beyond their Area of Operations (AO), which begs the question of whether a weapon system's engagement zone should be restricted to an AO, or if joint doctrine should be adjusted to reflect the growing capabilities inherent in maneuver units.

As the U.S. Army promotes the concept of Mission Command, this concept will likely place greater onus on individual commanders to understand the JFC's intent and then take appropriate actions in order to further the effort to achieve the JFC's objectives on the battlefield. Such a concept may lead commanders at all levels to leverage organic capabilities to the maximum extent possible in order to achieve the greatest impact in advancing given priorities. At the same time, there is a move afoot to maximize cross-domain synergy. These two initiatives could lead to friction in prioritizing, coordinating, and deconflicting the allocation of resources. Mission Command may promote the retention of capabilities so that the unit commanders have the maximum number of resources available in order to take advantage of opportunities

that present themselves. Cross-domain synergy would instead promote the tasking of resources at the highest command levels so that they may be allocated against the enemy in a coordinated fashion in order to create the largest impact on enemy systems and structures. Additionally, restrictions imposed by the geometry of AOs could limit the optimum use of new, long-range systems to the geographical limits imposed upon commanders who control the weapons in their assigned AOs, or lead to a tendency to enlarge the size of AOs affecting deep operations. New joint doctrine may be needed to address the inherent tension between Mission Command and cross-domain synergy and establish a framework for how commanders at all levels should work together to maximize the effectiveness of the joint force on the battlefield.

During the Gulf War, the U.S. left the non-contiguous battlefield of Vietnam behind and returned to the classic linear battlefield that the U.S. Military had been rehearsing for during the cold war. While the new weapon systems designed for AirLand Battle were used for the first time against an enemy force, neither these weapons nor the environment was so revolutionary as to necessitate new deconfliction strategies. The Multiple Launch Rocket System (MLRS) was fired using unguided rockets to a distance of around 30 kilometers, but lines of fire were easy to plot and fixed wing aircraft were able to fly above the arcs of the rockets.[37] Additionally, the deep fight was the province of the coalition air forces, and they coordinated the flight paths of cruise missiles as well as the waves of aircraft that would range far and wide over Iraq and Kuwait. AH-64 Apaches and other helicopter assets flew at low altitudes and were controlled at the brigade level, thus providing deconfliction with friendly ground operations and fires. A new weapon was also introduced on the battlefield. 32 ATACMS

were fired over 24 missions, but the low number of missiles fired simplified the joint coordination and did not lead to the identification of any gaps in doctrine with respect to the ATACMS.[38] Desert Storm represented the epitome of AirLand Battle tactics, and the 100-hour ground offensive demonstrated what can be achieved when joint doctrine maximizes the effectiveness of available weapon systems. However, problems were identified between commanders and the level of control at which long-range systems would reside.

The JFC, General Schwarzkopf, wanted to control air assets at the joint level, but corps commanders wanted to be able to direct the attacks of air assets over the entire depth of the battlefield.[39] The Air Component was dissatisfied because they could not hit all the targets they wanted because many were inside the Fire Support Coordination Line (FSCL).[40] The Corps commanders, especially General Fred Franks, were upset because they could not hit all the targets they wanted that were beyond the FSCL and indeed beyond their AOs.[41] The JFC seemed relatively pleased with the overall results, but it appears there was some tension on who was prosecuting the war; the Corps or the JFC.[42] Since the Gulf War, military capabilities have continued to evolve, but seams in joint integration and the deconfliction of long-range fires may have been masked by the nature of the most recent major engagements of US forces.

A More Complex Environment

While the U.S. Army still fields the MLRS to fire unguided rockets, ATACMS have become much more prevalent. Operation Iraqi Freedom witnessed the use of over 400 ATACMS munitions during the invasion of Iraq, and they have also been utilized in Afghanistan. The MLRS vehicle is now a platform for launching guided rockets and munitions and the ATACMS family of missiles has expanded to include a variety of

available warheads ranging from area weapons and bomblets to unitary warheads used to attack point targets. These same weapons can also be fired from a High Mobility Artillery Rocket System (HIMARS) platform that was designed to be air transportable by a C-130.[43] Since 2003, the U.S. Army has also added a more robust fixed wing capability to its maneuver units. This goes well beyond the small, hand-launched unmanned systems, such as RQ-11 Ravens, to include the MC-12 Liberty and Gray Eagle UAS which is capable of being armed with Hellfire missiles for an armed reconnaissance capability.[44]

Additionally, the U.S. Army is developing Counter Rocket, Artillery, and Missile (C-RAM) technologies that can range targets beyond visual range and could be used in a counter-air role, especially if they were used as counter-UAS weapons. Leveraging C-RAM technology to defeat both projectiles and UAS threats may make sense and should be pursued, but a joint solution will be needed as it would straddle the responsibilities of two component commanders. Traditionally, Short Range Air Defense (SHORAD) capabilities were kept at the lower tactical levels, but these systems were limited in range, and relied on visual identification of targets. Longer range anti-aircraft systems were centrally controlled as part of the Area Air Defense Commander's (AADC) layered defense. Now, field commanders may have much more capable systems at the tactical level that are not currently tied in to any theater air defense scheme.

With these factors in mind, the complexity of the current environment can best be demonstrated by two examples. The first is the 2003 advance of U.S. forces towards Baghdad, and the second is the use of long-range systems in Afghanistan. The challenges of the future may best be predicted by joint exercises that demonstrate the

holes in joint doctrine that need to be filled. This will allow the military to effectively leverage new capabilities while striking a balance between maximizing the flexibility and capabilities of commanders at all levels, and simultaneously preserving the cross-domain synergies available through the joint targeting process. At the same time, doctrine must minimize the threat of fratricide through effective coordination and deconfliction of efforts on the battlefield.

The March along the Euphrates

When the U.S. invaded Iraq in 2003, the U.S. Army advanced on the west side of the Euphrates while the U.S. Marines were responsible for advancing between the Tigris and Euphrates.[45] In accordance with joint doctrine, the Joint Force Air Component Commander was the supported commander for interdiction.[46] Despite the linear battlefield that typified the advance into Iraq, deconfliction of fires was a problem. The First Marine Division struggled to meld the requirements of maneuver-based concepts and fire-based concepts. Deconfliction paradigms for adjacent maneuver units requires linear separation (i.e. each unit stays on its designated side of the line) while fires are deconflicted across a two-dimensional zone that assigns specific responsibilities for coordinating air and surface fires.[47] This problem was mainly due to the fact that communications and computer systems at the divisional level were not sufficient to handle the task. This necessitated manual workarounds to ensure Major Subordinate Elements were aware of all fire control measures.[48] The speed of the coalition's advance towards Baghdad complicated the work as objectives were rapidly seized.

The situation faced by the Marines in 2003 has changed in that the number of weapon systems with very long ranges has now increased. While ATACMS were used in Operation Desert Storm and Operation Iraqi Freedom, they are now more integrated

into the units. Not only will the Division G3 need to cope with deconflicting advancing forces, they will also need to take into account overlapping fields of long range fires that will need additional deconfliction measures as they will likely have the range to affect special forces deep behind enemy lines. In addition, long-range fires could also conflict with the flight operations of aircraft that, heretofore, never needed to worry about lines of fire from friendly missiles originating from over 300 kilometers away. Perhaps the biggest differences between the ways long-range systems were used in Iraq during DESERT STORM and IRAQI FREEDOM compared to today lie in the further development and fielding of these systems and how mission command could develop in Army and joint doctrine. In 1990, ATACMS was an area weapon. Today it can be fitted with a unitary warhead to take out a precise target, it is more widely available, and could be potentially viewed as an organic fire asset. UAV systems and other fixed wing assets have also proliferated in the U.S. Army, and how they would be used under the current definitions of AOs has not been completely spelled out in joint doctrine. Additionally, the relative scarcity of such assets during the 2003 invasion of Iraq may have hidden problems with how these assets could or should be integrated into achieving synergistic effects on the battlefields of tomorrow.

Long-Range Weapons in Afghanistan

ISAF and OEF have also allowed U.S. forces to use new weapon systems in combat environments. This battlefield differs from the march up the Euphrates in that the battlefield in Afghanistan does not have a linear quality. Fighting an insurgency puts a premium on ISR and weapon systems that can effectively engage emerging and time-sensitive targets. ATACMS and UAS can be very effective in such tasks, and since the target sets tend to exist in very small areas, it may be easier to coordinate for the

sanitizing of airspace in a low-intensity, noncontiguous battlespace that allows for a deep attack without a corresponding deleterious effect across the whole-of-theater effort. For example, if a high-value target is located in a building in Khost, the airspace around the target and along portions of an ATACMS flight path could be cleared of aircraft, without a disproportionate effect on the prosecution of the war. Such noncontiguous battlefields with small, distributed targets are relatively common in today's conflict areas. In 2006, Israel attacked Hezbollah in Lebanon and faced a similar type of environment. In this case, Israel decided that the risk of fratricide to Israeli aircraft by high-altitude, long-range fires was negligible, and decided against deconfliction.[49] One Israeli officer said deconfliction would have been nearly impossible, although the Israeli Air Force did establish some deconfliction measures by asking the army to restrict the range of its MLRS attacks to 25 kilometers.[50]

Such methods of prosecuting a battle may work in these types of environments, but if this were a linear, high-intensity battle, in depth, with multiple targets to be attacked using ATACMS and other long-range systems in a short period of time, the deconfliction of airspace would be much more complicated, and yet very necessary, as was determined in the TRADOC Army Integrating Experiment SIMEX 2013.[51] The use of long-range, ground-based fires in this type of scenario could indeed necessitate a pause in the prosecution of the CFACC's deep interdiction battle if such fires were not pre-planned and coordinated across the joint force. Conversely, long-range ground fire might need to be restricted if the JFC decided that air operations take priority. Thus, while Afghanistan has allowed the U.S. to showcase new capabilities, the very character of the conflict in Afghanistan has not necessitated the refinement or

development of joint doctrine to optimize the use of these capabilities across the full spectrum of operations.

In addition to surface-to-surface fires, the U.S. Army has also been increasing its fleet of fixed wing and remotely piloted aircraft. These highly valued assets will be at risk of fratricide by long-range fires unless proper deconfliction measures are adopted. Such measures should be developed in coordination with the joint force so that all services involved can avail themselves of whatever deconfliction procedures are developed. The “little bullet, big sky” theory that was used in Lebanon may not be acceptable in a large-scale conflict with a peer or near-peer competitor where availability of assets are tight and the stakes are high. Additionally, like in the North Africa campaign of 1942 and 1943, allocating long-range resources to specific maneuver units may be counterproductive to the overall fight, and centralized control and tasking may aid in more effectively prosecuting the joint fight.

These revolutions in capabilities and their proliferation on the battlefield necessitates the need to reevaluate how best to use these assets. The systems now available at the tactical command level have the ability to reach well beyond traditionally sized AOs. Therefore, one must decide if it is time to resize the AO, reallocate the weapon systems, or to restrict the usable range of weapons to that of an assigned AO, or some combination thereof.

TRADOC Army Integrating Experiment SIMEX 2013

In July and August of 2013, the U.S. Air Force supported the Mission Command Battle Lab, Ft Leavenworth, KS, in the Army Integration Experiment (AIE) Simulation Exercise (SIMEX). The SIMEX was set in the 2020 timeframe, and the Mission Command Battle Lab was the lead with support coming from the Maneuver Battle Lab,

Fires Battle Lab, Maneuver Support Battle Lab, Aviation Battle Lab, Intelligence Battle Lab, Network Battle Lab, and Space and Missile Defense Battle Lab.[52] This exercise focused on a Corps Area of Operations where the Corps acted as a Senior Tactical Echelon and received a theatre JFACC from the Air Force who was dual hatted as the Airspace Control Authority and AADC.[53]

During the beginning of the scenario, the Corps exercised OPCON over multiple army divisions and a Reconnaissance and Security Brigade Combat Team (R&S BCT). The Corps assigned AOs to its divisions, but maintained C2 over the R&S BCT and retained a portion of its AO where the Corps acted as the Senior Tactical Echelon ("Intermediate Tactical Echelon" in Army Doctrine).[54] This exercise illustrated several areas where there may be a need to refine joint doctrine.

Allocating Areas of Operation

In this SIMEX, the Corps retained a portion of its AO and did not divide its entire AO among its subordinate divisions. Because the R&S BCT operated outside a Division (Div) AO, its air support and coordination had to be provided by the Corps Air Support Operations Center (ASOC) for all airspace deconfliction, integration of joint fires, and joint C2. This meant that air support had to come over the top of a Div AO, and Division fires and air support were affected. If the R&S BCT had been assigned to a Div AO, then a Division ASOC/Joint Air Ground Integration Center (JAGIC) could have provided C2. As it was, the ASOC was assigned at the Corps level in accordance with joint and Air Force doctrine.[55]

There needs to be a discussion on when a unit ceases to be an echelon of command and instead needs to fulfill a joint role. Joint fire support to ground commanders had been based upon the role that a unit is assigned, not whether a unit is

a corps or division.[56] In December of 2014, a new version of JP 3-09 was published which may call that practice into question. Specifically, the new JP 3-09 states:

> The [Air Support Operations Center] ASOC is the primary control agency within the theater air control system (TACS) for execution of air operations that directly support land operations within division-assigned airspace. The ASOC is an extension of, and directly subordinate to, the [Joint Air Operations Center] JAOC. Normally collocated with the senior Army [Fires Element] FE, the ASOC performs a current operations function, while planning and execution functions are performed by members of the [Tactical Air Control Party] TACP. ASOC and TACP personnel at the Army division may be integrated with the division fires cell and airspace element to form a [Joint Air Ground Integration Cell] JAGIC. A JAGIC is designed to fully integrate and coordinate all fires and air operations over and within a division commander's AO.[57]

When a Corps is operating as a senior tactical echelon, is it doctrinally recommended to have a JAGIC? If a Corps is operating as a JTF, should it be doctrinally designated a senior tactical echelon? The answers to such questions will undoubtedly have an impact on how joint fires are coordinated and positions are allocated within various staffs.

Fires Integration

This exercise assigned a Corps to an AO that was 25 nautical miles (NM) wide by 25 NM deep.[58] While there are no strict guidelines in FM 3-94 for how large a Corps AO should be, there are examples of AOs that were used in Operation Desert Storm and Operation Iraqi Freedom that could inform on how varied an AO could be in a linear battlefield over open terrain.[59] For Operation Desert Storm, VII Corps was assigned an AO that was approximately 50 miles wide for their breach of the berm and attack north.[60] In Operation Iraqi Freedom, the 3rd Infantry Division assigned a Brigade AO for their crossing of the berm separating Iraq from Kuwait that was approximately 34 miles wide.[61] For this exercise, the result of this constrained environment was the need for five

different fires headquarters to integrate effects inside a 25 NM by 25 NM box in the midst of a very intense fight.

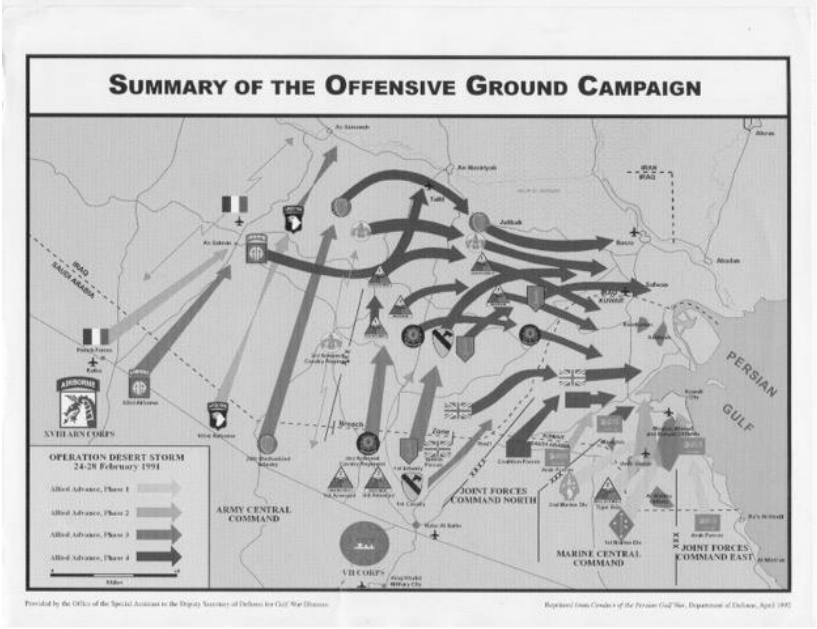

Figure 2: Operation Desert Storm Ground Campaign[62]

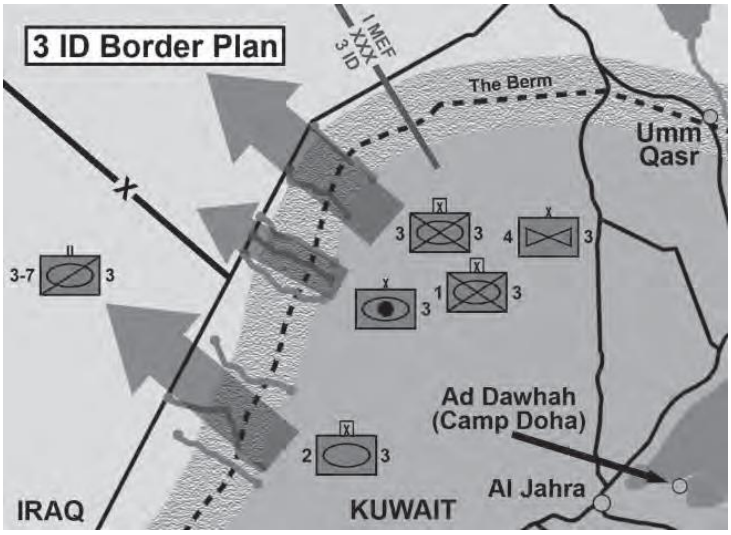

Figure 3: 3rd ID Border Breach Scheme of Maneuver[63]

Over this AO, 100 Close Air Support (CAS) sorties were allocated per day, and U.S. Army units flew Gray Eagles (MQ-1C) in addition to rotary-wing aviation assets.[64]

In an effort to deconflict fires, gun fire lanes were created and aircraft orbits were positioned outside of those lanes unless the aircraft were orbiting above 60K feet above sea level (MSL).[65] For this exercise, CAS assets would come in below the fire of high altitude artillery's minimum ordinate altitude, as opposed to the traditional method of flying over the maximum ordinate of the artillery fire. This method of allocating airspace was called the "Goal Post" method as the orbits were stacked on the flanks of the firing lanes and CAS was brought in under the arc of fires.[66] Platoon Area Hazard and Target Area Hazard were off limits to manned and high-value unmanned aircraft in order to minimize the chance of fratricide.[67] This method allowed for provision of surface to surface fires in the preplanned areas, but should surface fires be desired outside of the established firing lanes, coordinating the movement of the orbits was time consuming.[68] Artillery fires would have to cease while the aircraft repositioned across former gun-target lines in order to establish new firing lanes, and the speeds of the aircraft in the orbits would vary between the different jet and propeller driven aircraft/drones. Senior leaders commented that, "we had forgotten how to do major operations."[69] In fact, it may be more accurate to say that the face of major operations and the capabilities used to conduct them have changed so drastically that doctrine has not kept pace.

This exercise demonstrated that the former means of deconflicting aircraft and high altitude surface-to-surface fires were inadequate. Time, lateral separation, and vertical separation were either not feasible or unable to account for so many fires, in such a small area, over such a varied range of altitudes. As one participant said, "In execution it became an either/or proposition – either CAS could fly or fires could shoot, but not both."[70] Both the Army and the Air Force felt they had lost the flexibility required

to do their mission; CAS sorties went unused, and fire missions could not be used to full effect. This was further exacerbated by the fact that division and corps artillery that were servicing the deep targets consisted of rocket artillery while the artillery at the Brigade level used tube artillery for close-in targets. In effect, this meant that there was no way to fly over the maximum ordinate altitude for interdiction in the purple kill boxes per the standard Air Land Sea Application Center Kill Box procedures.[71] Just as important as the roles each unit will fulfill on the battlefield, one must contend with how deep an AO should be and where to place the Fire Support Coordination Line (FSCL).

> The optimum placement of the FSCL varies with specific AO circumstances, but considerations include the ground force positions and anticipated scheme of maneuver during the effective time period of the SCL, and their indirect fire support systems' range limits, where typically the preponderance of lethal effects on the AO shifts from the ground component to the air component.[72]

How does one now decide where the preponderance of lethal effects will be provided if the air cannot fly to provide CAS when the rocket artillery is used, and rocket artillery cannot shoot if aircraft are present? If the FSCL gets pushed to the end of the ATACMS range, and ATACMS are treated as organic assets, then coordination would be needed for all air interdiction attacks out to a distance of over 300 kilometers from the division artillery emplacements, and ATO sorties within the range of those artillery systems would have to be deconflicted on a dynamic targeting basis. The use of new deconfliction measures such as "Hot Walls" which clear a gun-target line corridor and the "Goal Post" technique described above provide promise for solving these issues, but they rely on long-range fires being viewed as joint assets as opposed to organic to ground maneuver units.[73]

Counter Unmanned Aerial System Experiment

In September of 2013, the Fires Battle Lab conducted an exercise to determine what the Army could do to effectively counter enemy Unmanned Aerial Systems (UAS) in a 2020 scenario.[74] Like the Army Integrating Experiment, this exercise exposed holes in the execution of joint doctrine. The possibility of using Army Aviation assets to engage enemy drones was attempted; however, this met with several difficulties.[75] The first was that Army helicopter units are not trained in intercepts, and the Army does not currently have any assets able to conduct Air Battle Manager duties.[76] Therefore, other Counter-UAS (C-UAS) solutions were sought, such as using Counter-Rocket, Artillery and Mortar (C-RAM) technology.[77] While feasible, such a solution would necessitate a reevaluation of joint doctrine.

Traditionally, the Army has possessed two classes of weapons for engaging enemy aircraft. The first is Short Range Air Defense (SHORAD) systems that relied on visual identification of target aircraft. SHORAD units are assigned to ground maneuver units, and while information was fed to them from the Area Air Defense Commander's (AADC) systems, they were operated in a manner to directly support the commander of a specific AO.[78] The second type of system is based upon the capability to engage aircraft at Beyond Visual Range (BVR). These long and medium range systems are tied into the overall air defense effort and the use of these systems were managed at the joint level through the designation of Missile Engagement Zones (MEZ) that were defined by the AADC and based upon the range of the weapon system as opposed to any maneuver commander's AO.[79] In May 2004, the Chief of Staff of the Army requested the development of a C-RAM or Indirect Fire Protection Capability (IFPC), and various systems have since been fielded for the protection of maneuver

commanders.[80] In the exercise, maneuver unit commanders requested that certain air defense artillery systems, both SHORAD and others with BVR capabilities, be operated through decentralized control and decentralized execution under the concept of Mission Command.[81]

Such an arrangement creates a doctrinal dilemma. Will a system with BVR capabilities that is supporting a BCT be able to operate at its maximum range or will it be restricted to the BCT's AO?[82] Will the systems work under the procedures developed for fires, or will they operate as part of the Area Air Defense Plan?[83] These lead to the need to determine who will be able to direct the IFPC system to engage known hostile targets – will the AADC be able to assign targets or only the maneuver unit? What if the target is within range of the system but outside the maneuver unit commander's AO? Joint doctrine would currently assign the BVR systems to the AADC, but this assumes it would be used in an Air Defense Artillery role. In a C-RAM role, it is clear that the maneuver unit commander would desire to control the system to defend from high speed projectiles aimed at his positions. Joint doctrine should be reviewed to determine how best to reconcile the desire for flexibility as described in the concept of Mission Command, and the need to maximize the effects brought to the battlefield through new weapon systems utilizing cross-domain synergy as stated in Joint Force 2020 and the Joint Operational Access Concept.[84]

Strategic Impact

The Department of Defense's (DOD) defense management activities examine doctrine, organizations, training, materiel, leadership/education, personnel, facilities, and policy (DOTMLPFP) when there is a capability gap. By utilizing the DOTMLPFP construct, combatant commanders and others in the DOD can attempt to define

nonmateriel-based solutions for achieving the required capabilities within the Armed Forces. In the case of long-range fires, it is apparent that materiel solutions were needed to enable the joint force to engage deep targets when air forces were unable to place high payoff targets within operational reach of their weapons. Such times could be at the start of a campaign against a near peer adversary with advanced integrated air defenses and other area denial capabilities, or when air assets are not in position to engage mobile targets that pop-up such as in a counter battery scenario. The military was able to develop long range systems that met the requirements of combatant commanders, but there may be a seam between developing a weapon system that can accurately engage distant targets and then crafting the doctrine that integrates such capabilities into the force.

In the case of long-range surface-to-surface fires, once aircraft are able to fly over the battlefield, effectively deconflicting the lines of fire from air operations throughout the Joint Operations Area (JOA) is highly desired. Unfortunately, there are tensions between current doctrine and these new capabilities. Current Airspace Control Measures may be too slow to clear the required airspace in time for a rapid prosecution of the target by surface-to-surface fires. Mission Command philosophies that promote the retention of long-range organic fires at the lowest level may be at odds with the JFC's desire to synchronize and manage effects across the entire JOA.

As illustrated by the historical examples presented above, there are three factors that influence how a weapon system will best be employed. The first is battlefield geometry. There will be differences in how to effectively deconflict a linear battlefield versus a noncontiguous battlefield, just as there will be differences on how deconfliction

is ensured depending on the size of commanders' AOs. The second factor is the intensity of the fight. The more objects flying through the air over a period of time, the greater the need for coordination and effective airspace management. While the invasion of Iraq in 2003 was a significant fight, only 400 ATACMS were fired throughout the entire invasion. That is an average of less than 20 per day or less than one per hour. It is conceivable that future battles in contested aerial environments will require many more engagements with long range, ground launched precision weaponry than have thus far been seen. The third factor is command and control over weapon systems. Are certain numbers of weapons to be allocated to various echelons, or will several commanders have the ability to control a single weapon? For example, one method of C2 could provide a corps commander with a "string" on 50 ATACMS, and division commanders with control of 20 ATACMS each, thus giving a limited capability to each echelon of command. This would work well for preplanned targeting, but may not be responsive enough to deal with rapidly emerging targets. Another option would be for the weapon systems to be placed on call to support several commanders. This would allow the weapon system to leverage maximum range, without restriction to an assigned commander's AO, but may create tensions in satisfying various commanders' priorities.

Each time significantly new capabilities are contemplated for introduction into the military, there must be an evaluation of how best to integrate those capabilities into the fielded forces. Such efforts should start well before the fielding of new weapon systems, and the best way to do it may be through the continued use of simulations and exercises that replicate the expected capabilities of these new systems. While this type

of experimentation is nothing new, the DOD needs to do better. It is not enough to do only service-specific simulation to ensure that Key Performance Parameters are met. Rather, simulations outside the Defense Acquisition System process are needed to develop concepts for integration of the new capabilities within the joint force. The ATACMS first saw combat in Desert Storm, and has been used in Iraqi Freedom and Afghanistan. Unfortunately there are still doctrinal gaps in how these systems should be integrated into the joint fight. The same is true for C-RAM and IFPC capabilities. These systems have been coming on line since 2004, but more than ten years later there are questions on how to effectively leverage these systems to the fullest extent.

To be fair, no one expected a B-52 to be used for close air support when it was first introduced, but as new munitions are developed, exercises and simulations should be leveraged to create the experiences that will enable new doctrine to be developed before these weapons arrive on the battlefield.[85] In a modern democracy, especially in a resource-austere environment, the military may not have the luxury of learning on the fly how to best use their assets. While North Africa was a wonderful opportunity for the U.S. military of WWII to figure out how to fight, the U.S. cannot assume there will be the strategic flexibility to sufficiently rebuild forces and methods after a war is begun. It is much better to be prepared to win going into the fight. As new munitions such as the variants of ATACMS are developed for legacy platforms like the MLRS, exercises and simulations should be scheduled to gain the experience that will drive the doctrine process.

Additionally, as the services develop their own doctrine, it is imperative to keep an eye on the joint fight and how best to integrate forces to achieve the cross-domain

synergy touted by the Chairman in his forward to the Joint Operational Access Concept.[86] This will best be achieved by a continuation and expansion of Warfighter Talks. These talks originated in the Chief of Staff of the Army and Chief of Staff of the Air Force Talks of 1965.[87] Since then, Navy Warfighter talks have also been developed, but as weapons continue to increase in range, closer coordination may be helpful. If the Navy's railgun would be used against targets inland, trilateral warfighter talks between the Air Force, Army and Navy, as opposed to the current bilateral talks may be in order.

Doctrine must lag, and be underpinned by, experience. It is imperative, however, that the military not wait any longer than necessary to gain the experience that will allow it to effectively engage and defeat potential enemies.[88] A forcing mechanism should be created to ensure that as the Defense Acquisition System works to bring materiel solutions to capability gaps, simulations and exercises are able to gain experience with these envisioned systems so that there is enough experience gained during development, testing and fielding of these materiel solutions to inform doctrine. If the joint community gets this right, the U.S. military will be able to maximize the effective use of its resources. If not, the joint force might end up working at cross purposes, the full capability of weapon systems will not be leveraged, and the enemy may be able to stymie the JFC's effort. The enemy might be able to take advantage of the time needed to deconflict joint fires, or they may place their forces in areas that will use friendly elements as a screen against the employment of U.S. weapon systems.

Conclusion

War is often attended by uncertainty and confusion. In order to cut through the fog and friction of war, the Army has revitalized the old Prussian model of *Auftragstaktik* through the concept of Mission Command. *Auftragstaktik* sought to allow subordinate

commanders greater autonomy in order to take advantage of opportunities on the battlefield. Under Mission Command, a clearly understood commander's intent empowers subordinate commanders to identify opportunities to further friendly objectives and frustrate enemy plans by the proper application of fires and maneuver. There is, however, a tension that exists between this goal and the reality of the battlefield. Maneuver unit commanders have a limited span of control, and they must coordinate and deconflict their efforts with their fellow commanders who are responsible for prosecuting the fight in adjacent areas. AOs have been established to assist in this deconfliction, yet as the range of certain weapons have increased, joint doctrine needs to be adjusted in order to quickly and effectively leverage the capabilities that these systems will have on the enemy. At the same time, commanders must establish safeguards to prevent fratricide while not creating safe havens from attack for enemy forces. In general, the longer the range of the weapon system, the more it should be under a centralized, joint control, but users and doctrinaires must come together to agree on recommended distances and paradigms. Doing this will enable the JFC to enhance synergistic effects on the battlefield. Simultaneously there is a need to establish the capability for local commanders to leverage these new systems to engage emerging and time sensitive targets. The work for the doctrinaires and tacticians will be to create procedures for the rapid deconfliction of these fires with myriad stakeholders in order to engage an agile, near peer competitor before targets are able to relocate. The work of the strategic leader in the military is to establish a system where this can happen.

In order to accomplish this, weapon systems in the Defense Acquisition System that provide significantly new capabilities should be incorporated into joint force combat simulations so that experience may be gained in attempting to incorporate these systems into the joint fight. The lessons identified should be provided to stakeholders to enable a review of the adequacy of both TTPs and joint doctrine. These simulations should be continued, as required, through the fielding of the weapon systems to ensure that both the units receiving them, and the command structures that will control them are able to effectively employ these assets in a cohesive, joint effort whenever called upon by the National Command Authority. If the DOD gets this right, they will be able to effectively plan and prosecute operations across the entire spectrum of conflict. If the military gets it wrong, it will have to learn painful lessons while in contact with the enemy. The one thing the U.S. military must not do is create service specific or joint doctrine that artificially limits the capabilities of our systems and frustrates the ability of JFCs to prosecute the fight.

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