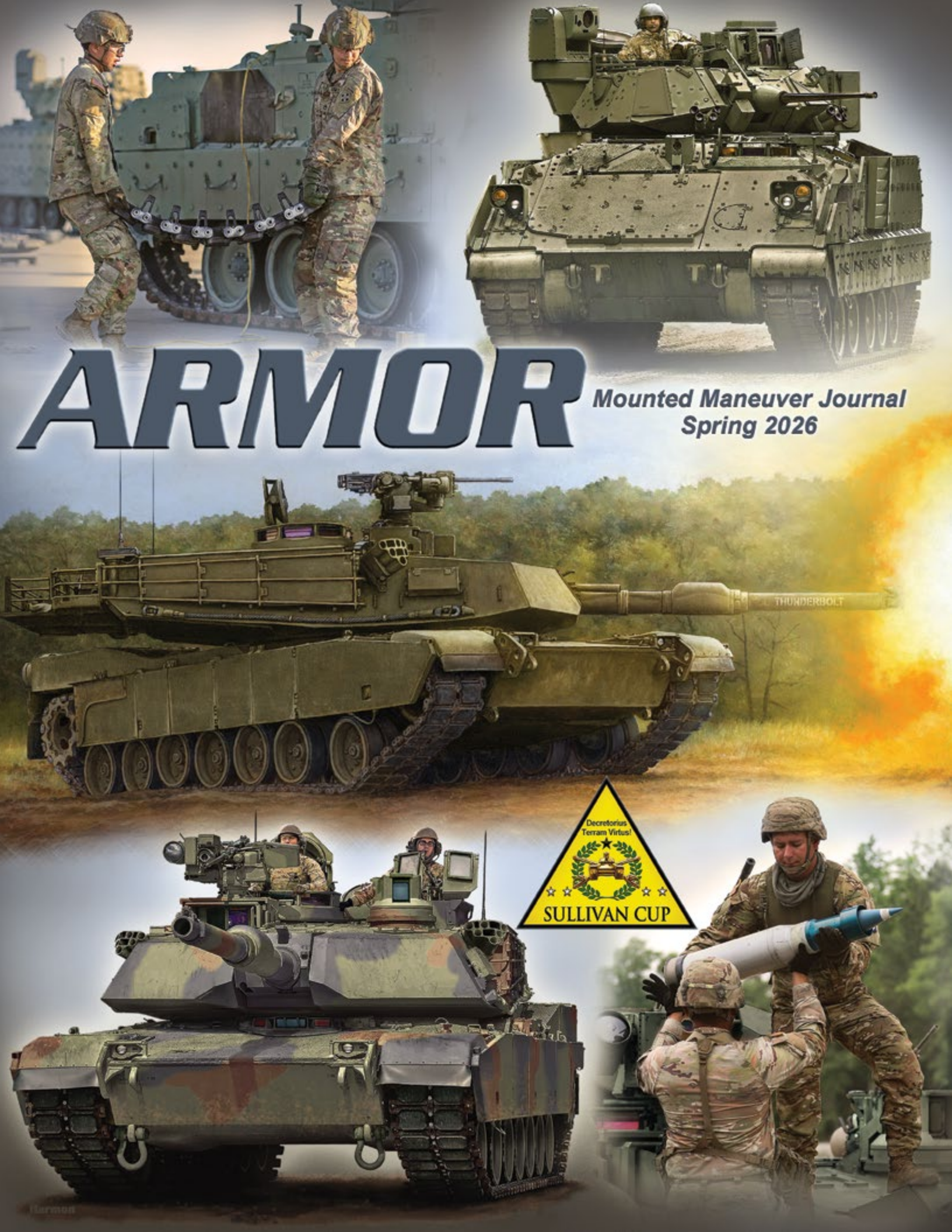
ARMOR
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Spring 2026
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ARMOR

The Professional Bulletin of the Armor Branch, Headquarters, Department of the Army, PB 17-26-1

ARMOR (ISSN 0004-2420) is published quarterly by the U.S. Army Armor School, McGinnis-Wickam Hall (Bldg. 4), Suite W141a, 1 Karker Street, Fort Benning, GA 31905.

Spring 2026, Vol. CXXXVIII, No. 1

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CHIEF OF ARMOR'S HATCH

BG Chad C. Chalfont
55th Chief of Armor

ATP 3-20.96, *Cavalry Squadron*, is Changing the Fight

In the next few months, we will publish the new edition of our ATP 3-20.96, *Cavalry Squadron*. This fighting manual represents a significant evolution in our cavalry doctrine, informed by what we are seeing in today's operational environment – and what we expect in tomorrow's. Simply put, the new doctrine anchors cavalry operations on its core missions to inform, protect, and fight for the main body. In this article, I will lay out where we have been, where we are going, and why it matters.

The *Cavalry Squadron* was last published in May 2016. While this might prompt us to ask, "why did we not update it sooner," I do not think that is the right question. A review of the 2016 manual shows us that our doctrine centers on reconnaissance and security as the two organizing principles for cavalry operations, and it is a great manual. So, I think the better question, is "why did we update the manual?"

Last year, four armored brigade combat team (ABCT) cavalry squadron commanders joined the Armor School and our doctrine team at Fort Benning for a week, where we collaborated on answering two questions: "does our cavalry doctrine need to change?" and "if it does, then how?" Their analysis accounted for the tenets and imperatives of operations, conducted in all domains and dimensions (see FM 3-0, *Operations*). The group considered the character of war through the lens of recent and current wars (new/emerging capabilities, persistent observation, and greater battlefield lethality and depth). Importantly, the team grappled with the problem of how to conduct manned ground reconnaissance and security against a capable, prepared, near-peer enemy.

Their answer to all of this was incisive. Instead of focusing our doctrine on what the cavalry squadron does (reconnaissance and security), they reoriented it to what the cavalry does for the main body. This unlocked a different way to view operations, rooted in both looking forward and looking back to military history. The new approach to our doctrine reinforces the fundamentals of reconnaissance and security and the tactics/techniques for accomplishing them. But the approach now doubles down on how the squadron fights for the main body. Two historical examples are what General Buford did for the Army of the Potomac July 1st, 1863 at Gettysburg and what 3-7 Cavalry did for the 3rd Infantry Division during the Thunder Run. So, at its core, the new manual describes how the cavalry squadron operates in three ways:

Inform – Information for the Main Body.

- The cavalry squadron drives understanding of the operational environment for the main body.
- The cavalry squadron develops the situation for the main body.
- The cavalry squadron enables commanders' decision making by gathering information and improving shared situational understanding for the main body.

Protect – Survivability of the Main Body.

- The cavalry squadron fights to protect the main body.
- The cavalry squadron conducts operations to prevent the main body from being surprised.
- The cavalry squadron fights to preserve the combat power of the main body.
- The cavalry squadron fights to gain/retain the initiative for the main body to allow it to dictate terms of battle against the enemy.

Fight – Mobility and Firepower for the Main Body.

- The cavalry squadron enables the main body to maintain tempo, allowing it to fight with speed and mass over time (momentum).
- The cavalry squadron fights to create

and exploit opportunities for the main body.

- The cavalry squadron fights to allow the main body to concentrate at the position and time that the commander chooses.
- The cavalry squadron enables the main body to execute transitions.

I believe our new *Cavalry Squadron* manual is coming at a great time for the Armor Force. The manual lays out how to fight the cavalry in ways that reflect the realities of the operational environment. It does so by using the foundational tactics and techniques that will be required whether we are fighting with the equipment we have today in our motorpools, or with the kit that we will field to our formations this decade. The shift from reconnaissance and security to inform, protect, and fight for the main body is important: it must inform how we train our units and develop our leaders moving forward. We are excited about the new ATP 3-20.96 and I would encourage every armor leader to read it.

In the pages of this edition of ***ARMOR*** Magazine there is more information on the *Cavalry Squadron* manual. We are excited for you all to read it upon final publication. In the meantime, I appreciate what all of you are doing to drive readiness and develop leaders in your formations. The Armor School is available to assist you in all that you do. If there is anything that we can do to help you, just holler!

FROM THE GUNNER'S SEAT

Forging the Future of Armor Leadership: Modernizing NCO PME

CSM Ryan W. Roush
Command Sergeant Major
U.S. Army Armor School

We are fundamentally reshaping how we train and educate our Armor non-commissioned fficers (NCOs). This article outlines the significant, positive changes coming to our Professional Military Education (PME). Our goal is to build more lethal, adaptive leaders while respecting your time and the critical needs of your formations.

Our modernization effort is guided by three core objectives:

1. **Reduce Course Duration:** We will significantly shorten the time leaders spend in PME, returning them to their units faster without sacrificing the quality of education.
2. **Specialize ALC:** We will create distinct and specialized Advanced Leader Courses (ALC) for 19C and 19K MOSs, moving away from the current combined course to provide more focused training.
3. **Refocus SLC:** In partnership with the MCoE, we will evolve the Maneuver Senior Leader Course (SLC) into two separate, tailored tracks: Armor and Infantry.

ALC Modernization: The Path Forward

Our transition begins with a 19D ALC pilot course in June 2026. This pilot is critical, as its lessons will directly inform the redesign of the 19C and 19K ALC curricula, which are scheduled for implementation in February 2027.

For the 19D ALC pilot, the course duration will be reduced from over six weeks to three weeks and five days, with no virtual or phased component. This significant reduction is made possible by increasing the course's focus and rigor. Through a deliberate analysis, we have refined the Individual Critical Task Lists (ICTLs) and will leverage detailed competency assessments to ensure every training event is purposeful and relevant to the demands of the modern battlefield.

The purpose of the 19D ALC is to provide Cavalry Scout NCOs with the leadership, tactical, and technical competencies required to lead squad and platoon-sized elements in reconnaissance and security operations. The course emphasizes mission planning, execution, and decision-making in support of the commander's information requirements and force protection.

This new structure builds upon prior operational experience to develop agile, adaptive leaders who directly contribute to mission success. We will use a modular approach to build proficiency sequentially:

Module A: Administration & Foundations: Complete all in-processing, readiness checks, and administrative requirements to begin training.

Module B: Combat Leadership: Develop the skills to lead an armored reconnaissance section/squad in complex environments.

Module C: Training Management: Master the ability to plan, prepare, execute, and assess individual and collective training to build unit readiness.

Module D: Sustainment Operations: Manage section/squad resupply, maintenance, recovery, and medical support in a contested environment.

Module E: Platform Mastery: Achieve technical and tactical expertise with reconnaissance weapons platforms and their advanced systems.

Module F: Threat Adaptation: Plan reconnaissance and security operations against a modern, multi-domain threat, including electronic warfare (EW) and cyber mitigation.

Module G: Tactical Application: Execute mission plans, adapt to a changing battlespace, and conduct consolidation through terrain board exercises and tactical exercises without troops (TEWTs).

The Way Ahead

This is an ongoing and transparent process. We will provide regular updates as we gather feedback from the 19D ALC pilot and finalize the future of 19C/K ALC and the new Armor SLC. We are committed to providing our NCOs with the most effective and relevant training to ensure we dominate on any battlefield.

Forge the Thunderbolt!

From Proficiency to Lethality:

The Framework for Continuous Improvement in Armored Crews

by SFC Chas D. Ward and SFC Kenneth L. Shelton

As leaders, we are often faced with the challenge of how to continuously improve a crew that has already achieved a high level of proficiency. When a crew has been together for over a year and consistently scores "distinguished" on all crew-level training tables, a dangerous period of stagnation can occur where after-action reviews (AARs) yield little substance for improvement. To counter this, leaders must evolve their training philosophy. The focus must shift from simply training for qualification to training for combat, a principle that applies to developing both highly experienced crews and new crews alike. By leveraging advanced simulation, implementing targeted challenges, and fostering stability, we can create a cycle of continuous improvement that forges the most lethal and proficient crews possible.

Evolving Training for Experienced Crews

To push an experienced crew beyond basic proficiency, we must first change how they measure success. During Crew Gunnery Tables IV-VI, evaluators should focus less on scoring and more on the combat-relevant metrics, such as the time from enemy exposure to engagement. If a crew waits until the last moment of a 50-second exposure to engage from a defensive position, we must question if the action is tactically sound or simply a method to guarantee a high score. As stated in Training Circular (TC) 3-20.31-25, *Gunnery: Bradley Fighting Vehicle*, "Proper evaluation and assessment of crew performance is key to improving individual and crew skills prior to moving to collective live-fire events." AARs for these crews should dissect tactical decision-making, scanning techniques, and target acquisition speed, framing the conversation around what would be most effective in actual combat. As of now, AARs during simulations tend to focus on "open time", "close time", and time spent in the defilade. These matrices are applicable to the grading process but do not focus on combat effectiveness. The doctrine reinforces that it would be advantageous for units to track metrics such as "time to fire," "time to kill," "scanning techniques," "exposure time", and "engagement techniques" to identify where to apply additional training effort. This change in mindset ensures that training directly contributes to a higher level of proficiency and a better outcome during collective-level events.

Maximizing Lethality Through Advanced Simulation

Conduct of Fire Trainer - Situational Awareness (COFT-SA) and other simulators are a critical, yet often underutilized, asset for advanced training. After a crew qualifies on Table VI, they should maintain a minimum of four hours per month in the simulator. These hours spent in the simulator are not just to repeat gate to live-fire (GTLF) nor to train for a better score within the simulator. AAR comments from live-fire exercises (LFXs) can be a great starting point for less experienced crews to choose exercises that directly relate to past behaviors. For experienced crews, TC 3-20.31-25 advises that "the unit should develop or utilize more challenging scenarios within the system to maintain crew proficiency." This consistent practice provides significant advantages. A crew maintaining this regimen by utilizing the combat-focused tables (401-421) will conduct approximately 1,920 digital engagements over a month, compared to the 160 engagements the same crew would see while conducting two gunneries in a year. This massive increase in repetitions—totaling a potential 2,080 engagements when combined with live-fire—builds deep institutional knowledge and streamlines future training requirements, allowing crews to proceed directly to the GTLF exercise; saving valuable time during high-operation tempo calendar weeks (T-6 to T week).

Developing New Crews and Remediating Underperformers

The foundation of an expert crew begins with stability and time. As

outlined in TC 3-20.31-25, effective crew management, which starts the moment a Soldier arrives at the unit, is paramount. TC 3-20.31-25 further specifies that to "best manage crew turbulence when establishing crew rosters, the commander and staff consider" a process of identifying, assessing, and assigning personnel. A key part of this is ensuring that "Vehicle commander (VC)/gunner combinations are selected together. This maximizes the key leader's longevity and future proficiency ratings in a more stable manner." Pairing key leaders to maximize their time together builds the communication and cohesion necessary for high performance. Furthermore, new crews must be allotted sufficient time to master foundational skills during Gunnery Skills Test (GST) training and simulations, without being rushed. This investment in time during prerequisite tables produces higher success rates and greater comfort with the platform. For crews that struggle, commanders can utilize *"Table B: Basic Skills Engagements"* to provide on-demand, remedial training. Although this requires ammunition outside of standard authorizations, it is a vital tool for elevating a potential Q2 or Q3 crew to a Q1 standard, thereby strengthening the unit's overall lethality.

Implementing Advanced Challenges and Fostering Competition

To truly test the mastery of top-tier crews, leaders should integrate challenges that go beyond standard qualification tables. This includes creating detection drills with peripheral targets, small threats, and artificial obscurants. Furthermore, *"Table C: Complex Engagements"* is an existing tool designed for this purpose. According to TC 3-20.31-25, "Table C provides a series of live-fire engagements to showcase a unit's experienced crews on a Bradley Fighting Vehicle (BFV), demonstrate their mastery of their profession, and to demonstrate their lethality in a rigorous, competitive course of fire." This table serves as an excellent framework for internal competitions, such as "Top Gun" or Sullivan Cup selections, creating a competitive environment that pushes the best crews to further hone their skills and demonstrate true mastery of their platform.

Conclusion

Leaders' responsibility to the Armor community extends beyond meeting qualification standards. We must actively cultivate lethality by using every asset at our disposal. For our new crews, it means providing the time and stability necessary to build a strong foundation for future success. For our experienced crews, this means shifting the focus of AARs to combat effectiveness, maximizing advanced simulator capabilities, and introducing complex challenges. While these efforts may demand additional time and resources, the goal must be to create the most proficient and lethal crews possible, ensuring our forces are prepared for the rigors of combat.

Sergeant First Class Chas Ward is a Gunnery Team Chief at the Bradley Master Gunner School at Fort Benning, GA. His previous assignments include serving as Division Main Battle NCO, Division Master Gunner, and Battalion Master Gunner for the 101st Airborne Division at Fort Campbell, KY, and as Squad Leader for the 3rd Battalion, 21st Infantry Regiment at Fort Wainwright, AK. A graduate of the Bradley Master Gunner School, the Maneuver Senior Leaders Course, and the Tactical Information Operations Planner Course, his awards include the Meritorious Service Medal, Special Army Interrogator Badge, Master Gunner Identification Badge, four Army Commendation Medals, and three Army Achievement Medals.

Sergeant First Class Kenneth Shelton is a Bradley Master Gunner Instructor with N Troop, 3-16 Cavalry at Fort Benning, GA. His previous assignments include serving as Squadron Master Gunner and Platoon Sergeant for 5-7 Cavalry, 1ABCT, 3ID at Fort Stewart, GA, and as an OC/T and Battalion Master Gunner for 3-362 Armor Battalion, 5th Armor Brigade at Fort Bliss, TX. His military education includes the Bradley Master Gunner School, Battle Staff NCO Course, Common Faculty Development Instructor Course, and the Maneuver Senior Leaders Course. He holds an associate of science in firearms technology from Sonoran Desert Institute. His awards include seven Army Commendation Medals, six Army Achievement Medals, seven Army Good Conduct Medals, the Iraq Campaign Medal with three combat stars, the Global War on Terrorism Service Medal, the Korea Defense Service Medal, the Armed Forces Reserve Component Achievement Medal, the Army Service Ribbon, the Overseas Service Ribbon (numeral 5), the Master Gunner Identification Badge, and the Basic Army Instructor Badge.

Secretary of the Army, Hon. Dan Driscoll, fires a 25mm cannon from an M3A2 Bradley Fighting Vehicle while visiting Fort Stewart, GA., June 23, 2025. *(U.S. Army photo by Sgt. David Resnick)*

Data Overload: Observations on Data and Mission Command from JMRC

by LTC Jordan Bradford, MAJ Edwin den Harder, and COL CJ Kirkpatrick

Data has become a cornerstone of decision making in modern military operations. As the complexity and speed of operations increases, commanders and staff must navigate an ever-growing stream of information to make timely, informed, and effective decisions. The ability to interpret, analyze, and apply data has transformed from a technical specialty to a critical skill set for leaders at all levels.[1]

"Many intelligence reports in war are contradictory; even more are false, and most are uncertain."[2]

For military staffs, the challenge of managing data is not a new phenomenon, but the scale and complexity of this problem continues to grow. Every technological innovation, from new unmanned aerial system (UAS) platforms to the proliferation of digital chat applications down to the team level, creates a new data stream. Flattened information sharing brings in more intelligence, surveillance, and reconnaissance (ISR) feeds, signals intelligence (SIGINT) data and electronic warfare (EW) reports. Each stream brings with it a new requirement for tracking, employment, and communication. Additionally, many of these systems have limited or no interoperability. The resulting volume of data at the tactical level creates a paradox: instead of clarifying the battlefield, it regularly overwhelms leaders and command posts (CPs), causing them to miss key information. Observations from the Joint Multinational Readiness Center (JMRC) indicate that brigade and battalion staff consistently struggle to exercise effective command and control (C2) precisely because of this data overload.

As a Combat Training Center (CTC), JMRC puts brigade and battalion commanders and staff under the increased cognitive load of simultaneous planning and executing of operations across multiple time horizons against a thinking, realistic opposing force (OPFOR). Major trends that contribute to data overload in this environment include CPs that struggle to balance survivability and functionality, a lack of data management standard operating procedures/tactics, techniques, and procedures (SOPs/TTPs), a focus on system management at the expense of analysis, and a lack of system interoperability. Two additional factors exacerbate the issue of data overload: the reduction in size of brigade and battalion staffs and the movement of the brigade's Military Intelligence Company (MICO) personnel to the divisional echelon.

The resulting impact on C2 is not "analysis paralysis," but a failure to recognize critical information in the stream of less crucial data, the loss of precious time to managing a disparate variety of systems, and an unclear common operating picture (COP). Unable to understand, visualize, describe, direct, lead, and assess (UVDDLA) as effectively, commanders and staff cannot take advantage of fleeting opportunities or mitigate the risks caused by unexpected enemy actions. This article not only describes the problem and its contributing factors as observed at JMRC but provides best practices to help brigade and battalion commanders and staffs address this challenge.

The Problem: When Data Hinders Rather Than Helps

A decade ago, brigade combat teams (BCTs) confronted fewer individual pieces of data, often governed by mission command system capabilities, collection capabilities, and data transport network bandwidth. By way of analogy, BCTs used to face the challenge of putting together a 100-piece puzzle of a dog. The quality of the image was not great, but with a relatively small number of pieces and limited work putting it together, one could rapidly identify that it was a dog. Today the challenge equates to a highly detailed 10,000-piece puzzle of that same dog. The picture quality is amazing when

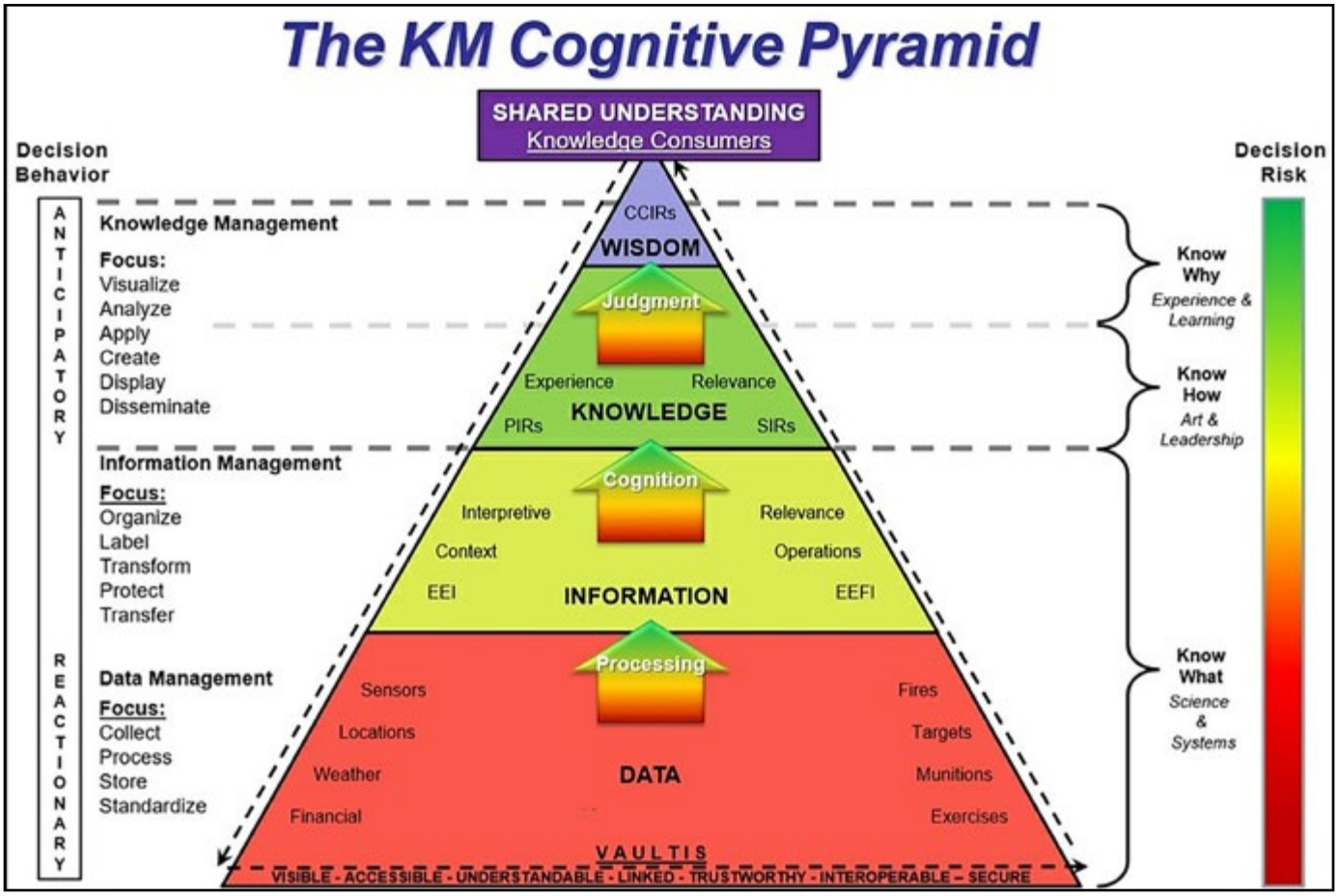


Figure 1. A representation of the Data, Information, Knowledge, Wisdom (DKIW) Pyramid. *(Photo courtesy of Wikipedia Commons)*

the puzzle is finished - but the pieces are tiny and you need thousands of them to recognize that the puzzle is a picture of a dog. Additionally, the work required to organize all those tiny pieces is greater.

As opposed to the past, where commanders and their staff often struggled with a lack of data, the contemporary challenge is processing, understanding, and acting upon a massive influx of data. Much of the data received at a CTC is seldom converted into a structured or usable form, which increases decision risk and presents an unclear picture for commanders (See Figure 1).

A major contributor to this issue is the sheer volume of data received at the tactical level: ISR feeds, SIGINT data, EW reports, and digital chat-based reporting that often extends down to team level generate a tidal wave of data. With multiple units moving, receiving different forms of contact, and taking losses, this situation quickly leads to the generation of dozens of individual digital reports in a short period of time that compete for the attention of those monitoring the C2 systems. Although generally perceived as a positive development, flattened communications across multiple echelons can dramatically increase the cognitive burden on leaders. In the most dramatic example witnessed at JMRC, one company commander received about 18,000 messages across multiple tactical chat groups over the course of a training rotation. This poses the dilemma where leaders must either read or ignore these messages.

This constant stream of unfiltered and unstructured data leads to cognitive overload and the loss or lack of recognition of critical information. When a staff member is sifting through hundreds of chat messages, it is easy to miss a report that answers a priority intelligence requirement (PIR) or friendly force information requirement (FFIR), validates a key planning assumption, or indicates that the OPFOR is executing a different course of action (COA). When staff officers and noncommissioned officers (NCOs) must manage a variety of disparate systems, this consumes precious time and mental energy. The lack of integration between mission command systems means that staff often spend an inordinate amount of their time simply trying to get information from one system to another and onto their COP. This is time they cannot spend conducting analysis, synchronizing the fight, delivering lethal and timely fires, or anticipating the commander's next decision point.

Trends

At JMRC, the data overload problem is formation-agnostic. In the past 18 months, mobile BCTs (MBCTs), Stryker BCTs (SBCTs), and armored BCTs (ABCTs) all grappled with balancing CP functionality and survivability, doctrinal gaps, training challenges, and technological/systemic issues that contribute to data overload. Equally noteworthy is that in the same period, no two

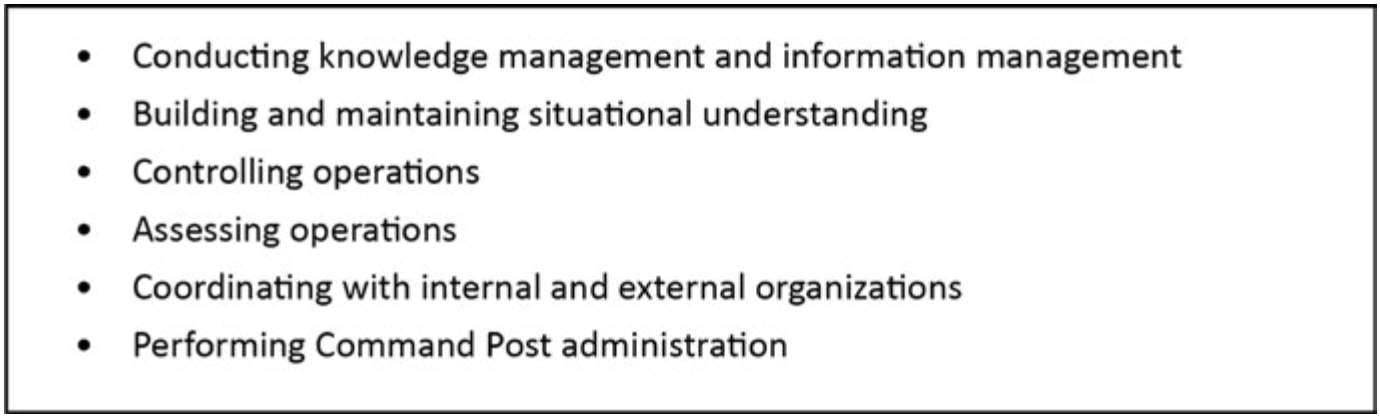


Figure 2. Six functions of a Command Post.

brigades operated with the same primary C2 systems, primary, alternate, contingency, and emergency (PACE) plans, and the number and composition of their CPs. This is not a negative situation, as commanders are encouraged to test new concepts and configurations, but suggests that doctrine has not caught up with innovation.

Commanders are rightfully concerned with the survivability of their command posts, as large, static, and easily targetable main CPs (MCPs) are a liability on the modern battlefield. This has led to a trend in smaller, more mobile, and more dispersed CP configurations. However, training units often struggle to balance CP functionality versus survivability. While observations from the Nagorno-Karabakh and Russo-Ukrainian wars clearly indicate the need for dispersed CPs with low visible and electromagnetic (EM) signatures, simply reducing the size of CPs without critical analysis of functionality leads to issues.[3] The pressure to reduce size of CPs often leads to the loss of critical capabilities and redundancies as members of the staff and their systems are dispersed. This, in turn, can result in an inability to execute the six functions of a CP (see Figure 2) during extended periods of high-tempo operations.

The lack of established and rehearsed SOPs and TTPs for digital information management is another leading contributor to data overload. Without these products or validation of processes through the staff training tables laid out in Training Circular (TC) 6-0.2, *Training the Command and Control Warfighting Function for Battalions and Brigades*, staff members attempt to establish product formats, reporting procedures, and knowledge management processes during military decision-making process (MDMP) or while in contact. Without prior familiarity and rehearsal, these attempts often induce more confusion than they alleviate and contribute to further cognitive overload.

Another observed trend is that training prior to JMRC rotations focuses on technical proficiency with systems, not the cognitive skills to analyze and manage the data they produce. Pressed for time during rotations, junior leaders and staff at echelon feel the temptation to pass raw data quickly rather than taking the time to analyze it and provide structured staff estimates or recommendations. This behavior leads to "stovepipes" by warfighting function as attendees do not provide the necessary inputs to integrating processes such as the targeting meeting or operations synchronization meeting (OPSYNCH). It also turns the commander into an action officer, pulling them away from their primary role. The result is a desynchronized fight with assets committed in the wrong location, attritted early, or failing to achieve their desired effects.

Additionally, garrison and home-station training provide insufficient "reps and sets" for staff to operate under conditions of sustained information saturation. A CP exercise (CPX) in garrison might involve a handful of simulated reports each hour, not the massive volume of accurate, inaccurate, and partial reports from organic and attached units that characterize the contemporary operating environment. It is not until a CTC rotation that units experience the full cognitive load of simultaneously planning and executing operations across multiple time horizons, meaning units must build systems at home station capable of handling larger than expected volumes of data.

Two years ago, working with multinational forces posed the only major interoperability challenges United States units faced. These challenges continue to grow as liaison officers (LNOs) now require more systems to ensure allies and partners remain integrated, but the problem is no longer isolated to multinational units. Given the partial fielding of a variety of mobile ad hoc networks (MANET), mobile user objective systems (MUOS), and the continued transformation to a modular, extensible, singular and open architecture under Next Generation Command and Control (NGC2), United States brigades now encounter interoperability challenges with adjacent brigades, aviation task forces, and their higher headquarters. Particularly for non-divisional units and rotational brigades not operating under their organic headquarters, communication systems interoperability must remain a key discussion. The issue is also experienced internal to a brigade, with direct reporting specialty companies and attachments that do not have a battalion headquarters over them experiencing it most acutely. Secure but unclassified – encrypted (SBU-E) networking alleviates some of these interoperability problems, but create new operational security (OPSEC) challenges at the tactical edge for the enemy to exploit.

Systems that are not integrated and do not communicate require "swivel chairs" or black box cross-domain

solutions at echelon. While the manual movement of data between C2 systems is certainly not new to anyone who ever took a radio transmission and typed it into their Joint Battle Command-Platform (JBCP), the amount of data now requiring a "swivel chair" increases the demand on the most precious commodity of radio telephone operators (RTOs), battle captains, staffs, and commanders – their time. It is also a source of human error and often creates duplicate requirements – such as the plotting of icons on multiple digital systems. Each system has its own interface, its own login requirements, and its own training requirements. The staff officer becomes a systems integrator by default, a role that they are often not fully trained or equipped to perform. Thus, systems fielded to help reduce staff workload are frequently the key contributors to the cognitive overload experienced in CPs.

None of these problems are new. An alphabet soup of transitions in our past (FBCB2, BFT, JCR, WIN-T, CPOF, CPCE) have created similar data overloaded BCTs and interoperability frustrations. Many of the TTPs we used in the past to overcome the avalanche of data still apply – we just have to develop, inculcate, and enforce basic discipline and knowledge management practices.

Best Practices

The best practices to many of our current digital challenges can be found in long-standing, analog-era formats and procedures. The first step is to enforce ruthless discipline in communication.

Establish and adhere to a 4-channel PACE Plan. RTUs are most successful when they establish a brigade 4-channel PACE (command, operations and intelligence (O&I), fires, and administrative and logistics (A&L)) and clearly delineate what traffic goes in each channel. Defined PACE should also include transport, as a PACE is not functional when everything uses the same transport layer. Units must define the PACE and rehearse it at distance to ensure full functionality. Leaders must immediately address any attempts to create separate or extra channels outside of the established 4-channel PACE, as messages on extraneous chats can quickly turn a brigade's orderly communication channels into something more akin to the unstructured chats we all often encounter on our personal devices. Particularly for digital chats, limiting attendees to only those that need access also helps keep communications channels streamlined and provides a forcing function for the filtering and analysis of data.

Use concise, standardized reports. Enforcing the use of concise, standardized formats in all digital reporting, especially in chat rooms, can dramatically cut down on unnecessary verbiage and make information easier to process quickly. Reporting formats like the SALUTE (size, activity, location, unit, time, equipment), SALT-W (size, activity, location, time, and what you are doing about it) and logistics status (LOGSTAT) help structure data and are also codified in doctrine to facilitate commonality in reporting.[4]

Focus Reporting on PIR and FFIR tied to COAs and Decisive Points. The commander's PIR and FFIR must drive information collection and reporting. Staff must constantly ask, "Does this help the commander make a decision?" and provide the filter to help the commander. When a PIR or FFIR is answered, simple processes like highlighting the chat message in a different color can ensure this critical information does not get buried by less crucial data.

Develop and enforce SOPs. Every brigade must develop, publish, and enforce a detailed SOP for information and knowledge management (KM) that governs how the formation communicates. This SOP should clearly define: 1.) Chat channel rules of engagement (ROE): Which chat rooms are for what purpose? Who is authorized to be in them? What are the rules for formatting messages? How are we identifying critical information that must not get lost between routine reports? 2.) The flow of information: The SOP should map out how a piece of data - for example, a contact report from a scout or ISR asset - is processed by the staff. Who receives it? Who logs it? Who analyzes it? Who is responsible for placing it on the COP? Establishing and rehearsing the SOP is essential to providing structure and setting expectations for communication across the organization.

Designing CPs. Rather than using the size of the CP as the first criterion, leaders should first establish the essential capabilities (personnel and systems) each command node must possess to meet its primary requirements. Once this occurs, it becomes much easier to reduce the size of command nodes without sacrificing functionality.

Embrace Automation: AI and Bot Integration. As AI integration into mission command systems continues to develop, brigades can leverage existing AI models to automate low-level tasks. Simple software bots or scripts can be programmed to monitor chat rooms for keywords related to PIR. When the bot detects a keyword, it can automatically highlight the text and send an alert to a specific channel, ensuring that potentially critical information gets immediate attention. This frees soldiers from the time-consuming task of reading every single message and allows them to focus their attention on analysis and prediction. One recent success at JMRC involved a brigade developing and employing an AI bot to assist with intelligence analysis. This bot parsed large amounts of data from the brigade internal O&I chats and provided estimates and recommendations on potential enemy COAs. While building and training this bot required a great deal of initial effort, it enabled a brigade S2 shop to rapidly identify key information and make assessments to the brigade commander.

Assume the "Swivel Chair" Burden: If a manual "swivel chair" between two systems is unavoidable, the highest echelon possible should execute that function. The higher headquarters, with its larger staff and greater resources, is generally better postured to absorb this friction than subordinate staffs. Observations indicate that pushing this burden down to lower echelons, particularly from the brigade to the battalion level, results in loss of information as subordinate elements do not have the personnel or system density to execute the swivel chair quickly enough while conducting their own operations.

"As communication technology has improved, so has the demand for information at the headquarters level. When these demands from headquarters are not synchronized with the work ongoing in units that are engaged in battle, the communication process itself can reduce battle effectiveness by diverting leader attention and by adding stress to an already overstressed situation."

The Way Forward

Brigades and battalions cannot solve the data overload problem on their own. Divisions and corps have a critical role to play and a responsibility to their subordinate units. Higher headquarters must establish a clear, nonnegotiable standard for how their subordinate brigades will communicate and share data. They must dictate the primary systems and reporting formats to solve the potential brigade-to-brigade interoperability challenges. Furthermore, if a division dictates a standard, it must also provide the necessary resources - the equipment/software, the training, and the field service representatives - to enable it.

Leaders at echelon should also take heed of this warning from a 1997 report: "As communication technology has improved, so has the demand for information at the headquarters level. When these demands from headquarters are not synchronized with the work ongoing in units that are engaged in battle, the communication process itself can reduce battle effectiveness by diverting leader attention and by adding stress to an already overstressed situation."[5] Through frank conversations to address shortcomings and set clear expectations, leaders can mitigate this risk and address the challenge of data overload.

Data management is certainly not a new problem and is inherent in the nature of war. Commanders must always balance analysis and decision making with time available. New C2 systems and AI have the potential to enable better-informed decisions. We may be on the cusp of moving past "the general unreliability of all information present(ing) a special problem in war: all action takes place…in the twilight, which, like fog or moonlight, often tends to make things seem grotesque and larger than they really are."[6] In the meantime, care must be taken to ensure these tools serve as a solution for data management, not another contributor to the problem.

Lieutenant Colonel Jordan Bradford currently serves as the Senior Brigade Trainer at the Joint Multinational Readiness Center (JMRC). He previously served as the Commander for Headquarters and Headquarters Battalion, V Corps. LTC Bradford's previous key roles include Brigade Executive Officer (XO) for 316th Cavalry Brigade and 199th Infantry Brigade at Fort Benning, GA; Battalion XO and S3 for 3-15 Infantry in 2nd Armored Brigade, 3rd Infantry Division at Fort Stewart, Georgia; and Division planner in 3rd Infantry Division. He is a graduate of the Intermediate Level Education at the Command and General Staff College and holds masters of art from the School of Advanced Military Studies and Webster University.

Major Edwin den Harder currently serves as the Brigade Executive Officer Observer, Coach, Trainer (XO OCT) at the Joint Multinational Readiness Center (JMRC) in Hohenfels, Germany. His previous key roles include serving as the Brigade Operations Officer Observer, Coach, Trainer (XO OCT) at JMRC, the Brigade S3 for 3rd Armored Brigade Combat Team, 1st Armored Division at Fort Bliss, Texas and the Battalion S3 for 4th Battalion, 6th Infantry Regiment, also at Fort Bliss. He is a graduate of the Intermediate Level Education at the Command and General Staff College and holds a master of art and a doctorate in History from Ohio State University.

Colonel CJ Kirkpatrick currently serves as the Commander of Operations-Group, Joint Multinational Readiness Center (JMRC) in Hohenfels, Germany. Prior to this assignment, he commanded the 2nd Armored Brigade Combat-Team, 1st Cavalry Division at Fort Hood, Texas. Colonel Kirkpatrick's previouskey roles include serving as the J3 for NATO Rapid Deployable Corps Türkiye in Istanbul, Türkiye, and as the G3 for 7th Infantry Division at Joint BaseLewis-McChord, Washington. He also commanded 4th Squadron, 3rd Cavalry Regiment at Fort Hood, Texas.

NOTES

1 Center for Army Lessons Learned, Commander and Staff Guide to Data Literacy (Fort Leavenworth, KS: Center for Army Lessons Learned, April 2025), i.

2 Carl v. Clausewitz, On War, ed. And trans. M. Howard and P. Paret (Princeton, NJ: Princeton University Press), 117.

3 LTG Milford Beagle, BG Jason C. Slider, and LTC Matthew R. Arrol, "The Graveyard of Command Posts: What Chornobaivka Should Teach Us about Command and Control in Large-Scale Combat Operations," Military Review (May-June 2023): 10-24. John F. Antal, 7 Seconds to Die: A Military Analysis of the Second Nagorno-Karabakh War and the Future of Warfighting (Casemate, 2022).

4 U.S. Department of the Army, Field Manual No. 6-99, U.S. Army Report and Message Formats (May 2021).

5 National Academies of Sciences, Engineering, and Medicine. Tactical Display for Soldiers: Human Factors Considerations (Washington, DC: The National Academies Press, 1997) https://doi.org/10.17226/4169.

6 Clausewitz, 140.

Winning the First Fight:

Modernizing Armor and Cavalry Doctrine

by MCOE Directorate of Collective Training and Doctrine (DCTD)

As the Army continues its path towards the most holistic modernization effort in recent history, the Maneuver Center of Excellence (MCOE) is aggressively updating doctrine and training products to ensure our formations can see, understand, and act faster than any peer adversary. A key tenet of this effort is the recognition that doctrine must be grounded in reality. While modernization efforts look toward the next decade, the DCTD remains focused on providing the tactics and techniques required for the Army of today to win with the equipment currently available in the arms room.

Cavalry Squadron: Reframing the Purpose

The revision of army techniques publication (ATP) 3-20.96, *Cavalry Squadron*, marks a significant shift in how we employ the eyes and ears of the brigade combat team (BCT). Moving away from the 2018 version, the new doctrine clarifies that reconnaissance and security are methods, not the sole purpose.

The Reframed Purpose: The squadron exists to inform, protect, and fight for the main body. This distinction empowers commanders to employ the squadron across a broader range of missions, emphasizing its role in supporting commanders at echelon.

Reintroducing the Offense and Defense: After two decades of focus on stability operations, we have reintroduced specific techniques for the squadron to conduct offensive and defensive tasks. The manual now details the unique planning and execution considerations for these missions in a high-intensity, multi-domain environment.

Dominating the EMS and Airspace: Lessons from global conflicts have made it clear that a squadron cannot survive without mastering the electromagnetic spectrum (EMS) and small unmanned aircraft systems (sUAS). The draft addresses:

- sUAS employment at echelon to enable combined arms maneuver in a contested environment.
- Counter-UAS (C-UAS) and electronic warfare (EW) terminology and protection.
- Integration of electromagnetic support and attack capabilities.
- Command and control (C2) integration, sustainment, and airspace management for high-density sUAS environments.

Aerial Overmatch: ATP 3-90.51 (sUAS)

To address the reality of persistent observation, DCTD is developing ATP 3-90.51, *Employment of Small Unmanned Aircraft Systems (sUAS)*. This manual is not a futuristic concept; it is a practical guide for integrating the sUAS platforms currently assigned to our formations.

Recent observations from combat training centers (CTCs) and operational environments reinforce that the formation that sees first, understands first, and acts first maintains the advantage. ATP 3-90.51 supports maneuver battle positions by providing standardized tactics, techniques, and procedures (TTPs) that integrate aerial reconnaissance directly into platoon, company, and squadron operations. By extending the "eyes" of the formation beyond the line of sight, sUAS allows maneuver leaders to confirm obstacle effects and detect enemy reconnaissance before physical contact is made. This preserves combat power and ensures the formation maintains the initiative during complex transitions like relief in place or passage of lines.

The Future Force: Armored Strike and TiC 2.0

Along with previously mentioned doctrine, the modernization of ATP 3-20.98, *Scout Platoon,* and ATP 3-90.5,

Combined Arms Battalion, is being informed by real-world data. We are incorporating Transformation in Contact (TiC) 2.0 lessons learned from 1st Cavalry Division's NTC 26-02 and will observe the 3rd Infantry Division's NTC 26-08 as it further informs Army senior leader decisions on the structure of armored brigade combat teams (ABCTs) in the summer of 2026.

Looking further ahead, ATP 3-90.55, *Armored Strike Platoon,* will serve as the blueprint for robotic integration and human-machine teaming (HMT). Following the force design update (FDU), this publication will focus on enhancing security operations to provide maneuver commanders decision time and space while economizing manned combat power to be placed critical points of friction.

Lethality: The C92 Series and Platform-Specific TCs

Coming out of the III Corps lethality studies, the Weapons and Gunnery Branch overhauled platform gunnery manuals. The C92 series of articles published in 2025 highlighted this transition toward platform-specific manuals like Training Circular (TC) 3-20.31-120, *Gunnery: Heavy Tank*. This shift prioritizes:

Tactical Relevance: Ensuring the way we plan, prepare, execute, and assess gunnery is rooted in the modern battlefield.

The Kill Chain: Standardized tower prompts are now synchronized with the Direct Fire Kill Chain.

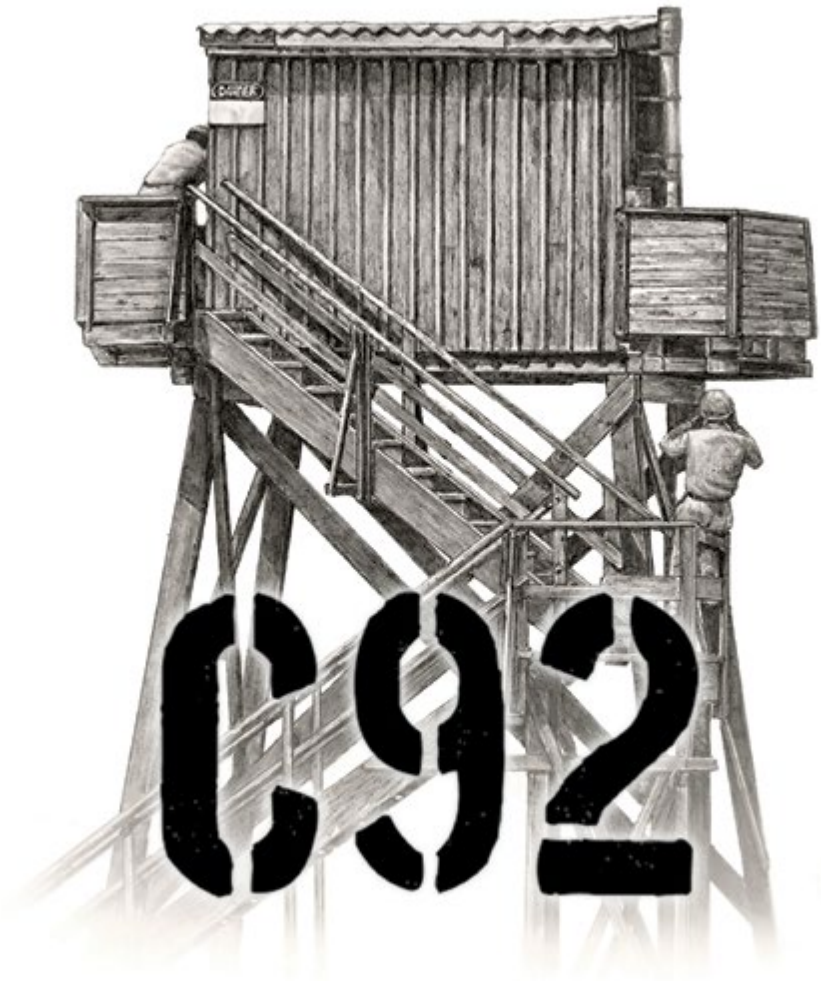
Outcome-Based Scoring: The new model prioritizes target destruction and "speed and violence of action" over minor administrative errors.

Developing Mastery: Three new TCs were published in 2025 with an additional six currently under development covering advanced topics such as platform fire control systems, range determination, gun tube technology, and ballistics. The goal is to provide every crew member with the information typically held at the Master Gunner level and sharpen atrophied skills across the formation.

A Call for Feedback: Fighting with the Tools at Hand

Doctrine is a living conversation between the schoolhouse and the motor pool. It is not intended to be a static wish list for future technology, but a manual for how the "Combat Arm of Decision" survives, fights, and wins with the tools currently available.

While formal input is gathered via the Army Doctrine Development Tool (ADDT), we invite the operational force to review published and draft products and provide candid feedback based on your experiences in the dirt. Your input ensures our doctrine remains relevant to the Soldier in the turret today. Through MCOE and Armor School leadership, units should expect to receive draft doctrine and handbooks to take into the field and provide feedback on to ensure doctrine is moving at the speed of change.



What Would You Do ?

ARMOR **magazine is excited to announce the restart of our "What Would You Do?" column, where we provide you with a scenario to challenge your tactical judgement skills. Each Spring issue of ARMOR magazine will contain a prompt with different tactical scenarios. The Fall issue will contain a selection of the responses received from readers as well as input from the Maneuver Captain's Career Course, Chief of Tactics. The information provided in these columns is designed in a way to allow for use during Leader Professional Development (LPD) sessions. To be clear, there are no right answers. The intent is to facilitate discussion among the community.**

SCENARIO. You are an armor company commander tasked to seize and hold a road-and-rail chokepoint that anchors the battalion's axis through a rolling agricultural valley with scattered villages, woodlots, and metal-sided farm infrastructure. Battalion reports frequent first-person-view (FPV) drone strikes, loitering munitions probing logistics nodes, and bursts of GPS degradation. Your company team is reinforced with a mounted infantry platoon with mortar team support, a small electronic warfare (EW) support detachment, two counter-small unmanned aerial systems (C-sUAS), and a loitering munition section. Battalion can provide limited short-range air defense overwatch in windows, but not continuously.

Enemy forces include a reconnaissance troop equipped with Dongfeng CSK 131 armored reconnaissance vehicles and UAS capabilities active during the previous 24 hours; enemy 9M133 Kornet anti-tank guided missiles (ATGM) have been fired from tree lines and upper stories along the valley floor; tank platoon equipped with Type 99A2 main battle tanks (MBTs) to the east. The enemy's ability to find, fix, and strike is enabled by drones, rapid targeting, and spot jamming. The forces fight using doctrine as described in ATP 7-100.3, *Chinese Tactics*.

MISSION. Armor company team seizes OBJ FORD NLT first light +2 hours IOT deny enemy access to the Battalion's axis of advance. O/O be prepared for enemy counter attack.

Commander's Intent: Broad purpose is to Deny enemy ability to consolidate gains and mass combat power in AO. Key tasks include rapidly seize terrain, deny enemy ATGM engagement area, posture to defeat enemy counter attack through zone, and prepare for follow-on missions.

Conditions representing the endstate: OBJ FORD free from enemy control, enemy unable to influeince friendly forces, collateral damage to infrastructure minimized.

TASK. Review the scenario, read and understand the mission, then provide your response. Using the notional operational graphic in Figure 1, frame the problem, define your company team approach and create an operational concept to secure the chokepoint. Be sure to consider the mission, enemy, terrain, troops, time, and civil considerations (METT-TC). Consider and describe how you would employ sUAS, loitering munitions, EW capabilities, and combined arms integration to seize and hold the chokepoint against a drone-enabled enemy. Be creative in your approach, but ensure all responses are anchored in the appropriate doctrine.

Responses should be between 500-750 words and submitted as a .docx (MS Word) file no later than 15 JUL 26 to

usarmy.benning.cac.mbx.armor-magazine@army.mil.

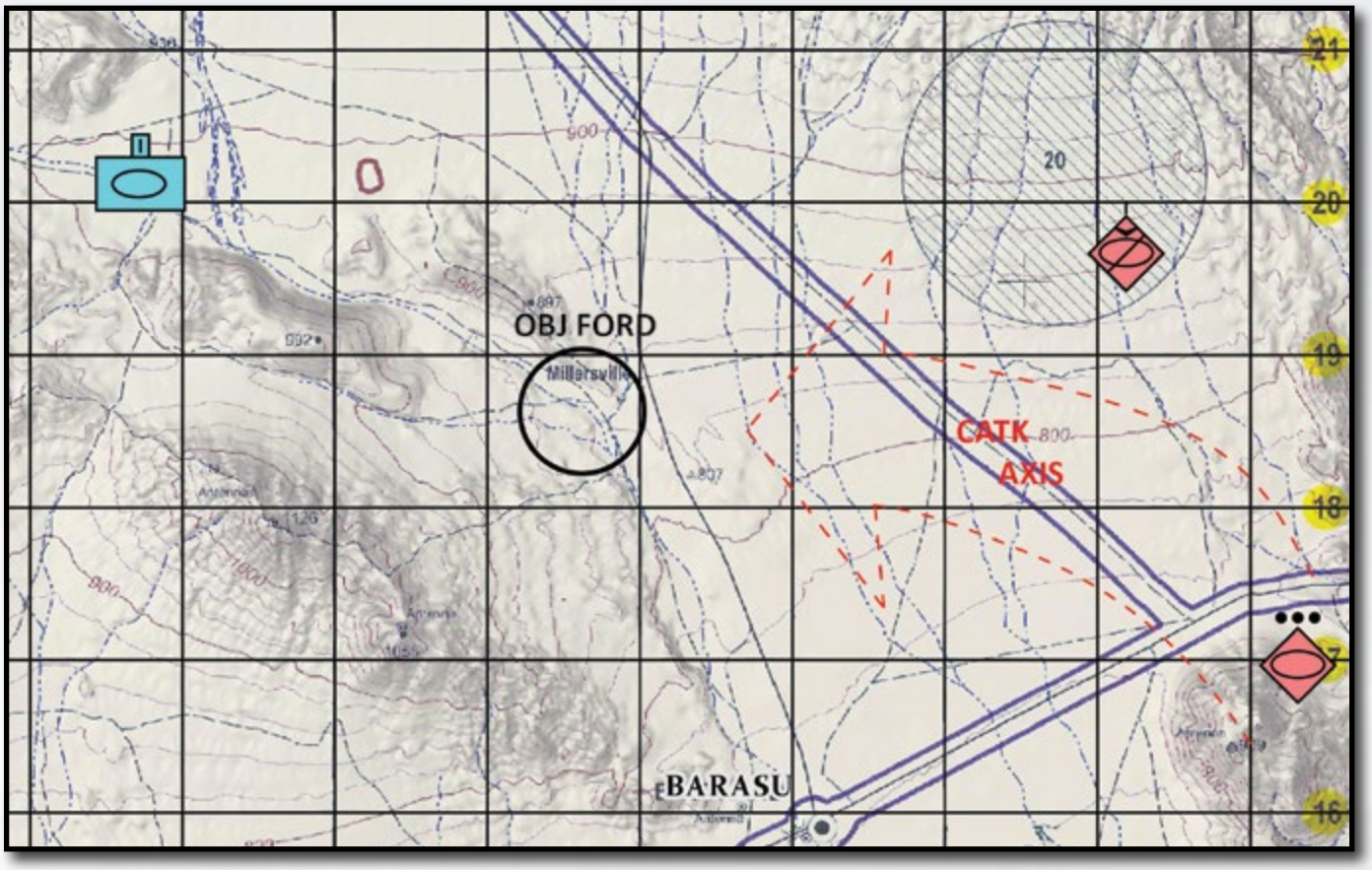


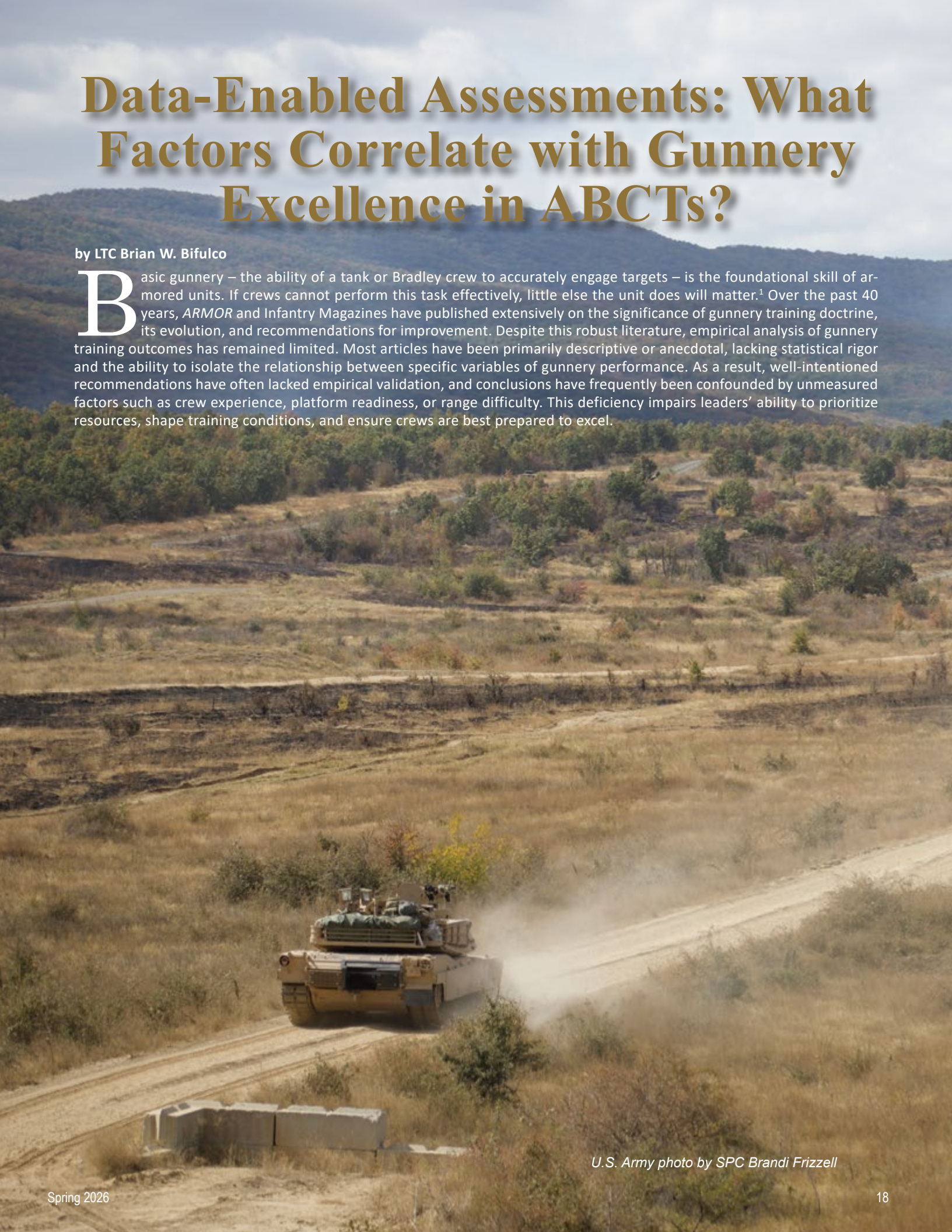
Figure 1. Notional operational graphics for use in tactical scenario.

We want to know, What Would You Do?

Data-Enabled Assessments: What Factors Correlate with Gunnery Excellence in ABCTs?

by LTC Brian W. Bifulco

Basic gunnery – the ability of a tank or Bradley crew to accurately engage targets – is the foundational skill of armored units. If crews cannot perform this task effectively, little else the unit does will matter.[1] Over the past 40 years, *ARMOR* and Infantry Magazines have published extensively on the significance of gunnery training doctrine, its evolution, and recommendations for improvement. Despite this robust literature, empirical analysis of gunnery training outcomes has remained limited. Most articles have been primarily descriptive or anecdotal, lacking statistical rigor and the ability to isolate the relationship between specific variables of gunnery performance. As a result, well-intentioned recommendations have often lacked empirical validation, and conclusions have frequently been confounded by unmeasured factors such as crew experience, platform readiness, or range difficulty. This deficiency impairs leaders' ability to prioritize resources, shape training conditions, and ensure crews are best prepared to excel.



U.S. Army photo by SPC Brandi Frizzell

	Bradleys					Tanks				
	(1) 4-9 CAV (SQDN)	(2) 1-5 CAV (IN CAB)	(3) 1-8 CAV (AR CAB)	(4) 1-9 CAV (AR CAB)	(5) 2ABCT (Total)	(6) 4-9 CAV (SQDN)	(7) 1-5 CAV (IN CAB)	(8) 1-8 CAV (AR CAB)	(9) 1-9 CAV (AR CAB)	(10) 2ABCT (Total)
Qualification Type										
% Distinguished	13.9	50.0	50.0	21.1	32.0	42.9	26.7	22.2	48.1	34.9
% Superior	27.8	18.8	25.0	36.8	26.2	7.1	33.3	33.3	14.8	22.9
% Qual. (Q1)	33.3	21.9	25.0	36.8	29.1	42.9	20.0	22.2	37.0	30.1
% Qual. (Q2)	25.0	9.4	0.0	5.3	12.6	7.1	20.0	22.2	0.0	12.0
Qualified Engagements (first attempt)										
Table III	7.6 (2.3)	8.9 (1.0)	9.8 (0.4)		8.5 (1.9)	8.7 (1.2)	8.0 (1.1)	8.6 (1.1)		8.4 (1.1)
Table IV	4.8 (3.6)	5.3 (2.4)	5.8 (2.5)		5.2 (3.0)	5.1 (2.0)	5.4 (1.5)	6.7 (2.0)		5.9 (2.0)
Table V	4.3 (2.8)	7.4 (1.7)	5.7 (2.5)		5.8 (2.7)	4.1 (1.3)	5.1 (1.4)	6.0 (1.9)		5.2 (1.8)
Table VI	7.3 (1.6)	8.4 (1.6)	8.6 (1.2)	7.8 (1.0)	7.9 (1.5)	7.9 (1.4)	8.1 (1.6)	7.6 (1.5)	8.3 (1.2)	8.0 (1.4)
Overall Score (first attempt)										
Table III	862 (73)	892 (82)	953 (29)		891 (78)	875 (64)	849 (48)	870 (61)		865 (59)
Table IV	689 (200)	658 (169)	588 (221)		655 (193)	585 (173)	647 (124)	653 (235)		632 (189)
Table V	560 (168)	805 (107)	621 (232)		666 (196)	570 (108)	643 (105)	607 (193)		607 (149)
Table VI	773 (125)	871 (98)	899 (55)	821 (81)	832 (111)	849 (88)	840 (104)	800 (106)	871 (70)	839 (95)
N	36	32	16	19	103	14	15	27	27	83

Table 1. Crew Performance - Proportions and Means (Standard Deviations)

In "A Data-Centric Approach to Increasing Crew Lethality: Proposing 'Moneyball for Gunnery,'" the authors begin to address this deficiency by employing statistical modeling to identify factors that may wield outsized influence on gunnery outcomes for Stryker-mounted machine guns and grenade launchers.[2] They find that Table III performance and unit culture strongly correlate with Table VI outcomes for these weapon systems. Our analysis innovates on this approach in three key ways. First, we extend similar statistical modeling techniques to focus on tanks and Bradleys; second, we include the complete gunnery table progression in our analysis; third, and most importantly, we expand the set of predictors to include factors that can be influenced by leaders from company to division and installation level.

Doing so provides data-informed insights that enable leaders at echelon to set conditions more effectively for gunnery excellence. Crucially, this analysis focuses on factors that transcend specific training regimens, ensuring relevance as the Army continues to reform and standardize gunnery training programs. In this way, the research buttresses ongoing initiatives such as Transformation in Contact (TiC) and gunnery readiness level (RL) progression to ensure our tank and Bradley crews are best prepared to win every future fight.

A Review of Gunnery Results and Data Collection

Table 1 shows the results of 2d Brigade Combat Team (Black Jack), 1st Cavalry Division's gunnery results, decomposed by battalion and platform, conducted from January to May 2025 at Fort Hood for all available tank and Bradley crews. Black Jack achieved first-attempt qualification (Q1) for 88.0% of tank crews and 87.4% of Bradley crews, with average Table VI scores of 839 for tanks and 832 for Bradleys.

As a TiC-designated brigade, Black Jack has focused on fielding new equipment and implementing novel concepts to inform the Army's continuing transformation of armored brigade combat teams (ABCTs). As part of this effort, Black Jack seized an opportunity during its gunnery qualification to undertake an ambitious data collection effort. This effort enabled a detailed analysis to pinpoint the underlying factors that contribute to readiness, assess their relative importance, and ultimately provide leaders with actionable recommendations for improving crew lethality.

From official Army systems, we compiled individual-level data on crewmembers, including Armed Services Vocational Aptitude Battery (ASVAB) composite scores, time in position, time in service, age, and whether they were suspended from favorable personnel actions ("flagged"). We complemented this with data we felt were relevant to training outcomes but were not available in existing Army data stores, including time since last gunnery qualification attempt, number of previous qualification attempts, results

of most recent qualification attempts, whether the individual was part of multiple crews (e.g., "jump" crews), hours spent in the simulator, and performance during gunnery skills testing (GST). Finally, we augmented individual-level data with unit-level data at the platoon, company, and battalion level, including retention performance and the number of assigned Troopers, flagged Troopers, non-commissioned officers (NCOs), master gunners (by platform type), and mechanics (by platform type). This consolidated data set provided an invaluable source of detail to identify what factors have outsized influence on tank and Bradley crew performance.

Modeling Performance: Turning Conjecture and Data into Actionable Insights

To evaluate the determinants of gunnery performance, we estimate two statistical models using regression. Regression is a statistical method to identify how changes in one factor are associated with changes in another, while holding other factors constant. This makes it a powerful tool for isolating which factors may have the greatest impact on outcomes and helping leaders make assessments that are based on evidence rather than opinion or speculation. Not all relationships identified by regression are strong or reliable. Correlations that are not statistically significant are more likely to be due to chance rather than a true relationship. To determine statistical significance, regression uses a measure called a p-value. A small p-value (commonly below 0.10) suggests that the relationship reflects a meaningful underlying correlation.

The first model, the Table Model, aligns closely with the prior research in "Moneyball for Gunnery" and isolates the predictive value of the gunnery table progression itself. The second, the Factors Model, expands the analysis to include individual-level, unit-level, and environmental factors that are more readily influenced by leaders at echelon. Each model is estimated using both linear and logistic regression, depending on the outcome of interest. We focus on two outcomes: a crew's overall Table VI score, which reflects a crew's ability to demonstrate any degree of proficiency, and a classification of whether a crew achieved Q1 qualification or not, reflecting a crew's ability to survive in combat.

Table 2: Table VI Outcomes (Table Model)

Note: The asterisks and pound sign indicate the level of statistical significance. Results with neither an asterisk nor a pound sign are not statistically significant. The numbers in parentheses are the standard errors used to calculate statistical significance.

	(1) Total Score	(2) Prob(Q1)
Table V Score	0.107 (0.057)	0.000 (0.000)
Table IV Score	0.083 (0.049)	0.000*** (0.000)
Table III Score	0.131 (0.078)	0.000 (0.001)
Table II (Simulator Hours)	-5.485* (1.597)	-0.018** (0.007)
Table I (# of First-Time Gos)	2.005 (1.743)	0.007# (0.005)
Retention % (CO)	1.482# (0.672)	0.003# (0.002)
Tank (*Base:* Bradley)	-33.528 (31.930)	-0.095*** (0.023)
N	139	139
	$p <$: # 0.2, * 0.1, ** 0.05, *** 0.01	

Table Model

"Moneyball for Gunnery" models Stryker Table VI scores as a function of practice table scores (Tables III through V), weather conditions, and unit culture. Building on this approach, our Table Model similarly includes practice table scores, but it also includes performance measures for Table I (number of first-time passes at GST stations) and Table II (number of hours in the simulator) to fully capture the complete doctrinal training progression. We proxy unit culture with company-level retention percentage, which serves as a plausible surrogate for organizational cohesion and leadership climate. We omit weather conditions as weather variation was minimal during the training window and tank and Bradley platforms – unlike Strykers – use advanced fire control systems that mitigate some weather effects through automated ballistic corrections. Table 2 reports the results.

Column (1): Total Score. In this column, the numbers are the change in Table VI score corresponding to a one-increment increase in the listed variable. For example, each additional percentage point that a company achieves in its retention mission corresponds to a 1.5-point increase in the Table VI scores for each crew in that company, on average. This finding is consistent with "Moneyball for Gunnery" that unit culture positively correlates with gunnery performance. Although difficult to quantify directly, retention rates may serve as indirect indicators of cohesion, professionalism, and command climate – factors that plausibly influence gunnery outcomes. Leaders may be able to better identify crews that are at risk if they observe wide variations in unit-level retention performance.

Column (2): Qualification Probability (Q1). We next examine the probability of qualifying Q1 using a logistic regression. In this column, the numbers are the percentage point changes (in decimal form) of qualifying Q1 due to a

	(1) Total Score	(2) Prob(Q1)	(3) Prob(Sup./Dist.)
Personal Characteristics			
Average ASVAB Score	1.416***	0.001	0.005**
	(0.514)	(0.002)	(0.002)
Tank (*Base: Bradley*)	-46.511**	-0.205***	-0.058
	(18.327)	(0.074)	(0.092)
Skill Factors			
Master Gunner	16.103		0.087
	(30.160)		(0.188)
Previous Sup./Dist.	38.395**		0.214**
	(18.669)		(0.098)
Experience Factors			
First Attempt	-26.557#	-0.138**	0.028
	(17.763)	(0.055)	(0.083)
# of Previous Attempts	3.052*	0.006	0.013#
	(1.645)	(0.007)	(0.008)
Environmental Factors			
# of Master Gunners (BN)	4.334	0.011	0.013
	(3.669)	(0.016)	(0.019)
# of Mechanics (BN)	3.723**	0.019***	0.001
	(1.566)	(0.007)	(0.008)
Retention % (CO)	0.637#	0.003#	0.005**
	(0.450)	(0.002)	(0.002)
Flagged % (CO)	-0.187	-0.013#	-0.008#
	(1.284)	(0.008)	(0.006)
# of NCOs (PLT)	8.160*	0.010	0.044**
	(4.202)	(0.018)	(0.018)
N	139	139	139
			$p <$: # 0.2, * 0.1, ** 0.05, *** 0.01

Table 3: Table VI Outcomes (Factors Model)

Note: The asterisks and pound sign indicate the level of statistical significance. Results with neither an asterisk nor a pound sign are not statistically significant. The numbers in parentheses are the standard errors used to calculate statistical significance.

one-increment increase in the listed variable. For example, every additional Table I GST station passed by a crewmember on the first attempt corresponds to a 0.7% increase in the probability of that crew achieving a Q1 qualification. This underscores the foundational role of individual-level proficiency and hands-on skills training in determining final gunnery outcomes. Battalion-level leaders should strongly consider centralizing training and testing of gunnery skills to ensure each crewmember is meeting rigorously-enforced performance standards before proceeding with the remaining training progression.

Platform type is also statistically significant. Tank crews are 9.5% less likely to qualify Q1 than their Bradley counterparts. This may be due to tanks having larger crews or more complicated engagements, such as the simultaneous engagement that requires striking targets with three different weapons systems. Tank companies should strongly consider pre-Table IV live fire training that focuses on machine gun-specific marksmanship and crew coordination for complex engagements.

Despite some statistically significant relationships, the Table Model provides limited insight into factors that drive crew lethality and therefore provides leaders with limited options to improve gunnery performance. The Factors Model addresses the shortcomings of the Table Model.

Factors Model

Gunnery performance may vary considerably due to differences in individual, unit, or environmental characteristics – factors that can be shaped by leaders at echelon before training commences. The Factors Model incorporates these sources of variation and offers relevant insights to better position subordinate units for success.

Table VI performance is modeled as a function of personal characteristics, previously demonstrated skill, gunnery experience, and the training environment. Table 3, Column (1) reports changes in overall Table VI scores, Column (2) reports changes in the probability (in decimal form) of qualifying Q1, and Column (3) reports changes in the probability (in decimal form) of qualifying at least Superior.

Personal Characteristics. Higher cognitive aptitude, as measured by the composite ASVAB score, is positively associated with performance. A one-point increase in the average ASVAB score between the vehicle commander (VC) and gunner is associated with a 1.4-point increase in that crew's Table VI score and a 0.5% increase in the

probability of qualifying at least Superior. A higher cognitive aptitude may better enable rapid mastery of platform complexity, troubleshooting under stress, and adapting quickly during live-fire scenarios. Often, units have allocated incoming personnel primarily by balancing military occupational specialty and rank across their subordinate units. However, these results suggest additional gunnery gains can be realized by tracking, allocating, and balancing incoming personnel by cognitive potential (through ASVAB scores, civilian education, certifications, or even language proficiency) as well.

Skill Factors. A crew that has previously demonstrated a high degree of proficiency is likely to continue doing so. A crew where either the VC or gunner has previously shot at least Superior scores 38.4 points higher on Table VI and is 21.4% more likely to do so again. Notably, if either the VC or gunner is master-gunner qualified or has previously shot at least Superior, then that crew qualified Q1 100% of the time.

Experience Factors. Inexperience substantially correlates with degraded performance. Crews with either a first-time VC or gunner score 26.6 points lower on Table VI and are 13.8% less likely to qualify Q1 relative to their experienced peers. Further, each additional Table VI attempt the VC and gunner have taken in their careers corresponds to 3.1-point increase on Table VI and 1.3% increase in the probability of qualifying at least Superior.

Environmental Factors. Organizational metrics strongly correlate with gunnery outcomes. Mechanics have a significant correlation with gunnery scores. Each additional mechanic in a battalion corresponds with a 3.7-point increase in Table VI scores and a 2.6% increase in the probability of qualifying Q1. A deficit of mechanics may reduce platform availability for training and increase the time crews spend on maintenance rather than gunnery preparation, training, and rest.

Similarly, the number of flagged Troopers in a unit correlates negatively with performance. Each additional percentage point of a company that is flagged corresponds to a 2.1% reduction in the probability of that company's crews qualifying Q1 and a 0.8% reduction in the probability of qualifying at least Superior. This effect likely operates through two mechanisms: reduced individual motivation and increased leader demands due to administrative burdens associated with misconduct management (e.g., counseling, legal processes, inspections, appointments, etc.). For those flagged Troopers pending separation, leaders can reduce these additional demands by surging legal services at key times to accelerate resolution of these cases and promote more focused attention on foundational training events.

NCOs are essential to coaching, validating training, and enforcing

Table 4: A Bradley Fighting Vehicle from B Co., 3rd Battalion, 15th Infantry Regiment, 2nd Armored Brigade Combat Team, fires at a target during gunnery at Fort Stewart, Ga., Aug. 14. *(U.S. Army Photo by SPC Jordyn Worshek)*

discipline and accountability throughout the training progression. Each additional NCO in a platoon corresponds to that platoon's crews scoring 8.2 points higher on Table VI and improves the probability of qualifying at least Superior by 4.4%. Leaders and strength managers often prioritize fill of Troopers in concert with a deployment cycle, with a unit being the priority to receive Troopers as it approaches a deployment and then deprioritized as it approaches the end of its deployment. NCO shortages have a disproportionate impact on training outcomes that will likely continue to propagate throughout the remainder of a unit's collective training progression. These results suggest that prioritization of fill may be better organized around when units are conducting foundational skill training, such as crew gunnery, regardless of the unit's placement in a deployment timeline.

Predicting Performance and Customizing Training

The Factors Model is valuable not only for understanding the drivers of crew lethality but also for providing insight to where additional training interventions may be warranted. All predictor variables in the Factors Model are known prior to the start of training, allowing leaders to assess qualification risk before a crew even begins the training progression. A natural question is how accurately the model predicts subsequent performance. Using model-predicted probabilities, we classify crews as Q1 if their predicted probability to qualify Q1 is greater than 50% and as Q2 if their predicted probability is less than 50%. Based on this threshold, the model correctly classifies crews – as Q1 or Q2 – 87% of the time. In other words, leaders can predict – nearly nine times out of 10 – which crews are most at risk of not qualifying on the first attempt before training begins.

Further incorporating Table I and Table II results raises the probability of correct classification to 93% providing leaders with an accurate assessment of which crews are prepared to continue on to live-fire training. This has immediate utility for company and battalion-level leaders. When resources such as range time, targeted coaching, simulator availability, remedial training, and competing non-gunnery requirements must be prioritized, the model serves as an additional analytic tool – complementing leaders' experience, intuition, and instinct – to ensure resource and training efforts are both targeted and customized for each crew to produce the greatest effect.

Conclusions and Recommendations

Individual, experiential, organizational, and environmental factors have a significant relationship with gunnery performance among tank and Bradley crews. Higher cognitive aptitude, previously-demonstrated gunnery skill, number of previous Table VI attempts, unit culture, and the number of NCOs and mechanics on hand has a positive and significant correlation with gunnery performance. The percentage of flagged Troopers and crews with first-time VCs or gunners correlate with degraded performance.

These results also provide actionable insights that leaders at echelon can leverage to maximize gunnery performance and crew lethality. Further, they underscore that Table VI success is the result of not only fidelity to a specific training regimen and its associated performance standards, but also a myriad of factors controlled or influenced at echelons from company to division and installation. It also demonstrates how robust data collection efforts, statistical modeling, and machine algorithms can converge to unlock novel insights and anticipate future performance. By integrating personnel data, unit characteristics, and environmental considerations into gunnery performance modeling, leaders can significantly influence crew lethality and training outcomes.

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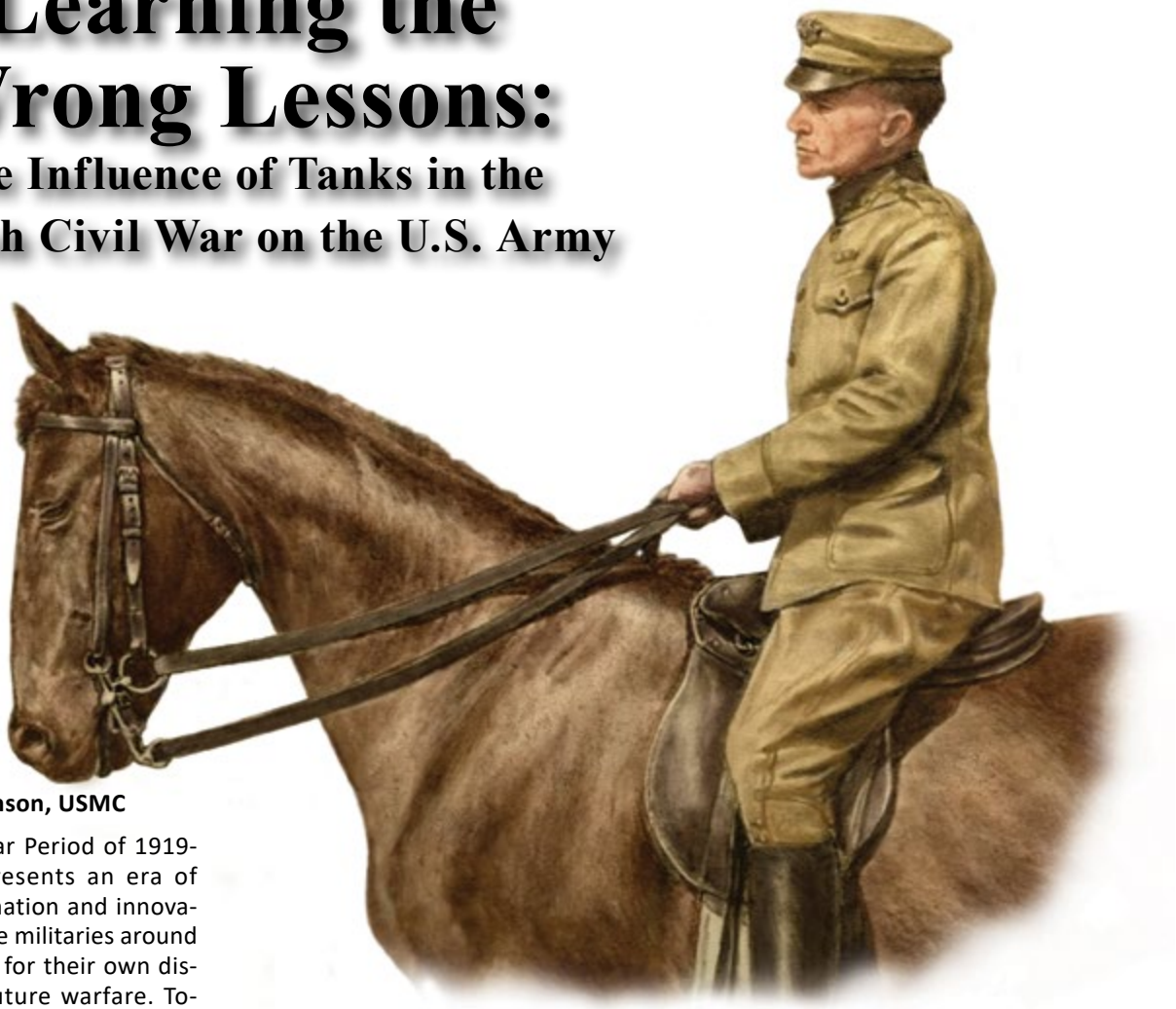
Learning the Wrong Lessons:

The Influence of Tanks in the Spanish Civil War on the U.S. Army



by Maj Michael Hanson, USMC

The Interwar Period of 1919-1939 represents an era of both stagnation and innovation, where militaries around the world prepared for their own disparate visions of future warfare. Towards the end of this period, the Spanish Civil War offered a glimpse of the nature of future combat, and several nations used it as a laboratory to test equipment and ideas that would inform how they should fight in the next great conflict. Germany, Italy, and the Soviet Union all sent advisors and equipment to Spain, ultimately a proxy conflict between their competing ideologies. Other countries, such as the United States, sent observers and studied reports detailing the combat. Despite this great opportunity, the United States Army drew the wrong conclusions in tank employment from the Spanish Civil War. These incorrect conclusions stunted the development of tanks and armored doctrine in the U.S. Army, leaving the American Army less prepared for the war that would come than the Germans who came away from Spain with better conclusions on the employment of armor. This paper will examine the lessons of armored employment in the Spanish Civil War and trace where U.S. Army thought diverged from the conclusions of the Germans.

Conventional wisdom recalls that, since its introduction during the First World War, the tank has been universally known as the decisive weapon of combat on land. However, this simple narrative misremembers history. A clearer memory would grant the tank this honor only after the success of the German blitzkriegs during the Second World War. The period between the world wars witnessed great, and sometimes bitter, debates between theorists in the armies of Great Britain, France, Germany, the Soviet Union, and the United States about the role of the tank in future combat.[1] These debates generally represented two schools of thought. The first saw the role of the tank largely unchanged from how it was employed during the First World War, as a direct support weapon to the infantry, a moving heavy weapons platform to reduce enemy strongpoints and enable the infantry's advance.[2] The other school saw the tank as a vehicle capable of independent action, a weapon that could penetrate the front line and drive deep beyond, wreaking havoc in the enemy's rear.[3] The U.S. Army counted proponents of both schools within its ranks, though disciples of the first school would dominate some of the highest positions of the Army even after the start of World War II.

During the interwar period, however, a vigorous debate occurred between the two camps, informed by theoretical writing, observations of other militaries, and testing of concepts and equipment in official experiments. Where each camp agreed though, was that the design of tanks had evolved since the First World War. During that war, tanks were large and slow, offering easy targets to defending artillery employed in direct fire mode.[4]

Interwar theory and experimentation in the U.S. Army up until the mid-1930's had settled on lighter tanks, which though lightly armored, possessed great speed and maneuverability. American theorists believed superior mobility would offer tanks the protection they needed against enemy fire.[5]

When civil war broke out in Spain, the U.S. Army watched closely and continued its internal discussion. Reports from Spain soon contradicted the assertions put forth by American tank theorists. According to CPT Hayden Sears, "It had been conclusively demonstrated that the lightly armored, high-speed tank was of …. no value against an organized position, …. In fact, in all cases where Russian tanks had engaged German and Italian tanks, the heavier armor and armament of the Russians had made them superior. Power, heavier armor, and armament had come forward as decisive qualities, rather than excessive speed."[6]

These comments reflected the physical characteristics of individual tanks, namely their armament, armor, and speed. The employment of tanks as units produced similar criticisms, namely that because tanks in such cases, as described by CPT Sears, had not been employed in mass but largely individually or in small groups, this method of employment allowed opposing anti-tank gunners to focus their fires on few or even lone tanks.[7] Likewise, the U.S. Army concluded that anti-tank guns would serve an outsized role in future combat, and placed its importance ahead of that of the tank.[8]

These thoughts held stock at the highest echelons of the Army by such influential leaders as the former Chief of the Infantry and then Military Attache to Spain MG Stephen Fuqua, then Chief of the Infantry MG George Lynch, and even then, Chief of Staff of the Army GEN Malin Craig. MG Fuqua's view was that "tanks did not prove themselves in separate offensive operations because they were effectively challenged by anti-tank weapons."[9] Fuqua was supported in his view by British and French associates who, "concluded their only value was in support of the attacking infantry."[10] MG Lynch expressed similar sentiments, believing the "accepted use of tanks had been largely discredited" by the Spanish Civil War.[11] Lynch declared, "The infantry tank has just one primary mission: the neutralization of machine guns…. It has paid for itself if it succeeds in eliminating this obstacle to the rifleman's advance." MG Lynch's conclusion was that "the tank is a powerful auxiliary."[12]

Informed by such perspectives of high-ranking officers, GEN Malin Craig, offered the conclusion of the U.S. Army's observation of the performance of tanks in Spain in testimony to a congressional subcommittee. He related that, "tanks were not successful due to anti-tank weapons, insufficient armor, and mechanical defects, tactical errors in their employment especially en

Figure 1. M3 Light tank going through a water obstacle, Fort Knox, Kentucky. *(Photo courtesy of the United States Library of Congress)*

masse, and inadequate support from artillery and tactical aviation."[13] Regarding the acquisition of new tanks, GEN Craig advocated for "a type suitable for close support of [the] infantry," in his December 1937 dated Report of the Chief of Staff.[14] Thus, the U.S. Army's underlying conclusion from the Spanish Civil War was that the role of tanks in future war was akin to the infantry support role they fulfilled during World War I, rather than as a weapon massed to break through and push deep beyond enemy lines.

In contrast to this, the Germans left Spain with much different conclusions. Regarding the threat of anti-tank guns, German MAJ Adolf Von Schell observed that due to a lack of organic anti-tank guns, most of the world's infantry formations could not actually halt an attack of massed tanks.[15] Furthermore, he noted that the anti-tank guns the infantry possessed were relatively weak, but upgrading to larger calibers would only inhibit the mobility of these infantry formations.[16] He concluded that the solution to this problem was in fact the tank itself, which could mount a larger gun while retaining mobility.[17] Thus, while the U.S. Army continued to advocate for light tanks to methodically support the infantry's advance, the German Army developed tanks with larger guns and heavier armor, designed to go head to head with other tanks and cut deep into the enemy's rear.[18] The lessons the Germans took from the Spanish Civil War manifested in the development of tanks that, in terms of firepower and protection, American tank theorists did not believe were even possible at the time.[19]

To be sure, there were officers in the U.S. Army that did not accept the views of high-ranking generals such as Fuqua, Lynch, and Craig. Going back to the 1920's, Infantry and Cavalry officers like BG Frank Parker, COL Daniel Van Voorhis, and BG Adna Chaffee advocated for combined arms formations of armored vehicles to be employed in mass to penetrate the front line and attack enemy rear areas.[20] They had dutifully observed foreign army experiments and experimented in armored tactics, techniques, and procedures with their own formations. The Depression era lack of resources for the military, as well as isolationist sentiments ended their experiments and severely curtailed their theories.[21] Despite these setbacks, officers such as these continued to articulate their theories of the role of tanks in future warfare, though their story is beyond the scope of this paper. Suffice to say, when the Germans surprised the U.S. Army establishment with their victorious blitzkriegs, the U.S. Army quickly turned to its own armor enthusiasts like BG Chaffee to quickly correct its shortfalls and prepare for the war that was coming.[22]

For armies around the world, the period between the world wars was a time of innovation and experimentation, as well as one of misinterpretation and stagnation. Like others, the U.S. Army experienced its own doctrinal journey to World War II. However, during one of the best interwar opportunities to learn about the role of tanks in ground warfare, the U.S. Army drew the wrong conclusions. The Spanish Civil War of 1936-1939 represents a lost opportunity to learn about the role of armor in future warfare. Yet, during this same time the Germans took away the correct lessons and used these to improve their tanks and armored forces in preparation for their blitzkrieg campaigns only a few years later. Only the shock of the German success in these campaigns would finally awaken the U.S. Army to the great potential of the tank and armored formations. It would be a long and extremely hard fight before American armored forces bested those of the Germans.

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Creative Maintenance Solutions in a Fiscally Constrained Environment

MAJ Jordan L. Woodburn, 1LT Trevor N. Stanley, and 1LT James A. Puls

Maintenance in a fiscally constrained environment is increasingly challenging. To combat this, 3rd Infantry Division (ID), 1st Battalion, 64th Armored Regiment, 1st Armored Brigade Combat Team (ABCT) has developed cost-effective, unique solutions to correcting what would be dead-lining faults with long lead times to repair. While deployed to the United States European Command (EUCOM) theater from January to October 2025, 1-64 AR served as the North Atlantic Treaty Organization (NATO) Battlegroup Poland and was task-organized with a company of light British reconnaissance, Romanian air defense artillery (ADA), and Croatian light infantry. During this time, the battalion utilized relationships, three dimensional (3D) printing, and precautionary measures to save money and keep vehicles in the fight.

1-64 AR's innovations cell originally acquired three Prusa MK4S 3D printers to facilitate production of first-person view (FPV) drone frames utilizing a variety of different filaments. After experimenting with the production of drone frames, unit icons (for crisis response option [CRO] planning purposes), and other smaller projects, the battalion maintenance control section (MCS) and battalion innovations cell combined to look at options for repairing dead-lining faults using the available printers. Three M2A4 Bradleys within the battalion had faults originating from missing auxiliary back-up sight thumbscrews and missing Joint Battle Command Platform (JBC-P) bushings. These two parts are vitally important to the Bradley and its operation. The auxiliary sight thumbscrew enables the gunner to adjust the sight picture and improves their ability to engage targets under degraded conditions. The JBC-P bushings prevent the computer system from taking damage in the turret while moving cross-country. Working together, the battalion innovations cell and MCS designed and printed replacement parts within 6 hours of original identification by rapid prototyping in the motorpool where the vehicles are stored. This enabled parts that would have potentially taken weeks to order, ship, and receive to be corrected nearly "on the spot" and with extremely minimal expense.

By utilizing the maintenance shop office "expandable van" that offers onboard power generation, the innovations cell was able to bring the broken part to a computer, take measurements, and print a prototype in 15 minutes. These prototypes were then tested on the actual vehicle and adjustments were made on the spot using 3D modeling software. Finalized versions of the repair parts were then exported to USB drives for transportation to the other two 3D printers, where the final designs were produced in the required quantity (16x parts)

with a production time of 6 hours.

For this example, a standard bushing for an M2 Bradley JBC-P commander's screen is costly and each screen requires 6x bushings to be mounted properly. Additionally, bushings on order typically take around 30 days to be delivered (dependent on location of vehicle). However, a set of 6 bushings can be printed in under 6 hours and done at a fraction of the cost. This provides the battalion with a rapid, low-cost replacement part to keep the vehicle fully mission capable (FMC) until the new parts come in. In this example, the cost to produce was far less than the actual part cost and effectively served as a stopgap to keep the vehicle FMC.

To further the capabilities of 3D printing efforts, the battalion innovations cell frequently queried operators during preventative maintenance checks and services (PMCS). The subject of their discussion was parts missing on their vehicles or current identified faults. Following discussion, the members of the innovations cell, alongside operators, conducted parts research to determine what parts could be 3D printed to restore capabilities to a vehicle, and sometimes even remove a dead-lining fault. During one of these engagements, the innovations cell determined that the battery retaining device on the D7 Dozer, commonly long-lead and expensive, is able to be 3D printed. With this in mind, the innovations cell began development of the part, which can be used to restore a critical mobility and counter-mobility asset to the battlegroup. This is just one of the many examples of how 3D printed Class IX repair parts can be used to build readiness and retain combat power.

As the NATO Battlegroup Poland, 1-64 AR had the unique opportunity to have three allied nations attached through NATO tactical control (TACON). One of the companies, a Romanian ADA company, "The Transylvanian Gepards" of the 3rd Air Defense Battalion, 81st Mechanized Infantry Brigade (ROU), has an integrated combat service support platoon. The platoon is well versed in custom fabricating and repairing parts rather than ordering new parts due to the age of some of the vehicles in their fleet and long part lead time, such as the FlaK-Panzer Gepard. Due to this, their mechanics commonly rebuilt mechanical parts and electrical wiring harnesses. When the 1-64 AR arrived in theater, it struggled to maintain its fleet of M88A2s. A common issue on each of the deadlined M88A2s was the brake pressure switch, which had an extremely long lead time of nearly 12 months. After working closely with the Transylvanian Gepards for a few months, 1-64 AR approached their maintenance team and asked if they could assist with the brake

Figure 1: D7 Dozer batteries with retainer missing *(Photo by 1LT John Douglas)*

Figure 2. Top view of CAD Rendering of D7 Dozer battery retainer created by the Innovations Cell. *(Photo by 1LT John Douglas)*

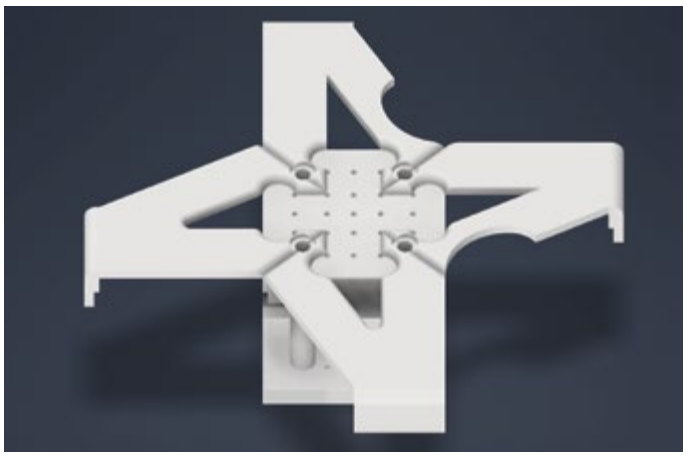

Figure 3. Side view of CAD rendering of battery retainer created by the Innovations Cell. *(Photo by 1LT John Douglas)*

Figure 4. U.S. Soldiers assigned to 1st Battalion, 67th Armored Regiment, 3rd Armored Brigade Combat Team, 1st Armored Division conduct live fire exercises in a M2 Bradley fighting vehicle during Rotation 23-06 at the National Training Center, Fort Irwin, Calif., April 7, 2023. (*U.S. Army photo by PFC Ridhard Monyer)*

pressure switch. Due to their many years of custom fabricating and repairing parts, the Transylvanian Gepard's maintenance team was able to repair every brake pressure switch in the battalion and do so at a fraction of the cost of a new one. The repaired parts were tested and found to be fully functional and the failure had occurred due to o-ring age.

Prevention of fault causation or worsening is the cornerstone to any effective maintenance program. The 1-64 Armor Battalion attempts to identify vehicle faults during PMCS and identify solutions to prevent faults from occurring in the first place through innovative solutions. The Battalion M2 Bradley Master Gunner identified a vulnerability in one of the controller area network (CAN) bus cables that runs on top of the JBC-P in the commander's station. This cable is vulnerable because it sits on top of the JBC-P which swings open and closed to enable the Bradley commander and vehicle crew to access the coaxial machine gun. As the door swings open, the CAN bus cable can become torn or impinged on the sharp edges of the commander's periscopes. To correct this, the Master Gunner designed a bracket which can be installed overtop of the vulnerable cables and shield them from becoming damaged. Easy to print and install, the device has been shown to successfully prevent the costly cable from becoming damaged. The 1-64 Armor Battalion has outfitted all Bradleys in their fleet with this device and has also shared it across the Brigade and with the 3rd Infantry Division Marne Innovations Center for dissemination across the Army as a whole.

Further working with the Engineers of the Battlegroup, the Battalion Innovations Cell once again focused their sights on the critical D7 Dozer fleet. During PMCS, the fusebox cover of one of the Dozers was found to be missing by an operator. The innovations cell was able to design and print a replacement cover (which can commonly become misplaced or lost) within the period of 48 hours. Without the cover, the fusebox is extremely vulnerable to the elements and can quickly become corroded and render the vehicle inoperable. The fusebox is also costly to replace and commonly long-lead. In an environment where every dollar counts for vital Class IX, an ounce of prevention is key to maintaining operational readiness (OR) rates. Using this as an example, the Battalion Innovations Cell plans on continuing to identify common faults and using 3D printed solutions to correct them where possible.

Due to the portability of the 3D printers, the Battalion Innovation Cell was able to prototype parts directly at the vehicle in need. By bringing the ability to manufacture to the mechanics, parts can be immediately identified, printed, and installed. However, there are several considerations when using 3D printed parts to remember: Parts must still be ordered against the ESR to replace the temporary 3D replacements. Any faults corrected by 3D parts can be moved from deadline to slash faults but cannot remove slash faults entirely (IAW Technical Bulletin [TB] 43-0249). Leaders who utilize 3D printed parts must use the "remarks" function on the ESR to indicate that parts must still be ordered and replace them once the original equipment manufacturer (OEM) parts arrive.

To further expand on this concept, the 1-64 Armor Battalion is currently expanding training on this capability to the formation. The Battalion Innovation's Cell will serve as the lead proponent of this effort and develop a block of instruction to share with members of each subordinate unit. The instruction includes a basic course on drafting engineering drawings which will give Soldiers the ability to communicate needed parts to the manufacturing hub (co-located at the field trains command post [FTCP]). A "part report" will be developed, standardized, and

distributed to be understood by operators as well. The report will include the location of vehicles needing parts, pictures of the broken part, number of required replacements, and dimensions of the broken part. This report will allow a manufacturing cell to print the required replacement and send them forward to the required operators on the daily battalion logistics package (LOGPAC). The Battalion Innovations Cell will also provide classes to all field maintenance teams (FMTs) and mechanics. This will allow them to understand the capability of 3D printers and encourage them to identify parts that can be replaced by 3D printed parts. Depending on the likelihood of a part to fail or become damaged / lost, this may even allow the innovations cell to produce a design for the part before it becomes an actual fault. The replacement design can then be kept on a local USB drive to be used when the part is required, almost like creating "running spares" on demand.

Sharing of Standard Triangle Language (STL) files is now commonplace amongst the Third Infantry Division at the Marne Innovations Center. The designs mentioned in this article and many more are currently being shared across the formation to not only enable the 1-64 Armor Battalion to save money and resources but to enable all adjacent units to do the same. To encourage ingenuity efforts in a formation, 1-64 Armor Battalion recommends establishing innovation's cells at the Battalion level. Units should select personnel with engineering backgrounds, well-versed in CAD and other design software to develop prototypes for printing. 3D printers and the software to use them are multi-faceted in that they can be used for Class IX repair parts, small unmanned aerial system (sUAS), terrain model kit (TMK) parts, and weapons parts. Innovations cannot be treated as a secondary duty and therefore requires an officer in charge (OIC), at a minimum, to work in the cell full time. Innovations also does not stop at just 3D printing; The cell is currently working on a prototype, named "Project Dreadnaught", which will be a field expedient drone cage for the M1 Abrams to improve crew survivability. This is in partnership with the Brigade Allied Trades cell, who provides a robust welding capability to the Battalion Innovation's Cell.

Figure 5. Image of CAN bus cables without bracket installed. *(Image by SFC Donald Fadel)*

Figure 6. Image of CAN bus cables with 3D printed bracket installed. *(Image by SFC Donald Fadel)*

Creative solutions to ongoing problems are not rank dependent, it is the unit's responsibility to arm Soldiers at the lowest level with the knowledge and guidance required to aggressively innovate across formations. Ingenuity wins wars and is a force multiplier. 3D printing, leveraging relationships, and preventative measures are effective tools that units can arm themselves with to enable effective maintenance, regardless of current fiscal statuses. The maintenance of an ABCT is not cheap and is sometimes constrained by global supply lines; creativity and innovation will be critical to the next victory of the United States.

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Figure 7. A M88 Hercules Armored Recovery Vehicle belonging to 4th Battalion, 6th Infantry Regiment, 3rd Armored Brigade Combat Team, 1st Armored Division, leaves the Unit Maintenance Collection Point during exercise Balkan Sentinel to recover a vehicle at Korean Training Area, Bulgaria, June 3, 2025. *(U.S. Army Photo by SPC Rayonne Bissant)*

From Contact to Overmatch:

Redefining Armor Fundamentals Through Transformation in Contact

by COL Bryan Bonnema, MAJ Aram Hatfield, and MAJ David Sturm

The fundamentals of Armor have not changed, but how we execute them is being radically transformed. In 1st Armored Brigade Combat Team (ABCT), 3rd Infantry Division (ID) known as the Raider Brigade, we have spent the last 18 months wrestling with this reality. The arrival of ubiquitous drones, persistent sensors, and machine-speed targeting is creating a new, complex environment. To make sense of this, we developed a theoretical framework we call Isolation–Exploitation–Regeneration (IER). IER is our theory for how to sequence modern combined arms. It is a mental model, not a rigid checklist. It proposes that we first use unmanned systems and long-range precision fires to find, fix, and attrit the enemy at key critical nodes, forcing them to fight disconnected battles (Isolation). Only then do we commit our massed, mounted combat power—our tanks and Bradleys—to strike the weakened enemy at a decisive point (Exploitation).

Finally, we rapidly reset the force to sustain a punishing operational tempo and repeat the cycle (Regeneration). We have used the IER framework to forecast the ways we believe transformation will change how units execute the fundamentals and identify the associated gaps and challenges.

The Armor Force Fundamentals

The Armor School recently codified the Armor Force Fundamentals, giving us a shared understanding of what constitutes "the fundamentals." It is broken into three parts: the Daily Dozen (the basics like security and maintenance), Critical Tactical Tasks (the small-unit actions like react to contact), and Formation-Specific Fundamentals (the core missions of our tank and scout formations). These fundamentals are designed to help commanders prioritize training and anchor leader development. Transformation does not replace these fundamentals; rather, it profoundly redefines their execution. The following analysis briefly examines this impact.

How the Fight is Changing

At a high level, transformation is reshaping our fight by moving the ABCT from a platform-centric model to a network-enabled one. This vision is being realized within the ABCT today, reflecting the Army's broader objective to become more data-centric, resilient, and expeditionary.

Reconnaissance and security will shift to a forward line of sense (FLOS). Instead of relying solely on a manned screen, we will push a persistent sensor network kilometers ahead of our manned formations. This robotic force will be a layered system of small drones at the platoon, medium-range drones at the battalion, and long-range sensors at the brigade, all running software that automatically finds and flags targets. The effect will be earlier detection and disruption, allowing commanders to preserve combat power and choose when and where to strike. This is a key enabler of the Isolation phase of IER, allowing us to detect, disrupt, and attrit enemy key nodes before manned platforms are committed.

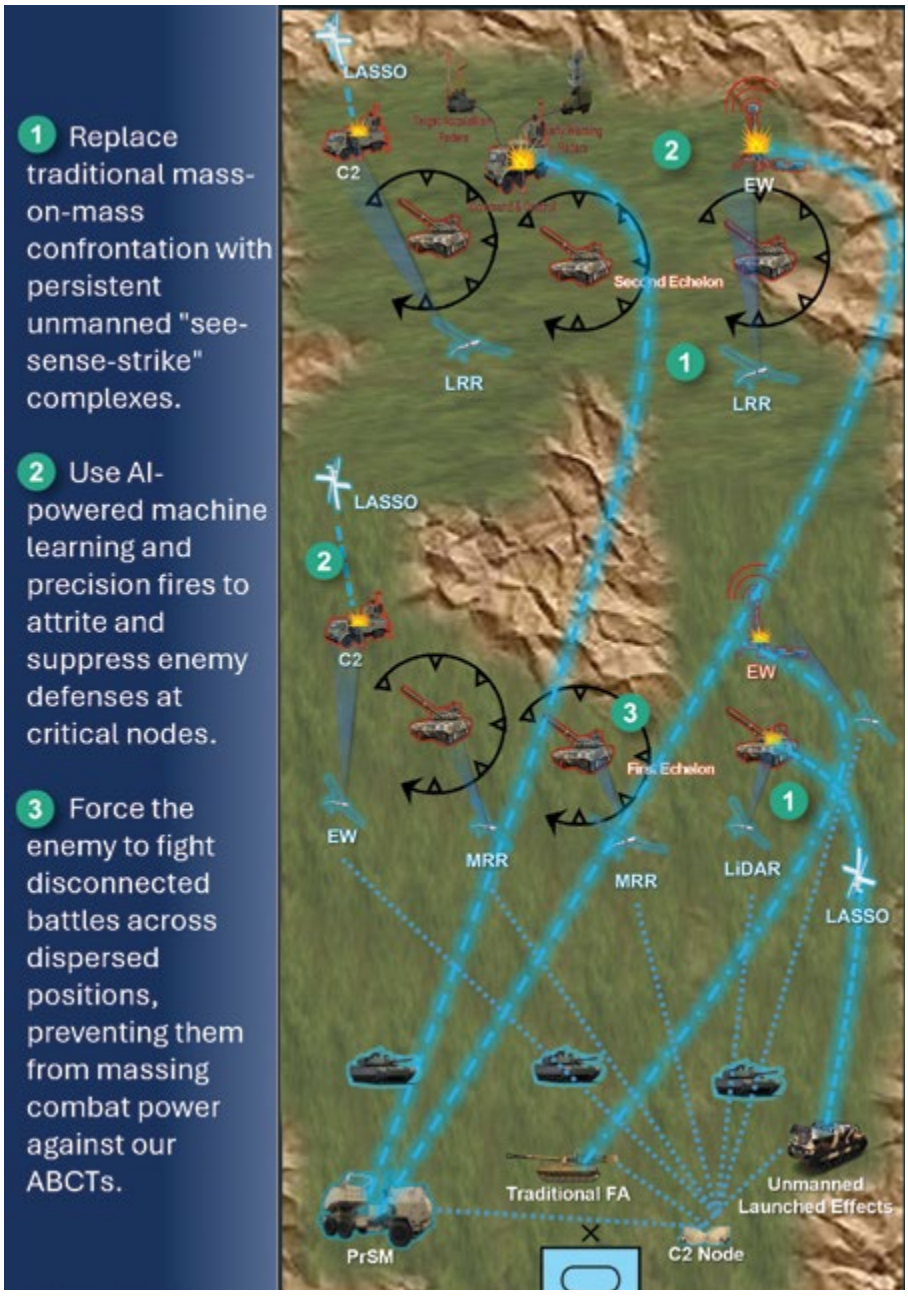
Airspace and the electromagnetic spectrum (EMS) have already become core company and battalion fights. The proliferation of friendly and enemy drones means that counter-UAS (C-UAS) has become a fundamental element of local security for every unit. Likewise, emissions control (EMCON) is now a critical command and control measure.

Perhaps the most profound change won't be to our equipment, but to our leaders. The future battlefield will place an unprecedented cognitive load on our company and platoon-level leaders. The increasing amount of data feeds at lower levels means that junior leaders must be ready to simultaneously process a drone feed on one screen, an Android Tactical Assault Kit (ATAK) display on another, and the real world through their sights or the hatch.

A Deeper Look: Redefining the Execution of the Fundamentals

The impact of these changes is best understood by looking at how they alter

Figure 1. Illustrates the "Isolation Phase' of the IER framework.



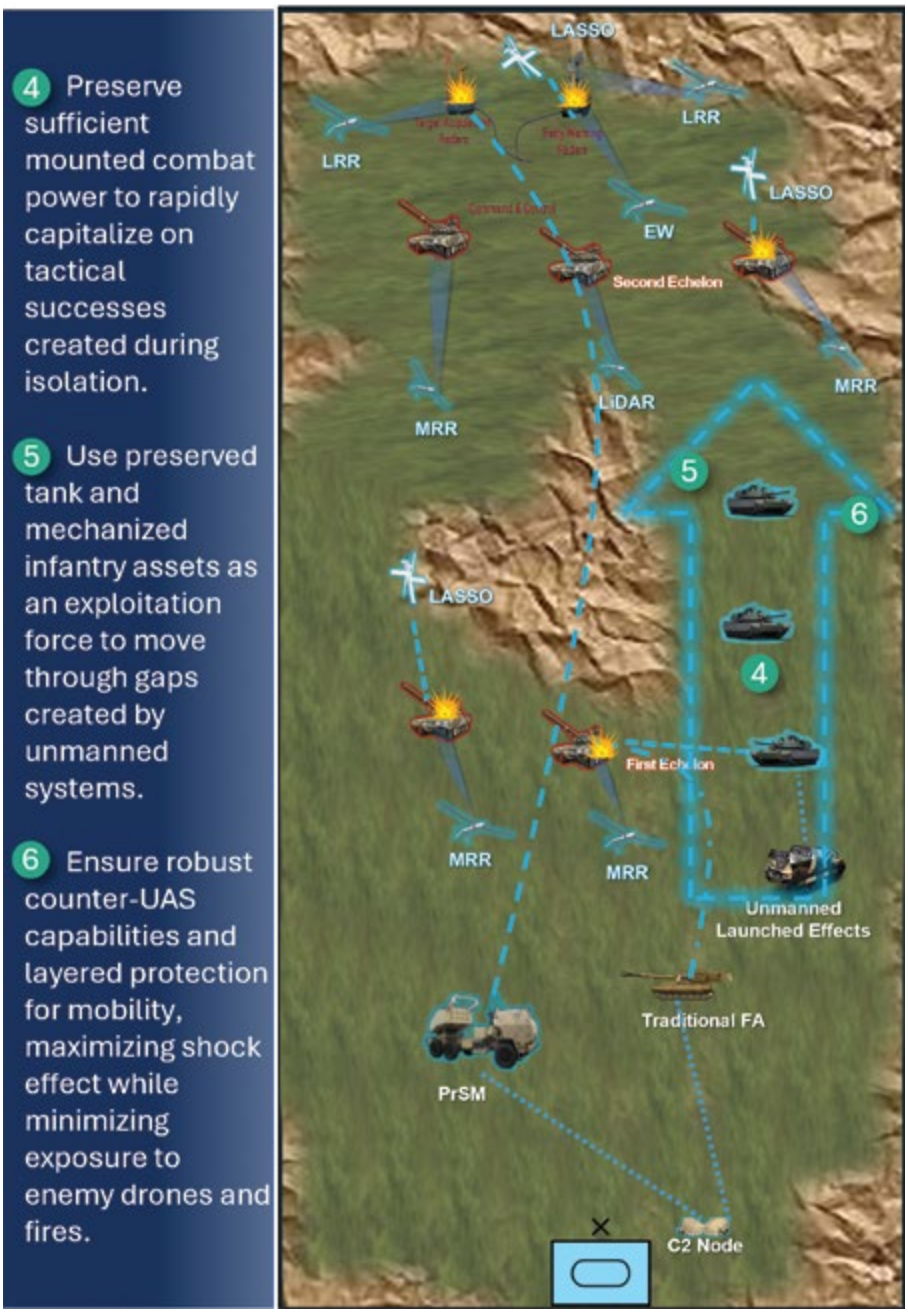


Figure 2. Illustrates the "Explotation Phase' of the IER framework.

the execution of our fundamentals in practice. For the Daily Dozen, the impact is profound. Security is now about establishing a C-UAS bubble and a robotic FLOS to provide warning time measured in hours, not minutes. Cover, concealment, and emissions control now prioritizes signature management in the thermal and electromagnetic spectrums over hiding in just the visible spectrum. Reconnaissance is now a continuous, multi-domain effort, fusing inputs from unmanned systems, aerial electronic warfare (EW), and ground sensors. Operations orders and graphics must evolve to include new control measures like UAS lanes, C-UAS bubbles, and digital kill boxes. Rehearsals must move beyond the sand table to include digital kill-chain walkthroughs and airspace deconfliction drills.

This redefinition extends to our Critical Tactical Tasks. Establishing security now involves deploying a network of sensors and effectors. Reacting to contact is increasingly a reaction to a digital signature or an automatic target recognition (ATR) system alert from the FLOS. The first action may not be direct fire, but a precision strike cued by an unmanned system. Re-establishing a perimeter and redistributing ammunition as part of consolidation and reorganization now must include regenerating the FLOS forward, re-arming loitering munitions, and updating the common operating picture. Conducting field maintenance will mean that a maintenance team will be just as likely to bring a ruggedized laptop and a 3D printer for a broken drone part as they are a torque wrench. Conducting casualty evacuation (CASEVAC) operations will become a complex tactical problem. Getting a wounded Soldier out will require a planned and rehearsed C-UAS corridor, obscuration, and deception to draw the eyes of enemy drones away from the evacuation route.

Our Scout Fundamentals are also transforming. A screen now transcends mounted and dismounted observation posts, requiring a deep, resilient, and multi-domain sensor web that can detect, identify, and sometimes even service targets long before they reach the main body. A reconnaissance handover is now a digital transfer of data, ensuring a seamless transition of understanding.

Finally, Tank Fundamentals are evolving. Engagement area development now begins 20 kilometers out, as the FLOS identifies enemy assembly areas. The execution of an in-stride breach now begins with loitering munitions and first-person view (FPV) drones suppressing overwatch before the reduction or assault force is exposed, preserving the shock effect of our armor.

Gaps in Training, Doctrine, and Leader Development

This redefined execution of our fundamentals naturally exposes gaps across our training, doctrine, and leader development enterprise.

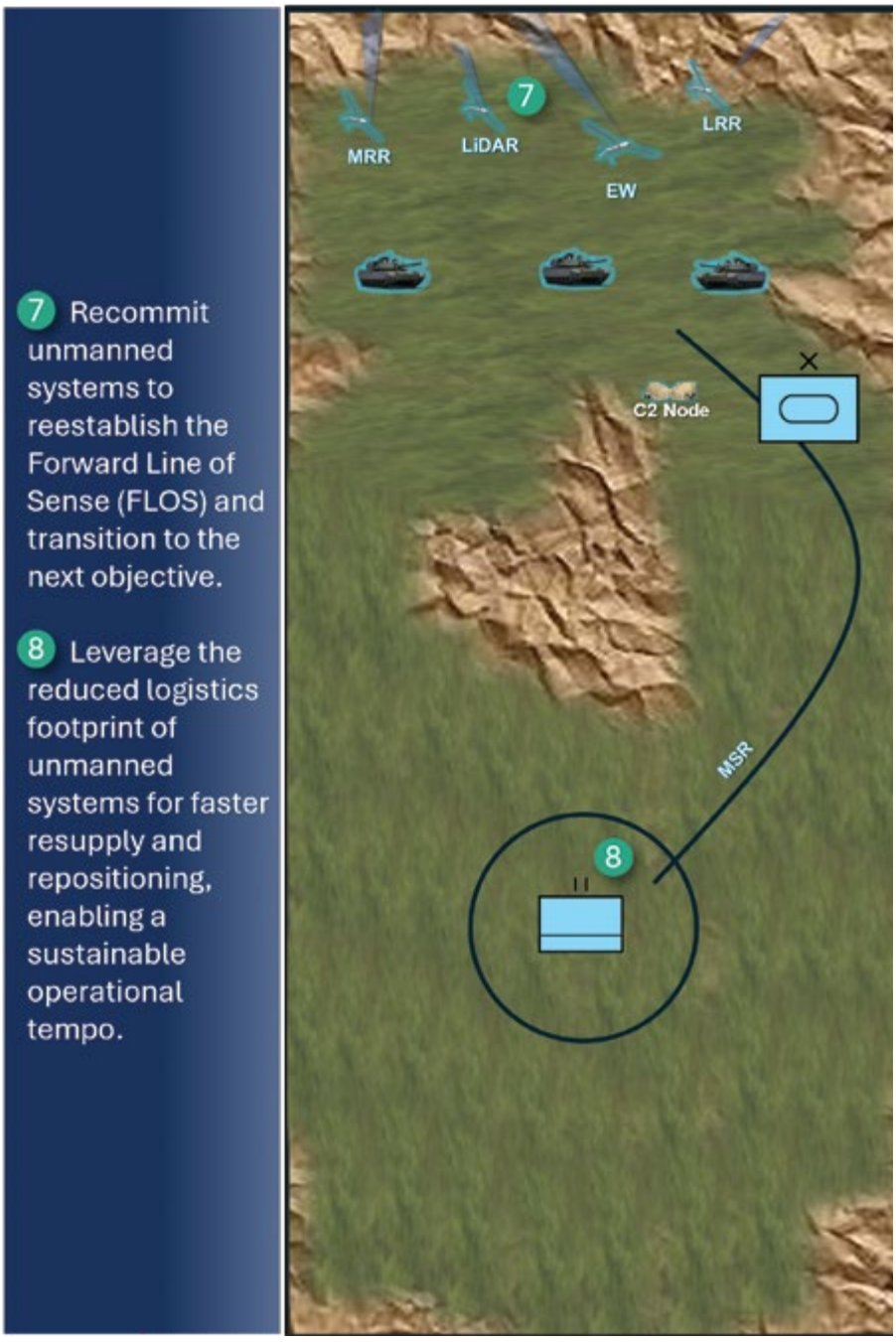
In training, we lack sufficient brigade-scale, instrumented repetitions that integrate unmanned systems, EMS, C-UAS, and digital fires in a contested environment. We must practice in degraded modes and incorporate AI-enabled planning. Critically, we must treat EW, small unmanned aerial

systems (sUAS), and C-UAS as 10-level tasks. Our experience shows that small-unit innovations, like adapting the Integrated Weapons Training Strategy (IWTS) to scale FPV drone capabilities, can be highly effective, but this requires ranges capable of massing these new effects and standardized approval pathways.

In Doctrine, we must formally codify the IER framework and the FLOS. We lack standardized unmanned control measures, clear precision strike release authorities at echelon, and established tactics, techniques, and procedures (TTPs) for cueing fires based on EMS intelligence. Without this common language, we risk confusion and fratricide at speed.

In Leader Development, we must build the "headware" for this new environment. Leaders at the company and battalion level need practical literacy in EMS and C-UAS, kill-web management, and complex airspace control. This reflects the modernization enterprise's emphasis on delivering capabilities at speed and scale—a principle that must apply not just to equipment, but to the knowledge our leaders need to employ it. We need a repeatable "innovation-to-scale" pipeline that allows the best ideas from our small units to be rapidly shared, tested, validated Army-wide.

Figure 3. Illustrates the 'Regeneration Phase' of the IER framework.



Challenges and Risks in Transformation-in-Contact

This transformation is not without significant challenges and risks that demand our full attention. Operationally, the density of airspace and EMS activity at speed elevates the risk of fratricide and signature exposure. We must also guard against an overreliance on automation without clear human-judgment rules, as mandated by DoD Directive 3000.09, *Autonomy in Weapon Systems*.[1] Sustainment at tempo—resupplying precision effects, power, and maintenance—will remain a pacing item. We must also assume our adversaries will adapt with jamming, deception, and C-UAS/EW capabilities.

Institutionally, we face the danger of learning the wrong lessons, succumbing to resistance to change, and managing increased costs. Perhaps the greatest risk is lacking a unifying framework, which can lead to a deviation from the Armor Force Fundamentals as we chase niche capabilities.

A Guiding Framework: Isolation–Exploitation–Regeneration

To mitigate these risks and align the branch, the IER framework provides a clear structure for planning and execution.

Isolation: Replace traditional mass-on-mass confrontation with persistent unmanned "see-sense-strike" complexes. Using AI-powered machine learning and precision fires, attrit and suppress enemy defenses at critical nodes, forcing them to fight disconnected battles.

Exploitation: Preserve sufficient mounted combat power to rapidly capitalize on the tactical successes created during isolation. Use tank and mechanized infantry assets as an exploitation force to move through gaps created by

unmanned systems, protected by robust C-UAS capabilities to maximize shock effect.

Regeneration: Recommit unmanned systems to reestablish the FLOS and transition to the next objective. Leverage the reduced logistics footprint of unmanned systems for faster resupply and repositioning, enabling a sustainable and punishing operational tempo.

This framework provides a common lexicon to plan, execute, and assess operations. It helps prioritize our training and procurement efforts and ensures that technology serves our operational concepts, not the other way around.

TiC positions the ABCT as the Army's premier formation for generating overmatch and imposing costs in contested environments, converting faster isolation, decisive exploitation, and rapid regeneration into operational tempo and decision advantage. Strategically, this advances deterrence credibility and warfighting readiness. To secure this future, we must impose institutional imperatives upon ourselves: codify the IER framework, standardize our control measures, scale innovation from the bottom up, and align our training and sustainment enterprises to the realities of contested, multi-domain operations. By doing so, we will empower the Armor branch to fight and win for generations to come, ensuring it remains at the forefront of the Army's transformation.

Colonel Bryan Bonnema is currently the Brigade Commander for the 1st Armored Brigade Combat Team, 3rd Infantry Division, operating in the EUCOM area of responsibility. His key command and leadership roles include commanding the 1st Battalion, 6th Infantry Regiment and G3 of the 1st Armored Division. COL Bonnema has been awarded the Purple Heart and two Bronze Star Medals. His education includes a bachelor of science from the United States Military Academy, a master of military art and science from Air University, and a master of strategic studies from the U.S. Army War College.

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Major David R. Sturm is currently serving as the Brigade Intelligence Officer (S2) for the 1st Armored Brigade Combat Team, 3rd Infantry Division, at Fort Stewart, Georgia. A graduate of the School of Advanced Military Studies at Fort Leavenworth, his previous key assignments include serving as a G5 Intelligence Planner for the 3rd Infantry Division and as a Brigade/Battalion Intelligence OC/T for the Operations Group at the National Training Center (NTC), Fort Irwin, California. MAJ Sturm commanded a Military Intelligence Company and served as a Battalion Intelligence Officer while assigned to the 1st Armored Brigade Combat Team, 1st Infantry Division, at Fort Riley, Kansas. He earned a bachelor of science in psychology from Texas A&M University.

Figure 4. RACER technologies that enable Unmanned Ground Vehicles (UGVs) to maneuver on unstructured, off-road terrain at speeds that are only limited by considerations of sensor performance, mechanical constraints, and safety. *(Photo by Thomas Sakell)*

NOTES

1 U.S. Department of Defense, "Autonomy in Weapon Systems," DoD Directive 3000.09 (Washington, DC: Office of the Secretary of Defense, January 25, 2023).

NOTE: The authors acknowledge using Ask Sage for brainstorming, prose refinement, and formatting assistance in preparing this article.

Steel Meets Sustainment:

Key Takeaways from the 12-Day War

by CPT Ben Kusinski

"The rapid employment of advancement and innovation of our capabilities is critical to mission accomplishment and sustainment. Technology is constantly changing and evolving, as are our adversaries. We must continue to drive the integration of today's cutting-edge technology for large scale combat operations."[1]

As tensions escalated between Israel and Iran in early June 2025, U.S. forces within the United States Central Command (USCENTCOM) Area of Responsibility (AoR) transitioned from a period of sustained preparation to rapid execution during the ensuing 12-Day War. Serving as a Battle Captain with 3rd Expeditionary Sustainment Command (3rd ESC) – the operational command post for 1st Theater Sustainment Command (1TSC) – I directly observed strategic-level decision making that significantly influenced the conflict's outcome. Although characterized by ballistic missile exchanges and precision air strikes, this conflict yielded critical lessons applicable to ground forces conducting large scale combat operations (LSCO), particularly regarding sustainment operations and the challenges of rapid force projection.

Key Lessons Learned

The 3 D's- Displacement, Dispersal, and Decentralization: Continuously jumping command nodes, personnel, and equipment at all echelons ensures that adversaries cannot effectively target key assets.

Drone Threat Mitigation: Precision guided munitions, one way attack unmanned aerial systems (OWAUAS), and small drones are the most prevalent threats to our modern-day forces.

Predictive Sustainment and Logistical Resilience: Data-driven insights, such as using predictive analytics to forecast consumption rates, are incredibly important when pre-positioning critical stocks. During the 12-Day War, rapid consumption rates of munitions and specific vehicle components quickly strained these supplies. Sustainment units at all levels need to plan for rapid replenishment and alternative sourcing.

Units Must have the Maintenance Capacity to Fight Forward: The high operational tempo exposed limitations in forward maintenance capacity. Leaders on the ground need to ensure soldiers have familiarity with maintenance procedures.

Command & Control (C2) in Contested Environments: Leaders must empower subordinate teams by providing clear, concise intent and guidance. Communications exercises and rehearsals are imperative prior to execution.

These insights underscore the enduring importance of agile sustainment frameworks in expeditionary warfare. They highlight how Armor Officers—traditionally focused on direct combat—can amplify combat power by mastering theater-scale logistics complexities. As mounted warfare experts, Armor Officers understand better than most the importance of sustainment operations in LSCO. By applying these lessons learned during the 12-Day War, we can ensure our armored force remains agile and lethal in contested environments.

The 3 D's- Displacement, Dispersal, and Decentralization

When the strategic withdrawal from Afghanistan occurred in 2021, remaining forces within USCENTCOM transitioned to a defensive posture. The USCENTCOM landscape of 2025 is one completely different than the one that veterans of the Iraq and Afghanistan Wars know. The focus of U.S. forces in the Middle East has slowly transitioned from counterterrorism to one of competition against potential adversaries such as Iran, China, and Russia. As operations have shifted from offensive to defensive in nature, U.S. forces have consolidated at several large bases, compared to the small forward operating bases and outposts prior to 2021.

Over time, these large bases such as Camps Arifjan and Buehring, have evolved into thriving sustainment hubs, providing critical support to the theater. However, this has also made these locations easy targets. With Iranian proxies conducting regular surveillance of U.S. forces and Iranian ballistic missiles becoming a realistic threat in the months leading up to the 12-Day War, soldiers and leaders

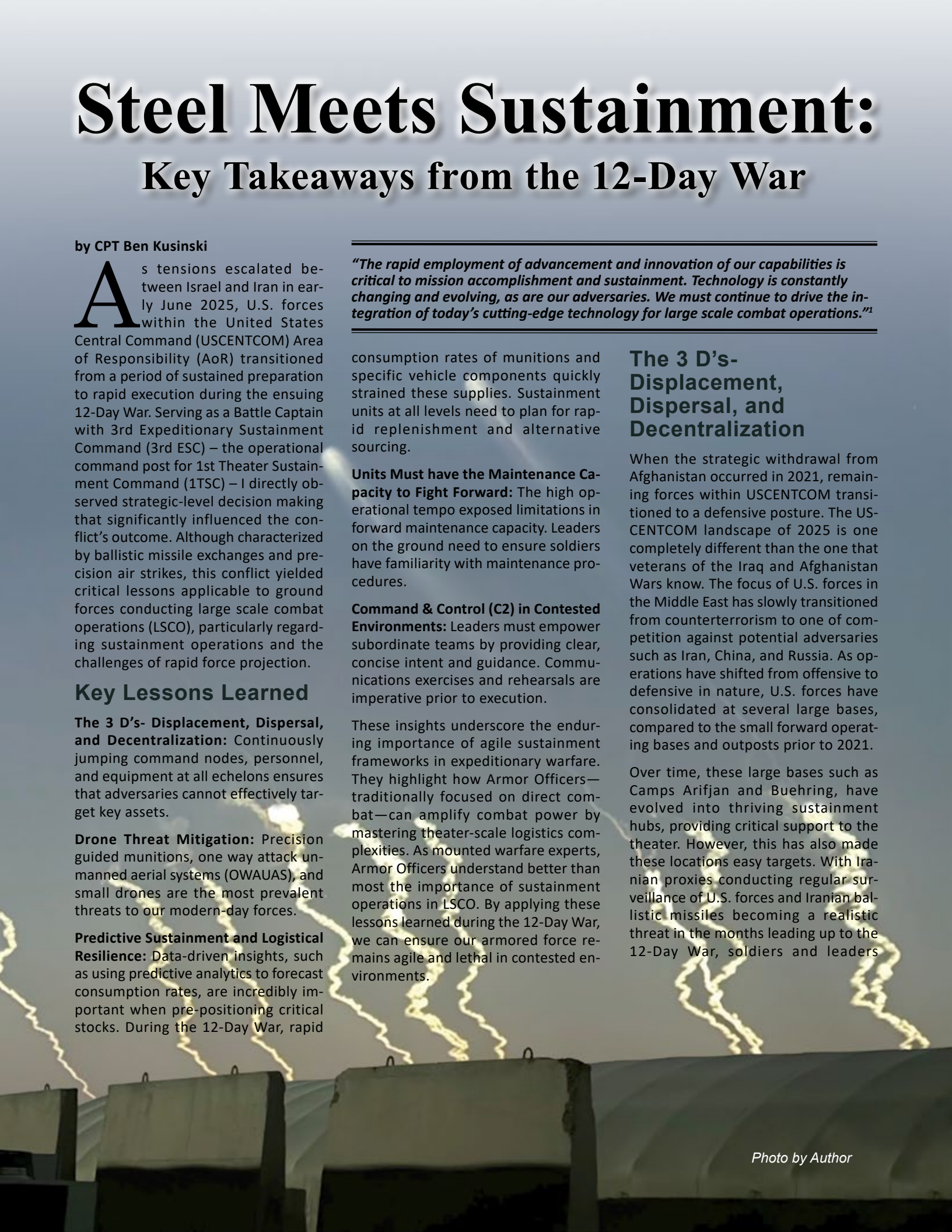


Photo by Author

"Sustainers must be agile, adaptive, and always ready to deliver combat power at the point of need, which is always rapidly evolving in large scale combat operations. We must ensure our mindset, precision, and purpose align with the mission."[1]

proactively took steps to enhance preparedness by hardening bunkers and executing command post jump plan rehearsals.

As GEN (R) David Perkins, 15th Commander of United States Army Training and Doctrine (TRADOC), highlighted in the 2014 TRADOC Pamphlet 525-3-1, *Win in a Complex World*, "The key to a Strategic Win is to present the enemy with multiple dilemmas. To compel enemy actions requires putting something of value to them at risk. Army forces allow joint force commanders to dictate the terms of operations and render enemies incapable of responding effectively." While command posts were displacing to alternate, contingency, and emergency locations, the Joint Logistics Enterprise and sister services simultaneously dispersed key equipment away from highly visible and easily targeted areas. By displacing personnel, dispersing equipment, decentralizing command and control, and conducting expeditious sustainment of forces, 1TSC was able to expand the United States Army Central (ARCENT) footprint. This provided senior leaders with options while rendering the Iranians unsuccessful in strikes against its high value target list as demonstrated by no casualties and minimal damage to infrastructure on Al Udeid Air Base, Qatar.

C2 in Contested Environments

Pre-war (C2) architecture mostly consisted of static command posts, either in hardened buildings or improved tents. With an uncontested environment in most of the Arabian Peninsula for several years, units down to the company level have easily been able to swiftly establish Non-classified Internet Protocol Router Network (NIPR) and Secret Internet Protocol Router Network (SIPR) capabilities. The 12-Day War reinforced the notion that commanders must become comfortable fighting with degraded communication systems and must routinely conduct effective training, such as communication exercises (COMMEX), to be prepared for C2 in contested environments.

Prior to the start of the 12-Day War, ARCENT conducted a COMMEX with 1TSC, Task Force Spartan, and other subordinate units. This COMMEX, planned and executed in response to the escalating tensions between Israel and Iran, exposed vulnerabilities in theater-level primary, alternate, contingency and emergency (PACE) plans. Operations Centers and Battle Desks had multiple forms of communication (such as NIPR, SIPR, Joint Battle Command-Platform (JBC-P), or Distributed Tactical Communication Systems (DTICs)/Iridium phones), but the soldiers on duty were not familiar with the equipment. After action review (AAR) comments showed that even within G/S6 sections, soldiers relied on a few subject matter experts to establish communication, resulting in single points of failure. For any type of rehearsal to be effectively conducted, clear and concise guidance must be given, and key leaders must have buy-in or be present. Without these, the result will inevitably be a "check the box"

Figure 1. An M1A2 Abrams Main Battle Tank assigned to 3rd Squadron, 278th Armored Cavalry Regiment, Task Force Reaper, participates in a joint live fire training exercise as part of BRIGHT STAR 25, Mohamed Naguib Military Base, Sept. 7, 2025. *(U.S. Army photo by Sgt. Grace Nechanicky)*

Figure 2. Combat Power Model found in ADP 6-0 Mission Command: Command and Control of Army Forces. July 2019.

rehearsal rather than a true test of a unit's capabilities. Deliberate AARs of this COMMEX reinforced that company-level training on proper usage of communications equipment is paramount. At critical moments during the 12-Day War, brigade and battalion command posts were unable to effectively communicate to their companies over secured channels due to simple mistakes that soldiers at the lowest level were making, such as accidentally draining radio batteries or not knowing how to conduct operator level troubleshooting of their equipment. Frequent and deliberate rehearsals of the PACE plan with key leader oversight should be planned into the training calendar of units at all echelons.

Multiple other lessons were learned regarding C2 practices. Due to the impressive C2 architecture in theater, division level headquarters were able to maintain 24/7 video strike bridges with downtrace brigades and battalions, allowing for instant touchpoints and flattened communications. Subordinate headquarters provided liaison officers (LNOs) to be physically located with their higher headquarters, while division level headquarters provided LNOs to their adjacent units. These LNOs allowed for enhanced coordination between different units, further helping provide timely reports and accurate information to commanders thus enhancing their decision making.

Drone Threat Mitigation

The 12-Day War highlighted the significance of drone mitigation in modern conflict, as Iranian forces employed a range of UAS and OWAUAS with varying effects. These Iranian UAS along with precision-guided munitions posed a substantial threat to the United States, Israel, and coalition forces. The Iranian drone capabilities include a range of systems, from small, handheld drones to larger, fixed-wing UAS. The smaller drones, like what is often seen in the Russia-Ukraine War, are designed to crash into their targets, detonating their payload on impact. These drones are highly maneuverable and can be difficult to detect, making them a significant challenge for air defense systems. The larger drones, on the other hand, can carry more sophisticated payloads. These drones can be used to conduct reconnaissance, strike targets, and disrupt command and control systems, making them an asset for Iranian forces. These drones can be as small as a few feet in length but still carry a significant payload capable of destroying equipment and personnel. Several Iranian drone variants, such as the Mohajer and Shahed 129, have operating ranges of hundreds of kilometers and could strike deep into friendly force territory.

Despite the U.S. Army's recognition of the increased significance of drone threat mitigation, there remains a doctrinal gap in current military doctrine such as FM 3-0, *Operations*. FM 3-0 mentions UAS threats and the importance of addressing them, but it does not provide detailed guidance on how to do so. The 12-Day War proved that US forces are extremely proficient at static base defense using Short Range Air Defense (SHORAD) systems and air-to-air interdiction, but we are untested at countering drones while on the move. While going through the military decision-making process (MDMP) at the brigade and battalion levels, it is imperative to consider available air defense assets and integrate their proper usage into courses of action that are developed. Potential solutions to the challenge of drone threat mitigation for maneuver units include the use of wearable or hand carried drone jammers. For tank companies and scout troops, outfitting Abrams and Bradley crews with weaponry such as shotguns can provide crewmen with an extra capability to counter small drones that may be difficult to destroy using the traditional personal weapons crewmen are issued. Overall, current U.S. Army doctrine recognizes the growing threat posed by drones and emphasizes there is a need for a multi-disciplinary approach to countering them. As doctrine evolves, more work will be needed to develop comprehensive guidance on how to counter UAS threats.

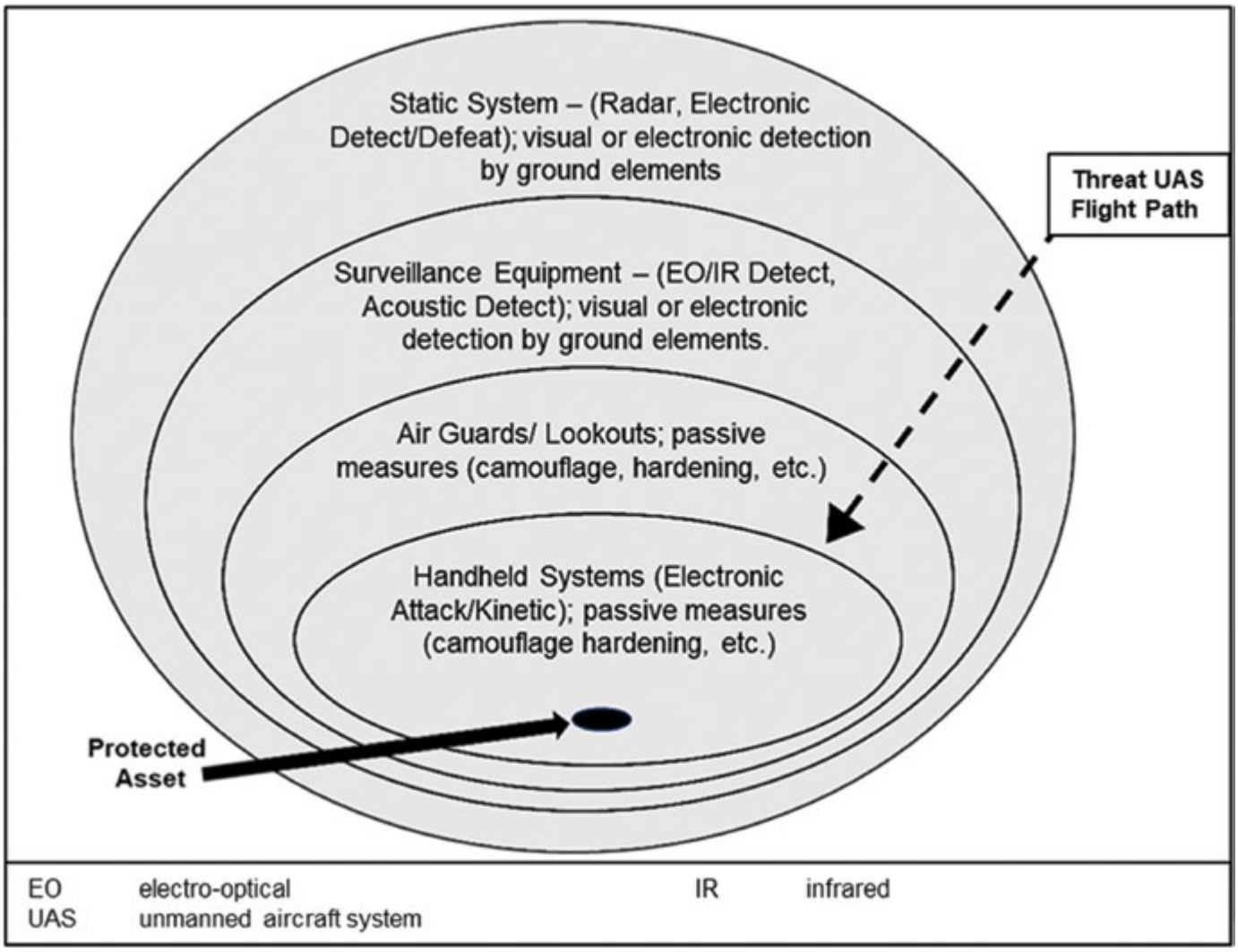
Predictive Sustainment and Logistical Resilience

The importance of pre-positioned stocks for rapid force projection cannot be overstated. These stocks are a critical enabler, providing the necessary materiel to support initial entry and subsequent operations. However, as the 12-Day War demonstrated, even the most carefully planned pre-positioned stocks can be rapidly depleted during sustained combat operations. To truly enhance readiness, sustainment planning must evolve beyond simple usage data. By embracing the principles of Predictive Logistics, sustainment commands can fuse real-time operational tempo (OPTEMPO) data, intelligence assessments, and environmental factors—a process known as sustainment preparation of the operational environment (SPOE). For example, by analyzing how the desert environment in CENTCOM degrades components like rubber seals and engine air filters, brigades can proactively forecast and pre-position these specific parts, moving from a reactive to an anticipatory sustainment model. This data-driven approach is essential for creating the deliberate, joint maintenance plan needed to ensure equipment drawn from army pre-positioned stock (APS) can maintain a high operational readiness rate during a sustained, high-tempo fight.

While brigade combat teams (BCTs) do receive a valuable repetition at utilizing APS while planning and executing rotations at the National Training Center (NTC), the very nature of an NTC rotation creates a training gap regarding the long-term realities of utilizing the APS fleet. The primary focus of BCTs at NTC is getting their fleets mission-capable for a two-week force-on-force battle. Equipment is used hard for a short duration, but little thought is given to what the operational readiness rate would be on day 30, 60, or 90 of a real conflict. While the NTC repetition is essential for mastering the speed required to draw APS, it is only the first step. Without dedicated training at home-station that focuses on long-term planning, maintenance forecasting, and fleet management, our armored forces risk continued success in an enduring conflict.

Further, the 12-Day War highlights that relying solely on large, centralized APS sites creates a vulnerability and increases our risk-to-force. A solution to this challenge lies in building resilience through dispersal, decentralization, and alternative sourcing. This involves establishing a network of smaller,

Figure 3. Layered defense unmanned aircraft system example from ATP 3-01.81 *Counter-Unmanned Aircraft System (C-UAS) Operations.* May 2025.



distributed supply caches to mitigate enemy targeting and ensure continuity should any cache be targeted. Agility is achieved by embracing non-traditional methods. For instance, forward-deployed units equipped with additive manufacturing capabilities (such as the U.S. Army Central Innovation and Manufacturing Center and their 3D printing initiatives) can produce certain non-critical repair parts on-demand, drastically reducing lead-times on these parts. Simultaneously, leveraging operational contract support (OCS) to establish pre-arranged contracts with host-nation or commercial partners for common supplies like water and fuel frees up military transportation assets for specialized munitions and critical components. This creates a multi-faceted and adaptive sustainment network, ensuring that combat power is maintained even when traditional supply lines are contested or disrupted.

Units Must have the Maintenance Capacity to Fight Forward

The 12-Day War strongly reinforced the critical importance of both maneuver and sustainment units having the maintenance capacity to fight forward. Pre-war maintenance infrastructure relied on large supply support activities (SSAs) and maintenance collection points (MCPs) serving as hubs for equipment repair, maintenance, and parts distribution. While these SSAs and MCPs have provided United States forces the ability to scale operations and have facilitated distribution of all classes of supply to all corners of USCENTCOM, they also created very visible high value targets for enemy targeters.

To mitigate this vulnerability, soldiers must be experts at performing 10-level (operator-level) and 20-level (organizational-level) maintenance. Soldiers must be trained to perform routine preventative maintenance, troubleshooting, and repairs. Similarly, mechanics must be experts in 20-level maintenance, able to solve complex maintenance problems with the capability to return equipment to fully mission-capable in a timely manner.

Predictive maintenance is vital in a LSCO environment. In LSCO, units cannot afford to experience equipment failures or extended downtime. Maintainers must be able to forecast maintenance issues based on historical trends to identify issues before they occur. Before and during the 12-Day War, 3rd ESC employed this predictive maintenance planning while supporting the Patriot and Terminal High Altitude Air Defense (THAAD) batteries in theater. 3rd ESC identified shortages in stockages for parts such as the Cooling Leaflet Electronic Terminal (CLET) fan, and in turn expeditiously sourced and transported several more into theater. Through this proactive planning, operational readiness statuses remained above 90% during the most critical points of the conflict, reducing the demand on the Joint Logistics Enterprise and allowing transportation assets to be utilized for other critical missions.

Conclusion

In conclusion, the 12-Day War provided invaluable lessons for our modern forces, highlighting the importance of adaptability and proactive planning in the face of evolving threats. Key decisions made at the strategic level and rapid execution at the tactical level prevented further escalation and limited direct United States involvement in the conflict. The lessons discussed above all underscore how complex and uncertain modern warfare is. As Armor leaders, we are trained to be experts in combined arms maneuver warfare, but to truly understand the complexities of modern warfare it is essential to broaden our perspectives beyond the tactical level. Joining a sustainment command as a broadening assignment offers a unique opportunity to understand the operational and strategic levels of warfare. By serving in a sustainment command, Armor leaders can develop a comprehensive appreciation of the logistics and support systems that enable our formations to operate effectively. Ultimately, the 12-Day War serves as a reminder that the character of warfare is changing, and as armored leaders at the forefront of ground combat we must adapt in response. By incorporating these lessons learned into our doctrine, training, and operations, we can enhance our ability to deter, disrupt, and defeat our adversaries, and emerge victorious in the conflicts of the future.

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NOTES

1 Brigadier General Peter L. Gilbert, Commander, 3rd Expeditionary Sustainment Command (ESC), XVIII Airborne Corps

The Army's New Maintenance Skills Test Program in the ABCT

U.S. Army photo by Jason Johnston

by CPT Gabriel Liranzo

As the Army continues to prepare for large scale combat operations (LSCO) along with the imperative for mobile, protective combat platforms like the M1 Abrams and M2 Bradley, the Armor community understands the need for established maintenance training standards to maintain our fleet readiness. Therefore, the Armor community has developed doctrine for the Maintenance Skills Test (MST) program. This program enables maneuver companies to better train and demonstrate proficiency and competence to operate more effectively in garrison, field training, and real combat environments.

The Russo-Ukraine conflict shows us that we can no longer only rely on our dedicated maintainers to be brought forward or even evacuate damaged/inoperable vehicles to the rear area to be repaired in a LSCO environment. In addition, due to manning challenges amongst maintainer military occupational specialties (MOSs) across armor brigade combat team (ABCT) formations, a greater significance on a more skilled and self-sufficient force of operators is needed now more than ever. Having served as a platoon leader and troop executive officer in a cavalry squadron within an ABCT for a combined 27 months, I witnessed firsthand constraints imposed by a lack of available maintainers to sufficiently man company/troop maintenance teams, operators with bare-minimum knowledge necessary to understand and repair their platforms, and a tendency for overreliance on civilian higher-level maintenance. Therefore, it is necessary that we deliberately implement a standardized approach to train and gauge our technical skills and understanding at the operator and junior leader levels across all ABCT formations. The MST implements the pre-existing structure and format of the Gunnery Skills Test (GST), with which combat platform operators are already familiar. MST prioritizes crew level understanding of common maintenance tasks and are subsequentially tested on their execution and understanding of their assigned platform. Like the troop leading procedures (TLPs), leaders are certified and validated by subject matter experts (SMEs) and then impart that knowledge to their respective echelons, teaching and testing their operators until their crews are certified. This contributes to the establishment of a crew-ownership culture within company/platoon formations, fostering a sense of pride and confidence with their assigned platforms. This will significantly enhance readiness and lethality while simultaneously decreasing the strain on maintenance systems across the Army.

Even as a pre-command Armor Captain, I believe a few must-haves should be done at the company level to properly implement this program within ABCTs as the Army continues its Army Structure (ARSTRUC) plan and continued transformations to prepare for future LSCO environments. Upon taking command of a company/troop, I believe it is necessary to coordinate with your First Sergeant (1SG) and executive officer (XO) to assess the level of technical knowledge and skillsets of the maintainers, non-commissioned officers (NCOs), and operators within your formation, while identifying which company internal SMEs you can most rely on. Then empower those junior leaders to lead the implementation of the MST in your company. With the help from your company/troop's SMEs,

determine what specific maintenance-related issues in your formation need the most attention and publish your maintenance priorities. Some of these priorities may be operator competency, platform specific maintenance issues, or resource requirements from the battalion/brigade level. Be sure to protect the time needed for your junior leaders during your company/troop training and maintenance meetings to drive action and assess the progress of crews. The commander must prioritize the planning and execution of MST as much as GST in the regular battle rhythm. Advocating and protecting this time contributes to greater lethality and will always be time well spent. Lastly, re-evaluating the results of this new program with feedback from all pertinent parties; operators, NCOs, maintainers, company, and battalion leadership helps ensure a more seamless implementation of the MST for your company.

In conclusion, line companies are overdue for greater standardization, and the MST will empower battalions, companies, and platoons to build greater ownership and mastery of their platforms and equipment. This renewed ownership will make the difference when we are in a real LSCO environment against our next adversary. In preparation for when crews must repair their own equipment in combat, empowering our formations to train with a standardized maintenance process makes all the difference in maintaining operational tempo after first contact. Thus, it's up to company commanders to drive this program to the forefront of their priorities and establish a culture of ownership and mastery to set the tone for future generations of crews and leaders that take pride in their equipment that will enable them to close with and destroy the enemy.

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Figure 1. U.S. Soldiers assigned to 2nd Armored Brigade Combat Team, 1st Armored Division conduct preventative maintenance checks and services on a Bradley fighting vehicle. *(U.S. Army photo by SPC Malakai Corley)*

Ukrainian Combat Employment of the Bradley Fighting Vehicle

by 1LT Jack Lynch

In the face of a determined adversary, tactical innovations are often deviations from established military doctrine. Combat in Ukraine demonstrates this principle vividly, particularly regarding the employment of the Bradley Fighting Vehicle (BFV). Army Techniques Publication (ATP) 3-21.71, *Mechanized Infantry Platoon and Squad*, 15 October 2024, outlines doctrine for BFV utilization. The Armed Forces of Ukraine (AFU) adapted the principles found in U.S. Army doctrine and in some cases, deliberately diverged from them to achieve battlefield success against a superior enemy. This essay argues that the AFU experience with the BFV offers valuable lessons for U.S. Army doctrine and tactics, highlighting the need to prioritize adaptability and decentralized initiative within mechanized forces. By examining both U.S. Army doctrine and Ukrainian battlefield applications, this analysis identifies key areas where tactical innovation can inform future force development and enhance the effectiveness of mechanized operations. Armor and Cavalry leaders should read this article to understand how to foster a culture of adaptation and empower subordinate leaders to exploit opportunities on the battlefield.

The BFV story starts with The Food Machinery Corporation that introduced the vehicle in 1981 to engage enemy armor, provide mobile fire support, and transport infantry. The U.S. Army fields several variants including the M2A2 Operation Desert Storm Situational Awareness (ODS-SA), M2A3, M2A4, and M3 (cavalry version). A 600-horsepower Cummins VTA-903T, 8-cylinder, 4-cycle, V turbo supercharged diesel engine powers the BFV and it carries a coaxial 7.62mm M240C, a 25mm M242 Bushmaster chain gun, and a dual tube-launched, optically tracked, wire-guided (TOW) missile launcher. The platform effectively engages infantry, light vehicles, and armored threats in both offensive and defensive operations. Its armor protects against small arms fire and shrapnel, and advanced sensors and targeting systems enhance situational awareness for the three-person crew and safeguard the seven infantry passengers. The BFV honors its namesake, Former General of the Army Omar Bradley's, emphasis on practicality and soldier survivability. Ukraine's operational use of the vehicle reflects principles that diverge from ATP 3-21.71. This essay first examines U.S. Army doctrine, then analyzes real-world battles where the AFU deviated from a doctrinal approach. Finally, it concludes that tactical innovation should drive larger changes at higher echelons.

Doctrine

U.S. Army doctrine establishes a unified operational framework at strategic, operational, and tactical levels. Army Doctrine Publications (ADPs) define principles; Field Manuals (FMs) detail warfighting tactics; and ATPs outline procedures for lower echelons. For example, ADP 3-0, *Operations*, 21 March 2025, Chapter 3-4 defines combined arms as, "the synchronized and simultaneous application of arms to achieve an effect greater than if each element was used separately or sequentially." FM 3-90, *Tactics*, 31 July 2019, describes the tactical sequence of find, fix, finish, and follow through. Tactics reflect combined arms

principles, and ATP 3-21.71 serves as the primary doctrinal reference for mechanized infantry platoons and squads. BFVs are critical assets in tightly coordinated combined arms formations. This approach requires standardization, a common operating picture, and close coordination. This coordination enables the BFV to deliver infantry and mobile firepower as part of a combined arms team. In contrast, the AFU uses the platform in dispersed, semi-autonomous groups. ATP 3-21.71 prioritizes tightly integrated, combined arms actions. The AFU emphasizes flexibility, autonomy, and initiative at the platoon level. Ukrainian commanders often employ the platform for mobile fire support and to place dismounted infantry further from objectives than ATP 3-21.71 prescribes. Distinctive challenges faced by the Ukrainians drive this doctrinal divergence. These challenges include strained logistics, unreliable maintenance, and reduced manpower. The following sections detail ATP 3-21.71's description of offensive and defensive tactics, then explicitly contrasts them with Ukrainian practices.

U.S. Army tactics center on synchronized layered fire support requiring platoons to operate within closely linked formations. ATP 3-21.71, Chapter 3-174, directs that offensive operations require mounted support elements to deliver suppressive fire coordinated with maneuver. This includes precisely timed shift fire commands to prevent fratricide and sustain operational tempo. In contrast, Ukrainians adapt by employing BFVs for independent breakthroughs, ambushes, and anti-tank operations, prioritizing flexibility and speed. Commanders task BFV-mounted TOW missiles with engaging armor targets. Junior leaders exercise greater autonomy in decision-making. This shift from centralized, combined arms actions toward decentralized, localized initiative, highlight a core doctrinal change.

ATP 3-21.71 directs mounted infantry squads to utilize the BFV to close on the objective and dismount at the last covered position before assault. The AFU commonly dismount infantry at greater distances from the objective and use the BFV as a fire support platform. Ukrainian forces make this adjustment because they anticipate anti-armor threats. Their focus is on suppressing Russina positions before dismounting infantry. This contrast highlights ATP 3-21.71 emphasis on rapid and protected infantry deployment. The AFU prioritizes survivability and standoff fire support.

Ukrainian employment of the BFV in defensive operations, diverges from ATP 3-21.71, Chapters 4-14 and 4-15, which recommend positioning the vehicle in area defense or as support for mobile defenses. The AFU instead deploy the platform to support mobile anti-armor teams and conduct ambushes against advancing Russian columns, often using a single fighting vehicle for these actions. These tactics leverage the platform's survivability and mobility to disrupt enemy momentum. The BFV's combat effectiveness also boosts infantry morale. Ukrainian

Figure 1. Two Ukrainian Bradley Fighting Vehicles stand ready to execute their next mission. *(Photo by Ukrainian Ministry of Defense)*

Figure 2. Ukraine map with administrative regions identified. *(Image by Central Intelligence Agency)*

forces demonstrate doctrinal innovation and operational pragmatism by adapting the BFV to dynamic defensive roles. ATP 3-21.71, Chapter 4-88, recommends hull-down engagements within layered defenses. Ukrainian units employ BFVs as mobile fire bases and obstructions along key avenues of approach. Operational necessity drives tactical innovation in contested environments as this adaptation illustrates. Ukrainian forces integrate these tactics into their overall defensive campaign to create a strategic advantage through unpredictability and rapid response capabilities. These moves in turn complicate Russian strategic planning and execution. This approach highlights tactical flexibility and aligns with Ukraine's broader strategy of leveraging asymmetrical warfare to counter superior forces.

The BFV enables the success of combined arms operations by integrating infantry and armor to create layered defenses. The AFU adopted this model, prioritizing mobile defenses, ambush tactics, and rapid repositioning over static formations. The AFU had limited time and resources that strained their ability to fully replicate U.S. Army training environments. The demand of rapid necessity instead of U.S. Army schoolhouse standards, created an environment of impromptu tactics. The BFV now functions as a mobile fire base, engaging Russian units from concealed positions and relocating to maintain tactical advantage. These adaptations suggest that future North Atlantic Treaty Organization (NATO) operations could benefit from smaller, dispersed BFV sections. The M3 remains an effective platform without combined arms coordination. The Ukrainian approach potentially invites unmanageable risk such as the isolation of elements from the response of friendly quick reaction forces (QRF). Excessive autonomy for junior leaders could also lead to resource misallocation and fratricide. Overall, these adaptations demonstrate both operational innovation and the platform's versatility in large-scale combat operations (LSCO).

The Battle of Robotyne

In 2023, Ukraine received its first M3s and rapidly integrated them into frontline operations. NATO instructors accelerated crew training. This enabled Ukrainian units to adapt ATP 3-21.71 to their operational needs. The late August early September counteroffensive that captured the town of Robotyne was the first step laying the foundation for the breach of the Surovikin Line. The Surovikin Line was a Russian echeloned defensive line integrating layered minefields, trench networks and mutually supporting strongpoints. It required deliberate breaching operations in which the M3 supported exploitation and eventual penetration. AFU used the vehicle's capabilities to adopt more aggressive and autonomous tactics, demonstrating the BFV's versatility and ability to reclaim contested ground.

The Kyiv Independent reported that the 47th Mechanized Brigade used the BFVs to transport assault teams close to enemy lines. The 25mm Bushmaster cannons suppressed Russian positions, enabling infantry to dismount and clear trenches with the protection of covering fire. Pvt Oleksandr Hlushchenko, a gunner, described how "the enemy's anti-tank teams tried to neutralize us, but the Bradley's speed and firepower gave us the edge in responding before they could strike".[1] Such firsthand accounts underline how a vehicle often criticized in the U.S. has proven indispensable on Ukraine's battlefields.

Ambush Tactics in the Luhansk Region

In Luhansk, AFU mechanized units employed the platform's mobility and firepower to conduct ambushes in dense forests. The Ukrainian Ministry of Defense announced the destruction of several Russian vehicles, including BMP-3s and T-72 tanks. A Ukrainian platoon leader recalled: "We set up along a tree line, waiting for a Russian convoy to enter our kill zone. The M3s opened fire with 25mm bushmaster cannons and TOW missiles, knocking out the lead and rear vehicles, trapping the convoy. We then dismounted and finished the rest with anti-tank guided missiles and small arms."[2]

Ukrainian troops love the BFV's reliability. Pvt Viktor Khamets, interviewed by The Wall Street Journal, explained: "We were advancing when Russian artillery zeroed in on our position. The Bradley took multiple hits, but the crew survived, and we managed to withdraw while continuing to fire. It saved my life." Sgt Andrii Sokolov echoed this sentiment: "Knowing we have a vehicle that can withstand RPG hits and keep moving changes everything. It allows us to push forward with confidence".[2] These accounts demonstrate not only battlefield effectiveness but also the psychological advantage the vehicle provides to the AFU. Comparing doctrine to practice reveals how a vehicle designed for the Cold War has been adapted for LSCO.

Figure 3. U.S. Soldiers assigned to 1st Battalion, 16th Infantry Regiment, 1st Armored Brigade Combat Team, 1st Infantry Division maneuver BFVs to seize an objective during Rotation 25-04 at the National Training Center, Fort Irwin, Calif., Feb. 9, 2025. *(U.S. Army photo by PFC Christopher Bailey)*

Conclusion

The successful integration of the Bradley Fighting Vehicle into the Armed Forces of Ukraine combat operations provides a compelling case study in tactical adaptation. Despite divergences from the standardized procedures outlined in ATP 3-21.71, the AFU leveraged the M3's inherent capabilities of mobility, firepower, and survivability to achieve significant battlefield effects. This adaptation, driven by logistical constraints, personnel limitations, and the unique challenges of the conflict, underscores the importance of fostering a culture of innovation and empowering small-unit leaders to exercise violence of action. For NATO, the Ukrainian experience offers critical lessons regarding the continued relevance of legacy platforms in LSCO. The enduring value of prioritizing innovation at all echelons of command is the need for doctrinal flexibility in the face of evolving threats. Further study of these adaptations will be essential to inform future doctrine, training, and modernization efforts, ensuring NATO maintains a decisive advantage in future conflicts.

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NOTES

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A Rapidly Changing Operational Environment:

Cavalry Scouts Need to be Painfully Light and Disproportionately Lethal

by SSG Matthew Watson

Analysis from the Russo-Ukrainian War and observations from our own Combat Training Centers (CTCs) have painted an undeniable and sobering picture of the modern battlefield. The findings in the "FY24 CTC Trends" and the "RUS-UKR War Informed Sprint Team Report" are not abstract future concepts; they are current, lethal realities. Data indicates the sensor-to-shooter link, once a matter of hours, has been compressed to single digit minutes.[1,2] At the same time, multiple Center for Army Lessons Learned (CALL) publications on command post survivability indicate that even well-rehearsed battalion headquarters are being detected and notionally destroyed within the first 24-48 hours of an operation. As the Center for European Policy Analysis (CEPA) report "An Urgent Matter of Drones" makes clear, this destruction is primarily driven by the pervasive and difficult to counter threat of unmanned aerial systems (UAS).[3]

For a Staff Sergeant, like me, leading a Cavalry Scout section, we cannot afford to think of these as abstract data points. It is my opinion that these are a direct threat to the survival of my Soldiers and the viability of our mission, a threat made tangible during my time in Europe from 2018-2022. I had a front row seat to this evolving operational environment both before, during, and after the Russo-Ukrainian War. From Private to Sergeant, I was emersed in this mission and was fortunate enough to learn from my non-commissioned officers (NCOs) and officers during the most malleable part of my career. As leaders in 2d Cavalry Regiment (2CR) adjusted our training and equipment such as the Dragoon for a large-scale combat operation (LSCO) oriented style of warfighting, I understood that what I learned in One-Station Unit Training (OSUT) had prepared me for the last war and equipped me with few tools for the war to come.

As my leadership developed me from junior enlisted to junior NCO the background of this development would be like everyone's in 2CR. Taking part in several multinational exercises, including Arrow 19 in the Russian bordering country of Finland, to Noble Partner 20 executed in the former Soviet country of Georgia. The proximity to our near-peer adversaries and emerging threats were made extremely clear to me a day after joining the corps of Non-Commissioned Officers. During Noble Partner 19, our squadron overcame unexpected adversity regarding a failure of sustainment. The fuel we required to conduct the 8-hour convoy to Vaziani military base did not arrive on time leaving our entire squadron immobile in the capital of Tbilisi. Over the next few days while our leadership moved mountains to get us the fuel needed, we took the unexpected time to conduct rehearsals and "hip-pocket classes". In typical team leader fashion, we ran our men through rehearsal of concept (ROC) drills, standard operating procedure (SOP), tactics, techniques and procedures (TTP), and battle drills, and the typical sergeants time training such as tactical combat casualty care, dead gunner drills,

U.S. Army photo by SGT Hunter Xue

rollover drills, call for fire, observation post selection, and reports. Little did we know these rehearsals would be rendered ineffective training scars days after we had conducted them. After the fuel was secured and the convoy completed it became clear we needed to reframe sustainment in modern warfare, however, what would soon become clear; sustainment is not the only aspect we needed to take a serious look at.

I vividly remember passing quarry's being operated by Chinese mining companies and former Soviet refineries still adorning the Hammer and Sycle on their smokestacks during our convoy. I thought, like many of my teammates, how bizarre it was to see the shadows of the defunct Soviet Union. When we drove through the city of Gori, still recovering from the Russian occupation, it was impossible not to think about the outcome of failed sustainment. In a pivotal moment of the 2008 Russo-Georgian war, after cluster bombing the city, Russian armored columns maneuvered uncontested down the E90 highway and captured the city as well as a plethora of military equipment including sixty-five T-72s, fifteen infantry fighting vehicles (IFVs) and dozens of armored personnel carriers (APCs) all abandoned because of what can only be described as a masterclass on Russian logistical strangulation. A very sobering reminder of what happens when you are ill-equipped to sustain a fight. No army is immune to the complications of sustainment.

The implication of the unexpected difficulties in our sustainment was not lost on anyone. The realization of exactly how devastating our Global War on Terror (GWOT) frame of viewing armed conflict was, was emphasized further just a few days later with the breakout of the Armenia-Azerbaijan war. With both countries' borders less than thirty miles away, our exercise quickly became the second thing everyone was thinking about. As the war developed and regional powers became drawn in, the feeling of being unprepared for this style of conflict kept my section leaders up at night. It became clear that Azerbaijani forces, equipped with a clear overmatch in technological assets including both Turkish and Israeli made UAS, were making quick work of Armenian armored units, defensive positions, and airspace. This brand of combined arms and maneuver was something we had not considered while creating the opposing force (OPFOR) for our own training. Our focus was centered around defeating armored threats with man-portable air-defense systems (MANPADS) and counter-improvised explosive devices (IEDs). These lessons felt immediate and personal. We had spent countless hours training for the wrong fight.

Now more than ever with the Russo-Ukraine war we are all vulnerable to the same mistake. The traditional methods of reconnaissance relying on layered concealment and the relative safety of standoff are evaporating in the face of this unprecedented battlefield transparency. We are now forced to confront a fundamental paradox: to survive, we must become "painfully light," shedding every possible signature to retain freedom of maneuver. Yet, to be effective, we must be

Figure 1. A cavalry scout assigned to 4th Squadron, 10th Cavalry Regiment, 3rd Armored Brigade Combat Team, 4th Infantry Division, lies prone and aims his weapon while pulling security on Fort Carson, Colorado, Jan. 27, 2026. *(U.S. Army photo by PFC Thomas Nguyen)*

Figure 2. The 11th Armored Cavalry Regiment facilitate a drone swarm of 40 drones during the battle of Razish, National Training Center on May 8th, 2019. *(U.S. Army Photo by PV2 James Newsome)*

"disproportionately lethal," capable of delivering a decisive blow to shape the battlefield. This is the new reality, and it demands a revolution in how we lead our sections.

Sensor-to-Shooter

The hyper-saturation of sensors may be the single largest change in our operational environment (OE). The modern battlefield is akin to a glass house, and we are still learning how to live inside it. It is no longer a matter of avoiding a roving enemy patrol, listening for the rumble of approaching armor, or relying on proven sustainment means such as air resupply in austere environments. Scouts are being perpetually hunted by a layered "system of systems," an adversary concept that the People's Liberation Army (PLA) and Russia have operationalized with frightening efficiency. This system integrates every method of detection imaginable, but its most ubiquitous and revolutionary component is the drone.

Drones have democratized airpower. The sky is no longer the exclusive domain of billion-dollar aircraft. It is now crowded with a dizzying array of UAS, widely available and often so intuitive to fly that they require no training. These drones can be broadly categorized into three nightmarish groups. First are the reconnaissance drones, the ever-present eyes that loiter for hours, using high-definition optics and thermal cameras to scan every wood line, every depression, every shadow. These platforms feed a constant stream of intelligence to enemy command posts, painting a bird's eye view of the battlefield that makes a mockery of traditional camouflage the dismounted scout has comfortably relied on in. Second, are the first-person view (FPV) "kamikaze" drones. These are small, fast, and agile quadcopters, often assembled from commercial parts, with an explosive charge strapped to them. Guided by an operator wearing FPV goggles, they can fly through open hatches, into fighting positions, and strike with unnerving precision. The pilot no longer needs to be geographically separated from the battle space there by shorting the kill chain. They are the snipers of the sky, capable of picking off individual Soldiers, high value targets like artillery, and vehicles while simultaneously acting as a reconnaissance asset and sensor. Perhaps the most cost-efficient force multiplier ever introduced. Finally, there are the bomber drones, often larger platforms that can drop mortar rounds or grenades with pinpoint accuracy onto positions that were once considered far enough off the forward line of own troops (FLOT) or concealed enough to be relatively safe.

An often-overlooked topic, inseparably linked to this emerging OE, is the cumulative effect of this constant, multi layered aerial surveillance is profoundly psychological. Interviews conducted by the United States Army Transformation and Training Command (T2COM) G2 indicate it induces a state of paranoia and exhaustion in even the most seasoned Soldiers. The lessons from Operation Atlantic Resolve bear this out; units operating in proximity to the Kaliningrad Oblast or Belarusian border are acutely aware of this constant potential for observation. There is no longer a "safe" rear area. Every moment from resupply operations to vehicle maintenance to a Soldier stepping out for a moment of rest is potentially a moment of discovery. This is not just a tactical problem; it is a human one. As a leader, section leaders

are now likely responsible for managing their Soldiers' cognitive load, a load that has been massively increased by the simple knowledge that they are always being watched. This constant stress degrades decision making, frays tempers, and erodes the very cohesion a unit needs to survive in combat. Due to the comparatively small size of cavalry teams and sections this effect has the potential to disproportionately impact Armor branch specifically cavalry elements section sized and below. The age-old need for enforcement of discipline, coupled with the section sergeants' watchful eye for complacency, has perhaps never been so apparent. The result is a battlefield where the front line is not a geographic location, but a state of being. The front line is wherever a sensor can see you. Our training is yet to reflect this truth.

This new reality threatens to exploit the decades of combat experience the Armor Branch has incurred during the global war on terror. Once our greatest strength, this experience now has the frightening potential to be our greatest weakness. Years of TTPs, training, and combat experience combined with a "we have always done it this way" mind set have the potential to transform into training scars. We are all susceptible to this truth. Now more than ever leaders at the lowest levels need to be able to ask themselves why they train the way they do and if that answer holds up under these emerging threat environments. That perfect, covered and concealed observation post we have all spent years identifying and occupying? A thermal camera sees right through the foliage, picking up the heat signature from the Bradley's engine, which was shut down an hour ago. That secure command post we thought was safe, five kilometers behind the line of contact? It just gave away our position with a single, high-power radio transmission, and a swarm of FPV drones is now on its way. The infrared (IR) buzzsaw that was templated as near side recognition for the rearward passage of lines (RPOL)? Queued the enemy to launch indirect fires during the most vulnerable part of the RPOL. This is the essence of battlefield transparency. It is the end of sanctuary. It forces us to accept a new, uncomfortable truth: we can no longer rely on traditional cover and concealment, we must consider all forms of contact down to the lowest level. We must blend into the background noise of the battlefield, a task that demands a radical reinvention of our tactics, techniques, and procedures.

Balancing Signature Management with the Fundamentals of Reconnaissance

In an operational environment against our peer-to-peer adversaries, Cavalry scouts' survival hinges on communication. Crypto fill and Cypher might be enough to stop our adversaries from listing to what our scouts are reporting, however the electronic signature of a radio is enough to get our sections killed. It requires a fanatical, section-wide devotion to signature management (SIGMAN), a discipline that must now be treated with the same reverence as marksmanship or land navigation. No longer is SIGMAN primarily a Signal corps responsibility. The section leader will soon find himself responsible for engraining that in his elements. SIGMAN is the art and science of blending in, and it must be practiced across every domain.

Visual and thermal signatures are the most obvious. Our vehicles, especially the Bradley Fighting Vehicle (BFV), are massive heat signatures. Even after shutdown, they radiate heat for hours, appearing as glowing beacons to enemy thermal optics. Traditionally we have focused only on visual camouflage. We must become masters of thermal discipline, understand the thermal properties of the terrain and use it to our advantage at the lowest level. This means seeking out areas with high thermal clutter, like dense urban areas or rocky terrain, to mask our signature. It means understanding the science of cooldown times and planning our movements and halts accordingly. It requires us to use specialized thermal blankets not just covering our vehicles with camo net and foliage, but to create thermal decoys, false heat signatures that draw the enemy's attention and munitions away from our actual positions. This all may seem obvious, but you may be surprised to learn that currently, 19D Cavalry Scout, 19C Bradley Crewman and 19K Armored Crewman at OSUT, all have a lesson teaching camouflage of a vehicle. Across all three lesson plans the word decoy is only mentioned once. Other than putting a camo net on a vehicle and understanding that snow will impact a thermal no thermal masking techniques are mentioned or taught. This is a frightening realization when you consider the vast majority of OSUT graduates will fill the driver position as their first role after graduating. This would be less of an issue if it was covered in Advanced Leader Course (ALC), however, it is not. The lesson plan is not the problem; it is the example. The mindset is the problem.

All Staff Sergeants and above in the Armor branch have one thing in common. We have all trained to the point of muscle memory. Knowing this, we need to actively seek out things like camouflage a vehicle and make efforts to change them. The most basic TTPs are going to be the ones that get our sections killed, never stop asking why do it this way? Questions that were easy answers can get complex when you take the time to deliberately think about them. Serving as a OSUT Instructor I have become all too familiar with the "Private questions". Increasingly often I find these questions that once were an easy answer, something requiring some serious thought. . Questions like, does it still make sense for a patrol base to be a triangle? A trainee asked me that very simple question a year ago and I still have not come to a conclusion. SIGMAN is more than just BLUES, and we will fail if we are not extremely critical of our own TTPs at the section level. *[Editor's Note: BLUES is a Cavalry acronym for: Blend in with the surrounding area. Low to the ground. Unexpected sites should be used. Evacuation routes planned during site selection. Silhouetting should always be avoided.]*

The electromagnetic spectrum (EMS) is likely the greatest challenge. Every device we carry, from our tactical radios to our Joint Battle Command-Platform (JBC-P) and blue force tracking (BFT) systems, are a beacon screaming, "Here I am!" Our doctrine has become incredibly reliant on a constant flow of digital information, but this

connectivity is a double-edged sword. As observed in numerous CTC rotations and exercises under Atlantic Resolve, our adversaries are adept at electronic warfare (EW). They can detect, direction-find, and target our transmissions at frightening speed. Leading a scout section now means being an amateur network administrator, constantly weighing the need for situational awareness against the risk of electronic detection. It means abandoning the practice of continuous broadcasting and embracing "pulse" communications, short, data dense transmissions followed by long periods of radio silence. It means using the radio when we must, not when we want to. Every scout platoon in the Army has signal flags collecting dust in a container express (CONNEX) right now. Imagine how big of a signature your section gives off while reporting readiness condition (REDCON) status and start point (SP). We have the solution; it just takes some inward reflection to decide to implement. Electronic detection demands that we become experts in directional antennas, meticulously orienting them to minimize our electronic signature. Most importantly, it means being prepared to fight with far less reliance on receiving information on the radio. Every scout must have a complete understanding of the commander's intent, the mission's objectives, and the plan for degraded operations. We must rigorously train with analog navigation, runners, and disciplined reporting methods because it is not a question of if our digital systems will fail, but when.

This leads to, in my opinion, the most counter intuitive aspect of SIGMAN: dispersion. The "TDF CP Survivability" handbook's emphasis on dispersion is a lesson written in blood.[4] A clustered section is a lucrative target, one that an enemy commander is willing to expend significant resources to destroy. To survive, we must break apart. Three BFVs cannot be within sight of each other. Dismounted teams must operate in buddy pairs, separated by hundreds of meters. We must think, not as a single section, but as a constellation of independent, mutually supporting nodes. This radical dispersion will create significant challenges for command and control, logistics, and mutual security. It stretches the capabilities of our radios and makes resupply harder. The answer is rehearsals. If we change our most basic of section TTPs, we can adapt. The alternative is annihilation. As section leaders, our role shifts from directly controlling teams to orchestrating them. We can provide the intent, the boundaries, and the objectives, but we must trust our team leaders to execute with minimal communication. The NCO Corps is routed in decentralized command; empowering subordinate leaders is the only way forward. It requires a level of trust, training, and initiative that our Army has long preached, but seldom practiced to this extreme. The combination of obsessive SIGMAN, radical dispersion, and disciplined mobility are the ingredients of a technically and tactically proficient scout section. If we do not think our sections can do this, we all need to take a long look at why.

Figure 3. Cavalry Scouts recover casualties in their Bradley Fighting Vehicle after encountering an ambush from the nearby hillside during a training exercise at Twin Bridges training area, South Korea, Dec. 8, 2015. *(U.S. Army photo by SSG John Healy)*

The Disproportionate Punch: From Eyes and Ears to Claws and Fangs

Survival is the prerequisite, but it is not the mission. A scout section that only hides is not a reconnaissance asset; it is a liability. If we cannot gather and report information and enable informed decision making, we are wrong. In this new environment, where finding the enemy is synonymous with being found, we can no longer be passive observers. The scout section must be disproportionately lethal. We must be able to deliver a blow so swift and violent that it neutralizes the immediate threat and creates an opportunity for

us to displace, while being light enough to retain the freedom of maneuver.

This lethality must first be organic. The days of a scout section defending itself with only machine guns and wishful thinking are over. We must be armed with systems that allow every scout to punch like a heavyweight. The proliferation of advanced anti-tank guided missiles (ATGMs) is only the tip of the iceberg. Every scout vehicle and dismount team should be equipped with systems like the Javelin, giving them the ability to destroy main battle tanks from kilometers away. But the true revolution lies in arming our sections with loitering munitions. The ability for a two-man scout team, hidden in a basement or a ditch, to launch a small, man-portable drone, identify an enemy air defense system or command vehicle, and destroy it with a self-contained warhead is a fundamental game changer. It transforms every scout from a simple reporter into a precision strike asset capable of forcing the enemy to make high stakes decisions under pressure. We cannot wait for this technology to be perfected; we must demand it, train with it, and integrate it into our TTPs now. Furthermore, we cannot just hide from drones; we must have the ability to fight back. Waiting for air defense assets not indigenous to your section to protect your people is a recipe for disaster. We need an organic counter-UAS (CUAS) capability. This could take multiple forms: compact electronic jammers that can sever the link between a drone and its operator, directional energy systems, or even specialized airburst munitions for our 25mm cannons. A scout section that can create its own protective bubble, blinding or destroying enemy drones in its immediate vicinity, regains its freedom of maneuver. It can move, observe, and report without the fear of being fixed by enemy UAS.

The second, and ultimately more powerful, form of our lethality is networked. Our most powerful weapon is not the cannon on our BFV; it is the network we use to bring the full might of the combined arms team to the enemy. A scout section that can provide a real time, targetable, quality location of an enemy artillery battery to a Guided Multiple Launch Rocket System (GMLRS) battalion influences the battlefield that is wildly disproportionate to its size. A scout team can accomplish this if equipped with small UAS (sUAS). This must be our asymmetrical advantage. It requires a new level of technical mastery from our Soldiers. They must be experts not just in vehicle identification, but in digital targeting systems, laser designation, and capabilities of indirect fire assets at their disposal. Our next fight will likely be alongside our NATO allies. Can my scout team pass a target to a Polish artillery battery? Can I talk to a German Tiger helicopter? Can I tell the difference between a friendly Finnish BMP and an enemy? As a section leader, we must now ensure our Soldiers are fluent in language of joint fires, capable of navigating different systems, data formats, and rules of engagement. We are no longer just the "eyes and ears of the commander"; we are the trigger finger of the entire combined arms team.

Leading in the Crucible

Our job as section leaders has become one of managing constant, multi-domain risks. We are no longer just tacticians; we are signature managers, joint fires experts, network administrators, and drone operators, all while trying to keep our Soldiers alive under the most intense pressure imaginable. This requires a fundamental shift in how we think about leadership and expertise within the reconnaissance community.

Our training must undergo a violent evolution. The scripted, linear lanes of our CTCs, while valuable for validating basic competencies, are insufficient for preparing us for this environment. We need force-on-force training where a thinking, unrestricted OPFOR is equipped with the same UAS, EW, and precision fire capabilities that our adversaries possess. Units should be graded not just on whether they found the enemy, but on their signature, and how many times they were detected electronically. Training must induce communications failure and force leaders to operate under these conditions for an extended period.

We must empower our team leaders and Soldiers to a degree that is uncomfortable for our current institutional culture. With our section dispersed over kilometers of terrain and operating under strict emissions control (EMCON), we cannot micromanage. We must trust that our team leaders, understand the commander's intent and can make life-or-death decisions on their own. Our primary job is no longer directing their move but training them to operate in our absence. We must give them the tools, the authority, and, most importantly, the trust to execute the mission when they are alone and being hunted.

We must shed the old, comfortable ideas of what it means to be a reconnaissance element. We must embrace the paradox of being painfully light and disproportionately lethal.

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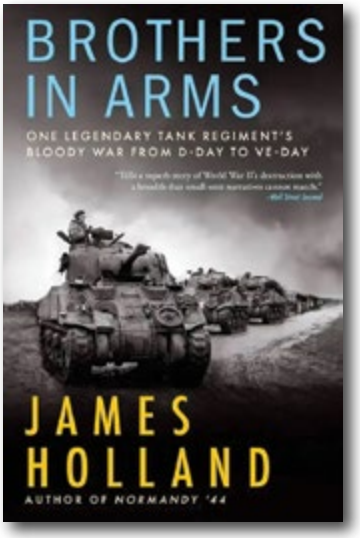
BOOK REVIEWS



BROTHERS IN ARMS (One Legendary Tank Regiment's Bloody War from D-Day to VE-DAY) by James Holland, Atlantic Monthly Press, 529 pages, 2021

The interwar period between the First and Second World Wars can serve as a point of comparison for the U.S. Army's current modernization campaign, known as the Army Transformation Initiative (ATI). The technical and tactical innovations by the German Army, and lack thereof by the French and British, during those interwar years are often used as a warning as to the dangers of peacetime complacency. However, a less appreciated story is that of how the British Army, with the assistance of the American Lend-Lease Program, converted from a territorial defense and constabulary force into a technologically and tactically superior beast within two years of their 1940 defeat in France. In Brothers in Arms, author James Holland tells the story the Sherwood Rangers Yeomanry's tranformation from a horse mounted cavalry regiment in Palestine in 1939 to a highly competent Sherman tank mounted cavalry regiment in North Africa by 1942. The Sherwood Rangers not only spearheaded the British Normandy landing at Gold Beach on 6 June 1944, but were also the first British troops into Germany, and ended the Second World War with the most battle honors of any regiment in British history.

Holland is an English historian, prolific author, broadcaster, and podcaster (We Have Ways of Making You Talk). *Brothers in Arms* is one of Holland's more than twenty Second World War non-fiction books and is a follow up to his broader Normandy campaign work, *Normandy '44: D-Day and the Battle of France* (Bantham, 2018). Admittedly inspired by Stephen Ambrose's *Band of Brothers* (Simon & Schuster, 1992), Holland follows one British mechanized cavalry regiment from their preparations in southern England, through the D-Day landings, the liberation of France, the ill-fated Operation Market Garden, and ultimately the defeat of the Third Reich. Holland's work serves as a testament to the potential transformation that can be achieved with the right amount of leadership, training, and technological innovation.

One of Holland's key insights is that there is no substitute for combined arms maneuver. The Allied way of war was ''steel not flesh." The use of overwhelming and accurate artillery fire (to include naval gunfire), air superiority, armor, engineers, and infantry, allowed the Allies to continuously attack and defeat the Germans with a less than three to one manpower advantage. While the Allied casualty rate was high, the aforementioned materiel and tactical advantages kept the relative combat power ratios favorable to the Allied side. As today's Army embarks on the ATI, we must remember that technology can enable and enhance combined arms maneuver, but technology cannot replace combined arms maneuver.

A key aspect of the Allies superior way of war was the armor-infantry team. Although the Sherwood Rangers were a pure tank regiment, they quickly became adept at working with not only British but also American infantry. Across Normandy, the Netherlands, and Germany, the Sherwood Ranger tanks provided fire fight ending direct fire lethality to the infantry, while the infantry protected the tanks from the dreaded German Panzerfaust equipped infantry in complex and restrictive terrain. The close cooperation of armor and infantry remains an essential part of modern combat. Any changes to the armor-infantry team through ATI, will still require close collaboration between these two arms.

The success of the Sherwood Rangers, and the Allies in general, relied heavily on air superiority. Since the North African campaign, the Allies benefited from the situational awareness, protection, and firepower provided by the near constant presence of friendly aircraft overhead and the lack thereof by German aircraft. The only real obstacle to Allied air support was the poor European weather, which deteriorated the further east that the Sherwood Rangers fought and the later that operations occurred in the calendar year. The Second World War and beyond given of air superiority is no longer assumed in modern combat. The integrated air defense systems (IADS) of our enemies and the relatively recent dominance of unmanned aerial systems (UAS) on the Ukrainian battlefields have forced modern day militaries to rethink all aspects of ground combat. Today's maneuver forces must not only use technologies, tactics, techniques and procedures to protect themselves from enemy UAS, but they must also find new ways to integrate UAS to enable combined arms maneuver.

In summary, James Holland's *Brothers in Arms*, is a worthy addition to the history of armored warfare. The Sherwood Rangers' story of transformation from a constabulary force to a technically and tactically adept armored regiment also serves as a point of comparison for the U.S. Army's ongoing transformation initiative. Ultimately, it reminds us that there is no substitute for tactically sound combined arms maneuver.

RETIRED COL Chris R. Willis

237th CAVALRY REGIMENT

The regiment was constituted on 3 July 1946 as the 185th Tank Battalion in the Ohio National Guard. It was organized and federally recognized on 20 January 1949 with headquarters at Cincinnati. On 15 September 1949, it was redesignated as the 2nd Battalion of the 107th Armored Cavalry Regiment. On 1 September 1959, it became the 2nd Reconnaissance Squadron, 137th Armor.

On 1 April 1963, the Squadron was redesignated as the 237th Cavalry, a Combat Arms Regimental System parent regiment, consisting of the 1st Squadron, part of the 37th Infantry Division. The Squadron was organized from existing units of the 2nd Reconnaissance Squadron. The 1st Squadron's Headquarters and Headquarters Troop (HHT) was redesignated from the 2nd Reconnaissance Squadron HHT at Cincinnati, Troop A from the 2nd Reconnaissance Squadron's Troop A at Cincinnati, Troop B from the 2nd Reconnaissance Squadron's Troop B at Cincinnati, and Troop C from the 2nd Reconnaissance Squadron's Troop C at Cincinnati. The 1st Squadron participated in the 1965 Cincinnati Memorial Day parade, displaying its heavy tanks. Elements of the squadron, equipped with eight M48 Patton tanks and 30 jeeps, participated in the 1967 Veterans Day parade in Cincinnati.

PB 17-26-1
PIN 222837-000

Headquarters, Department of the Army
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