Field Artillery

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Contents

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Purpose

Originally founded as the *Field Artillery Journal*, the *Field Artillery Professional Bulletin* serves as a forum for the discussions of all U.S. Army and U.S. Marine Corps Field Artillery professionals, Active, Reserves and National Guard; disseminates professional knowledge about progress, development and best use in campaigns; cultivates a common understanding of the power, limitations and application of Fires, both lethal and nonlethal; fosters Fires interdependency among the armed services, all of which contribute to the good of the Army, joint and combined forces and our nation. The *Field Artillery Professional Bulletin* is pleased to grant permission to reprint; please credit *Field Artillery Professional Bulletin*, the author(s) and photographers.

Cover

(Front) Soldiers load a M777 Mobile Howitzer while (*Back)* Fort Sill Commanding General Winston P. Brooks prepares to order *send it! (Photo by Angela Turner, Fort Sill PAO)*

FROM THE COMMANDANT OF THE FIELD ARTILLERY SCHOOL

BG ALRIC 'RIC' L. FRANCIS

The Future of Field Artillery: Transformation and Readiness in the 21st Century

As the U.S. Army looks toward the future, the Field Artillery faces a rapidly evolving battlefield characterized by technological advancements, complex threat environments and the continued necessity for large-scale combat operations (LSCO). Despite the innovations in warfare, the Field Artillery's foundational role in shaping the outcome of battles remains indispensable. This article examines the strategies and initiatives currently in place to ensure that the Field Artillery remains a potent and adaptable force in the future, focusing on the branch's four strategic priorities.

Mastering the Fundamentals: The Bedrock of Artillery Excellence

The core principles of Field Artillery—shooting, moving, communicating and surviving—remain fundamental to operational success. While technology evolves, these principles continue to guide the branch's development and ensure the effectiveness and survivability of artillery units on the battlefield. Mastering these elements is vital, especially in the face of complex Multi-Domain Operations (MDO) and the unpredictable nature of modern warfare.

Shoot: Delivering timely, accurate and responsive artillery fires is essential to mission success. Artillery units must consistently hone their skills in target acquisition, fire direction and precision in delivering lethal effects. Our ability to mass artillery fire is paramount today and into the future. Training programs emphasizing these skills will ensure that Redlegs remain lethal, responsive and reliable in any operational environment.

Move: Mobility remains a crucial aspect of artillery operations. As the Army increasingly focuses on highly maneuverable and rapidly deployable units, artillery formations must be able to reposition quickly and adapt to the shifting battlefield. Training in this area ensures that artillery units are agile, responsive and ready to support maneuver forces immediately.

Communicate: Effective communication between artillery units and other military branches is essential for coordination, command and control and situational awareness. Modern artillery must seamlessly integrate with other combat and support elements, ensuring that the right information reaches decision-makers and operational units swiftly and accurately.

Survive: Survival is critical in a future battlefield dominated by advanced adversaries and technological advancements. Artillery units must be able to deliver devastating effects while minimizing their vulnerability. The ability to rapidly emplace, displace and hide increases units' survivability. Training in battlefield concealment, redundancy in communication and enhanced protection systems will ensure that artillery units can sustain their operations while remaining difficult to target.

Developing Expert Redlegs: Building the Future Force

The development of expert Redlegs is central to the long-term success of the Field Artillery. This development is not limited to technical proficiency but includes leadership, resilience and adaptability. The U.S. Army is committed to fostering a culture that supports growth in three key domains: institutional, operational and self-development.

Institutional Domain: In the institutional domain, the Army focuses on creating a learning culture that adapts to emerging threats and technologies. Updates to doctrinal manuals, including FM 3-60 on Army Targeting and ATP 3-09.93 on Fire Support for Echelons above Division, reflect the ongoing modernization efforts. These resources ensure that Redlegs are equipped with the latest knowledge and tactics to operate effectively in a multi-domain environment.

Operational Domain: Artillery units must remain adaptable and agile to meet the demands of modern warfare. Operational training, such as integrating unmanned aerial systems (UAS) for forward observation and target acquisition, represents a shift in how artillery engages the battlefield. Field Artillery units must be proficient in employing these technologies to enhance operational success.

Self-Development: The Army emphasizes the importance of self-development, encouraging Redlegs to pursue lifelong learning and continuous professional growth. This includes access to educational opportunities, professional reading and participation in training programs outside the traditional framework. By fostering a commitment to self-improvement, the Field Artillery ensures that its Soldiers remain prepared to meet the evolving challenges of modern warfare.

Continuous Modernization: Keeping Pace with Emerging Technologies

Modernization is essential for maintaining the Field Artillery's advantage in combat. The Army's ongoing modernization efforts focus on leveraging emerging technologies, such as artificial intelligence (AI), machine learning (ML) and unmanned systems, to enhance precision, coordination and effectiveness in combat operations. Fostering a culture of experimentation allows us to learn as we modernize our capabilities.

Technological Integration: The integration of UAS at the battalion level for target acquisition and reconnaissance is just one example of the Field Artillery's modernization efforts. These technologies provide real-time intelligence, enabling artillery units to adapt quickly and deliver precision fires. Incorporating these systems will continue to evolve, ensuring that the Field Artillery remains a flexible and lethal force capable of responding to emerging threats.

AI/ML and Decision-Making: Machine-enabled decision-making is another aspect of modernization. By harnessing AI/ML, the Army can improve its targeting accuracy, automate time-consuming processes and create predictive models for battle space management. These innovations will enhance the Field Artillery's ability to deliver fires quickly and precisely, even in complex, contested environments.

Operational Integration: Modernization also extends to integrating new weapons systems, like long-range hypersonic weapons (LRHW), into the Field Artillery's capabilities. These systems offer enhanced range, lethality and accuracy, further cementing the Field Artillery's role in future conflicts.

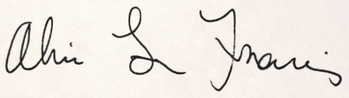
Strengthening the Profession: Developing Leaders for the Future

Leadership is the cornerstone of success in the Field Artillery. Professional writing and communication remain integral to the development of leaders, fostering a culture of continuous learning and professional growth. The Chief of Staff of the Army's Harding Project and integrating professional writing into professional military education (PME) programs ensure that leaders have the skills to lead effectively in modern warfare.

Professional forums, such as the *FA Professional Bulletin* and *Field Artillery Journal*, provide valuable platforms for exchanging ideas, lessons learned and best practices. Through these efforts, the Field Artillery will continue to develop innovative leaders who are prepared to meet the challenges of tomorrow.

The Field Artillery stands ready for the challenges of the future. By mastering the fundamentals, developing expert Redlegs, embracing continuous modernization and strengthening the profession, the Field Artillery is poised to remain a dominant force in the U.S. Army.

King of Battle!



Dispersed Command Posts in Large-Scale Combat Operations: Accepting New Challenges and Mitigating Risks to Achieve Success

By CW2 Mathias Kitz

Introduction

Recent Chinese literature describes the People's Liberation Army (PLA) vision of attacking enemy systems through system destruction warfare, focusing on degrading or disrupting information flow, operational systems, operational architecture and operational tempo.[1] The PLA places a high priority on targeting command posts (CPs) in all four areas, indicating a clear intent to disrupt the very core of our operations. In response, U.S. Army divisions must prioritize the survivability of their CP through dispersed operations while conducting targeting of the adversary successfully. Targeting in Large-Scale Combat Operations (LSCO) relies on survivability of the CP through dispersed operations. Divisions must accept new challenges and mitigate risks to achieve success.

When leaders describe building the Army of 2030, a common frame of mind is "the world is changing, and the Army is changing with it."[2] The Army is refocusing its mindset from a Global War on Terror to Multi-Domain Operations (MDO). This shift ensures the Army maintains a competitive advantage compared to our growing near peer threats of China and Russia. Command post survivability was of minor concern in the Global War on Terror as the Army had multiple advantages compared to a less threatening adversary. The Army had a general sense of security behind reinforced buildings and compounds and conducted business relatively unimpeded. The next fight may be against a near-peer threat in areas where we do not have those advantages, and we may be forced to fight in other ways.

In February 2023, the Army of 2030 initiative became official. This series of Force Design Updates (FDUs) aims to reorganize and equip divisions as the tactical decisive formation in LSCO.[3] Army 2030 has nearly 40 FDUs that support over 30 modernization initiatives, and as the force develops, these initiatives are fulfilled.[4] The U.S. Army Training and Doctrine Command (TRADOC) Proponent Office-Echelons Above Brigade (TPO-EAB) has developed a list of Army 2030 learning demands that influence decision making and modernization initiatives. One learning demand is "command and control," which addresses CP survivability and data and decision making.[5] Dispersed CP operations will include command and control challenges that divisions should train for now. Accepting new challenges will serve as building blocks for future success.

Accept New Challenges

Field Manual (FM) 3-60 depicts an example of a Division/Corps Targeting Coordination Board.[6] This specific example highlights over 39 key participants that should be in attendance and located at the division or corps main command post. Despite historical norms, divisions must adapt their approach to targeting in LSCO to ensure the survivability of CP members. The traditional method of conducting targeting from a single, large CP may foster synchronization and collaboration, but it is not reflective of the Mobile Division Army 2030 envisions. The targeting community has become accustomed to this approach, evidenced by multiple in-person meetings for coordination. A fight against a near-peer threat does not guarantee the luxury of the close, physical proximity divisions take for granted. Targeting members must break free from the comfort of traditional targeting practices that rely on in-person meetings among different staff sections to navigate the complexities of multi-domain operations and distributed means.

Command posts replicating dispersed operations often lack the necessary level of training and preparation, especially while executing a dispersed targeting process. The level of integration that must be reached between targeting members is difficult to achieve when proximity is altered. Divisions may engage in field exercises or operations, setting up staff sections in mobile CP vehicles or smaller cells under the premise of being separated in time or space but still operate within proximity. Challenges arise when integration becomes problematic and individuals resort to familiar methods and physically move from one location to another. These situations are difficult to replicate because they are not the main training objectives, but they should be. Divisions must train for the fight they may face and do so with the Army 2030 framework in mind.

Mitigate Risks

Army Techniques Publication (ATP) 6-05 emphasizes the critical role of CP functions in providing commanders with essential support in understanding, visualizing, directing, leading and assessing operations.[7] Successful targeting hinges on the decision-making abilities of commanders, who rely on the information and analysis provided by their staff within the CP.[8] Commanders must carefully assess the risks associated with executing dispersed operations. Situational understanding, controlling operations, and maintaining situational awareness are vital to all types of CP and may be compromised if operations are dispersed.

The Army's 2023-2024 Acquisition Program Portfolio highlights the Command Post Integrating Infrastructure (CPI2) as a replacement for the large CP of the past.[9] This concept was originally tested by 4th Infantry Division in 2021 as an effort to modernize tactical CP.[10] Initial tests proved that the new version of the CP could emplace and displace faster than ever before allowing FDU milestones to progress. Emplacement and displacement of the CP is only part of the remedy for disbursed operations. The other half of the equation is how staff sections integrate while using the CPI2. Targeting professionals must start using capabilities like CPI2 to determine how to effectively integrate amongst themselves while still targeting the adversary successfully.

The CPI2 will be fielded to ninety-two units in fiscal year 2025; divisions must consider how to integrate and synchronize staff sections using CPI2 capabilities to see success in dispersed operations.[11] The CPI2 consists of three main components: the Mission Command Platform (MCP), the Command Post Support Vehicle (CPSV) and the Integrated Support System (ISS). The MCP provides digitally connected workstations for staff members; the CPSV hosts mission command servers, communications, and a Unified Voice Management System (UVMS) for conferencing; and the ISS ties the systems together using the Command Post Display System.[12] The combination of these systems allows the commander to gain situational understanding, control operations, and maintain situational awareness. Systems like the CPI2 will promote success if unimpeded, but there are associated risks.

The biggest risk in dispersed operations is the dependence of an uncontested network. Adversaries will try to degrade our capabilities, and we will have to adjust to achieve success.[13] Divisions can mitigate this by implementing Digital Sustainment Training (DST) at all echelons. DST should focus on exercising communications plans which may be leveraged in a contested environment. There may be times when those plans are simply not enough, and decisions must be made.

In 2012, GEN Martin E. Dempsey, Chairman of the Joint Chiefs of Staff (CJCS), published the Mission Command White Paper. In the paper, he suggests that commanders must use mission command to combat threats in the future.[14,15] Joint Publication (JP) 3-0 states, "successful mission command demands that subordinate leaders at all echelons exercise disciplined initiative and act aggressively and independently to accomplish the mission."[16] This is an important specification especially regarding the targeting process.[17] There will be times that decisions must be made, and the commander may not be around to make these decisions. This is when mission command is used to make decisions. Mission command must be coupled with authority matrices to ensure that

the right people are making the best decisions at the proper levels. Commanders can replicate instances by conducting realistic training wherein these methodologies are practiced. Although there is risk associated, rehearsals and authority matrices help to minimize this level of risk.

Conclusion

The Army of 2030 initiative is indicative that the potential to face a near-peer threat in the future could be a reality. The 2022 United States National Defense Strategy (NDS) codifies this further prioritizing the People's Republic of China (PRC) challenge in the Indo-Pacific region as well as the Russia challenge in Europe as high priorities.[18] These threats plan to target one of our biggest vulnerabilities, the command post. As the Army competes in Multi-Domain Operations, divisions will be presented with dilemmas they have never faced. Commanders must be willing to accept new challenges and risks while effectively finding ways to integrate and synchronize their staff. Training for dispersed operations requires critical and creative thinking to exercise and become efficient with new equipment. This is especially important when implementing the targeting process while dispersed.

Commanders must find ways to mitigate the risks associated with a dispersed targeting process. This must be the focal point for training, and risk mitigation measures should be employed. Exercising a combination of mission command coupled with authority matrices will serve to mitigate that risk. One thing is for certain, a fight against a near peer threat will not be fought from the large CP traditionally employed. Divisions must be able to survive and defeat the adversary with effective targeting. Targeting in LSCO relies on survivability of the command post through dispersed operations. Divisions must accept new challenges and mitigate risks to achieve success.

Chief Warrant Officer 2 Mathias Kitz currently serves as a Field Artillery Intelligence Officer for America's First Corps at Joint Base Lewis-McChord, Washington. He holds an Associates of Arts from American Military University and is currently pursuing a Bachelor of Science in Environmental Management through American Military University. He is a graduate of the Field Artillery Warrant Officer Advanced Course. His previous assignments include Brigade Targeting Officer, Brigade Field Artillery Intelligence Officer, Brigade Counterfire Officer, Field Artillery Brigade Assistant Counterfire Officer and Battalion Targeting Officer.

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2. (U. S. Army 2022)
3. (LTC Kevin Hadley 2023)
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6. (H. D. Army, Army Targeting 2023)
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DIVISION FIRES: *The* Alignment *of* EAB Cannon Battalions *under* DIVARTY

By CPT Benjamin Harrell

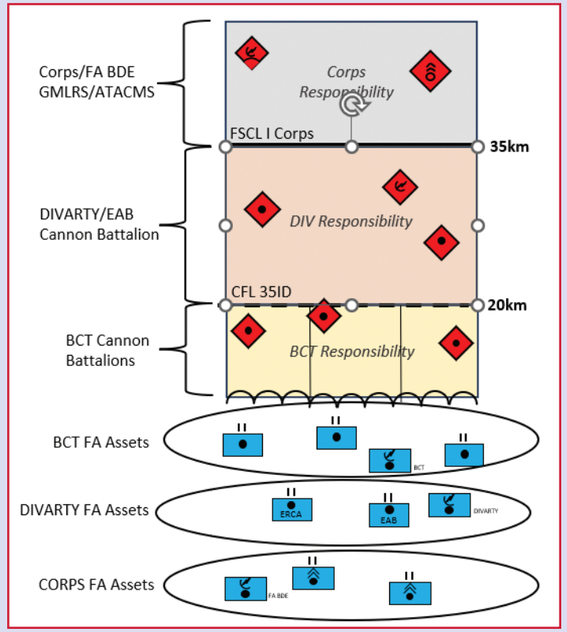
Currently, over a dozen echelon above brigade (EAB) cannon battalions exist in the Army National Guard (ARNG), commonly assigned under Field Artillery Brigades (FAB) and Maneuver Enhancement Brigades (MEB). They are a unique artillery formation that exists in both towed and self-propelled 155mm configurations with a significantly lighter footprint than its brigade combat team (BCT) sibling. These battalions are also a projected benefactor of the Army's pursuit of a longer-range howitzer with the self-propelled enhanced artillery requirement (SPEAR) with 2nd Battalion, 222nd Field Artillery Regiment, Utah ARNG and 2nd Battalion, 142nd Field Artillery Regiment, Arkansas ARNG already identified as the first two recipients1. They are designed to be allocated to a FAB or division artillery (DIVARTY) due to their lack of organic radar and observer assets.

Due to this limitation, they typically are not deployed independently but have been used to fill out and augment other Field Artillery battalions ahead of deployments. Within the FAB, these battalions are fielded alongside Multiple Launch Rocket System (MLRS) and High Mobility Artillery Rocket System (HIMARS) battalions, which achieve more than double the range of their cannon counterparts. Typically, the EAB cannon battalions take a back seat to rockets in training scenarios because they do not meet the needs of the FAB and, in turn, the corps in large-scale ground combat. Historically, the Army has neglected and mismanaged these battalions by placing them in formations that either have no use for them or cannot effectively employ them.

By task organizing these formations under the DIVARTY, they can be employed in the deep area, which is doctrinally meant to be beyond the BCT's boundaries, as well as be used to reinforce the BCT in the division decisive operation or be a dedicated counterfire shooter for the DIVARTY target processing section (TPS). This relationship better matches their range and configuration, given that they would likely be allocated to the division from corps in a GS role regardless. The key benefit in doing so is giving the DIVARTY commander greater flexibility with a fourth, dedicated firing battalion that can meet the basic needs of the DIVARTY, especially when no HIMARS/MLRS assets are allocated from the corps to the division.

SUPPORT TO DIVARTY FUNCTIONS

The first function of the DIVARTY outlined in Army Techniques Publication (ATP) 3-09.90 is the delivery of fires. By adding an additional battalion of cannons under direct control of the DIVARTY, the division tube strength is increased from 54 to 72 and enables the DIVARTY to deliver fires into the deep area without further encumbering the three downtrace battalions already committed to supporting each BCT. These three additional firing batteries can be allocated in several combinations



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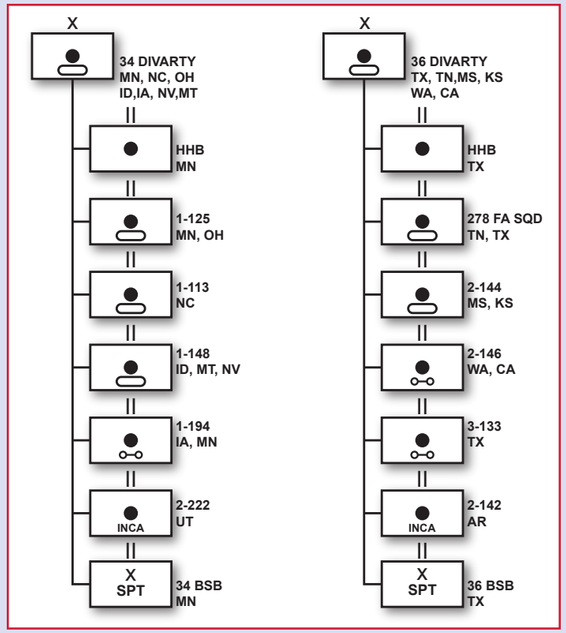

Projected structures for the 34th DIVARTY (Penetration) and 36th DIVARTY (Heavy)

to support the division's tasks, including weighting the division main effort through reinforcing a BCT cannon battalion, suppressing enemy air defenses (SEAD) in support of the division's air assets and allocation of a battery to the DIVARTY counterfire cell.

Having an additional battery allocated in a reinforcing relationship creates greater freedom of maneuver for a BCT commander, particularly in high-risk tasks such as a wet gap crossing or a breach. The DIVARTY can re-allocate firing units from other battalions to support such an operation; however, it is at the detriment of those BCTs and their shaping operations. Instead, having the fourth (and potentially fifth as required) reinforcing battery in position and firing in support of the BCT enables more rapid displacement of the organic battalion to cross the objective and get set for follow on operations without disrupting fire support for the maneuver elements.

Through coordination with the division joint air-ground integration center (JAGIC), the EAB cannon battalion enables SEAD to be conducted with much closer control and responsive fires, shaping the deep area without impacting the resources of the BCT commander in the close area. Maintaining this tighter segregation on zones of responsibilities allows the BCT cannons to be controlled at the lowest level possible and enables the DIVARTY to support a division SEAD while reducing the unneeded impact on the subordinate units.

Counterfire can be expedited greatly by allocating a battery to the DIVARTY counterfire cell, particularly if the responsibility for reactive counterfire is left solely to the DIVARTY TPS, which is empowered to send targets directly to the platoons while the battalion maintains control of their positioning, ammunition and movement. Allocating those firing units precision and rocket-assisted munitions further enables rapid and responsive counterfire into the deep area. Setting aside firing units for rapid execution of counterfire allows the DIVARTY to shape future operations by attiring enemy indirect fire systems in the deep area.

In the proposed Multi-Domain Operations (MDO) Ready Division structure, the penetration and heavy division templates already have EAB cannon battalions aligned under the DIVARTY, in addition to each of the battalions allocated to the subordinate BCTs. This could easily be expanded to the light and joint forcible entry templates using 155mm towed battalions given the number of under-utilized battalions found in the National Guard.

LIMITATIONS

In its current configuration, the EAB cannon battalion has several shortcomings that hinder its role in the deep fight, whether under a DIVARTY or FAB. The most glaring of these is the limited range fan. It stands to reason that an EAB battalion with identical range to its BCT counterparts will not be effective in engagements in the deep area. In the short term, this creates a heavy dependence on rocket-assisted projectiles, while in the long term, fielding SPEAR, or other extended range systems such as BAE's M109-52 SPH resolves this shortfall. Similarly, in M777A2 equipped battalions, a long-term solution will need to be met as the Army continues to explore wheeled options for the light and Stryker formations.

Currently, the EAB formation only exists in the Army National Guard and, as a result, is not

In virtually all cases, HIMARS/MLRS exceedingly outperform the capabilities of cannons and is the preferable option for the deep fight.

available on the same training cycle as the Regular Army (RA) DIVARTYs. This means that in the short term, the live and collective training opportunities for an RA-to-ARNG pairing would be limited to the annual training period of the EAB battalion. Though, combat training center (CTC) rotations and larger exercises can be coordinated with enough deliberate planning and coordination. A similar issue can arise for ARNG-to-ARNG pairings if they are not in the same state but again can be remedied with deliberate planning and coordination at the state level.

Further, simply aligning an additional battalion under the DIVARTY will not always be sufficient to meet the division's needs. The need to mass more fires will still necessitate the DIVARTY adding missions to the BCT battalions' queues. The addition of the fourth battalion should be seen as an enabler and an additional resource rather than a solution.

In virtually all cases, HIMARS/MLRS exceedingly outperform the capabilities of cannons and is the preferable option for the deep fight. However, there is no guarantee that the division will be assigned rocket artillery from corps. As a result, having the EAB cannon battalion serves as a default to meet the requirements without HIMARS/MLRS and allows for better prioritization of those rocket assets when they are made available to the division.

Finally, deliberate coordination and allocation of ammunition is critical to supporting the EAB battalion without taking away from the requirements of the existing battalions. Careful considerations of the missions of each BCT, as well as the DIVARTY, will dictate to whom special munitions are allocated while range fans should dictate the concentration of rocket-assisted and guided munitions between the battalions.

CONCLUSION

Aligning EAB cannon battalions under DIVARTYs represents a move to better equip the division for MDO while making the best use of existing force structure. By integrating these formations directly into DIVARTY, their operational capabilities are maximized while streamlining command and control and reducing strain on the existing firing units within the division. This realignment addresses longstanding challenges in properly utilizing EAB cannon battalions. Historically, they have been underutilized or misallocated within existing force structures, limiting their impact. Placing these artillery assets under DIVARTY command ensures that they are aligned in a manner that fully leverages their capabilities as the DIVARTYs continue to come online.

The key advantage of this realignment is the increased flexibility it offers DIVARTY commanders. With these cannon battalions under their direct control, commanders can deploy them to support various divisional tasks from weighting the division's decisive operation to providing dedicated counterfire capability. Moreover, aligning EAB cannon battalions under DIVARTY has broader implications for the division's readiness for Large-Scale Combat Operations. As emerging cannon technologies are adopted and fielded, the utility of the EAB cannon battalion will only grow and further allow the division to create overmatch in the deep area.

CPT Benjamin Harrell serves concurrently at the KSARNG G3 as a CUOPS Officer and at the 130th FAB as the Brigade Fire Control Officer. He previously served as the AGR Training Officer and AS3 of the 1-161st Field Artillery. He has also served as a Platoon Leader and FDO in a Paladin Battery, as well as a Brigade S1 OIC. Prior to commissioning, he served as a Fire Direction Section Chief in the 2-130th Field Artillery (HIMARS), including a deployment to Syria in support of Operation Inherent Resolve in 2017-18.

The Future of Strategic Fires Target Acquisition

By MAJ Joseph A. Schmid

Portions of this article are taken from the author's Master of Military Art and Science thesis titled "The Eye of Providence: Disruptive Technology, Deep Convolutional Neural Networks, and the Future of Strategic Fires Target Acquisition." This thesis has been edited for the purpose of publication in the *Field Artillery Professional Bulletin.*

"Ducunt volentem fata, nolentem trahunt."
Fate leads the willing and drags the unwilling.
—Seneca

"Drive Change ... Forge Victory."
—LTG Milford H. Beagle, 2024

Introduction

Recent advances in the fields of artificial intelligence (AI), computer vision and convolutional neural networks have begun impacting the wider world in highly visible ways. For example, knowledge generation applications such as Perplexity AI, Bing Copilot and Phind facilitate accurate text and image response to a wide variety of user prompts. In this way, by leveraging a form of inductive reasoning, nascent AI chatbots interact with specific user prompts and formulate tailored responses. It would seem as if these applications were on the verge of sensemaking or at least something remarkably close to it.

Contemporary writers have observed this phenomenon and applied it to future AI applications within the military domain. For example, Warrant Officer 1 (WO1) Clifford A. Baxt illustrates how AI can optimize the sensor-to-shooter chain.[1] Similarly, Norine MacDonald and George Howell discuss how unmanned aerial vehicles of all sizes could use increasingly accurate forms of machine vision for potential target classification.[2] Their ideas provide excellent initial observations into how future AI applications can optimize targeting. However, all three writers stay within the realm of general explanation. In other words, they provide a superficial explanation of how umbrella terms such as AI, machine learning and computer vision may facilitate future targeting.

In part, this article intends to build upon their ideas while providing the specific explanation of how Deep Convolutional Neural Networks (DCNNs) can facilitate automatic target acquisition for the fires warfighting function. Essentially, this article will get into the specifics of how to build AI applications for the purpose of warfighting. Consequently, I argue, mature applications of DCNNs will play an outsized role in future conflict because the side with the highest quality DCNN will be able to more rapidly find, classify and target adversarial combat power formations.

Deep Convolutional Neural Networks

This section portrays a general sense of what DCNNs are, how they are trained, how they operate and how they are currently performing in the contemporary military domain. In this way, the intent is to familiarize the reader with this novel technology. Once a general sense of DCNNs has been achieved, the article will move more fully into the military domain while explaining how DCNNs will contribute to future targeting cycles within the U.S. fires warfighting function.

To start at the beginning, think of DCNNs as a way to reach a desired end; that end is what theorists refer to as artificial general intelligence or AGI. Microsoft researchers Sebastien Bubeck et al. "use AGI to refer to systems that demonstrate broad capabilities of intelligence, including reasoning, planning and the ability to learn from experience, and with these capabilities at or above human level."[3] Therefore, DCNNs are the stacked neural networks that enable a machine to understand, learn and, most importantly, remember things. Memory is what facilitates extended learning. Keeping this in mind, DCNNs are an imperfect plastic representation of the human brain.

Haohan Wang and Bhiksha Raj trace the origin of DCNNs all the way back to 300 BC when Aristotle introduced what contemporary researchers refer to as associationism. Associationism was Aristotle's method for understanding how the human mind learns and remembers. For example, in his book Memory and Reminiscence, Aristotle asserts that the human mind recalls data and experience through four laws: the laws of (1) contiguity, (2) contrast, (3) frequency and (4) similarity.[4] The law of contiguity refers to recalling memories that may be "spatially joined but essentially different."[5] Therefore, these are memories of different things that occurred in the same time period. The law of contrast refers to the opposite of similarity or recollections that are defined in opposition to other memories.[6] The law of frequency encapsulates memories which an individual finds him or herself continuously pondering.[7] And lastly, the law of similarity refers to memories that share common characteristics.[8] According to Aristotle, these are the four methods a human brain leverages to learn to recall memory.

Keeping this information in mind, DCNNs use the latter three laws (contrast, frequency and similarity) during supervised, unsupervised and semi-supervised training for the purpose of correctly classifying an object within a bounded box in the real-world. This ability to classify objects in the real world is referred to as computer vision as well as object detection. Computer vision and object detection is what allows a myriad of machines, such as unmanned aerial systems, to participate in automatic target acquisition. However, to reach a relative level of competence, a machine must first be trained.

DCNNs are trained in one of three ways: supervised, unsupervised and semi-supervised. Supervised training refers to DCNNs being fed labeled data by a human supervisor so the DCNN algorithm can then build a "predictive model" which it can then recall memory for the purpose of classifying objects in the real world.[9] For example, a DCNN that has been constructed to recognize Russian-built S-300 air defense platforms will be fed thousands, millions or perhaps even billions of different S-300 images. The similarity and frequency of the S-300 pictures construct what the DCNN will recognize as an S-300. Furthermore, as the DCNN is fed different labeled images of other types of Air Defense Artillery (ADA) systems, it will learn to differentiate or contrast between the different types of systems. In this way, supervised training constructs a DCNN algorithm which has been specifically designed to classify an image after receiving some sort of input data, usually in the form of still picture or video.

Conversely, unsupervised training refers to DCNNs being initially fed non-labeled data. Unsupervised training still facilitates object detection, only in a different manner. For example, unsupervised training researchers state:

> *"The DCNN architecture is designed such that the network learns automatically the 'important' underlying pattern of the data. Therefore, [researchers] can train DCNNs to learn the features using unlabeled data. This is called feature learning. Then, after training the DCNN models in [an] unsupervised way, they are used to extract features from a small amount of labeled data which are used to train classifiers in a supervised way."*[10]

Therefore, an unsupervised training method enables the machine to learn on its own while self-correcting during the latter stages of training with a small amount of labeled data.

Sticking with the S-300 example, a DCNN would be specifically constructed for S-300 object identification. Then, while training in an unsupervised manner, the DCNN would engage with unlabeled data for the purpose of differentiating between S-300 images and non-S-300 images. After its training session is complete, referred to as an epoch, the DCNN compares its identifications with a small set of labeled S-300 images. Utilizing the Aristotelian law of similarity, unsupervised training still produces the machine's ability to detect and classify images.

Lastly, semi-supervised training refers to DCNNs which undergo training epochs that use both labeled and unlabeled data simultaneously. This training method treats unlabeled data as variables that the machine must "iterate" to accurately categorize along with the labeled data.[11] Referring back to our S-300 example, a semi-supervised training epoch would feed the DCNN labeled S-300 images alongside unlabeled S-300 images and other random images. The DCNN will then learn from the labeled images and attempt to intuit which unlabeled images are also S-300 platforms. In this way, DCNN algorithms build robust architecture during multiple iterations of epoch training for the purpose of facilitating object detection in the real world. Now that this research paper has summarized the three methods of training DCNNs, it will transition to describing DCNN architecture.

Deep Convolutional Neural Network Architecture

DCNN architecture consists of two components (feature learning and classification) which support four distinct layers (convolution, activation, pooling and fully connected) that enable the algorithm's ability to detect objects. Refer to Figure 1 "DCNN Architecture" for a graphical depiction of DCNN architecture. We will move left to right beginning at the input image:

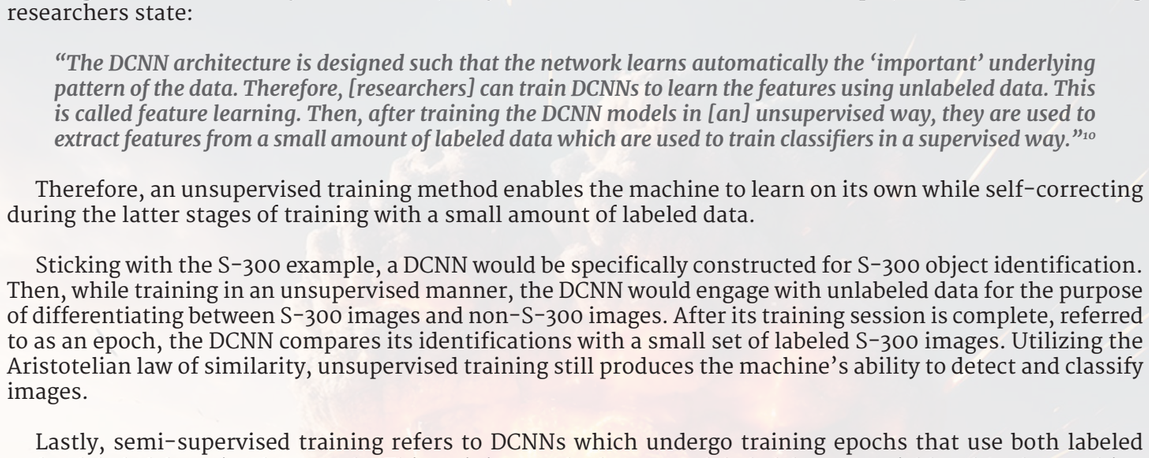

Figure 1. DCNN Architecture. Source: Created by Author

First, a DCNN will encounter an input image via still picture, video, electronic signature or some other measurable phenomena present in the real world. The first DCNN layer that will interact with the input image is the convolutional + rectified linear unit, or (ReLU) layer. This layer interacts with the input image by running a frame, sometimes referred to as a sliding window, over the input image in order to initially extract features from the input image.[12] From this extraction, the DCNN begins building a quantitative feature map of the image that the ReLU layer can then exploit.

The ReLU layer acts as an activation function that assists the DCNN in sorting through the feature map.[13] Figure 2 portrays how the ReLU layer numerically filters through input image features that it deems important or not important for object detection. This importance is defined by the prior epoch training that the DCNN has undergone. Positive values remain the same while negative values are automatically assigned a zero value. In this way, ReLU activation functions conserve computational power while simultaneously setting the conditions for the subsequent pooling layer.

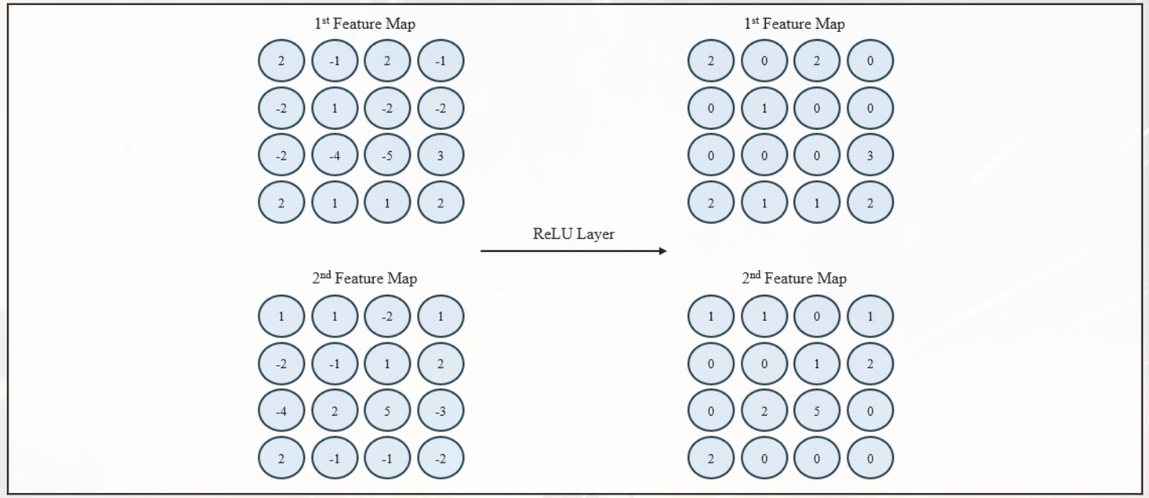

Figure 2. ReLU Layer. Source: Created by Author

The pooling layer interacts with the values assigned by ReLU in order to isolate important features identified by numerical value as well as systematically minimizing the "spatial size" of the original feature map.[14] In this way, pooling layers capitalize on the ReLU values in order to "reduce computational complexity" and begin extracting the primary features that constitute a known object. The result is a bounded box, as represented by Figure 3, that isolates an object from the background features of an input image. This bounded box represents the transition from the feature learning component to the classification component within DCNN architecture.

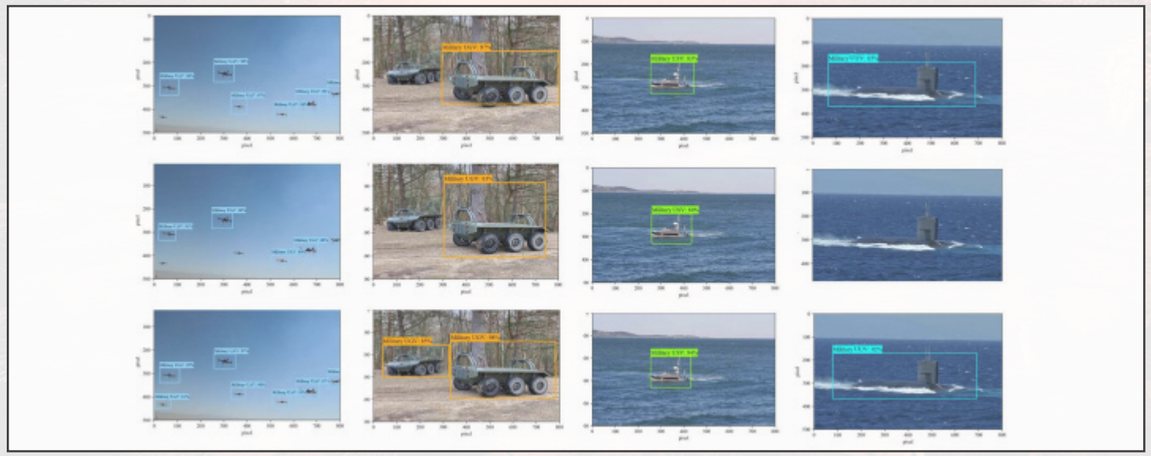

Figure 3. Bounded Box. Source: Liming Gao, Chao Li, Zhuo Wei, Xiangdong Han, Feng Dang and Xuemei Wei, "Military Unmanned Equipment Image Target Recognition Method based on Improved Deep Learning," Paper presented at the 2nd International Conference on Algorithms, Network, and Computer Technology, Wuhan, China, August 12-October 12, 2023, 5, DOI 10.1088/1742-6596/2732/1/012004.

Now that the DCNN has successfully isolated an object within its feature map, it can begin classifying the object within the bounded box. Classification is conducted in three steps: (1) flatten, (2) fully connected and (3) softmax. When a DCNN conducts flattening, it is essentially combining all the data points from the previous pooling layers which can amount to hundreds, thousands, hundreds of thousands or even millions of individual pooled feature maps. Consequently, the flattening phase of classification combines all the individual pooled feature maps into one long string of data which the neural network can begin processing. For example, Avijeet Biswal states that "flattening is used to convert all the resultant 2-Dimensional arrays from pooled feature maps into a single long continuous linear vector."[15] Consequently, this linear vector contains the numerical code that the machine will use to ultimately classify an image in the subsequent fully connected layer.

The linear vector of data is now prepared to move through the fully connected layer. The fully connected layer receives the linear vector of data and processes it through interconnected neurons which remain linked to every previous and subsequent DCNN layer.[16] In other words, think of the fully connected layer as the layer which is doing the majority of the sensemaking because the fully connected layer is applying the linear vector of data to the recollection knowledge it has attained through previous epoch training. In this way, the linkage between the flatten and the fully connected stages produces a "class score" for the object within a bounded box, which represents the likelihood that an isolated image matches with a previously trained object.[17]

From the class score, the final softmax application derives a probability statistic for each class in which the DCNN has been trained. If the probability statistic associated with any classification rating reaches the minimum threshold for positive identification, then the machine will assume that the bounded object it is looking at is that type of classification. Let's turn now to the current state of target acquisition DCNNs in order to determine their current state of readiness in the contemporary military domain.

Previously Constructed Target Acquisition DCNNs

Perhaps the most obvious use of DCNN disruptive technology for the military sphere is its ability to rapidly acquire and classify potential targets from video input. For example, B. Janakiramaiah et al. recently conducted a study that illustrates the efficacy of DCNNs for military target acquisition.[18] Their multi-level CapsNet DCNN trained on 600 images of armored cars, multi-barrel rocket systems, tanks, fighter planes and helicopter gunships as well as 500 images of non-military general objects for a grand total of 3,500 input images. Following epoch training, their DCNN achieved a 96.54% accurate target identification rate. Consequently, these researchers argue that their DCNNs provide a viable option for automatic target identification in contemporary armed conflict.

Similarly, building upon the previous ideas offered by Janakiramaiah et al., Guozhao Zeng et al., operating out of the Chinese National University of Defense Technology, successfully realized a portable DCNN for target acquisition.[19] Their 15-layered-DCNN trained on six military objects and achieved an average 75% accurate target identification rate. The researchers conclude that their DCNN offers the Chinese military a viable option for military object detection.

And lastly, Anishi and Uma Gupta built a DCNN that is capable of differentiating between tanks, rifles, people, cars and trucks using images derived from regular daylight hours as well as images captured with night vision.[20] Their model consisted of 58 convolutional layers with five pool layers and demonstrated the need for high computing power to manage increasingly larger datasets. Therefore, this study, as well as the two previously mentioned studies, illustrates how DCNNs may contribute to the future of military target acquisition.

Bringing It All Together

Now that this article has offered a general sense of what DCNNs are, how they are trained, how they operate and how they are currently performing in the contemporary military domain, it will transition to describe why it matters for the fires warfighting function. Take, for example, John Boy's OODA loop (observe. orient, decide, act) concept and apply it to how human staffs at the division, corps or Army level move through the targeting process.

In his book A Discourse on Winning and Losing, Boyd describes how the OODA loop, colloquially known as "The Big Squeeze," facilitates a competitive thinking process capable of adapting to "an unfolding, evolving reality that is uncertain, ever changing and unpredictable."[21] Figure 4 illustrates how one moves through the observation, orientation, decision and action stages of Boyd's concept. For years, human agents in all occupations have relied on this simple yet effective framework to update actions based on what is being observed in a chaotic environment.

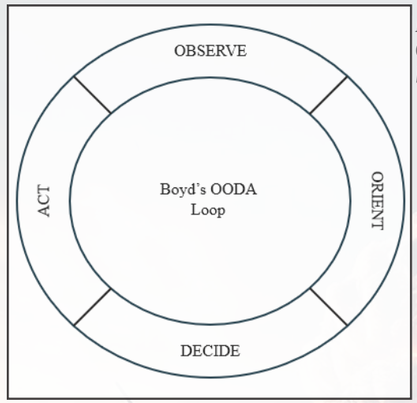

Figure 4. Standard Boyd OODA. Source: Created by Author

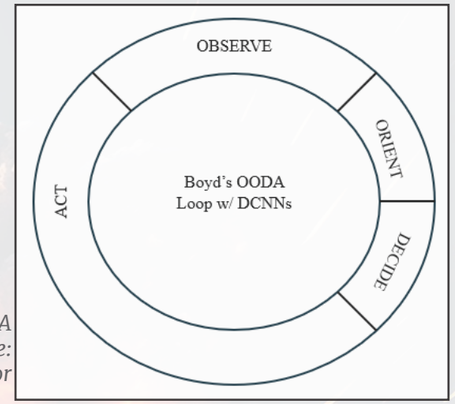

Figure 5. Boyd's OODA w/ DCNNs. Source: Created by Author

Consider how an Army staff facilitates the targeting process. Intelligence sections sift through massive amounts of observed data in the form of reports. Gun, rocket, rotary and fixed wing combat power is oriented based on placement of the coordinated fire line (CFL) and fire support coordination line (FSCL). The staff then works in conjunction with the commander to decide what/where/when targets must be destroyed. Finally, action occurs. This is a continuous process reliant on copious amounts of human effort over a repetitive daily cycle. Certainly, this process has worked in the informatized age, absent of emerging artificial intelligence concepts. However, in the age of "intelligentized () warfare," as conceptualized by the Peoples Liberation Army, will our old mode of Army targeting be enough?[22]

I would suggest the Fires community consider how targeting DCNNs can dramatically intensify the speed and responsiveness at which the deep fight is prosecuted. With the inclusion of future target acquisition DCNNs, Boyd's loop begins to look more similar to how it's depicted in Figure 5. The orientation and decision steps become much tighter leaving more room for spontaneous action at lower levels of command.

Target acquisition DCNNs can be constructed for intelligence, surveillance and reconnaissance (ISR) platforms which would then flood the area of operations with machines that can identify size, type and activity of enemy combat power. This data could then be fed into an umbrella command and control DCNN whose softmax layer is cognizant of friendly firing unit locations/readiness levels and is therefore positioned to intuit which firing unit is best suited to engage the targets fed to it by the subordinate target acquisition DCNNs.

Think of this umbrella DCNN as the AI sensor-to-shooter tool called for by The U.S. Army in Multi-Domain Operations 2028 document. It asserts "the key to converging capabilities across all domains, the EMS [electromagnetic spectrum], and the information environment is high-volume analytical capability and sensor-to-shooter links enabled by artificial intelligence, which complicates enemy deception and obscuration through automatic cross-cueing and target recognition."[23] In this way, target acquisition and decision support DCNNs offer a viable option for achieving intelligentized warfare. Now, for the sake of visualization, consider the below theoretical scenario portraying how DCNNs may assist a future joint task force (JTF) while operating in the South China Sea (SCS).

In the near future, the Joint All Domain Command and Control (JADC2) architecture will be empowered by DCNNs which are capable of fusing massive amounts of ISR data with available Army, Navy, Airforce, Cyber and Space fire support systems. Each component command of a JTF maintains and employs its own proprietary DCNN which has been trained to recognize and prioritize adversarial weapon systems operating in a bounded geographic area. These individual component DCNNs are actually portions of an umbrella DCNN which the JTF commander and his staff exploit during the joint targeting cycle to facilitate rapid target acquisition and prosecution.

The umbrella DCNN is instantly cognizant of both the potential targets which are being fed to it by the subordinate component DCNNs as well as the positions, ammunition allocations and readiness of all the JTF commander's fire support systems within the assigned combatant command. Consequently, the DCNN is able to rapidly suggest which targets should be actioned by which friendly fire support system—regardless of component—in order to achieve the most desired effect.

The task that the JTF currently finds itself in is perhaps best described by General Charles Flynn and Lieutenant Colonel Tim Devine in which new Army long range precision missiles such as the Precision Strike, Strategic Mid-Range and Long-Range Hypersonic missile augment the Navy and Airforce's ability to penetrate and dis-integrate adversarial A2/AD bubbles within the SCS.[24] Flynn and Devine portray further how Army fires assets can be positioned "on key terrain inside the first island chain [in order to hold] the adversary's critical capabilities at risk via cross-domain strike."[25] Therefore, the JTF commander may position fire support assets within the Philippines, Borneo, Taiwan or the Ryukyu islands.

Keeping this scenario in mind, the JTF Multi-Domain Task Force would be receiving its targeting data from the DCNNs of other air, maritime, cyber or space components which are being filtered through the umbrella DCNN maintained at the JTF commander level. Consequently, the joint targeting cycle would be rapidly enhanced by orders of magnitude because it is no longer tied to the 96-hour cycle which requires numerous layers of human interaction between multiple services who, at times, find themselves at odds with each other. Instead, the umbrella DCNN, which is cognizant of all known potential targets as well as the location, munition allocation and status of all friendly fire support assets, would simply select the best positioned asset to achieve the desired effect.

In this way, with the assistance of robust and tempered DCNNs, JADC2 could actually become a reality. Interservice rivalries, turf wars and personal grievances would fade into the background while performance optimization and speed of joint targeting would become preeminent. Of course, this is merely a theoretical conceptualization. However, it does illustrate how DCNNs can greatly increase the effectiveness of target acquisition within armed conflict.

Conclusion

Of course, this is only a theoretical scenario. However, it does illustrate how future conflict could become incredibly reliant on neural networks which can outperform staff processes rooted solely in stand-alone human cognition. This article strove to bring the idea of DCNNs that much closer to the U.S. Army Fires community. The use of DCNNs for targeting may be uncomfortable for some decision makers because DCNNs represent a disruptive technology which upends established modes of warfighting. However, although the nature of war never changes, its character surely does. DCNNs, automatic target acquisition, computer vision and the myriad other applications for military-centric AI will assuredly change the character of future warfare. I agree with Seneca's quote at the head of this article. We must embrace target acquisition DCNNs or suffer being dragged through inevitable defeat because of our unwillingness.

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138th Field Artillery Brigade Incorporates Artificial Intelligence

By CW4 Joseph P. Lyddane,
138th Field Artillery Brigade
Targeting Officer

DOHA, Qatar - In the current landscape, the term artificial intelligence (AI) pervades virtually every facet of our daily lives. It is being used in autonomous driving vehicles, enhanced facial recognition software and optimizing marketing and social media campaigns. The military is starting to see the advantages of machine learning on land, sea, air, space and cyber domains.

The evolution of technology and the incorporation of non-conventional tactics on the battlefield require similar innovation and creativity.

The 138th Field Artillery Brigade (FAB), supporting Operation Spartan Shield and Operation Inherent Resolve during FY23-24, was leveraging AI in their daily battle rhythm under the directive of the United States Central Command (CENTCOM). The Maven Smart System (MSS) by Palantir along with National Geospatial Agency (NGA) Broad Area Search - Targeting (BAS-T) uses AI generated algorithms and memory learning capabilities to scan and identify enemy systems in the area of responsibility (AOR). Data is extrapolated from various intelligence surveillance and reconnaissance systems to provide the analyst with Named Areas of Interest (NAI). MAVEN's BAS-T capability allows the analyst to narrow their search sector by concentrating on specific locations and ruling out others, necessities when time is of the essence.

MAJ Tyler Brown, CW4 Jody Lyddane, SSG Matthew Beverly, SSG Earnest Cansler III and SSG Zane Caudill pose for a team photo at the Combined Air & Space Operations Center, Al Udeid Air Base, Qatar. *(Photo By LTC Carla Raisler, Kentucky National Guard Public Affairs Office.)*

The 138th FAB was embedded at the Combined Air & Space Operations Center (CAOC) Al Udeid Air Force Base, Qatar as a Lethal Fires Element (LFE) consisting of five individuals who were collocated with the Maven Field Service Representative (FSR). This allowed them to maximize the functionality of the program and recommend changes to current software to tailor it to Field Artillery operations.

Positive target identification (PID) is at the forefront of the targeting process. The speed at which a hostile target can be detected is crucial to the remaining steps of the targeting cycle (Decide, Detect, Deliver, Assess). AI is able to assist by filtering specific user defined parameters, sifting through large amounts of data, extracting what is relevant and providing analysts like Staff Sergeant Zane Caudill, an intelligence analyst for the 138th FAB, with near-real time data that is used by the operations community for validation against the commander's objective. Once confirmed, the information can be interfaced with existing Army Mission Command Systems like the Advanced Field Artillery Tactical Data System (AFATDS) to generate fire missions.

The speed at which a hostile target can be detected is crucial to the remaining steps of the targeting cycle (Decide, Detect, Deliver, Assess).

Maven is a joint tool which allowed the 138th FAB LFE to pass digital information from AFCENT to the FAB fire control element located at the Joint Training Center in Jordan. Additionally, Maven provided the commander, Colonel Steve Mattingly, with a common operating picture (COP) used for situational awareness to assist him in making informed decisions.

AI will continue to impact the battle space, whether through autonomous weapon systems, cyber security protocols or unmanned aerial vehicles (UAV). It is transforming the way we operate, the way we respond and impacting mission planning and resource allocation. The use of AI will continue to expand possibilities for the Armed Forces and is potentially the key technology to ensure the U.S. Military remains strategically, operationally and tactically prepared.

CW4 Joseph P. Lyddane serves as the Command Integrator (AGR) for the 138th Field Artillery Brigade of the Kentucky Army National Guard, with 24 years of dedicated service. A 131A Field Artillery Targeting Technician, he holds a Master's Degree in Operational Leadership.

Commissioned in 2010 after completing the Warrant Officer Candidate School at Fort Rucker, CW4 Lyddane completed the Field Artillery Warrant Officer Basic Course and Warrant Officer Intermediate Level Education. His operational experience includes deployments in support of Operation Enduring Freedom and Operation Spartan Shield/ Operation Inherent Resolve, where he served as the Lethal Fires Element Senior Targeting Officer.

Reflections of a Battery Operations Officer: NTC Rotation 24-03

By 1LT Michael Potts

On January 3rd, 2024, 2nd Battalion, 18th Field Artillery Regiment (2-18 FAR) conducted a no notice Emergency Deployment Readiness Exercise (EDRE) to the National Training Center (NTC) at Fort Irwin, California. The EDRE saw over 100 pieces of equipment and over 200 officers, non-commissioned officers (NCOs) and enlisted service members mobilize several hundred miles to test the worldwide expeditionary capabilities of a Multiple Launch Rocket System (MLRS) battalion. These are the lessons learned of a battery level fire direction officer (FDO)and his team.

JBC-P

The operation started with an advanced echelon (ADVON) element from each battery conducting a reconnaissance, selection and occupation of position (RSOP) of their respective position areas for artillery (PAA). This included a 20-kilometer movement out of the Rotational Unit Bivouac Area to a release point and a further movement from there. Alpha battery's movement from the release point was approximately an additional ten kilometers.

A communications check was conducted prior to movement with the primary communication platforms, Joint Battle Command – Platform (JBC-P) and alternate, frequency modulation (FM). Both communication platforms were fully operational prior to movement.

Once at the release point, the alpha battery element conducted a communications check with the lead battalion element prior to pushing out to their PAA. It was at this point when the alpha battery element realized that their JBC-P transceiver lost connection to the network and was operating in a degraded "terrestrial orphan" status. Alpha battery maintained voice communications with the battalion and pushed on.

Upon arriving at their designated PAA, alpha battery re-established voice communications with the lead battalion element using a VRC-92F and two High Mobility Multipurpose Wheeled Vehicle (HMMWV) whip antennas. Unknown to alpha, the lead battalion element then relocated out of communications range. Alpha battery tried unsuccessfully to re-establish communications with battalion for the remainder of the day until they rejoined the rest of the battery upon their arrival at the PAA.

Proposed Solution

The lack of long-range communications equipment greatly hindered alpha battery's attempts to re-establish voice communications with battalion. Having only four operational JBC-Ps in the battery ruled out bringing a spare JBC-P.

JBC-Ps are an exceptional communications platform when fully mission capable. However, most service members currently do not have the expertise needed to troubleshoot the platforms or conduct field expedient repairs. Signal Support System Specialists (25Us) assigned to the S6 are often too overtasked to be able to assist in troubleshooting of such platforms between running retransmission and troubleshooting upper/lower tactical internet at the main command post.

The Mission Training Center has classes on the operation and use of JBC-P but does not offer classes on the installation or troubleshooting of these systems. Field Service Representatives (FSR) are also overtasked, with the one at Fort Sill pulling double duty as the FSR for both JBC-P and Harris high frequency (HF) systems. Additionally, many Soldiers discount the effectiveness of JBC-P due to the frustration that stems from their knowledge gap that exists in the system.

A potential solution is to have the JBC-P fielding team conduct a course on installation and troubleshooting of these systems. This would create an understanding of JBC-P at every echelon and build confidence in the Soldiers of their issued equipment. This would lead to the ability to conduct repairs in the field while freeing up S6 and the FSRs to manage more pressing concerns.

However, in the interim, a standard operating procedure (SOP) implemented to great effect after the initial movement on day zero was to outfit each ADVON vehicle with an OE-254 omni-directional ground mount antenna which provided a much greater range than the HMMWV whip antennas ADVON was previously outfitted with. Though the OE-254 provided a vast improvement to the HMMWV whip antennas, it was not without its limitations.

Ground Mount Antennas

Fire direction centers (FDCs) within a MLRS battalion are spread across the battlespace. It was not unusual for FDCs to be 15 – 20 kilometers away from each other due to operational requirements imposed by the launchers. This was compounded by the aggressive terrain of NTC with major terrain features such as the Granite Mountains blocking line of sight between FDCs.

Weather effects also played a critical role with communications. Fog, low cloud ceilings and precipitation reduced communications range at times degrading or dropping voice and digital communications altogether. The OE-254 system also started to show its age with systems in alpha battery's inventory initially fielded in 2016. It was not uncommon for crews to switch between components or systems in an attempt to re-establish communications or be forced to relocate altogether due to the limitations of their equipment.

Proposed Solution

The OE-254 takes a two-man crew ten minutes to emplace, can only be connected to one radio and can only operate on very high frequencies (VHF). The total weight of an OE-254 system is over 40 pounds. The batteries' FDC typically had to emplace at least two OE-254s, one for digital communications and one for voice communications to their higher headquarters. Several new ground mount antenna systems, however, promise to deliver better performance such as the RAMI254-EXT LB or System IAM-7M.

The RAMI254-EXT LB is made by the manufacturer of the current OE-254 and is RAMI's solution to a potential replacement for it. From RAMI's website, the RAMI254-EXT LB "…is comprised of fewer piece parts, allowing for quicker assembly and erection, along with being capable of VHF, UHF, and L-Band operation modes." The RAMI254-EXT LB is also capable of connecting to two radios simultaneously,

effectively halving the time required to emplace an FDC. This also reduces precious space required to transport long range communications and frees up space for other mission essential equipment.

The Rolatube IAM-7M is a 15.9-pound system that can be deployed by a two-man crew in under five minutes, is capable of both VHF, ultra-high frequency (UHF), and dual-band frequencies. It also "delivers significant increases in range capability and performance for VOR communications compared to traditional equipment" according to Rolatube's website. The IAM-7M is also compact, measuring 10" x 12.5" x 10 when stowed, again saving precious space during transportation. The IAM-7M, unlike the RAMI254-EXT LB, is only capable of connecting to a single radio. The biggest disadvantage of the IAM-7M is cost. A recent quote provided to alpha battery from Rolatube is $9,000 a system, over 4,000 dollars more than the existing OE-254 system.

Situation Updates

NTC 24-03 was a complex, rapidly evolving scenario where 2-18 FAR provided long range precision fires in support of 1st Armored Division (1AD) and other allied units. As such, enemy and friendly situations changed with notional maneuver-based triggers which drove changes to friendly unit positions, high payoff targets and attack guidance.

The primary plan to disseminate such updates was via free text through JBC-P. However, with the limited number of operational systems dispersed throughout the battlespace, it was difficult to create a shared understanding within the formation of how the operation was progressing.

This led to confusion about which phase of the operation the battery was in or what targets to prioritize based on the high payoff target list. Updates were only passed down when the battery commander or operations officer was able to travel the 15 kilometers to the main command post to receive an update in person from the intelligence section.

Proposed Solution

It is imperative that all units are synchronized in their efforts throughout all phases of the operation. As such, a daily situation update should be passed via voice or Advanced Field Artillery Tactical Data System (AFATDS) free text at a minimum. This allows battery commanders and operations officers to focus and prioritize their efforts in line with the appropriate phase of the operations order.

FSCMs

During NTC 24-03, the battalion operated in a direct support role to 1AD and their associated DIVARTY. As such, FDCs were required to keep updated digital and analog trackers of the current division operational picture. This included several hundred square miles of battlespace with over 500 fire support coordination measures (FSCMs). These FSCMs were transmitted via AFATDS from battalion FDC to battery FDC, and from battery FDC to platoon FDCs, a process which took several hours to complete. Once the FDC received their FSCMs, they were required to update their analog trackers, a process which took several more hours to complete. In total, it would take approximately 12 hours to complete a FSCM scrub from when battalion would initially send down new FSCMs to when the platoons would complete their analog products.

These FSCM scrubs would happen daily each time requiring FDOs to reverify the FSCMs drawn on their analog trackers and draw any new ones sent down. The process was not only time intensive and labor intensive, but it also severely restricted the FDO's ability to declare a mission safe.

Proposed Solution

In a MLRS battery operations center (BOC), a safety data calculator is connected to the AFATDS via LAN to import all required data to produce a "Safety-T." This is an accepted process in the MLRS community and carries little to no risk of data loss between computers.

The proposed solution is to connect the AFATDS to a printer via LAN loaded with acetate to print off clear overlays for FSCMs. Optimally, all three FDCs within a firing battery would be issued a printer. This not only leads to redundancy in the event a printer is non-mission capable, but it would also eliminate the need for a runner to carry overlays to each FDC, which at times are tens of kilometers apart.

If it is not possible for each FDC to have its own printer, BOCs at a minimum should have a printer. BOCs would then be able to make copies of overlays to have a runner deliver to their subordinate platoon FDCs.

If neither option is possible, the battalion FDC would be able to make copies of overlays to deliver to each battery and platoon FDC. This would require the battalion FDC to create six copies of overlays in addition to any copies they would like to keep in their FDC. Battalion would then have to send a runner to the BOCs, or vice versa, and the BOCs would distribute the overlays from there. This last option has no built-in redundancies and would be the most time-consuming of the three options. It would also take resources away from BOCs that could otherwise be tactically fixed in operations.

Though the practice of manually drawing overlays in degraded operations is not to be undermined, being able to expediently print overlays of FSCMs would vastly reduce in position ready to fire times for a firing battery. It would enable firing batteries to quickly overlay much larger sections of the battlespace, ensure that batteries could provide timely and accurate fires on demand, ensure a second independent check would be available at every FDC and be more accurate than what a field expedient hand drawn overly could provide.

Closing Comments

NTC 24-03 was a challenging and rewarding experience which tested how a MLRS battalion would perform during worldwide expeditionary operations. Though overwhelmingly successful, alpha battery and 2-18 FAR learned valuable lessons that will shape their SOPs and the way they train moving forward.

JBC-P is a valuable tool to coordinate over long distances throughout the battlespace. More training is needed to use these systems to their full potential.

Long-range communications are a necessity with the distances MLRS FDCs are expected to operate at. Ground mount antenna systems make a valuable redundancy in the event JBC-Ps are rendered in-operable. However, more modern technology and systems would make formations more lethal and allow Soldiers to focus on fire direction instead of repeatedly relocating for better reception or constantly troubleshooting communications.

Situation updates are required to synchronize efforts in time and space. Leaders at all echelons must be kept apprised of updates to better support the maneuver commander. FDOs must be kept updated on the location of friendly and enemy locations to be able to violently execute the high payoff target list.

FSCMs are an integral part of the Field Artillery. FDOs must be able to quickly and accurately declare a mission safe to provide fires in support of the maneuver commander. Though the importance of being able to hand draw FSCMs should not be understated, Field Artillery units should leverage available technology to expedite their emplacement times.

1LT Potts served as the Operations Officer for Able Battery, 2nd Battalion, 18th Field Artillery Regiment during NTC Rotation 24-03. His previous duty assignments include Support Platoon Leader (Camp Casey, South Korea) and Fires Platoon Leader (Fort Sill, Oklahoma).

The New Digital Kill Chain

Understanding ITN Capabilities and Benefits to the FA Enterprise

By MAJ Matthew Huff and CPT Christopher Drew

Introduction

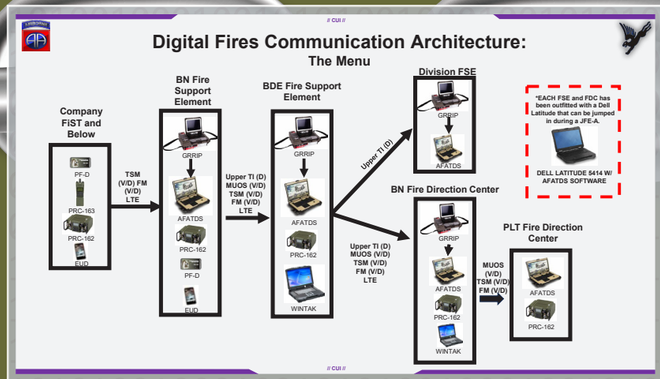
On a cold February night in the desert, a few fire supporters conducted a final last check on their radios before crossing over the berm. The year was 1991 and only one battalion out of the hundreds of thousands of Soldiers and Marines assembled for Operation Desert Storm had been issued new radios for the occasion.[1] Single Channel Ground and Airborne Radio System (SINCGARS), designed to synchronize and integrate communications across the spectrum during the height of AirLand Battle, has left an incredible impression on the Army through over 30 years of conflict. The two main benefits of SINCGARS were its impressive encryption capabilities and the fact it supported up to 16 kilobytes of data traffic—unprecedented for the time.[2] This new capability, along with hundreds of others fielded during the 1980s and 1990s, was a significant factor in the rapid defeat of the Iraqi Army. While shooting and communicating will remain a central pillar in war for the foreseeable future, this dynamic has changed drastically in recent years. In an era of increasing digital competition, the requirements for encryption have increased exponentially alongside the amount of data sent between a growing number of command nodes. With that in mind, the beloved RT-1523 (ASIP) series of radios and entire communication ground communications architecture of relying on SINCGARS is being transformed.[3] To win the next war, the entire Field Artillery Enterprise must once again check our radios and master the system of the future: the Integrated Tactical Network (ITN).

Capabilities and Equipment

Managed by the Program Executive Office for Command, Control and Communications-Tactical (PEO C3T), ITN is defined as "a simplified, independent, mobile network solution that is available down to the small-unit dismounted leader to facilitate mission command, situational awareness and air-to-ground integration."[4] Two key aspects differentiate ITN for brigade and below digital communications from its SINCGARS-based predecessor. First, software-defined tactical radios with dual-channel capabilities enable leaders to use multiple waveforms simultaneously with continually upgraded encryption. Second, using commercial off-the-shelf (COTS) waveforms and components enable Soldiers to conduct both Line of Sight (LOS) and Beyond Line of Sight (BLOS) fire missions in multiple unique ways. Instead of issuing a one-size-fits-all communications package, ITN gives commanders a variety of options to access lower and upper tiers of communication depending on the situation. Between the 82nd Airborne Division's rapid response to COVID-19 and activations due to unrest in Iraq, the withdrawal from Afghanistan and the Russian-Ukrainian War, it became clearer than ever—units need flexible communication options in response to operating in unique and austere conditions.[5]

Unlike a typical fielding period where all brigade combat teams (BCTs) would ultimately acquire similar equipment and capabilities, the Army decided to rapidly issue ITN equipment over the course of a decade in two-year capability set (CS) increments to assess the effectiveness and update the fielding packages. Beginning in 2021, the Army fielded ITN to four Infantry BCTs and three Expeditionary Signal Battalions. CS21 includes

1 Withington, Thomas. "Life in the Old SINCGARS Waveform Yet!" *Defense and Security Monitor*, 17 May 2022, dsm.forecastinternational.com/2022/05/17/life-in-the-old-waveform-yet/.
2 Ibid.
3 Munoz, Carlo. "US Army Seeks 'graceful Migration' from Sincgars." *Janes.Com*, Jane's Find unrivaled intelligence, consultancy and advertising solutions to the defense and national security sectors., 25 Jan. 2021, www.janes.com/defence-news/news-detail/us-army-seeks-graceful-migration-from-sincgars.
4 U.S. Army. "Integrated Tactical Network." *PEO C3T*, peoc3t.army.mil/Organizations/PM-Tactical-Radios/Integrated-Tactical-Network/. Accessed 11 Mar. 2024.
5 Ibid.



radios which allow users to have access to traditional SINCGARS, High Frequency (HF), Warrior Robust Enhanced Network (WREN) Tactical Scalable MANET (TSM), Mobile User Objective System (MUOS-SATCOM) and much more.

The 3rd Brigade, 82nd Airborne Division (3/82) fielded equipment included AN/PRC-163 and AN/PRC-168 leader radios alongside larger AN/PRC-162 radios. The AN/PRC-163 is a handheld leader radio that connects SINCGARS and TSM waveforms to transmit voice and data across networks. The AN/PRC-162 is a two channel manpack radio that is capable of SINCGARS, TSM and MUOS waveforms to transmit voice and data across networks. While SINCGARS allows for traditional LOS communications with voice and data transmission, TSM and the use of the Tactical Radio Integration Kit (TRIK), helps create a BLOS bubble where communications can extend indefinitely. Lastly, MUOS is the next generation satellite communications that allows users to send voice and data transmissions to almost anywhere in the world. The multitude of wavelengths allow organizations to create and modify a communications plan based on the specific mission variables applicable to the task at hand. However, for Field Artillery units to create a plan, they must understand the capabilities and how to successfully operate each system.

As the direct support (DS) Field Artillery battalion (FA BN) for 3/82 ABN, 1st Battalion, 319th Airborne Field Artillery Regiment (1-319th AFAR) began the process of using ITN by analyzing how the newly-field fires equipment would nest within the brigade's CS21 fielding. In addition to the equipment above, forward observers were now outfitted with Precision Fires-Dismounted (PF-D)—fires software loaded on a Galaxy S-20 end user device (EUD)—and AN/PRC-163 radios to send digital fire missions, geometries, videos, pictures and messages to the Battalion Fire Support Elements (BN FSEs) over the SINCGARS or TSM waveform. The BN FSE, which is the center of gravity for digital fires, use SRNC-4G laptops with Advanced Field Artillery Tactical Data System (AFATDS) software or a Dell Latitude 5414—a substitute AFATDS explained later in this article—with AFATDS software to connect with a AN/PRC-162 radio to control fire mission processing, disseminate products and for mission planning. The AN/PRC-162 radio gives the organization the flexibility to control two networks simultaneously, have BLOS capability and transmit data packages much faster than SINCGARS. With these capabilities, 1-319th AFAR approached the process of designing a new kill chain.

The New Digital Kill Chain

1-319th AFAR spent the last two years integrating these new systems and experimenting to develop tactics, techniques and procedures (TTPs)—as there is no current doctrine for digital fires using ITN. After training and testing through countless home station training events and a Joint Readiness Training Center (JRTC) rotation, the battalion generated a way of successfully conducting digital fires (See Figure 1). The focus for the digital kill chain starts at the BN FSE. Below that, platoon forward observers (PLT FO) and company fire support team (FiST) echelons. The observer should pass the call for fire in any means necessary and available with the goal of being fully digital but acknowledging this is not always feasible. This is due to both the network architecture as well as equipment limitations with the current fielding. Regardless of the situation, the digital kill chain must begin at the BN FSE. From that point through to the shooter, each echelon deals in data messages transmitted via AFATDS. The battalion had great success displaying this methodology at JRTC rotation 23-07.[6] Fire mission transmissions over a TSM network were four times faster than traditional digital fires over SINCGARS FM. When seconds count for both the maneuver elements on the ground and in the electromagnetic spectrum for potential detection, this is a significant advantage. But beyond simply making fire missions faster, ITN bolsters additional capabilities for the DS FA BN and the BCT.

6 Joint Readiness Training Center. Operations Group, Ft. Polk, LA, 2023, *JRTC Rotation 23-07 AAR V2*.

Expanded Benefits to the FA Community

ITN adds capability and capacity for the battalion via weight reduction, access to echelon above brigade (EAB) artillery assets, adaptability to a specific environment and increasing integration of mortars into the Fires enterprise. Weight of equipment and power requirements are always a planning consideration for operations, especially for a light Infantry division. CS21 enables users to carry less overall weight by having multi-function radios. The AN/PRC-163 is a dual band radio that enables the user to talk SINCGARS and TSM both voice and digital through the PF-D and EUD. The AN/PRC-162 has all those features in addition to offering BLOS capability through the MUOS constellation. Having these radios reduces the number of radios end users are required to carry. Additionally for the FA community, AFATDS computers are a consideration as the MILTOPE computers traditionally used are heavy and bulky—again not always great for a battalion in direct support to light Infantry.1-319th AFAR found a solution in using a live-fire certified alternative computer. The Dell 5414 laptop offers a lightweight, semi-ruggedized computer that is nearly three times less weight than the MILTOPE variants, offers significantly longer battery life and is easy to replace due to the reduced cost of the computer. The battalion acquired enough to equip each fire direction center (FDC) and BN FSE with one by searching across the BCT for unused systems. While the Army is looking towards the next generation of AFATDS computer, this offers an interim solution that adds redundancy and capacity to the enterprise. ITN added new capabilities to the battalion beyond just adding capacity for the AFATDS systems and lightening the load for Paratroopers.

In addition to a weight and power reduction, ITN offers access to assets not seen before in the direct support FA BNs. With the added capabilities in CS21 of the MUOS waveform and the TRIK boxes—which offers an encryption and waveform translation feature, the BN can now talk to EAB fires assets. In large scale ground combat—where the Army is now focused—command and support relationships may change often to appropriately weight the changing main efforts. These capabilities allow units to change relationships rapidly because they will not be limited by encryption or types of radios that are fielded across the Army. 1-319th experimented with this concept by establishing communications with both 18th Field Artillery Brigade (FAB) as well as a non-organic division headquarters while supporting the Project Convergence Capstone Four experiment. In addition to accessing EAB assets, ITN has integrated the brigade's fire support systems to levels never seen before. The fires enterprise internal to the brigade—fire supporters, the FA BN and mortars—can now seamlessly talk and pass digital missions. 1-319th AFAR executes full digital missions internal to the battalion regularly, but in the past six months, it has also executed two fully digital live fire exercises with mortar platoons from different maneuver battalions (See picture below.) While the mortar systems currently rely on the mortar fire control systems, a somewhat antiquated system, for digital fire missions, the future replacement is an application on the Android Team Awareness Kit (ATAK) system. This addition will streamline digital missions for mortar integration. Digital connectivity adds not only speed to executing fire missions but offers increased accuracy by enabling the FA BN to push meteorological updates to the mortars, something that is often overlooked by mortar platoons.

Finally, and perhaps the most important, is that ITN enables units to adapt properly to the environment within which they operate. The suite of capabilities that are fielded with ITN, CS21 for 1-319th AFAR, offer the ability to create a true PACE plan for its communication architecture. Unlike with legacy systems where the PACE plan included different methods of the same transport method, (i.e. FM frequency hopping and single channel plain text) ITN offers completely different modes, such as TSM, SINCGARS, LTE services and MUOS. Furthermore, it offers an opportunity for units to conduct a deliberate mission analysis and adapt their PACE plan to environment based on both mission variables and operational variables to better protect its own forces and operate securely to shorten the kill chain. For example, if the unit is operating in a desert spread out over large distances, then perhaps SINCGARS or MUOS will best support the operation. If operating within an urban landscape where cell services are abundant, though, then perhaps LTE services will mask signals best. This ability to adapt architectures to the environment is leaps ahead of legacy systems. However, if organizations want to use ITN to its full extent, then they must learn the systems and put it into practice regularly.

As mentioned in the intro to this article, the contemporary operating environment is complex and the need to use digital fires is pervasive.[7] Units must incorporate new systems into its operating procedures, but to do so requires a few changes in perspective and approach to training and manning. First, the radio has fundamentally changed from legacy systems. The radios fielded today are more computer, network based than a traditional radio. This change in perspective offers insights on how to operate and employ the ITN systems. Communication specialists must fight to be multi-functional experts, understanding both radio and antenna theory but also networking. Moreover, operators must work hand in hand with communications personnel to share feedback and to build a knowledge base for troubleshooting issues. Not long-ago Artillerymen were known as communications experts and often outpaced their Radio Telephone Operator (RTO) counterparts at the platoon and company echelons. This must be a truth again; fire supporters and fire direction personnel must be masters of their communication systems. Because of this required expertise, talent management demands organizations to look at their manning guidance. Too often in the past, units have prioritized putting the best personnel in lower echelon organizations internal to the company FiSTs, often at the degradation of BN and BDE FSEs. While units ought not leave company FiSTs unmanned or ill equipped, ensuring talent in communications expertise must be prioritized at the BN and BDE FSEs. This will ensure digital systems are operational and enables those experts to teach subordinate echelons. 1-319th manned within this guidance over the past year and saw marked improvement in digital communications throughout the organization with little to no degradation of capabilities at the company level. Finally, units must have leader emphasis on digital communications. If leaders fold too quickly and fall back to legacy systems or easy transport methods like SINCGARS voice, then the organization will never advance its capabilities and use the ITN to its full potential.

Conclusion

The changing operating environment requires the Army to adapt and develop new capabilities to ensure success in the next conflict. The Army's ITN is the current answer, but it is still in testing and fielding through a bottom-up user approach. 1-319th AFAR focused on using ITN over the past 20 months and developed both tremendous capability and TTPs for application as well as captured successes and failures for future iterations of capability sets and any future fielding to other units. The digital kill chain that 1-319th uses today is leaps and bounds ahead of where it was two years ago and continues to stand at the cutting edge of digital fires. Through leader emphasis and change in perspectives, a unit can achieve success and gain advantages such as access to EAB assets, integrated fires architecture inside the brigade and improved survivability in the electromagnetic spectrum. Field Artillery has been and will continue to be the King of Battle but only if it continues to adapt, experiment and share lessons learned across the community.

MAJ Matt Huff is a career Artillery officer originally from Chicago, IL. After graduating from Ohio University with a Bachelor's of Science in Geography/Meteorology, MAJ Huff began his career at Ft. Campbell with the 101st ABN DIV, where he served as a Fire Support Officer in 2nd BCT. Following attending the Ranger Assessment and Selection Program, MAJ Huff served at the 1st Ranger Battalion. MAJ Huff attended FACCC and then served four years in the 82nd ABN DIV as a Battalion S4,, Battery Commander, and Deputy Secretary of the General Staff. He then attended ILE and SAMS at Ft. Leavenworth, KS. After schooling, MAJ Huff returned to the 82nd Airborne Division where he served as a G5 Planner, Brigade FSO, and currently serves as the Executive officer of 1-319th AFAR.

CPT Christopher Drew is currently assigned to 1-319th AFAR serving as a M119A3 Battery Commander; supporting 3BCT, 82nd Airborne Division—one of the original four Brigades fielded ITN. Prior to his current assignment, CPT Drew also served as the Brigade Fire Control Officer, and Battalion Fire Direction Officer. CPT Drew has extensive experience in the Light, Airborne, and SOF communities: serving in the the 173rd Airborne Brigade Combat Team, the 75th Ranger Regiment, and the 82nd Airborne Division.

7 Amerson, Kimberly, and Spencer Meredith. "The Future Operating Environment 2050: Chaos, Complexity and Competition." *The Future Operating Environment 2050: Chaos, Complexity and Competition | Small Wars Journal*, 31 July 2016, smallwarsjournal.com/jrnl/art/the-future-operating-environment-2050-chaos-complexity-and-competition.

Transforming Artillery Communications

C2 Fix and Unburdening the Fire Support Enterprise

By CPT Cindy Yam and CPT Justyn G. Curtis

Introduction

Over the past 18 months, the 1-320th Field Artillery Regiment (FAR) has transformed its communication and operational infrastructure, integrating advanced technology to meet the demands of Large-Scale Combat Operations (LSCO). Through the fielding of the integrated tactical network (ITN), the transition from secret to secure but unclassified-encrypted (SBU-E) fire control systems and extensive training and validation exercises, the battalion has streamlined its communications network and enhanced the efficiency of its fire support operations. This paper explores how these advancements not only improved the precision and effectiveness of the artillery's kill chain but also increased the unit's operational agility and survivability. These technological upgrades, while presenting some challenges, have positioned the battalion to maintain critical command and control (C2) capabilities in complex and dynamic combat environments, setting the foundation for future combat readiness.

The ITN fielding—combined with C2 fix—outfitted 1-320th FAR with modern communication platforms and network capabilities not previously seen while greatly simplifying our network security and setup. Our headquarters (HQ) and staff received new communication mission planners (RAPTRs), transport nodes (starshield) and connections to the tactical network through the Trik Voyager 8. We received new computers that act as radios including the AN/PRC 163 and AN/PRC 158. These new pieces of equipment combined with a transition to the SBU-E network made huge impacts on how our unit conducts fire support operations.

The shift to SBU-E represents more than just a technological upgrade; it has fundamentally transformed our operational capabilities. Simplifying and streamlining communications through C2 fix reduced the amount of equipment required in the field, simplified the establishment of our digital network and improved the process for forward observers (FOs) to execute digital fire missions. This increased efficiency has directly translated into higher mission success rates and a more agile and responsive command and control structure in the fiercest conditions.

ITN Fielding: MUOS (Mobile User Objective System) – Fight Further

The adoption of MUOS marks a substantial leap forward in artillery communications, particularly through its point-to-net digital communication capabilities, which facilitate seamless over-the-horizon connectivity. MUOS has been rigorously tested in various scenarios, including Joint Readiness Training Center (JRTC) 24-03 and 24-10 as well as the 18th Airborne Corps' 1000 Decision Exercise, where it successfully executed fire missions across vast distances, such as from Fort Campbell, Kentucky to Alexandria, Louisiana and Fort Johnson, Louisiana. As the primary means for both tactical and technical fire direction, MUOS has proven indispensable in diverse operational contexts.

MUOS' ability to maintain reliable connectivity during dismount and in challenging environments has revolutionized mission planning and execution. The system not only enhances our capacity for long-range operations but also ensures continuous communication without the frequent need for communication security (COMSEC) changes—a common challenge with legacy systems. MUOS' power efficiency and simplified setup further increases the operational sustainability of our equipment, ensuring our systems always remain fully mission capable.

One of the key components of MUOS is the reliance on directional antennas, which are necessary for establishing and maintaining a secure and high-bandwidth connection with MUOS satellites. Because of the need to maintain a precise alignment with the satellite, MUOS systems struggle to stay connected while on the move. The directional antennas must remain pointed directly at the satellite to sustain the connection, and even small deviations caused by movement can disrupt the signal. As a result, users often need to perform a "quick halt" to realign the antenna and reestablish a stable connection. The need to halt and reestablish a connection can interrupt communication and potentially lead to gaps in critical information flow, which could affect operational effectiveness.

MUOS offers a significant advantage over legacy systems by eliminating the need for frequent COMSEC changeovers which ensures continuous, uninterrupted operations. Additionally, MUOS simplifies connectivity by reducing the need for multiple cables. Where legacy systems often required two to four cables along with complex TSM/ULTRA LINK configurations, MUOS operates efficiently with just a single CAT5 cable, streamlining operations and reducing the logistical burden associated with specialized G-ARMY purchases. Despite its limitations, such as the single-profile communication constraint and its ability to stay connected on the move, MUOS has become an essential component of our artillery's communication infrastructure, necessitating ongoing adaptations and resource management to maximize its potential.

MUOS facilitates mission command post (MCP) survivability and long-range fires from virtually any location. This gives artillery units a unique advantage in enhancing the survivability of both the MCP and the howitzers. With MUOS, the MCP can effectively operate from concealed positions within wooded or otherwise challenging terrain, significantly reducing its visibility to adversaries. This allows the MCP to maintain command and control without exposing its position, thereby mitigating the risk of targeted attacks. Simultaneously, the ability to conceal howitzers in similar terrain is critical to preserving their operational effectiveness, protecting them from enemy detection and counter-battery fire and ensuring they continue to provide crucial fire support when needed.

MUOS' flexibility and range enables commanders to position units and command posts without the constraints of traditional communication infrastructure. This capability is particularly crucial in dynamic combat scenarios where the element of surprise and the protection of critical assets like the MCP and howitzers can be decisive. By allowing both the MCP and the artillery to remain agile and less detectable,

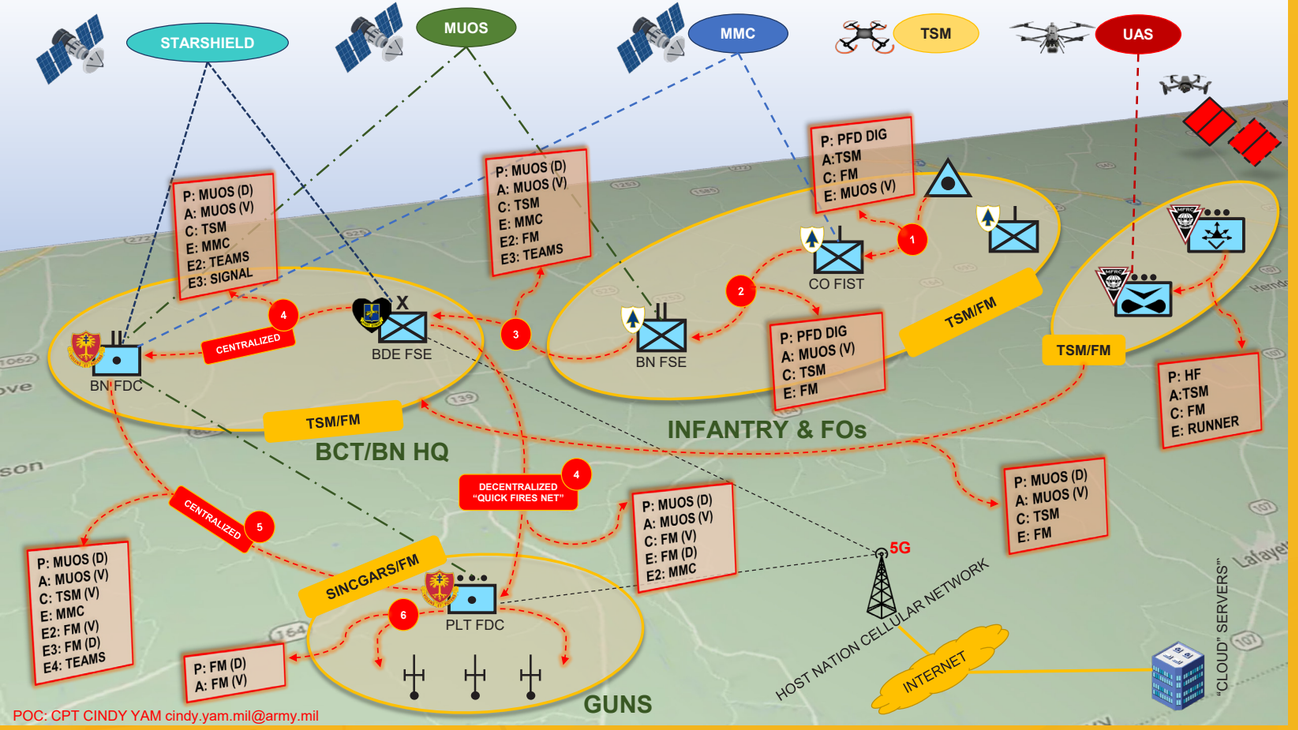


Figure 1: Fires Communications Architecture. *(Diagram created by the author, CPT Cindy Yam)*

MUOS supports sustained operations in LSCO environments. This ensures that commanders can manage the fight with minimal disruption while maximizing the operational effectiveness of their forces by maintaining the lethality and readiness of the guns.

TSM (Tactical Scalable Mobile Ad-hoc Network)

The TSM network has become a critical element in our artillery operations by offering robust support for both voice and data transmission, especially for forward observers operating on SBU-E. With the right equipment density and mission planning, TSM enables accurate position location information (PLI) and common operational picture (COP) displays on Android Tactical Assault Kit (ATAK) devices. This capability—coupled with the transition to SBU-E—has facilitated the integration of Precision Fires Digital (PFD) into the digital fire support kill chain. Once the ATAK server restriction for the PFD is resolved, the transition to TSM and SBU will allow observers to both conduct fire support missions and understand the COP on one device rather than the five pieces of equipment needed to do the same on legacy systems. As a result, TSM emerged as the primary communication method within our fire support teams (FiSTs) and for batteries to maintain command and control, proving essential for rapid and reliable operations at the company, battery and platoon levels.

The resilience of the TSM network allows units to maintain communication while increasing survivability through effective concealment in the noise floor. This advantage is particularly crucial in ensuring uninterrupted command and control during tactical movements and operations. TSM has demonstrated its reliability, especially in transmitting fire missions though voice communications, making it a trusted component of our communication strategy. The network's ability to digitally transmit data from platoon-level FiSTs to the battalion fire direction center (BN FDC) is a testament to its effectiveness. However, further testing and refinement are necessary to fully leverage TSM's capabilities, particularly in enhancing its digital communication functions and ensuring seamless integration into the broader fire support kill chain.

MMC/ATAK – LIVE COP

The Mounted Mission Command (MMC) system provides a live COP, enabling echelons to share PLI and tactical overlays in real-time. This system's key features include secure messaging, overlay sharing and live mapping of operational areas, significantly enhancing situational awareness and command control. The vehicle-mounted configuration of MMC ensures its effectiveness while on the move, offering commanders and leaders a portable workstation that can be utilized in dynamic combat environments.

MMC's digital fire mission capabilities, accessed through the "call for fire" button on the taskbar, offer a unique advantage by allowing the creation of target list worksheets in draft format. This feature simplifies and offers another way for mission processing which reduces dependency on alternative communication methods, especially if primary digital systems fail. However, challenges remain in fully utilizing MMC's potential, particularly regarding file attachment and sharing in a tactical environment. Additionally, the introduction of new ATAK/WINTAK features aimed at improving air assault operations and logistical tracking presents both opportunities and challenges. The effectiveness of these features is currently limited by operator training and experience, highlighting the need for continued education and system improvements in order to fully integrate these tools into our operational procedures.

SBU-E (Secure but Unclassified-Encrypted)

SBU-E systems are designed to be interoperable with a wide range of communication platforms—to include tactical radios, satellite communications and mobile networks. The systems allow for quick dissemination through secure but unclassified, increasing situational awareness across the artillery kill chain. This classification enables secure communications to integrate with other devices without the associated restrictions in policies that do not compromise classified data.

The transition to SBU-E streamlined our communication mission planning for our HQ staff and forward observers. By eliminating redundant equipment, such as additional end-user devices, TRIK Ultralight and multiple cables, we've enhanced functionality while simplifying the setup. The consolidation of Blue Force PLI and enemy target information onto a single COP has greatly increased the likelihood of successfully executing digital fire missions from observers to guns. This transition has also mitigated the risks associated with the delicate setup of TRIK Ultralight for secret network connections, thereby improving the reliability and efficiency of our digital fire missions.

SBU-E's integration with commercial 5G/LTE internet has opened new possibilities for communication and coordination across our systems. This transition has allowed us to explore innovative communication methods, such as using Microsoft Teams (MS Teams) for real-time data exchange that facilitate the lethality of the fires warfighting function (WFF) and size, activity, location and time reporting (SALT-R).

The transition from secret to SBU-E has introduced some challenges, particularly in maintaining seamless communication between different classification levels and the servers that connect Advanced Field Artillery Tactical Data Systems (AFATDS) to other Army platforms like the Data Distribution System (DDS). Although a cross-domain solution has been established to enable communication between secret and SBU-E AFATDS systems, the process is heavily dependent on specific equipment and the efficient transfer of data packages. For example, during JRTC 24-10, when Comanche Battery, 1-320th FAR was direct support (DS) to 101st Division Artillery (DIVARTY), the successful implementation of this solution required DIVARTY to provide the tactical cross-domain solution (TACDS) and configure it appropriately. The battery needed the TRIK system to connect their devices. Once the systems were configured, communication proceeded without major issues; however, complications arose when transferring complex data such as the target list worksheet and geometries, which had to be sent individually rather than in bulk.

Additionally, AFATDS systems under SBU-E have encountered limitations in connecting to other Army platforms (MMC, WINTAK, ATAK, etc.), a capability that was more readily available when operating on the Secret Internet Protocol Router Network (SIPR). Previously, when 1-320th operated on SIPR, they could seamlessly connect to the DDS and display fire missions on the COP. Currently, under SBU-E, this integration is not as straightforward, requiring manual input by operators for tasks that were previously automated. This shift has introduced inefficiencies that need to be addressed to fully realize the benefits of the transition to SBU-E.

The transition to SBU-E also complicates the Field Artillery's ability to rapidly task organize for combat under a division unit of action. SBU-E is highly effective for communication and data sharing at the brigade level and below, especially when all units are on the same classification level to exchange information. However, integrating external artillery organizations in a direct support, general support or general support reinforcing role into the kill chain can be a work intensive process. Without centralized oversight and the necessary CDS provided by division, we cannot link the different artillery units operating on different classification level. This is due to the transition between secret to SBU-E, which reduces the interoperability between platforms on AFATDS and other communication systems. We witnessed the challenges of integrating SBU with SIPR firsthand during the operation previously mentioned where DIVARTY provided DS to comanche battery. The lack of automated data flow from external organizations requires manual coordination. These cross-domain solutions require division to rapidly configure and manage, introducing potential delays and additional points of failure. This transition creates a limitation in supporting decentralized, joint artillery, LSCO operations. Despite these hurdles, the SBU transition enhanced our ability to conduct digital fire missions and maintain command and control in complex operational environments.

C2 fix and the ITN fielding helped unburden brigade combat team and below command posts and facilitated tactical changes in 1-320th's artillery operations. We greatly increased the range and functionality of our networks while simplifying the planning and employment of those networks. These changes allowed us to deliver over the horizon fire support and command and control while greatly increasing our unit's survivability. In these command posts, we now have a much greater understanding of the COP and can share that information down to the FO team on the ground on a singular device. We further unburdened our FOs and simplified their ability to use the digital kill chain in support of our maneuver units. C2 fix and ITN have greatly increased unit effectiveness and survivability.

Conclusion

In conclusion, the 1-320th Field Artillery Regiment's transformation over the past 18 months has significantly enhanced its communication and operational effectiveness, adapting to the complex demands of LSCO. The fielding of the ITN—combined with the transition from secret to SBU-E systems—streamlined communications and bolstered fire mission execution. These advancements reduced equipment burdens, simplified network setups and increased operational agility for FOs and command posts. The introduction of integrated technologies such as MUOS, TSM and MMC provided the battalion with unprecedented capabilities in long-range communication, situational awareness and fire support, ensuring more precise and efficient artillery operations.

Despite challenges, particularly with cross-domain solutions and maintaining seamless connectivity between classification levels, these technological upgrades fundamentally improved the battalion's ability to deliver effective fire support while enhancing unit survivability. By leveraging the capabilities of the ITN and SBU-E, the unit has successfully integrated cutting-edge technology into its communications framework, ensuring readiness and lethality in future LSCO environments. The continuous testing, learning and validation exercises have further solidified these advancements, making 1-320th FAR and 2MBCT more adaptive, responsive and prepared for complex combat scenarios.

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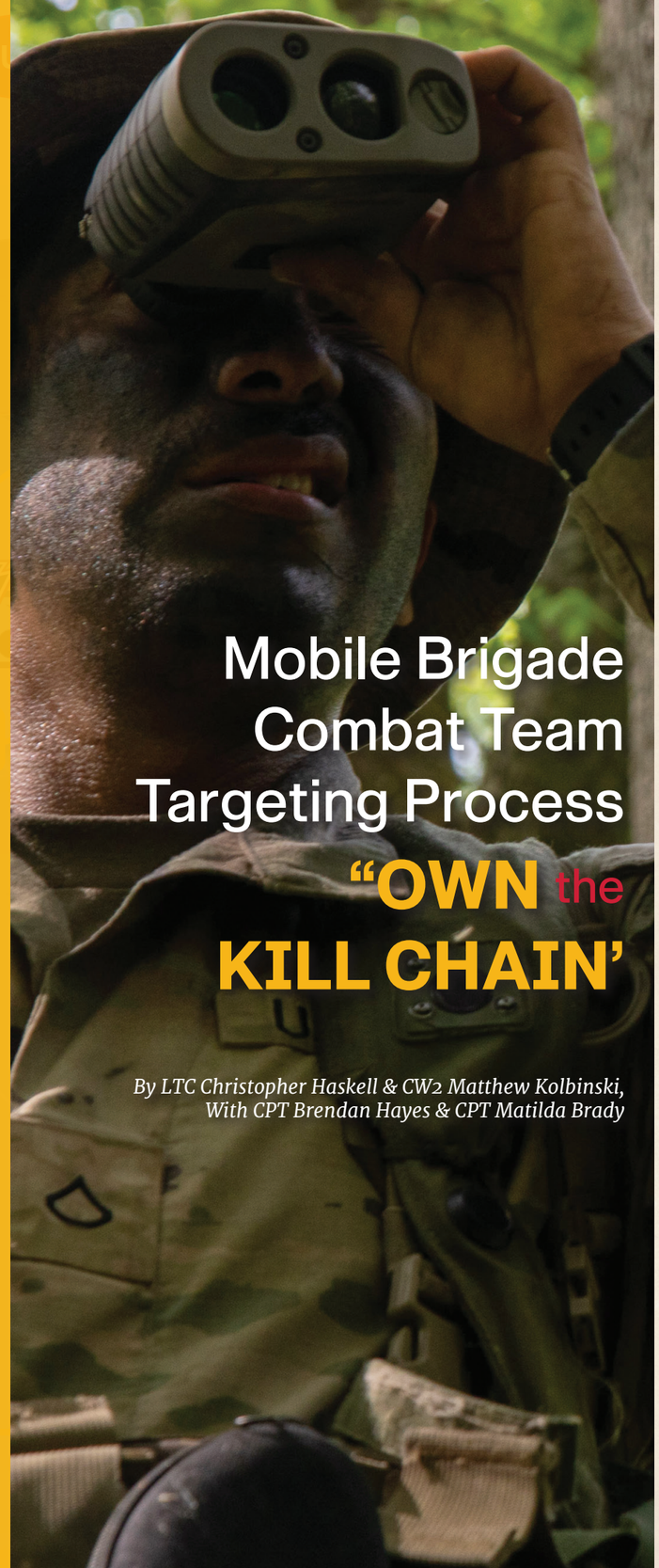
CPT Justyn Curtis is the Battalion Fire Direction Officer for 1-320th FAR, 2nd Mobile Brigade Combat Team, 101st Airborne Division (Air Assault), where he has helped spear head the transition from SIPR to SBU-E (Secret but Unclassified-Encrypted) for fire mission processing.



Mobile Brigade Combat Team Targeting Process "OWN the KILL CHAIN'

By LTC Christopher Haskell & CW2 Matthew Kolbinski, With CPT Brendan Hayes & CPT Matilda Brady

The Army introduced the Mobile Brigade Combat Team (MBCT) to support division as the new unit of action. The MBCT, outfitted with equipment like the Infantry Squad Vehicle (ISV) for mobility and unmanned aircraft systems (UAS) for sensing and striking, supported with new communications infrastructure through C2 fix allows commanders to greatly increase operational tempo. As a result, 2MBCT required a more agile, adaptive and responsive targeting process tied to critical events instead of the 72-hour Air Tasking Order (ATO) cycle.

The challenge the fire support enterprise faced with the existing targeting process was that it remained tied to both a timeline that cannot maintain the pace of operations and resources not always aligned to the MBCT commander. To address this need, 2MBCT developed a process based on the find, fix, finish, exploit, analyze (F3EA) targeting cycle anchoring it around two boards called "flash mobs," a term acquired from 3rd Brigade, 25th Infantry Division. At the Joint Readiness Training Center (JRTC), 2MBCT implemented this process resulting in an increased lethality for the MBCT despite some challenges.

Left: PFC Martin Martinez, a senior scout observer assigned to Multi Functional Reconnaissance Company, 2nd Brigade Combat Team, 101st Airborne Division (Air Assault), conducts reconnaissance on an enemy position during Operation Lethal Eagle 24.1 at Fort Campbell, KY, April 26 2024.

The 2nd Brigade Combat Team, 101st Airborne Division (Air Assault), is one of the Army's first units to prototype the Mobile Brigade Combat Team (MBCT) concept. The MBCT will be lighter and more lethal while providing increased mobility to close combat forces. The Army is undertaking its most significant transformation in more than 40 years to dominate large-scale combat operations in multi domain environments. Through Continuous Transformation, the Army will maintain dominance against rapidly evolving and emerging threats in an era of dynamic change in the character of war.

DVIDS photo by SGT Caleb Pautz, 101st Airborne Division (Air Assault)

The MBCT fielded new mobility, sensing, striking and communication technology to complement its unique force structure, which offered the MBCT commander an opportunity to own the kill chain organically and rapidly set conditions to win. The ISV offers an MBCT the ability to steal a march and close on its objectives through rapid ground or air assault operations at scale. 2MBCT reconnaissance and observation elements received UAS, some equipped with artificial intelligence (AI) enabled payloads, that improved target understanding and identification. Simultaneously, some of these assets were modified to provide additional strike capabilities. The improvements to the digital infrastructure from C2 fix and integrated tactical network (ITN) fielding enabled the MBCT fire support network and targeting operations to be executed on-call and persistently available across the entire battlespace. This influx of new technology allowed the MBCT to own every element of the process. Targeting efforts remained hyper-focused on setting conditions for the BCT agnostic of delivery system whether it be a fire mission, company attack or an electronic warfare (EW) ambush.

The brigade targeting process must be able to rapidly organize, gain understanding of the enemy around critical events and facilitate employing organic assets to achieve the commander's desired effects while informing division's deliberate targeting cycle. The 2MBCT process did this by assembling warfighting functions (WFFs) nested within the brigade battle rhythm and organized around critical events instead of administrative timelines. 2MBCT executed two primary targeting boards daily: a planning board (up to 72 hours in advance) and a refinement board (next 8-12 operational hours or critical event). Both boards focused condition setting by addressing one or two high-payoff targets (HPTs) to ensure organizational efforts remained focused on the critical event. Commander's guidance, terrain analysis and the enemy event temp informed selection of HPTs and identified initial areas to observe to gain confirmation of our understanding of the enemy plan. National technical means (NTM) can enhance this process, but terrain analysis—coupled with the enemy event temp—proved effective.

The Process: Supported by Technology

The **targeting board** executed off an analog or digital common operational picture (COP), overlayered with the enemy event temp, and facilitators aligned all available assets against the MBCT's future critical events. The planning board is held by the plans cell and confirms commander's priorities, identifies named areas of interest (NAIs) to confirm enemy situational template (SITEMP) and identifies initial desired effects and potential target locations. Identifying critical events (aligned with "find" of F3EA) allows for the coordination and synchronization of the enhanced observation capability of the MBCT due to its robust small unit reconnaissance capability. The multi-functional reconnaissance company (MFRC) at brigade and the multi-purpose company (MPC) at battalion (BN) are both outfitted with commercial off the shelf (COTS) small, unmanned aircraft systems (sUAS). Based on commander's guidance and desired effects, multiple observation and engagement options are developed remaining delivery agnostic. The executable targeting synchronization matrix (TSM) is produced to see each target in time and space while enabling rapid and accurate refinements. Nominations for echelons above brigade (EAB) assets and close air support (CAS) allocations that are situationally dependent and heavily reliant on available assets will also compliment the organic strike capabilities to nest with higher headquarters' ATO cycle.

The **refinement board** is held by the current operations cell, executed off the MBCT TSM and combined arms overlay and fed by the enemy SITEMP. The board takes a deliberate look into the next twelve operational hours or the MBCT's critical event, ensuring alignment throughout identification, observation and delivery of effects. The board ensures subordinate units understand task, purpose, method and effect, enabling 2MBCT's success. Units can maintain target custody with sUAS and EW systems (fix) and refine target location and weapon pairing (finish). The refinement boards serve as a distributed combined arms rehearsal (CAR) for the critical event and feed directly into the daily Field Artillery (FA) technical rehearsal conducted from the updated TSM and target list worksheet (TLWS).

The **transition from planner to executioner** is nearly simultaneous following the refinement board. The 2MBCT fire support officer (FSO), targeting officer (TARGO), S2 and FA intelligence officer (FAIO) consolidate the refinements, enhanced targeting guidance and relative inputs from accompanied WFFs. All the data is then updated on the TSM, fire support overlay and TLWS and is published through the MBCT's orders process. The refinement boards serve as a distributed CAR for the critical event and feed directly into the daily FA technical rehearsal conducted from the updated TSM and TLWS. Remaining finish agnostic (fire mission, electronic attack and/or maneuver operation) is key to the holistic approach of the targeting meetings.

The Details:

2MBCT executes this targeting process enabled at each echelon by organic formations and technology.

FIND: 2MBCT informed by the Joint and Interagency Community

- *Multifunctional Reconnaissance Company (MFRC), 3 X Multipurpose Companies (MPC), UAS, EW, and AI enabled systems*

Transformation in contact (TiC) removed the cavalry squadron, the shadow platoon and the brigade intelligence support element (BISE) from the Infantry BCT (IBCT). In its place, the MBCT established robust small unit reconnaissance capability in the MFRC at the brigade level and MPC at the BN level—both fitted with COTS sUAS. The MFRC is a highly mobile and uniquely enabled company aligned with the MBCT and direct support (DS) artillery BN that is tasked with understanding the enemy and destroying key enemy capabilities. Their team brings the capacity to gain and maintain contact through COT sUAS (Parrot Anafi Mil, Skydio X2D, Vesper, PDW C100) and EW systems (Beast +, Beast, Kraken, TEWS-I and Signal harvest). These capabilities are aligned against the commander's intelligence and targeting objectives through our process highlighted above. The MPCs serve similar purposes but are tasked with counter-reconnaissance efforts as well for their parent BN headquarters.

Each of these assets can be employed effectively with a detailed terrain analysis and enemy event temp. However, utilizing passively collected intelligence and EAB assets gained through deliberate liaison officer (LNO) networks at our higher headquarters can allow us to greatly increase the effectiveness of our limited elements. The LNO network is led by the FAIO at the division analysis and control element (ACE) and supported by the BCT with the correct information technology and guidance to help the MBCT achieve its information requirements and targeting objectives.

FIX

- *Multifunctional Reconnaissance Company (MFRC), 3 X Multipurpose Companies (MPC), Mortars, Artillery, UAS, and EW.*

Similar capabilities to the "find" step exist to conduct secondary roles by fixing a target. Here, what is old is new again. The MBCT focuses on getting a human observer enabled by UAS or other technology to fix the HPT and ensure delivery of the desired effect. Through the usage of the MFRC and MPCs accompanied by their sUAS, EW systems, they track and maintain target custody. Simultaneously, they conduct location refinement and weapon pairing based off organic assets available often found in the 'finish" step. Weapon systems normally used to finish can be re-tasked to fix the enemy for a predetermined set of time, enabling the detailed precision required to finish. While the MFRC and MPC are focused elements for this discussion, any company in our MBCT with a forward observer team can and does execute this task.

FINISH

- *6 x M777 Howitzers, 12 x M119A3 Howitzers, 120MM / 81MM Mortars, Switchblade one-way attack drones, Infantry Battalions*

The MBCT is organically aligned with their composite FA BN; this being the linchpin of the kill chain. The FA BN equipped with 6 x M777 howitzers and 12 x M119A3 howitzers remains the most casualty producing weapon system on the modern battlefield. The MFRC, equipped with loitering munitions, such as the Switchblade 600, provides one-way strike

capability, which is primarily reserved for the most critical or advantageous HPT based on commander's guidance. Involvement of Infantry BN commanders and their staff at the targeting boards streamlines the utilization of maneuver units or their mortar systems as delivery mechanisms in support of MBCT targets. Nominations for EAB assets and CAS allocations that are situationally dependent and heavily reliant on available assets will complement the organic strike capabilities. The overarching point to how the MBCT finishes is that it is agnostic to the ways and means in which it is executed.

EXPLOIT

- *Multifunctional Reconnaissance Company (MFRC), 3 X Multipurpose Companies (MPC), Drones, EW, EAB Collection Assets, NTM.*

One of the most significant advantages of the MBCT force structure, paired with the targeting process and technology, is its ability to enable ground units to gain and maintain contact with the enemy and never allow them to regroup. For 2MBCT, this can be as simple as maintaining visual contact via UAS and shifting indirect fire as an enemy retrogrades. The actions depend again on our organic ability to sense and affect our HPTs. Here our utilization of sUAS from either the MFRC, MPCs or company organic forward observers tied back into delivery systems and the F3EA targeting process in the flash mob are critical to success.

ANALYZE

- *Multifunctional Reconnaissance Company (MFRC), Three Multipurpose Companies (MPC), Drones, EW, EAB Collection Assets, NTM*

The key component to understanding the effects of our efforts and feeding back into the cycle is the holistic assessment of the enemy. The tasking for assessment is predominantly aligned to the unit designated to observe the target throughout its life span. The information is evaluated by the MBCT S2, FAIO and TARGO to rapidly turn it into actionable, targetable intelligence that can be applied to defeat the enemy in detail.

JRTC 24-10 The Defense:

During the refinement board focused on period of darkness 19-20AUG24 with a defined critical event of defending along PL Dogwood, the 2MBCT S2 enemy event temp identified three separate maneuver forces and two possible avenues of approach. The friendly maneuver plan was designed to turn the enemy into the main engagement area in the north along ASR Helium by utilizing decoy emitters replicating a more robust defensive line in the south. The S2 team identified two critical NAIs—2314 and 2407—to determine if the enemy would approach along the southern or northern avenue of approach and with what critical equipment. In the targeting board, the targeting team identified specific information requirements that led to task and purpose for collection assets and the MFRC to identify those forces. Additionally, we enhanced NAIs 7001 and 2408 to targeted areas of interest (TAIs) associated with organic delivery from the FA BN based on the event temp in order to destroy the enemy force in the appropriate engagement area. Those TAIs resulted in task and purpose to 2-502nd Infantry BN's MPC and FA BN. Finally, each TAI had associated observers to assess results along with layered EAB assets to enable follow on attacks. 2MCBT executed that targeting board in accordance with the published battle rhythm at 0800 the day of the defense, allowing for rapid synchronization of efforts in current operations, updated fighting products and a technical rehearsal that afternoon from sensor to shooter.

In practice, it played out almost flawlessly except for a critical misstep in the identification. Our LNO within the joint air-ground integration center (JAGIC) initially provided intelligence from NTM that identified an enemy company plus sized element moving along our northern avenue of approach. Information passed through Microsoft Teams, ATAK and MUOS over ICE to our MFRC confirmed a force moving towards 2-502's main engagement area. 2-502's MPC received that notification and utilized forward observers with sUAS to identify enemy mechanized forces along their main obstacle belt despite missing them at our initial GATOR mine obstacle belt. As the mechanized forces initiated a breach, the forward observer confirmed composition and called in the planned BN mass fire mission on the force. The fire mission resulted in the destruction of a company plus of mechanized vehicles and dismounts, which was confirmed through the observers and validated through JRTC Operations Group. The challenge was a misidentification of the assaulting force with the reconnaissance force leading. This ultimately led to successful destruction of the enemy's feint and reconnaissance but left their assault force intact for future engagements. The process and its execution proved itself multiple times during this iteration. Despite errors that led to less than perfect results, we believe the core of the efforts was successful as evident by a coordinated FA BN mass inside of an obstacle tied to direct fire and observation that was all synched and rehearsed by the results of the refinement board.

"Finally, leaders also must make additional efforts to continue to inform and participate in division's targeting cycle while executing a process focused on organic assets."

Limitations and Way Forward

A critical component to this method was our command team involvement supported by a deliberate LNO. The MBCT commander dedicated at least two hours per day to these efforts and allowed the staff and subordinate commanders to execute staff work in front of him to make this successful. The 2MBCT commander placed critical personnel across the higher headquarters staff to act on his behalf. He placed intelligence leaders in the BICE and fires leaders in the JAGIC equivalent. He provided these LNOs with guidance and information technology to ensure 2MBCT's needs were met. These LNOs proved critical to our success but came at a cost to both future and current operations.

The targeting boards adapted the F3EA targeting process into a medium that enables 2MBCT to maintain momentum and initiative but requires increased leader engagement. This process places a high demand on commanders and leaders at echelon and draws them into closer and more dynamic fights. Additionally, more discipline is required to ensure the constant flow of information—enabled by the robust communications platforms—does not cause unnecessary confusion. Finally, leaders also must make additional efforts to continue to inform and participate in division's targeting cycle while executing a process focused on organic assets.

Given the flexible nature of this targeting process, it compliments a more ridged military decision-making process by enabling rapid precision in execution. It is most effective when employed following mission analysis and all critical fighting products have been produced in draft, enabling further planning. This medium then intuitively acts as a transition point from future to current operations, focusing on the next critical event until fruition or until the situation on the ground dictates. The MFRC paired with unique capabilities and outfitted with emerging technology directly tied to the targeting process increased both real-time understanding for the 2MBCT command and key staff as well as increased lethality.

While this dynamic targeting process may not be adaptable to every formation type, the applicable lessons learned to all other commanders is an opportunity to unhitch from a deliberate targeting process tied to the ATO cycle that often fails to meet the needs of the close fight. This process will allow the MBCT to fit neatly inside the division as the unit of action and set the conditions to win where they fight.

LTC Christopher Haskell (1-320th BN CDR/2MBCT Fire Support Coordinator)

CW2 Matthew Kolbinski is the Targeting Officer for 2MBCT 101ABN DIV (ASLT). He has served in the military for 18 years, first as a 13D/J Field Artillery Automated Tactical Data System (AFATDS) Specialist and now as a 131A Field Artillery Targeting Technician. His previous positions are serving as the Battalion targeting officer and Brigade field artillery intelligence officer for 2-11FA 2BCT in Schofield Barracks Hawaii. In his current assignment he has led the targeting efforts associated with 2MBCT's role in Transformation in Contact (TiC), ITN integration and Secure but Unclassified (SBU) employment.

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Agility Theory

By MG (Ret.) Richard Longo and MAJ Brandt Murphy

...Thus, an army without flexibility never wins a battle. A tree that is unbending is easily broken...
-Lao Tzu, Tao Te Ching (~4th Century B.C.)

I. Introduction.

Agility is a tenet of operations that exists alongside convergence, endurance and depth. Defined in Field Manual 3-0, *Operations*, the tenets of operations are desirable attributes that should be built into all plans and operations, and they are directly related to how the Army's operational concept should be employed. Moreover, commanders use the tenets of operations to inform and assess courses of action throughout the operations process. Agility, therefore, is defined as ***"the ability to move forces and adjust their dispositions and activities more rapidly than the enemy."***[1] Agility is necessary for units to gain and maintain the initiative and mitigate risk. It is enabled by the elements of operational art (OpArt) as depicted in Army Doctrine Publication (ADP) 3-0, *Operations (see Figure 1)*. We incorporate the elements of OpArt to develop operations, and we must ensure that the tenets are built into such plans. Effective employment of all the elements of operational art enables agility, yet the most vital elements are *tempo, decisive points, phasing & transitions* and *risk*. Tempo dictates the relative speed of operations while phasing and transitions ensure that rapidly changing conditions are accounted and adapted for. Concurrently, simultaneously impacting multiple decisive points mitigates the relative risk posed by delayed sequencing of effects.

Agility is empowered by OpArt, which enhances freedom of action and ensures unrestricted operational dexterity. *Dexterity*, while not doctrinal, is defined as readiness and grace in physical activity, especially skill and ease in using the hands; mental skill or quickness.[2] In this case, operational dexterity refers to a commander's ability to execute operations, as a physical activity, with both skill and quickness. As such, this article is not meant to serve as a "how to" guide for achieving agility in conflict - it is a brief discussion of a set of principles and how their application may enhance the reader's understanding of agility as a tenet of operations.

Elements of Operational Art:

End State & Conditions
Center of Gravity
Decisive Points
Lines of Operations & Lines of Effort
Tempo
Phasing & Transitions
Culmination
Operational Reach
Basing
Risk

Figure 1

II. Agility Principles & Outcomes.

The tenet of agility aids commanders in the following principles: *understanding, deciding, acting, assessing* and *adapting* to difficult circumstances during the tumult of battle.[3] Before acting, the commander is required to *understand* the battle through situational awareness and then *decide* upon courses of *action* necessary to win. Therefore, upon review of the totality of actions taken throughout the battle, *assessments* inform command-driven *adaptations* to evolving conditions.

1 FM 3-0, *Operations*, 01 October 22, p. 3-3
2 Merriam-Webster.com Dictionary, s.v. "dexterity," accessed October 11, 2023, https://www.merriam-webster.com/dictionary/dexterity.
3 FM 3-0, *Operations*, 01 October 22, p. 3-3

As these principles are achieved, both *initiative* and *momentum* of conflict are controlled, and the *tempo* of battle is dictated as an outcome. While tempo is defined as ***"the relative speed and rhythm of military operations over time with respect to the enemy,"***[4] it unfortunately lacks the depth of meaning required to fully understand how synchronicity affects friendly and enemy forces simultaneously in battle. To that end, tempo should not be viewed simply as relative speed and rhythm over time. Rather, it should be understood as the effect resulting from the *time by which a force is able to maintain absolute synchronous action that simultaneously awards advantage and negates the enemy's ability to gain or maintain the initiative*. Plainly stated, the side that is most agile controls the tempo of battle, maintains the compounding advantage of initiative and dictates the speed by which opposing forces operate (or desperately attempt to adapt).

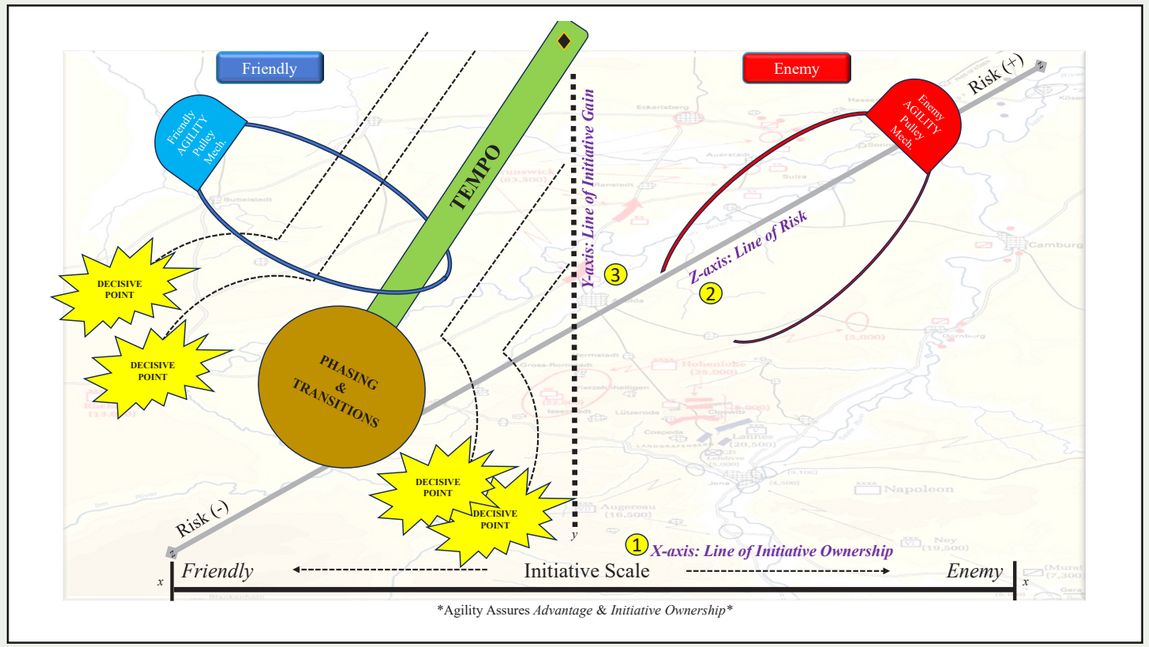
III. Agility & The Pendulum of War: Challenging Newton's Third Law of Physics.

Isaac Newton's third law of physics suggests that for every action there is an equal and opposite reaction. However, when employed effectively as a tenet of operations, agility challenges such law. By using agility as a **pulley mechanism** to control tempo and maintain the initiative, the commander is therefore able to deny the enemy's opportunity to produce an "equal and opposite" reaction. Through dexterous action, the most agile commander is best able to anticipate and execute rapid adjustments across the battlefield.

Analogously, the figure below, which the author describes as the "Pendulum of War" (Figure 2), depicts *agility* as the pulley mechanism by which a commander is best able to maintain control of both *tempo* and *initiative*. Thus, the commander is enabling the rapid execution of multiple *decisive points*. This advantageous paradigm is compounded by synchronous effects enacted by timely responses to evolving conditions. Reactions determine shifts in *phasing* and are adapted to by deliberate *transitions* during operations. Regarding relative positions on the **initiative scale** (puck 1, *x-axis* at the bottom of the figure), the most agile commander is assured ownership of advantage and initiative. Most importantly, along the "z-axis" (puck 2), **risk mitigation** is an intrinsic by-product of the most agile commander. As shown in the

4 ADP 3-0, *Operations*, 06 October 17, p. 2-6

Figure 2: The Pendulum of War



decision dominance is necessary for a commander to gain the initiative and determine the flow of battle over an adversary

figure, the risk continuum mirrors the pendulum's sway. The "y-axis" (puck 3) denotes the line of initiative gain for opposing forces. In other words, as the whole-of-pendulum (tempo, phasing and transitions) is controlled by the most agile commander, risks are mitigated and the overall risk level remains low.

By incorporating agility to dictate the sway of the "Pendulum of War," the commander's level of decision dominance is enhanced. Defined as ***"aspirational, situationally dependent and always relative to an opponent…to understand, decide and act faster and more effectively than the threat,"***[5] *decision dominance* is necessary for a commander to gain the initiative and determine the flow of battle over an adversary. In this manner, not only does the most agile commander control tempo and the initiative, but he also compels the enemy force to operate within the friendly commander's decision-making outcomes.[6] This outcome is primarily enacted through physical means which, in turn, affects the human dimension with respect to perceptions, decision making and behavior. As the lethal and non-lethal means of war impact the enemy more rapidly and at multiple decisive points, the enemy commander's psyche is put into a state of desperation, which results in self-inflicted mistakes in decision making.

IV. Conclusion.

This article examines agility as a tenet of operations and how understanding its principles enhances a commander's ability to gain and maintain the initiative, as well as dictate tempo. By viewing agility through the many lenses inherent to OpArt, we are better able to understand how agility enables the commander to mitigate risk and achieve decision dominance relative to the enemy commander's actions and reactions. It is in this way that Newton's Third Law is challenged and exploited to the friendly commander's advantage. By forcing the "pendulum" to swing at will and without ever crossing the line of initiative gain, the friendly commander is best able to move forces and adjust their dispositions and activities more rapidly than the enemy, as well as understand, decide and act faster. Within the realm of Large-Scale Combat Operations, agility is the tenet that enables lethality and rapid action resulting in decisive victory.

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5 FM 3-0, *Operations*, 01 October 22, p. 3-14
6 FM 3-0, *Operations*, 01 October 22, p. 3-13

THE BATTLEFIELD COORDINATION DETACHMENT IN FUTURE WARFARE

By COL Kevin L. Jackson

Future warfare will necessitate service interdependence, and the theater air control system (TACS) will remain key to effective joint force integration and mission success. The TACS includes critical liaison elements from each component: the Army's battlefield coordination detachment (BCD), the Air Force's joint air component coordination element (JACCE), the naval and amphibious liaison element (NALE), the Marine amphibious liaison element (MARLE) and the special operations liaison element (SOLE). Each element within the TACS can build capacity, interoperability and synchronization across the components from the tactical level through the operational and strategic levels of warfare.

The services must continue to man, train and equip these formations with the most qualified personnel to act on behalf of the component commander or designated joint task force commander. Monitoring the war in Ukraine has demonstrated how each element of the TACS assists in crisis management and builds situational awareness during conflict for our component commanders. The ability to leverage joint force capabilities against any problem set and focus on the joint force commander's priorities, no matter who the supported commander is, remains the key to future success. In this article, we will examine how the Army's BCD helps build warfighting capacity and improve operational synchronization, which is essential to achieving convergence against a near peer threat.

The BCD is a multi-functional Army organization that enables select operational functions as the senior liaison between the Army Forces (ARFOR) commander and the air component commander. BCDs are aligned within geographic combatant commander's air operation center (AOC) around the world. The BCD interfaces with the appropriate staff directorates within the AOC to ensure that the Army commander's requirements are represented to the air component commander (ACC). An AOC is inherently a joint or multinational organization. Key tasks for the BCD include exchanging current intelligence and operational data (priorities, friendly order of battle and scheme of maneuver) and support requirements (intelligence, surveillance and reconnaissance, joint fires, space effects, suppression of enemy air defense and electronic warfare) as well as coordinating ARFOR requirements for airspace coordination measures (ACM), fire support coordination measures (FSCM) and theater airlift.[1]

The BCD doctrinally does not interact with the corps unless the corps is designated as a joint task force or serves as the land component commander. In the last year, 19th BCD in Europe has learned that the BCD can significantly impact the land component's objectives while in competition by nesting efforts across the breadth of the land component to include corps and their assigned divisions. This nesting allows the BCD to better understand and integrate land component efforts at echelon and strengthen theater effects. The BCD's presence in the AOC provides access to multiple joint components and multinational partners and allows the BCD to pass information and opportunities to the corps and vice-versa. The 19th BCD and command relationship with the theater fires command (56th Artillery Command) strengthens the targeting kill chain and allows synchronization across all domains with the multi-domain task force and other assets available to the theater fires command. A renewed relationship with corps headquarters (HQ) and enablement by the theater fires command provides unlimited opportunities for future warfare with the BCD. It is worth noting that while this expansion beyond the doctrinal mission of the BCD works in competition and builds the foundation for success in crisis and conflict, the BCD must return to its doctrinal mission of liaising between the land and air components in crisis and conflict to be effective.

1 ATP 3.09-13

As a second example, the 19th BCD is leveraging air mobility as a weapon system. The BCD works closely with airborne units, and the BCD's unique relationship with the air component's tactical airlift squadron improves the efficiency and support to Army formations. The BCD in competition plays a critical role in hosting the European Joint Airborne Air Transportability Training conference for the theater to ensure proper allocation of air support to land component airborne units. As a result, the Army can continue building competency during competition that could enable a joint forceable entry operation in conflict. The corps also have High Mobility Artillery Rocket System (HIMARS), and the relationship of the BCD and assigned corps' Fires brigade allows increased support to conduct HIMARS rapid infiltration (HIRAIN) training. Additionally, it increases the air component's familiarity with employing an Army key weapon system and its associated critical munitions like Army Tactical Missile System (ATACMS) to support the component commander's operational requirements. The 19th BCD provides the core of the North Atlantic Treaty Organization (NATO) Allied Land Command (LANDCOM) BCD in competition and can level multinational assets like the Belgian A400 and Hungarian C-17s for joint forceable entry operations.

Advancing technology of both friendly and enemy capabilities is changing the supported versus supporting roles by phase. For example, Ukraine has shown how contested airspace may limit maneuver and the need to destroy the integrated air defense systems (IADS) is essential. The need to destroy IADS in the initial phases of a conflict may require the air component to be the supported command. The land component's current long-range and mid-range munitions like the Guided Multiple Launch Rocket Systems (GMLRS), ATACMS and other future munitions capabilities—like the Precision Strike Missile (PrSM) and hypersonics—may be used to support the air component in destroying IADS assets. The air component's ability to quickly reposition materiel, munitions and equipment—specifically HIMARS—might be critical for the initial phases of a conflict. The need to train this capability and establish coordination and employment techniques are paramount for future warfare and the ground liaison officer can be a tremendous asset with these efforts.

The BCDs all have associated ground liaison detachments (GLD) or a reconnaissance liaison detachment (RLD). The GLDs are manned with a senior Field Artillery captain and a senior fire support non-commissioned officer (NCO) while the RLDs are manned with a senior Intelligence captain and a fire support NCO. The role of the GLD and RLD are a lesser-known capability of the BCD and are often underutilized in helping achieve the land component commander's objectives. I would argue that they are a critical component to integrating joint capabilities into the land component's scheme of maneuver. The GLDs can integrate key capabilities for the land component to include F35s, F16s and other sensors with link technology that enable long-range fires.

19th BCD and the Army Joint Support Team conducting an air-space practical exercise with Rapid Reaction Corps France and Eurocorps in Lille, France.

The RLD's ability to integrate with the air component's intelligence, surveillance and reconnaissance (ISR)group or distributed ground station enterprise is vital to the Army. The RLD can work to dynamically re-task intelligence assets or get Air Force support in advanced target development for key targeted areas of interest that will enable Army success in the future. The "best athlete" from each component is what matters to enhance and achieve effects for the joint force commander. GLDs and RLDs are vital to achieving that effect.

The BCD is trained, manned and equipped to coordinate for the land component to the air component across all domains with a few additional resources. The synergy of the BCD within the AOC and access to other liaisons from other components residing in the AOC enhances coordination across all domains. For example, the NALE's presence in the AOC allows coordination for bomber task force missions, protection and other maritime capabilities potentially provided for the land component. Some BCDs have Space officers who coordinate Space operations with the theater fires command, multi-domain task force and the Space Force. A few additional personnel with functional expertise in space, cyber and electronic warfare added to the BCDs' modified tables of organization and equipment (MTOEs) would allow coordination for the Army's joint capabilities across components and capabilities from other components leveraged in support of Army and land component operations.

The BCD, though small, has senior officers and NCOs in key positions with subject matter expertise in key warfighting capabilities which include targeting, airspace management and intelligence. The BCD can assist the air or land component commander in helping to build capacity with other multinational formations. For instance, in a security force assistance or teach, coach, mentor role, the BCD could send functional experts to provide tailored training packages to improve the readiness of multinational component organizations. The BCD could also identify gaps in doctrine and assist both national and multinational partners and allies in developing effective tactics, techniques and procedures (TTPs) that increase their overall warfighting capability.

In the European theater of operations, the BCD has taken advantage of several opportunities to increase warfighting capability across NATO at the tactical, operational and strategic levels of warfare. Below is a short summary of efforts with NATO that build flexibility and capability for the joint force. At the tactical level, the BCD in Europe utilizes training and engagement at NATO corps HQs focused on air-land integration to increase warfighting capability, as well as provide the land component increased synchronization with NATO units across Europe. At the operational level, the BCD utilizes engagements with NATO LANDCOM and Allied Air Command (AIRCOM) to share U.S. Army doctrine, systems, processes, TTPs and lessons learned as a roadmap for success in the air-land integration arena. The use of programmed battle staff training events with both AIRCOM and LANDCOM—focusing on targeting, the joint air tasking cycle and unit air space management— has been key to success prior to major joint exercises.

The future fight is both joint and multinational with increased reliance on technology across all domains. The elements of the TACS structure, like the BCD for the land component, are key to leveraging the "best athlete" resident in each component to impact the fight for the joint force commander. BCDs will continue to execute those tasks at the component level while the GLDs and RLDs remain as the critical linkage at the tactical level for employment and coordination of joint assets. Commanders that enable flat organizations that nest operations and efforts from tactical to strategic level encourage disciplined initiative and convergence of effects across the joint force.

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19th BCD and the Army Joint Support Team conducting an Air Land Integration Symposium with Rapid Reaction Corps France in Lille, France.

The Field Artillery Battalion S2 *and the* Integrating Processes

By CPT Preston Quinn

Together, Field Artillery and Military Intelligence can be greater than the sum of their parts. However, to achieve their maximum potential organic, Field Artillery battalion (FA BN) S2s must sufficiently and accurately inform the FA BN commander's decisions and the brigade's lethal targeting efforts. The unit's mission cannot succeed if fires and intelligence fail to coalesce around their shared responsibility to lethally target capabilities on the brigade's high-payoff target list (HPTL). Unfortunately, some FA BN S2s – even the best among us - fail to make ourselves relevant to FA BN commander decision-making and brigade lethal targeting.

Armor and Infantry brigades are both assigned a 13A, Field Artillery officer, by the modified table of organization and equipment (MTOE) to fill the FA BN S2 billet - only Stryker brigades are assigned a 35A, Military Intelligence officer. Despite this, from my observation, Military Intelligence officers most often fill 13A slots and thus bring different skills and experiences out of primary military education (PME) to bear on the FA BN's operations than intended. Therefore, it is vital that post-PME development must establish a set of unified set of expectations on how a 35A or a 13A perform as the FA BN S2.

Based on rotational observations and doctrinal references, I make several recommendations to FA BN S2s – regardless of military occupational specialty (MOS) - that will make them more effective contributors to the unit's mission. On the other hand, to FA BN leadership, if your FA BN S2 is not meeting expectations, consider coaching them on the below points. They will often be the root cause from which a failure to meet expectations is just a symptom. I will introduce to S2s the concept of integrating processes defined by Army Doctrine Publication (ADP) 5-0 as an informative perspective for understanding an FA BN S2's role and responsibilities.

The intelligence warfighting function is vital to the Army's integrating processes – a fact that is sometimes lost on its practitioners and is directly tied to the success of an FA BN. An integrating process "consists of a series of steps that incorporate multiple disciplines to achieve a specific end."[1] ADP 5-0 identifies the following five integrating practices:

- **Intelligence Preparation of the Operational Environment (IPOE).[2]**
- **Information Collection (IC)**
- **Targeting**
- **Risk Management**
- **Knowledge Management (KM)**

All five of these practices are well-nested inside the significant intelligence warfighting tasks. *(See Figure 1).*

Practice #1: Intelligence Preparation of the Operational Environment (IPOE)

The first cardinal error S2s make is typically a failure to fully understand their information gaps. Ask questions early and often. It is the mark of a good S2 to know their information gaps. Utilize an active request for information (RFI) plan in IPOE step one to resolve information gaps whether the appropriate source is the higher echelon, national resources or the skilled and experienced staff that share the main command post (MCP) with the S2.

1 ADP 5-0, *The Operations Process*, Headquarters, Department of the Army, Washington, D.C., 31 July 2019, para 1-71.
2 Doctrine is in the process of transitioning from Intelligence Preparation of the Battlefield (IPB) to Intelligence Preparation of the Operational Environment (IPOE). They are the same process. IPB and IPOE are used interchangeably throughout.

INTELLIGENCE WARFIGHTING FUNCTION

The related tasks and systems that facilitate understanding the enemy, terrain, weather, civil considerations, and other significant aspects of the operational environment (ADP 3-0).
The intelligence warfighting function tasks are–

- **Provide intelligence support to force generation.**
- **Provide support to situational understanding.**
- **Conduct information collection.**
- **Provide intelligence support to targeting.**

Figure 1. Significant Intelligence Warfighting Tasks. FM 2-0, pg. xii, 01OCT2023.

The second cardinal error many S2s make is to devote too little emphasis to topics that deserve it during IPOE or, conversely, to emphasize things that don't matter. This typically occurs for two reasons: first, Military Intelligence Captains Career Course (MICCC) trains its students to be a maneuver S2, not an FA BN S2; second, the S2 likely has not sufficiently acquainted themselves with Field Artillery doctrine.

Just because something is important to the S2 does not entail that it is important to the FA BN commander, staff or battery commanders. Doctrine recognizes this problem by explicitly stating that the mission analysis brief may consist of "Initial IPB [IPOE] products that impact the conduct of operations."[3] Restriction of IPOE products to those relevant to the commanders and staff in doctrine is a direct reflection of the reality that time is an omnipresent constraint on military operations. The S2 should be ready to brief it all and know it all, but the S2 cannot let the "so-what" become de-emphasized. By emphasizing everything, an S2 emphasizes nothing.

How does the S2 know what is important? They should place an emphasis on the IPB products listed in Fires doctrine. An S2 must read Field Artillery doctrine to understand the decisions, capabilities and limitations of the FA BN and its commander. The Army Techniques Publication (ATP) 3-09 series is the best place to start. The baseline for IPB familiar to intelligence professionals is ATP 2-01.3; however, the most important additional reference specific to an FA BN S2 executing military decision-making process (MDMP) and IPB is ATP 3-09.23, para. 1-35 and para 1-49.

The best S2s can gather and synthesize information and judgements from the staff and integrate it into IPOE, IC and targeting. My observation from rotations is that S2s failing to adequately capture the expertise and good judgement of the staff can make inappropriate or irrelevant recommendations to the commander. To that end, S2s should execute continuous "reverse IPOE," a process in which the S2 gathers information from staff members and even enlists their assistance to design products – e.g., the modified combined obstacle overlay (MCOO), enemy courses of action (COAs) and the event template.

Just as the U.S. Army has its own language, each branch of military specialization also has its own language. An S2 that fails to speak the language of the commander and staff they serve will ultimately fail to achieve relevance. Does the S2 understand the logical basis and practical implications of the coordinating fire line (CFL) and fire support coordination line's (FSCL) locations on the battlefield?

How does the brigade's placement of intelligence control measures like the intelligence handover line impact how intelligence and fires coordinate?[4] Does the intelligence handover line adequately support sensor-to-shooter links to the FA BN commander's batteries? An FA BN S2 that speaks to these questions demonstrates that they understand the fault lines in the fires-intelligence complex and is identifying risks for the commander's consideration.

3 ADP 5-0, *The Operations Process*, Headquarters, Department of the Army, Washington, D.C., 31 July 2019, para 5-80.
4 FM 2-0, *Intelligence*, Headquarters, Department of the Army, Washington, D.C., 01 October 2023, para 3-39.

Practice #2: Information Collection (IC)

A fact that becomes obvious to all S2 sections attempting to plan information collection is the absence of any collection assets with reach beyond the forward line of own troops (FLOT). FA BN S2s seem to accept that this means their collection assets cannot be put to good use. This is not accurate. The FA BN's organic collection plan must focus on indications and warnings intelligence (I&W). All battalions in a maneuver brigade have collection assets that are intended for local reconnaissance and provide I&W intelligence – the reason a maneuver BN can collect beyond the brigade FLOT is because they are usually positioned on it, so I&W intelligence for that unit necessitates observation beyond the FLOT. The FA BN S2 can still derive value by using organic collection assets to monitor likely threats to the FA BN, albeit behind the FLOT. With appropriate line-of-sight, the S2 can establish an additional defensive perimeter using the asset as a ground-based electro-optical sensor. The FA BN MCP and batteries can mount their assets on tall poles (anecdotally, the OE-254 post has been used although that is not its intended purpose) to serve as an "eye-in-the-sky." In the event of an enemy penetration of friendly defensive lines, the FA BN should utilize their collection platforms to identify enemy movements within the brigade rear area for its own protection and to keep the brigade's response maximally informed.

Practice #3: Targeting

The assistant S2 (AS2) is the FA BN S2 section's targeting officer and counter-fire officer.[5] This reference is misleading. By MTOE, no brigade combat team is allocated an AS2 billet. One could infer that the BN targeting officer or counter-fire officer would be best positioned to serve additionally as the FA BN AS2. This point of doctrine requires clarification.

ATP 3-09.23 makes this interesting claim despite no FA BN being assigned an AS2. The targeting officer needs to have three distinct points of contact at brigade to sufficiently inform brigade targeting efforts: the brigade intelligence support element (BISE), the brigade collection manager and the brigade Field Artillery intelligence officer (FAIO).

The most important role the FA BN S2 section plays in brigade targeting efforts is their refinement of the brigade S2's assessment of enemy position areas of artillery (PAA). The FA BN AS2 should come to a common understanding with the BISE on the assessment of enemy artillery tactics, artillery capabilities and vulnerabilities and the probable locations of enemy PAAs. Similarly, as an interested party in the counter-fire fight, the FA BN AS2 should normalize assessments of enemy radar position areas (RPA), sectors of search (SOS) and frequency bands, frequency ranges with the BISE.

The FA BN AS2 must also work with the brigade collection manager to ensure that the FA BN commander's chief concerns – enemy artillery, enemy weapons-locating radars (WLR) and HPTs – are addressed in the brigade IC plan. In particular, the FA BN AS2 should ensure that friendly WLRs are incorporated into the IC plan using cueing, cross-cueing and mixing. If possible, the FA BN commander's priority information requirements (PIR) should also be nested within the brigade commander's PIR to give better chances of answering those PIR since the organic FA BN collection assets are insufficient to address all the commander's PIR. The FA BN S2 can provide unique value to the brigade collection manager by ensuring that the brigade IC plan sufficiently pursues information that is essential for accurate target identification, target verification and combat assessment – all of which support the decide, detect, deliver, assess (D3A) targeting methodology.[6]

Lastly, the FA BN AS2 should provide input to the brigade FAIO regarding the brigade's HPTL, target selection standards (TSS) and target selection matrix (TSM).

5 ATP 3-09.23, *Field Artillery Cannon Battalion*, Headquarters, Department of the Army, Washington, D.C., 01 October 2023, para 1-49.

6 ATP 2-01, *Collection Management*, Headquarters, Department of the Army, Washington, D.C., 17 August 2021, para F-20.

Practice #4: Risk Management

FA BN S2 support to risk management falls under the intelligence warfighter's responsibility to support protection operations. Essential contributions the S2 section needs to make to the FA BN are:

Recommend survivability move criteria to the FA BN S3 and MCP jump schedules to the staff to mitigate enemy targeting operations. The single greatest threat the FA BN faces in Large Scale Combat Operations (LSCO) is counter-battery fire enabled by WLRs. Following enemy artillery fire, the S2 must also consider the threat posed by enemy rotary and fixed-wing air assets, unmanned aerial systems, special purpose forces (SPF) and operational security (OPSEC) compromise from non-hostile actors in the operational environment (e.g. civilians taking photos of FA BN PAAs and posting them online).

Ensure subordinate and supporting units are kept informed of the enemy situation.7 The action elements of the FA BN are its batteries and WLRs. Leaving the batteries in the dark regarding risks leaving the FA BN's most forward element unprepared to mitigate the risk contingent with LSCO. Ask the battery commanders about their decision points and provide the relevant inputs to those decision points. This provides battery commanders a greater ability to design an appropriate PAA defense plan. In a similar vein, the FA BN S2 should provide input to the creation of the WLR's cueing schedule to prevent the enemy from acquiring and exploiting their positions.

Practice #5: Knowledge Management

There are three essential events which occur in the knowledge management life cycle of the FA BN S2 section. First, the acquisition of existing knowledge at the beginning of the operation. Second, the creation and storage of new knowledge during the operation. Third, the long-term storage and assessment of knowledge at the end of the operation in preparation for the next mission. These phases apply to both digital (sharedrive, SharePoint, portal, email, messaging services) and analog repositories (maps, acetate sheets, printed products, trackers, event logs, chit sheets used for transmission within the MCP). Ask the following questions:

How is information stored?
When are information trackers updated?
Who updates information on running products?
What sources of information are considered credible?
Who needs to know?
How is information transmitted to those who need to know?
What information supports the commander's decision points?
What information would trigger the use of fires to prosecute targets?
What information would be worthy of follow-up collection (cueing, cross-cueing, mixing)?

Conclusion

The combined intent of all the above recommendations is to ensure the FA BN S2's relevance to the FA BN commander and staff but also to the larger collection and targeting efforts that the FA BN commander relies on and supports, respectively. It is common for S2s to know their explicit responsibilities to their commander and staff. It is much less common for S2s to understand how their work influences beyond their immediate commander and to the larger organization. As a channel for influence, there is perhaps no BN S2 for whom the integrating processes are more important than the FA BN S2.

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7 ATP 3-09.23, *Field Artillery Cannon Battalion*, Headquarters, Department of the Army, Washington, D.C., 01 October 2023, para 1-35.

Talent Management of Critically Short Military Occupational Specialties:

Observations of Current Processes and Recommendations for Change

CW4 Chris Ludwick – Field Artillery Warrant Officer Career Manager

Intro

Over the course of the last four years, the Army has made tremendous improvements to its personnel management systems and processes. Beginning with the introduction of the Army Talent Alignment Process (ATAP) in 2019, followed by the release of the Integrated Personnel and Pay System – Army (IPPS-A) in 2023. The total force has witnessed firsthand just how serious the Army has become about truly placing people at the forefront. No longer are officers and units forced to speculate on what's available to them. Thanks to ATAP, there is a collaborative environment from which to formulate educated decisions based on officer preferences and unit requirements.

Despite the numerous benefits of IPPS-A, it is ATAP that has had the largest impact on talent management and distribution. In its basic form, ATAP is a market-style hiring system that aligns officers and units based on preferences from both sides of the equation. The overwhelming benefit of this style of talent management is that it provides unprecedented levels of visibility to officers participating and searching for new employment and to units on the hunt for fresh talent. There will be more discussion of ATAPs structure later, but first, it's important to highlight the two components that make it effective: inventory and demand.

Assignment variety, one of ATAP's hallmark characteristics, only exists when the balance of officers participating matches a high percentage of known vacancies for a given Military Occupational Specialty (MOS) and grade. Put simply, job or assignment location diversity only occurs if there are enough personnel to fill more than just the Army's highest priorities. For many MOSs, the task of creating diversity through inventory availability is relatively easy for junior grades such as Warrant Officer One (WO1) and Chief Warrant Officer Two (CW2), making the ATAP market the ideal mechanism to distribute personnel. However, at senior grades, it is not.

The remainder of this article will narrow the personnel management aperture to focus specifically on the Field Artillery Technician, a warrant officer MOS deemed critically short based on current and projected available strength and overall demand from the operational Army. It will discuss in detail, this unique cohort and highlight several reasons to change the way we manage and distribute talent within the force, primarily for senior grades.

Background

For a young officer preparing for their first move, talent management pre-ATAP appeared very "fluid" from the outside looking in. One could say it was less structured and lacked the transparency of ATAP. Approximately nine months before reaching their Year/Month Available to Move (YMAV) they would have a simple, yet effective conversation with their career manager to discuss professional development needs and personal desires. This conversation typically ended with the career manager requesting a list of locations to which the officer and if applicable, their family, would be comfortable moving. The general assumption is that one of the locations provided aligned with both the needs of the Army and the officers wishes. If not, each side would go back to the drawing board to determine the best fit. Ultimately, the moving officer would receive orders to a new location and the cycle would begin all over again.

Talent Management in the 21st Century

From the onset, ATAP was highly effective at managing the distribution of Soldiers across the Army. Units were able to interview and select personnel from a pool of talent while warrant officers participating in the market had incredible insight and influence over their own careers. As we exited the wars in Iraq and Afghanistan, entering what many believed would be a period of relative peace and stability for the Army, the future of ATAP was bright.

Despite the overwhelming success, there is still something missing in terms of assignment variety, especially for those warrant officers who are part of specialties that are well below optimal strength. Personnel falling into this category tend to have fewer options based on the low inventory of personnel moving in each cycle. Unfortunately, they typically end up relocating from one high-tempo unit to the next with little time to conduct a personal or professional assessment of their career, compete for a broadening assignment and maybe most importantly, reconnect with family. To the Army's detriment, warrant officers finding themselves in a continuous cycle of fast-paced activity inevitably elect to retire and seek employment elsewhere.

Challenges

The term "burnt out" is commonly used to describe an individual's mental and physical state as it relates to their daily activities, work environment or personal life. For many mid and senior grade Field Artillery Technicians, this is a common reality. To get a better understanding of why it has such an impact, we must take a closer look at the basic characteristics of the group.

Most of the current Field Artillery CW3s and CW4s matured through the Army's enlisted ranks navigating the continual rotation of forces combatting terrorism around the world. They successfully completed numerous overseas assignments, extended training exercises and have largely put the needs of the unit above all else. In an effort to find a different perspective of the Army, they submit an application to become a warrant officer, are eventually selected and are placed right back into the fray as a brand new WO1. Outside of schooling and time for a brief move from one location to the next, they have done little to alter the rigorous pace experienced while serving as an Enlisted Soldier.

Warrant officers who've lost their drive or willingness to serve are becoming more common each day. It's not that they're underperformers or lack technical expertise; it's simply because they have reprioritized what they see as being most important. While making the decision to willingly depart the Army is a deeply personal choice, there are cascading effects that occur with the loss of each one. In this instance, their departure represents one less Soldier available to move which equates to fewer assignment options for those remaining and one more unit in need of the skills this MOS provides.

The Need for Change in Distribution Strategy

A low inventory of Officers participating in a market leading to a lack of diversity and assignment opportunity is a challenging problem to solve. However, one could suggest the realignment of all technical warrant officers, or at a minimum, those deemed critically short, to one cycle per year. The summer movement cycle is likely the best choice given the fact that many mid-career Officers have school aged children and prefer to move between academic years to lessen the burden on their families. Besides the obvious personal benefits, this approach would also ensure a decent balance of broadening and operational assignments from which to interview for since there would be an approximately 30% increase in the quantity of movers participating in the market. The downfall with this course of action is that it would force those families who prefer to move in the winter to adjust their plans, potentially increasing friction within their homes.

The second option could be described as a balanced merger of talent management processes. The Army could give career managers a bit more flexibility and allow them to blend current systems and practices with those in existence prior to ATAP. The basic premise is to permit career managers of understrength MOSs to receive a preference list of potential assignments from the Officers identified to move who are of the grade CW3 through CW5 and work to place them on assignment to one of those locations. The biggest friction here is that the gaining unit no longer gets a vote in who they receive. However, one of the largest benefits would be that the Army is once again placing a degree of career control in the hands of the officer and potentially giving them more input than they would have participating in a market with limited assignment options.

The third and final course of action is a bit more radical and the most likely to draw criticism. Nonetheless, it is worth consideration. With such high demand for quality warrant officers at senior grades in our most influential positions, the Field Artillery branch should research the possibility of establishing panels to determine which Officers fill each assignment. For example, the Field Artillery Commandant, with concurrence from Human Resources Command, could hold an annual selection panel to align talent to the highest priorities across the Army. Using a fraction of the information available to members of promotion selection boards, a small panel of senior Field Artillery leaders could determine "best fit" based on knowledge, skills and behaviors (KSB). Officers competing for positions under review of the panel would have their voices heard by submitting a preference sheet rank ordering the entirety of available options. The downside to this course of action is that it could appear as a "good-ole boy" system where Officers were being aligned to certain jobs based on their personal relationships instead of past performance or career progression.

Supporting this effort is the fact that over the past few years, the Army has slowly shifted from a brigade combat team (BCT) centric force to a pre-Global War on Terrorism (GWOT) structure where the division is the unit of action and focal point of operations in armed conflict. Inside most specialties, jobs are delineated by importance to the formation in which they operate and the doctrinal mission of the organization. For example, CW4 Field Artillery Technicians serving in the operational force at the two-star level, to include special operations and cyber, as the units senior Targeting Officer are of immense importance. They have a great deal of influence and responsibility to facilitate the targeting process on behalf of the commander and to conduct talent management of the Field Artillery Technicians residing in their subordinate units. Within the same field, corps, theater fires command or element and Multi-Domain Task Force Targeting Officers serve a similar role and require a highly talented senior CW4 or CW5 to ensure maximum efficiency. When looking at the MOS from a broadening or force generating perspective, positions such as the Field Artillery Proponent warrant officer, career manager and warrant officer Instruction Branch Course Manager require an equal degree of talent. The challenge in front of the Field Artillery Branch continues to be on-hand strength versus organizational need.

Conclusion

We know the Army has made tremendous strides in talent management and distribution and have developed systems that are very successful. However, we must continue to ask ourselves if it is enough and if we should have a "one size fits all" process regardless of on-hand strength of the MOS being managed. Regardless of the outcome, the ATAP market is highly effective in aligning talent to the right location at the right time for our healthy populations.

Despite its success, there should be another review of the techniques employed when volume does not exist. Ideally, the system is modified to provide a bit more flexibility while maintaining the strong, policy-based structure of current practices.

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