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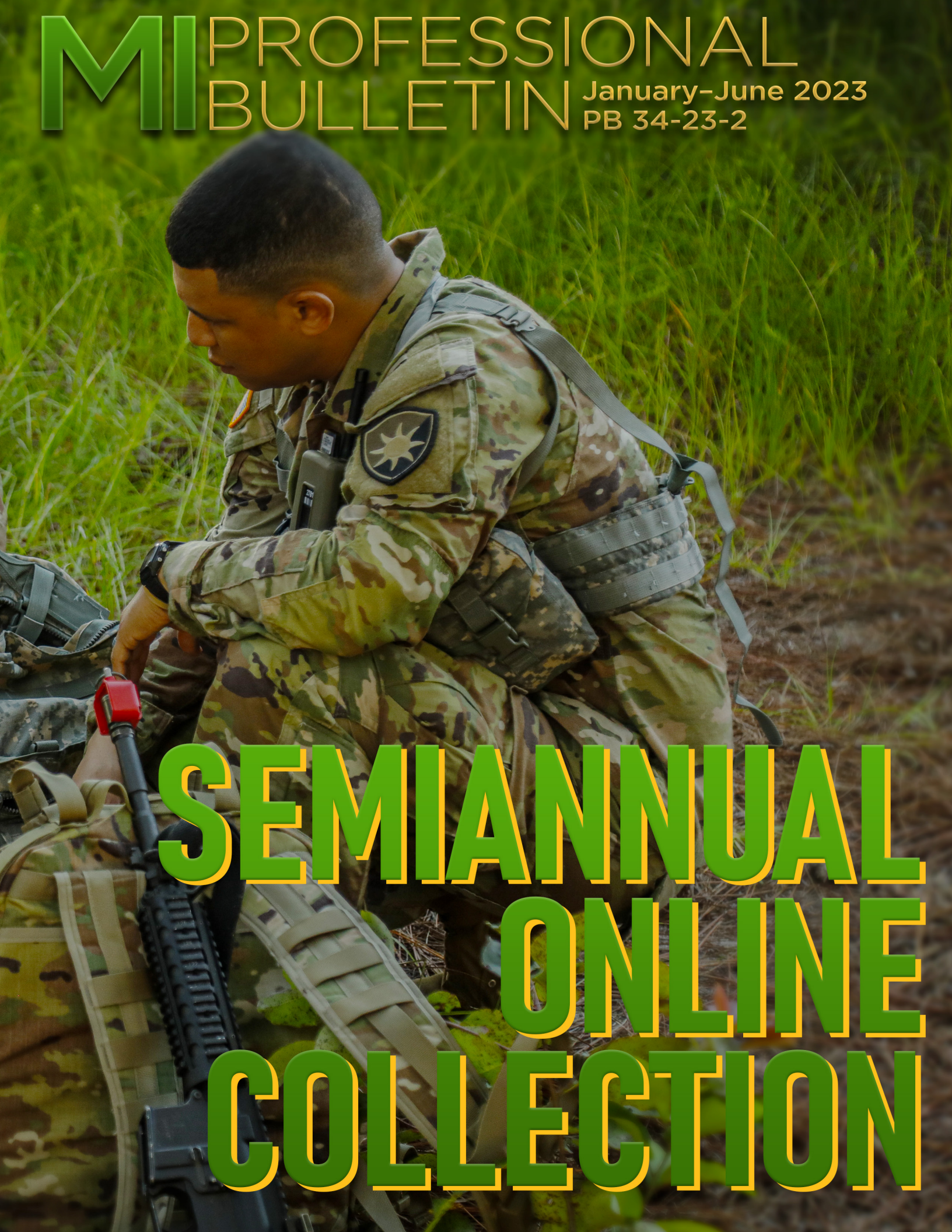

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January–June 2023

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5th Squadron, 7th Cavalry Regiment, 1st Armored Brigade Combat Team, 3rd Infantry Division, electromagnetic team Soldiers support training in preparation for Exercise Combined Resolve XVII on 18 July 2022.

THE USE OF ELECTROMAGNETIC WARFARE CAPABILITIES DURING COMBINED RESOLVE XVII

by Captain Dillon Aiken

Introduction

In the summer of 2022, while deployed as part of Operation European Assure, Deter, and Reinforce, 5th Squadron, 7th Cavalry Regiment (5-7 CAV), 1st Armored Brigade Combat Team, 3rd Infantry Division (1-3 ABCT), participated in Exercise Combined Resolve XVII at the Joint Multinational Readiness Center (JMRC), Hohenfels, Germany. The squadron's use of integrated electromagnetic warfare (EW) capabilities produced several lessons learned. Key observations from the exercise included the importance of establishing habitual relationships between EW enablers and their supported units, the need for deliberate planning and execution to ensure effective use of EW capabilities, and the benefits of assigning fires assets to immediately engage targets identified by EW teams.

Task Organization and Enablers

During the exercise, 5-7 CAV was task organized with support from:

- Three armored reconnaissance troops.
- One tank troop.
- One Belgian intelligence, surveillance, target acquisition, and reconnaissance (ISTAR) company.
- One Lithuanian reconnaissance company.
- One forward support troop.
- One headquarters troop.

The squadron could employ two Raven unmanned aircraft systems (UAS) simultaneously using the systems organic to each armored reconnaissance troop and the Belgian ISTAR company. The squadron received additional support from:

- 1-3 ABCT's organic Shadow UAS.
- 7th Squadron, 17th Cavalry Regiment's organic Shadow UAS and AH-64 Apache helicopters.
- An attached Q-50 lightweight counter mortar radar.
- The Belgian ISTAR's organic ground radar system.
- Cueing from signal intelligence (SIGINT), human intelligence (HUMINT), and open-source intelligence.
- Echelons above brigade capabilities to include ground moving target indicator, full-motion video, and electronic intelligence.

While 5-7 CAV has a habitual relationship with 1-3 ABCT SIGINT that usually includes attachment of the Prophet systems, these systems were unavailable for this exercise. Instead, 1-3 ABCT attached two EW teams to the squadron for the duration of the exercise. These teams came with two Joint Light Tactical Vehicles (more commonly known as JLTVs) for mounted electronic support and two dismountable Versatile Radio Observation and Direction (VROD)/Versatile Modular Adaptive Transmission (VMAX) systems. The VROD system provides an electronic support capability, while the VMAX system provides both an electronic support and electronic attack capability.

Employment of Electromagnetic Warfare Teams

The EW teams' primary mission was to identify signals of interest for cueing other collection assets to additional collection opportunities against the opposing forces. The combined information collection effort would lead to situational understanding for the brigade combat team.

A single VROD system will produce a line of bearing that identifies the azimuth to the signal of interest. Two systems will produce a cut, which provides an approximate distance and direction sufficient to cue another collection asset. Three systems will produce a fix, which provides a high-fidelity targeting solution sufficient for a call for fire or precise cueing of another collection asset. Achieving a fix not only requires three VROD systems oriented on the same signal, but it also requires line of sight among the three systems to allow the sharing of information. The line of sight constraints within the restrictive terrain of JMRC required 5-7 CAV to collocate the two JLTV's with a single troop. This effectively limited targeting fidelity with the VROD systems to, at best, a cut.

To gain higher fidelity on the signals of interest, 5-7 CAV chose to use the EW teams as a cueing asset. Once the teams identified the location of a signal of interest, the location was passed to the squadron tactical operations center (TOC) over frequency modulation (FM) or the Joint Battle Command-Platform (JBC–P). The TOC compared the report to templated enemy locations based on S-2 analysis. If the signal of interest corresponded with a templated enemy location, such as a command and control node, the battle captain tasked another collection asset to look for an indicator or a specific information requirement at that location. Figure 1. illustrates an example of this process.

The same process applies in adverse weather conditions or when Ravens are not available. Redundancy built into the collection plan allows the use of organic, attached, and available assets to develop the situation and drive the targeting process.

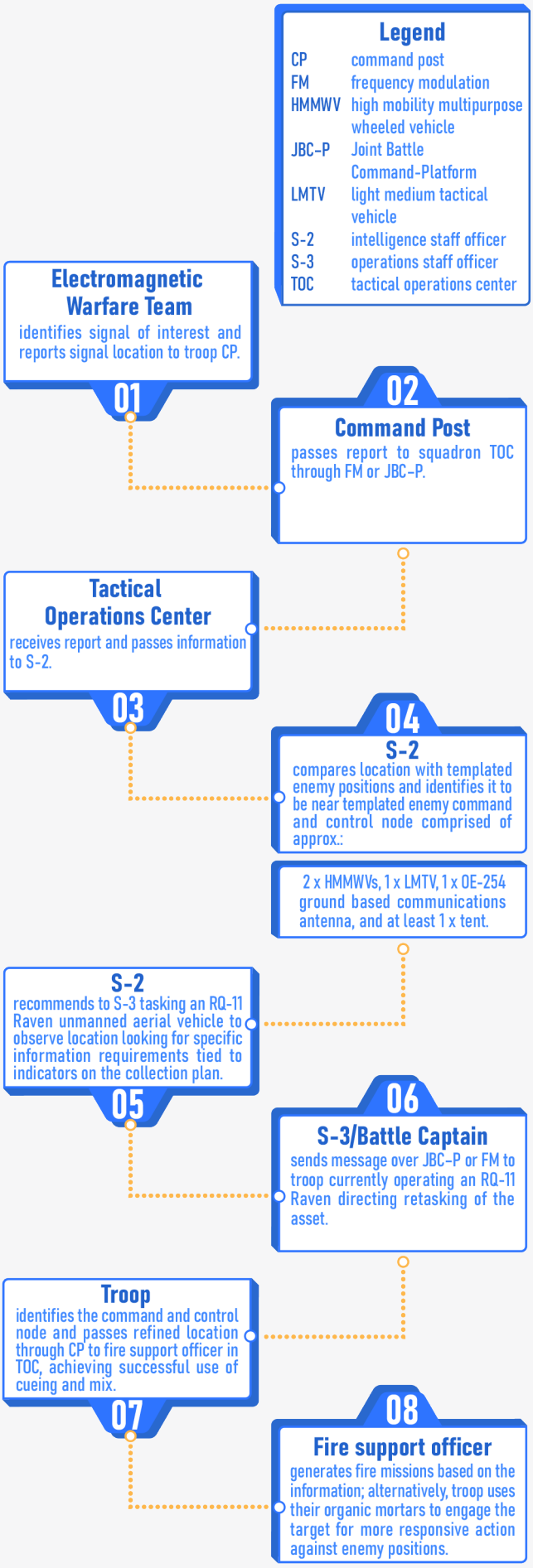


Figure 1. Electronic Warfare Team Employment

Recommendations

While EW was a significant enabler for 5-7 CAV during Exercise Combined Resolve XVII, there are several ways to improve the effectiveness of EW, thereby generating options for the commander to achieve a relative advantage on the battlefield. Recommendations going forward include:

Leverage Resource Materials. Leverage resources like *The Electronic Warfare Smartbook*[1] during initial exercise preparation to understand planning considerations and best practices for EW capabilities. Figure 2, adapted from FM 3-12, *Cyberspace Operations and Electromagnetic Warfare,* provides an overview of tasks that EW can accomplish. While 5-7 CAV exhibited a baseline understanding of EW from having a full-time EW noncommissioned officer in the squadron, there was not a deliberate process to plan for and integrate EW effects into operations before the exercise beyond its inclusion in the information collection matrix and the information collection synchronization matrix.

Integrate EW Personnel into the Military Decision-Making Process (MDMP). *The Electronic Warfare Smartbook* recommends including EW personnel early in the MDMP to gain an understanding of both electronic support and electronic attack capabilities. EW personnel can assist in generating specific information requirements and indicators for information collection related to the threat electronic order of battle. EW personnel help to generate an understanding of enemy composition and disposition. The smartbook also discusses ways that EW can support each warfighting function during the MDMP and operations process. The consolidation of EW personnel at the brigade level made it challenging for 5-7 CAV to incorporate them into the MDMP, but prior coordination would have made it possible.

Define Metrics. During the assessment phase of the operations process, consider using metrics, such as those developed by the National Training Center and used for evaluation of rotational training units. Again, *The Electronic Warfare Smartbook* provides relevant examples of metrics for EW.

Integrate Mission Teams. To increase the responsiveness of targeting operations, consider assigning a field artillery platoon with the responsibility to engage targets identified by EW cueing. The platoon could begin to clear friendly air and ground forces upon identification of a signal of interest and be prepared to immediately engage upon target identification.

Habitual integration of EW teams with their supported units is essential to success. While the squadron integrated an EW noncommissioned officer and a VMAX/VROD system into both the platoon live fire exercise (LFX) and troop combined arms live fire exercise (CALFEX), this was not sufficient to develop relationships of mutual trust and understanding among all EW enablers and the troops. At the brigade level, the EW officer must prioritize the incorporation of supporting EW enablers into all feasible training events with the supported unit. This integration should include both mounted and dismounted maneuvers to ensure that the operational tempo can be maintained. Coordination is especially important when mixing wheeled and tracked vehicles as platforms.

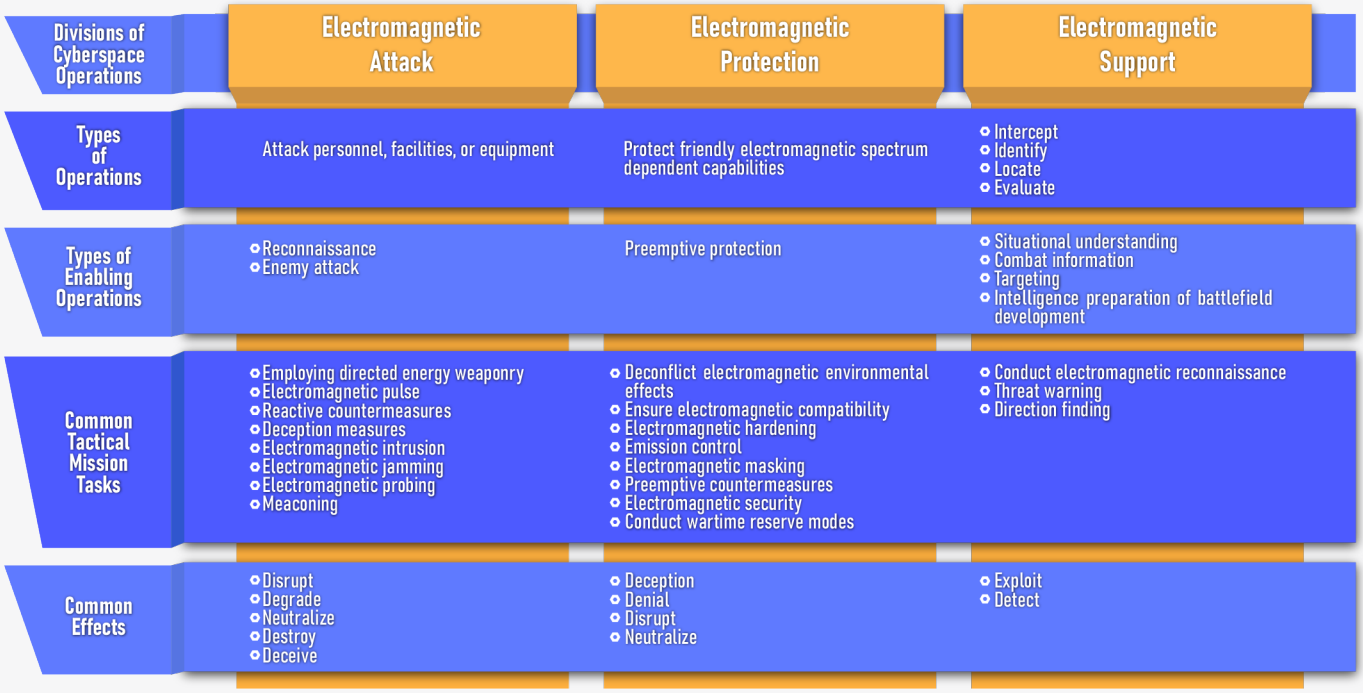


Figure 2. Electromagnetic Warfare Taxonomy[2]

Additionally, EW teams can build mutual trust and understanding by demonstrating the capabilities of their systems. The supported unit has a responsibility to cultivate this trust and understanding by requiring EW support during exercises. The supported unit should plan to have live electromagnetic emissions present during training events. This creates opportunity for signal identification by the EW team, which allows the supported unit to take additional action. During platoon LFX and CALFEX, 5-7 CAV attempted to replicate this through "white card effects" that showed what the VROD screen would look like if it were observing a signal of interest. This is good, but observing a live emission would be significantly better.

Conclusion

5-7 CAV exhibited a willingness to embrace EW capabilities during Exercise Combined Resolve XVII to improve signals acquisition for an integrated collection strategy. The squadron benefitted from this integration through improved cueing of reconnaissance troops and better planning fidelity based on an enhanced understanding of the opposing force's locations. A deeper dive into resource materials and changes driven from lessons learned will further expand the squadron's capabilities. Full integration of EW capabilities with the array of other collection assets available to the squadron will help create a robust intelligence picture. This allows the commander greater flexibility and assurance during both planning and decision making.

Endnotes

1. Department of the Army, Center for Army Lessons Learned Handbook No. 16-15, *The Electronic Warfare Smartbook* (Fort Leavenworth, KS: Center for Army Lessons Learned, May 2016), https://www.army.mil/call (common access card login required).

2. Graphic adaptation from Department of the Army, Field Manual 3-12, *Cyberspace Operations and Electromagnetic Warfare* (Washington, DC: U.S. Government Publishing Office, 24 August 2021), 2-8.

CPT Dillon Aiken currently serves as the 3rd Infantry Division G-2T Targeting Officer. He previously served as the S-2 for 5th Squadron, 7th Cavalry Regiment, 1st Armored Brigade Combat Team, 3rd Infantry Division. He deployed in that position as part of Operation European Assure, Deter, and Reinforce.

5th Squadron, 7th Cavalry Regiment, 1st Armored Brigade Combat Team, 3rd Infantry Division, electromagnetic team in a mounted configuration conducts support for Combined Resolve XVII at the Joint Multinational Readiness Center, Hohenfels, Germany, on 18 July 2022.

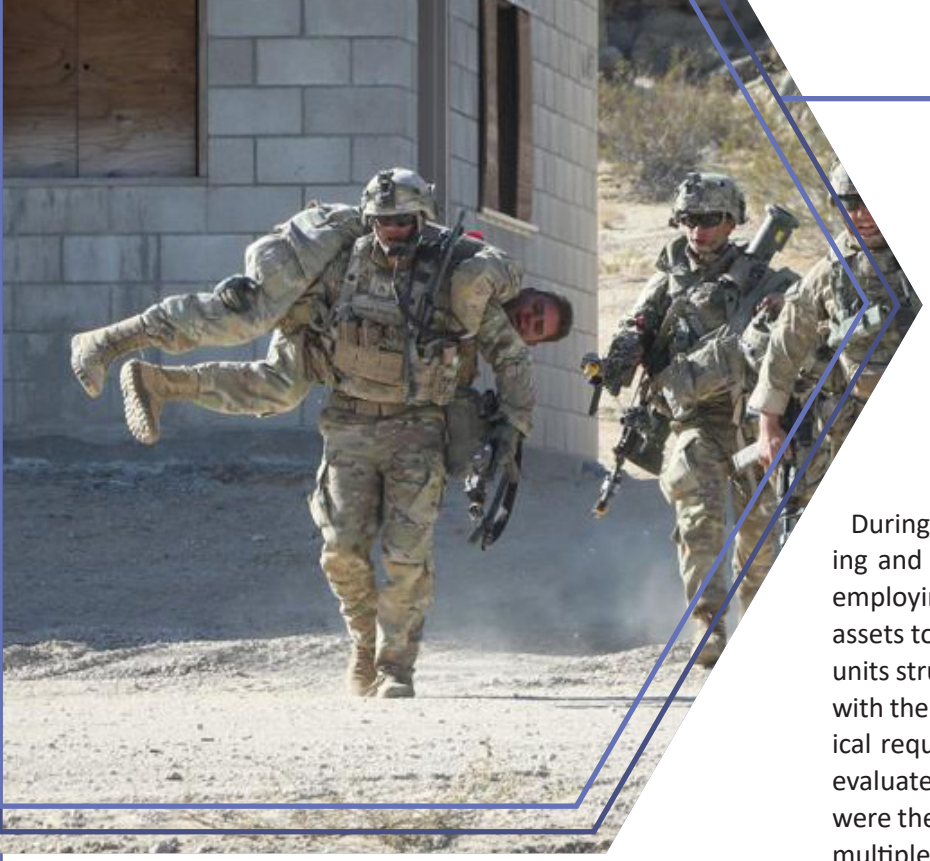
A G-2'S OBSERVATIONS FROM THE NATIONAL TRAINING CENTER AND WHAT TO DO ABOUT THEM

by Lieutenant Colonel Victor Somnuk

U.S. Army soldiers assigned to the 3rd Armored Brigade Combat Team, 1st Cavalry Division, inspect their vehicle during Motorpool Monday at the National Training Center, Fort Irwin, CA. (U.S. Army photo)

Introduction

The National Training Center (NTC), Fort Irwin, California, provides a realistic training environment for rotational training units to build and sustain readiness across the warfighting functions. For the intelligence warfighting function, NTC helps highlight and assess the ability of rotational training units to execute the intelligence process. The 1st Cavalry Division's 2nd and 3rd Armored Brigade Combat Teams and the 3rd Cavalry Regiment participated in rotational training at NTC from March through May 2022. The division staff supported the units throughout their rotations, with the division G-2's support including reception, staging, onward movement, and integration support teams; soldiers embedded with the units; and reachback to home station for intelligence processing, exploitation, and dissemination support.



3rd Calvary Regiment Soldiers carry a simulated casualty to the evacuation point during a decisive action rotation at the National Training Center (NTC) in Fort Irwin, CA. (U.S. Army photo by SPC Kyler Chatman, Operations Group, NTC)

Observations

Several strengths and weaknesses were identified from the training. The most apparent weaknesses across the force were a lack of proficiency in connecting, collecting, and communicating with military intelligence (MI) systems and the utility of unit primary, alternate, contingency, and emergency (PACE) plans to synchronize, collect, and disseminate intelligence. However, the units displayed strength in intelligence analysis, assessments, support to targeting, and overall crew proficiency once MI systems connected and collected the data needed to analyze and provide support to targeting.

In preparation for NTC, the 1st Cavalry Division and the 3rd Cavalry Regiment conducted Military Intelligence Training Strategy (MITS) Tier 2 (intelligence platforms) evaluations using the Intelligence Electronic Warfare Tactical Proficiency Trainer at the Fort Hood, Texas, Mission Training Center, which has an incredibly competent and supportive staff. The brigade combat team and regiment S-2s prepared their teams to address Tier 2 shortfalls and to provide the full suite of intelligence capabilities for Tier 1 (intelligence warfighting function) certification at NTC. Still, it became clear early in the unit deployment cycles that MI systems operability would be a challenge. Adherence to the conditions and standards laid out in the TC 2.19-400 series of publications is important to assess the readiness and proficiency of the intelligence warfighting function, especially for MI systems, prior to deployment. Leaders must be wary of relying on completed checklists serving as the measure of the intelligence warfighting function's effectiveness. Training artificialities exist in the MITS training circulars that can create a false sense of proficiency on MI systems.

During two of the rotations, the units had difficulty gaining and maintaining the upper tactical internet while also employing all available organic intelligence equipment and assets to collect and communicate across echelon. All three units struggled to communicate and synchronize intelligence with their down trace battalions and squadrons. This is a critical requirement that, unfortunately, MITS Tier 2 does not evaluate. Further exacerbating the communication struggle were the winds in the Mojave Desert reaching over 30 mph, multiple command post jumps, and the opposing force frequently wreaking havoc on the units' systems and process. These types of challenges are difficult to replicate during a MITS Tier 1 event at home station.

Individual Soldiers and crews displayed skilled proficiency in driving the intelligence process once mission command and MI systems were connected, operational, and optimally employed. The analytical skills of each unit enabled commanders and staff to understand and visualize the opposing force and terrain, supporting informed decision making. As a result, deep understanding of the enemy through refined intelligence preparation of the battlefield and effective processing, exploitation, and dissemination of geospatial and signals intelligence and human intelligence led to timely and relevant support to targeting.

Path Forward

The following summary covers actions the 1st Cavalry Division will implement to capitalize on lessons learned and mitigate the identified challenges. This will position the division to deploy ready crews and equipment that can fully leverage the Army intelligence enterprise at NTC or in theater.

Intelligence Systems Maintenance and Training. Soldiers require consistent and realistic training on the Distributed Common Ground System-Army intelligence systems and the dedicated time to maintain and operate them. Maintenance must improve to ensure that systems are ready to connect, collect, and communicate at NTC or in theater. As part of the Army intelligence enterprise's efforts to be multidomain operations capable, the 1st Cavalry Division is taking the following actions to improve the maintenance, training, and effectiveness of current systems.

Input Intelligence Systems and Components into the Global Combat Support System-Army (GCSS–A). MI systems are difficult to maintain for many reasons. Improved command awareness can spur a resolution to maintenance issues. The U.S. Army Forces Command order titled "Corps and MSC tasked ISO Intel WFF Systems Readiness," published 22 October 2019, tasked units to update GCSS–A with MI systems; thereby, ensuring property accountability, prioritization as pacing items, and readiness reporting. MI systems and sub-components reflected in GCSS–A will highlight longstanding issues tied to prime movers that frequently break down and low-density parts that render an MI system non-mission capable. Command emphasis is requisite to accomplishing this task. The importance of a dedicated automated logistical specialist (military occupational specialty [MOS] 92A) assigned to the MI company to assist in uploading and maintaining the data must be stressed.

> **We don't rise to the level of our expectations, we fall to the level of our training.**
> **—Archilochus, Greek soldier and poet (680 and 645 BCE)**

Develop and Codify Tango Tuesdays. The intelligence warfighting function is dependent on the expertise of military intelligence systems maintainers (MOS 35T) to maintain intelligence systems and is often dependent on their proficiency to operate and troubleshoot non-maintenance issues. During the NTC rotations, operator proficiency gaps monopolized the time of 35Ts during every rotation. The 1st Cavalry Division instituted *Tango Tuesdays* to improve the maintenance and operation of MI systems. Similar to *Motor Pool Mondays*, an unofficial but well-understood U.S. Army vehicle maintenance program, the intelligence warfighters dedicate Tuesday mornings to complete preventative maintenance checks and services (PMCS) on MI systems and conduct operational tests. Lessons learned in the months since implementing Tango Tuesdays include the need to train Soldiers on how to appropriately perform PMCS on MI systems and the need to list the operational tasks that Soldiers should conduct. The 1st Cavalry Division is also working to codify Tango Tuesdays in an order to protect the time for MI companies within the brigade engineer battalions and to capture equipment maintenance and operating requirements. A good working relationship between the division G-2, G-6, and the brigade and brigade engineer battalion commanders and executive officers is important to garner the command influence necessary for implementation and execution of Tango Tuesdays.

Replicate Realistic Field Environment for Tier 2 MITS Events. MITS Tier 2 is the intelligence platforms certifying event and provides the best assessment of MI systems readiness. 1st Cavalry Division units, however, executed the certification events with fiber connections and shore power (grid power). These artificial connections reduced the normal equipment and architecture coordination requirements with the S-6 while ensuring the evaluation of intelligence analysis and assessments. Unfortunately, this also led to a false sense of proficiency. Units should conduct Tier 2 certification in a field environment with *all* organic MI systems connecting, collecting, and communicating within an established brigade architecture, including mission command information systems (MCIS), to properly validate the systems and PACE plans. Tier 2 certification should assess the compatibility and capabilities of systems across networks.

Require all MI Soldiers take the Digital Intelligence Systems Foundation Course (DISFC). Understanding MI systems and how the sensors, processors, outputs, and transport (SPOT) methodology interacts with the PACE plan, across echelons and networks, is key to building a viable intelligence architecture with functional redundancy. DISFC provides the basic information all MI Soldiers should know to develop better intelligence architectures with the systems available to them. The course empowers the creativity and initiative to drive the intelligence process when primary systems or networks are contested. The 1st Cavalry Division G-2 integrated DISFC into the division's training plan and is strongly encouraging all subordinate brigades to include it as part of their training progression from Tier 4 to Tier 2 MITS.

Connect, Collect, and Communicate. Soldiers at every echelon must understand and rehearse PACE plans for them to be effective. Processing, exploiting, and disseminating intelligence depends on well-established and rehearsed PACE plans. Likewise, the SPOT functions within the PACE plan must be understood and codified. A sobering trend during the NTC rotations was the hesitance of intelligence sections to switch from primary systems to alternate methods resulting in stagnant intelligence, idle Soldiers, and an unsynchronized intelligence picture. This hesitance may result from:

- Insufficient knowledge of the SPOT data flow.
- Limited familiarity with the PACE plan.
- No codified PACE plan criteria delineating movement to another method.

Typically, Soldiers do not understand how to manage the architecture or drive the intelligence process to get information flowing again. Below are three measures the 1st Cavalry

Division is taking to help intelligence sections connect their systems, collect information, and disseminate the information. Strong relationships with the S-6 and S-3 are vital to train and rehearse using MI systems and MCIS with consistency to validate PACE plans.

Develop a Thorough and Redundant Intelligence Architecture. The intelligence warfighting function has redundant capabilities to both connect and collect. Redundancy mitigates communication degradation challenges units will likely find at NTC and in theater. Including all organic MI systems in the intelligence architecture provides options when equipment falters or there is a need for additional bandwidth. Every battalion has a Global Broadcast Service and One System Remote Video Terminal that provide the S-2 with amazing capabilities to keep commanders and higher echelons informed. The brigades are equipped with the Trojan Special Purpose Integrated Remote Intelligence Terminal (SPIRIT), Modular Communications Node-Advanced Enclave (MCN–AE), Tactical Intelligence Ground Station, and Prophet systems, which all can connect and collect information. It is vital that units' assigned equipment deploys and integrates into the architecture to enable a multichannel PACE plan. Lower tactical internet radios and the Joint Battle Command-Platform are critical to communication, dissemination, and receipt of information.

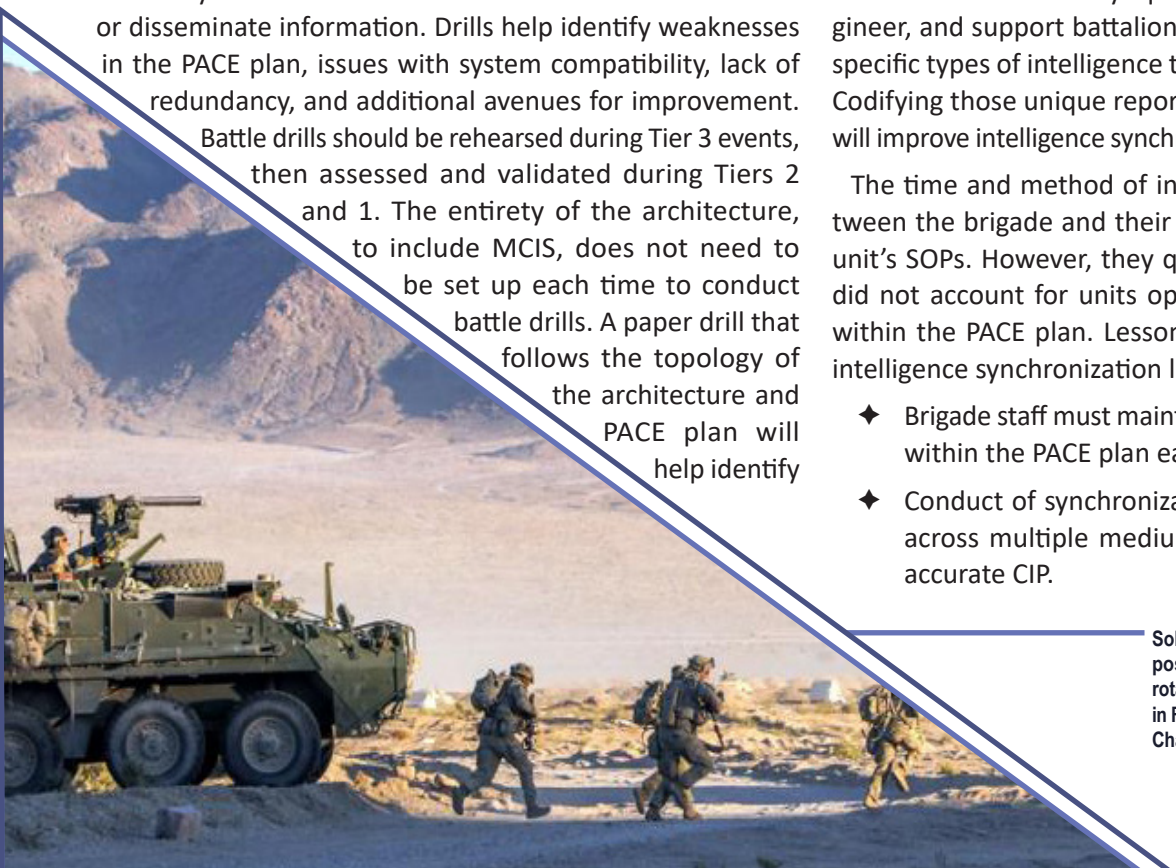
Develop Battle Drills to Rehearse Architecture and PACE Plan. Battle drills for intelligence systems operations and the interoperability of systems and networks within an architecture and PACE plan will improve communication and the speed of the intelligence process. Establishing drills requires incorporating criteria to shift along the PACE plan when a system cannot connect to a network or cannot collect or disseminate information. Drills help identify weaknesses in the PACE plan, issues with system compatibility, lack of redundancy, and additional avenues for improvement. Battle drills should be rehearsed during Tier 3 events, then assessed and validated during Tiers 2 and 1. The entirety of the architecture, to include MCIS, does not need to be set up each time to conduct battle drills. A paper drill that follows the topology of the architecture and PACE plan will help identify transition points across systems and networks that will likely create interoperability issues. Interoperability concerns should be explored during Tango Tuesdays (for example, shifting from Primary: MCN–AE for Top Secret connectivity to Alternate: Trojan SPIRIT). Criteria for PACE transitions can be time or event based (for example, transition to Trojan after 20 minutes of no upper tactical internet on the Army's tactical network, or during tactical operations center tear down).

Equip and Train on Lower Tactical Internet to Maintain the Common Intelligence Picture (CIP). The brigades' inability to dialogue with their battalions further exacerbated the challenge of maintaining the CIP during the NTC rotations. Producing an intelligence picture was difficult when MI systems and/or connectivity were inoperative, and information was not collected. Sometimes the rotational training units relied on lower tactical internet to synchronize and disseminate intelligence. Intelligence sections require a dedicated radio and the Joint Battle Command-Platform to maintain communications and the CIP. Every intelligence section must field these modified table of equipment items, and they must integrate them into the architecture and PACE plan. Tango Tuesdays must include MCIS along with radio operators designated for each system to increase proficiency.

Dedicate a Standard Operating Procedure (SOP) to Intelligence Synchronization. The units' struggles to maintain a CIP did not cease upon establishing communications. Many down trace battalions and squadrons did not know what their brigade required, and brigades did not know what information to share with each battalion. Much of this information is METT-TC[1] dependent; however, there are specific types of information that are useful to cavalry squadrons, maneuver, artillery, engineer, and support battalions. Similarly, those units collect specific types of intelligence that are useful to their brigade. Codifying those unique reporting requirements into an SOP will improve intelligence synchronization across the battlefield.

The time and method of intelligence synchronization between the brigade and their battalion S-2s was in all three unit's SOPs. However, they quickly learned that their SOPs did not account for units operating using different means within the PACE plan. Lessons learned from executing the intelligence synchronization led to two SOP adjustments:

- Brigade staff must maintain awareness of which system within the PACE plan each battalion is using.
- Conduct of synchronization meetings needs to occur across multiple mediums and formats to ensure an accurate CIP.



Soldiers from 3rd Cavalry Regiment move their position forward during a decisive action rotation at the National Training Center (NTC) in Fort Irwin, CA. (U.S. Army photo by SPC Kyler Chatman, Operations Group, NTC)

3rd Armored Brigade Combat Team, 1st Cavalry Division, ready their vehicles for inspection during Motorpool Monday at the National Training Center, Fort Irwin, CA. (U.S. Army photo)

The same adjustments held true for knowledge management and the dissemination of intelligence. The best practice was to disseminate across every available medium to increase synchronization.

SOPs are often tedious to build, and then units egregiously underutilize them. They rarely live past the regime that built them because units do not view SOPs as living documents to reference and validate at every training event or exercise. SOPs do not always account for issues experienced and lessons learned during exercises. They are often purpose built for the unit that drafted them and not shared with subordinate or higher units. Units should treat SOPs like playbooks. They should rehearse and validate them during Tango Tuesdays and battle drills. A deliberate reading of the SOP with supporting echelons will identify friction points and ensure the intelligence enterprise is at least familiar with synchronization and reporting requirements.

Conduct Pre-Combat Checks and Pre-Combat Inspections. Communications security, Global Broadcast Service Mission Requests, accounts, equipment, SECRET Internet Protocol Router Network tokens, authority to operate, etc., can set the intelligence warfighting function up for success or limit its ability to operate intelligence systems and provide the commander and staff the intelligence needed to support decision making and targeting. The final MITS certification event typically concludes months before a deployment. Tango Tuesdays can help identify potential shortfalls before a unit deploys. Units should build a deliberate precombat check/precombat inspection into the train up and conduct it 60 days prior to deployments. This allows sufficient time to process requests for access and accounts.

Conclusion

In hindsight, the challenges that 1st Cavalry Division's units faced at NTC are not unusual. They are frequently found in lessons learned and after action reviews. How the Army can improve training and readiness to avoid succumbing to the perennial shortfalls is less obvious. This is not a call to shift training focus away from intelligence analysis and assessments. It is, however, an acknowledgement of the importance of maintaining and operating MI systems and programs of record to truly improve readiness. DISFC is an excellent baseline to introduce intelligence Soldiers to systems and networks. Building additional depth with Gunner Entry Programs and Digital Intelligence Systems Master Gunners across the brigades is an additional high return investment. Tango Tuesdays is a method to provide consistent time for improving system maintenance and operator proficiency. Including the S-6 and MCIS in Tier 2 events, as proven by the 3rd Cavalry Regiment, will provide a better assessment of the intelligence warfighting function's proficiency and ability to connect, collect, and communicate with MI systems. A renewed focus on codifying intelligence synchronization, reporting requirements, and rehearsals in a living SOP will improve communication and the intelligence picture.

Endnote

1. METT-TC is a mnemonic used by the military to help Soldiers remember and prioritize what mission variables to analyze during an operation. METT-TC stands for mission, enemy, terrain and weather, troops and support available, time available, and civilian considerations.

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THE HARD TRUTH ABOUT PACE

by Chief Warrant Officer 2
Jonathan Burnett

Introduction

A hard concept for any unit to fully grasp, and one usually thrust upon its commander, is the formulation and implementation of a primary, alternate, contingency, and emergency (PACE) plan for command and control. The truth is that many units may be more inclined to accept a thumbs-up on the matter than accept the fact they are not mission capable. This mischaracterization of readiness results from an incomplete understanding of what a PACE plan requires. Often, we operate with little to no understanding of the electromagnetic spectrum and our systems architecture, yet we expect the communications systems to work perfectly, focusing our efforts elsewhere. This deficiency, our units' problems with PACE plans, often passes down from commander to commander. Though commanders give their guidance and intent regarding PACE plans, units are still missing the mark when it comes to formulating the plan and the plans implementation. Units must focus on communications planning in the same way they focus on mission analysis and course of action development. Developing comprehensive PACE plans will allow commanders to receive, transmit, and disseminate information and orders at any time, without any loss of communications. Effective communications planning creates an environment where units—

- Become agile.
- Employ successful, simple missions in complex environments.
- Adapt effectively to uncertainty.

Maintaining communications is of utmost importance for commanders. Therefore, PACE plan development should be a top priority. Commanders should understand what a quality plan looks like and assist in PACE plan development when necessary. In doing so, command teams can field a comprehensive but simple plan that allows flexibility to address problems during operations. A PACE plan is not important to just one warfighting function or one commander; it is important to leaders at every echelon. All leaders must be able to communicate. Communications planning is a whole of staff responsibility. It does not fall exclusively on the S-6, or the commander. We, as leaders, also share the responsibility when the systems included in our plan falter. Developing the PACE plan can be one of the most complex problems a leader will face. Units who can effectively communicate though, will succeed!

PACE Fundamentals

The operational environment is constantly changing with an influx of innovative technology and communications methods. This will continue to get more complex and impact how the Army conducts operations. Commanders must initially place a substantial emphasis on creating the PACE plan to establish redundant lines of communication. Without this emphasis, commanders are not providing proper task and purpose to their subordinate leaders. Commands that emphasize communications planning must also allow subordinate leaders to resource and train the plan's elements. The commander's emphasis, focusing on lines of communication, encompasses the radio spectrum, visible light, and at times could have a physical aspect. Commanders and subordinate leaders should consider the following recommendations as they develop their PACE plan.

Use organic equipment while understanding how to leverage external capabilities if systems fail. Organic equipment should always be the primary method a leader uses when assessing their options. Utilizing equipment a unit has on hand, means leaders can train, maintain, and employ systems they control. Leaders should also be familiar with other capabilities within their sphere of influence. We sometimes lose sight of other options because the equipment is assigned to someone else. Though not within our control, these capabilities can be useful if organic systems fail.

Recognize the threat from electromagnetic warfare (EW). Our enemies have capabilities on par with, or superior to U.S. military capabilities. We should not plan for the best-case scenario; instead, we should plan based on our weaknesses being exploited. We cannot control what the enemy does; however, we can control how we adapt to the situation the enemy presents us. When planning, leaders should identify potential friction points the enemy will exploit with EW. Leaders who are overly reliant on one system could unintentionally foster a situation that halts progress when on the offense, limits the ability to request support during a defense, or worse, culminates in mission failure due to a lack of support.

An air defense battle management system operator, 38th Air Defense Artillery Brigade, assembles an omnidirectional, line of sight antenna. The antenna enabled communication with aviation assets during a unilateral joint training exercise that refined systems and concepts for enhanced tactical planning, coordination, and interoperability in a multidomain environment on Sagami General Depot, Sagamihara, Japan, September 17, 2019. (Photo by SGT Raquel Birk)

Understand the radio spectrum. Radio systems operate on different frequencies. Including several radios that operate on the same frequency range does not mean you have multiple channels within your PACE plan. For example, if you have three cars which run on gasoline, and you have no gasoline to fuel the vehicles, you are down three cars. If you have three cars—one runs on gasoline, one on diesel, and one on electricity—when you run out of gasoline, you will still have two other vehicles to use. This does not negate the need for system redundancies if equipment becomes inoperable due to mechanical failure.

Create triggers that force progression between the channels. If one channel becomes compromised or degraded, there must be standing guidance to ensure subordinate units work through the PACE plan. Triggers can range from operating specific channels during time windows or transitioning due to terrain. Commanders must understand some echelons do not have the ability to monitor all channels simultaneously. Triggers become increasingly important the further removed a leader is from a tactical operations center setting.

Develop and execute communications plan driven battle drills. Units cannot let battle drills remain conceptual; training is the right place for experiential learning. Training environments allow Soldiers to become comfortable with systems and processes, and many times, Soldiers will find flaws with the plan. Leaders who build specific communications driven battle drills or scenarios can develop skilled, competent crews. These venues also serve as a proving ground for instructions.

Remove the throwaway channels. Of course, if we have upper-tactical internet we will use it, and if all else fails, we will send communications via courier. When leaders accept the primary channel as upper-tactical internet and the emergency channel as courier, they have effectively only two valid channels—alternate and contingency. Getting rid of the throwaway channels ensures subordinates are really doing some analysis on potential communications problems the unit may encounter.

Getting Started

When creating a PACE plan, leaders can start with the unit's Modified Table of Organization and Equipment (MTOE)/Table of Organization and Equipment (TOE). The Army develops these documents to outline the specific organization, staffing,

and equipment units need. When looking at this document, leaders should identify the communications equipment the Army indicates their unit needs and identify what they have on hand. Next, figure out if cross-leveling of equipment occurred because of operational necessity. Leaders must inquire with their next higher headquarters to identify the fill percentage for each communications system by line-item number. Sometimes the Army does not completely fill a unit's MTOE/TOE during equipment fielding for a variety of reasons. If the unit does not have a full complement of equipment, submit a request to fill shortages. Having a full complement of systems will increase communications options for the unit. Leaders can include projected theater provided equipment in their plan if theater alignment is in the unit's future.

Cross-Leveling Equipment

Cross-leveling is the authority and ability to shift materiel inventory from one owner to meet the requirement of another. At the theater strategic and operational levels, it is the process of diverting en route or in-theater materiel from one military element to meet the higher priority of another within the combatant commander's directive authority for logistics. Cross-leveling plans must include specific reimbursement procedures.[1]

Once leaders understand the unit's assigned equipment, the next step is to check the equipment maintenance. Often, units neglect to conduct regular preventative maintenance checks and services for communications equipment. A straightforward way to check this is to look for the latest DA Form 5988, *Equipment Maintenance and Inspection Worksheet*. Odds are good that your unit is not using the DA Form 5988 for communications equipment. This can potentially lead to PACE plan failure. If commanders account for prime movers on a unit status report, why not communications systems? Communications systems enable effective operations, so units should track them as a command maintenance priority.

Finally, leaders need to know the communications capabilities of their adjacent units, higher echelon, and subordinate echelons. Leaders must nest their PACE plan with higher commands and complement their adjacent and subordinate units. Nesting is not just ensuring each echelon has the same equipment but ensuring each echelon can transmit information freely and effectively. If a commander's communications systems are incompatible with any echelon, PACE plan development or its subsequent application will not be successful. The same is true when systems and processes are ineffective. Organizations can create thorough plans for PACE communications execution, but if their systems and processes operate on different schedules, the lack of coordination will hinder mission success.

The Basics

There are three types of PACE plans: independent, dependent, and combined. Independent plans use only a unit's organic systems that are manned and maintained by assigned personnel. Dependent plans heavily rely on, and leverage, systems not owned by the unit. For example, a commander may have no organic high-frequency radio equipment, therefore, the unit builds a relationship with an attached command to use theirs. Combined plans merge independent and dependent systems into one plan.

Leaders at every echelon must identify the type of PACE plan they can deploy and the equipment's capabilities on the radio spectrum. Leaders must understand frequency bands and wave forms on the radio spectrum because each group possesses different properties. These properties could be positive or negative depending on the unit's operational environment. Leaders who have a general understanding in this area can predict friction points, strengths, and weakness of their PACE plan. For example, 5th generation of mobile networks, commonly known as 5G, is a wave form which can transmit large quantities of data extremely fast but cannot transmit the data over distance without relays.[2] If a leader uses equipment which relies on this wave form, they must utilize relay stations to transmit over long distances. The trade off to this wave form is a leader can transmit massive quantities of data quickly.

To further explain why an understanding of the radio spectrum is important, look at the capabilities of amplitude modulation (AM). AM radios can send signals during the day that reach users a hundred miles away with line of site. Line of sight meaning antenna A can see antenna B without obscuration and can send and receive signals. Using AM at night can extend the distance by hundreds of miles because of skywave propagation. Skywave propagation is when frequencies bounce off electrically charged particles in the ionosphere and refract back down to earth.[3] This allows leaders the ability to communicate beyond line of sight. High frequency radios can use line of sight and beyond line of sight through skywave propagation like AM radios but operate on different frequency ranges; however, these different radio types cannot communicate with one another.[4] Without a basic understanding of available communications systems, leaders lack the knowledge to develop comprehensive PACE plans.

Leaders with good PACE plans incorporate how they transition through the channels and regularly rehearse these transitions through battle drill execution. Leaders also need to incorporate two additional factors into their PACE plan development: EW indicators and triggers. Leaders must understand how EW affects their communications systems. Constant buzzing, static, or white noise over the radio may indicate potentially compromised equipment. A lack of communications

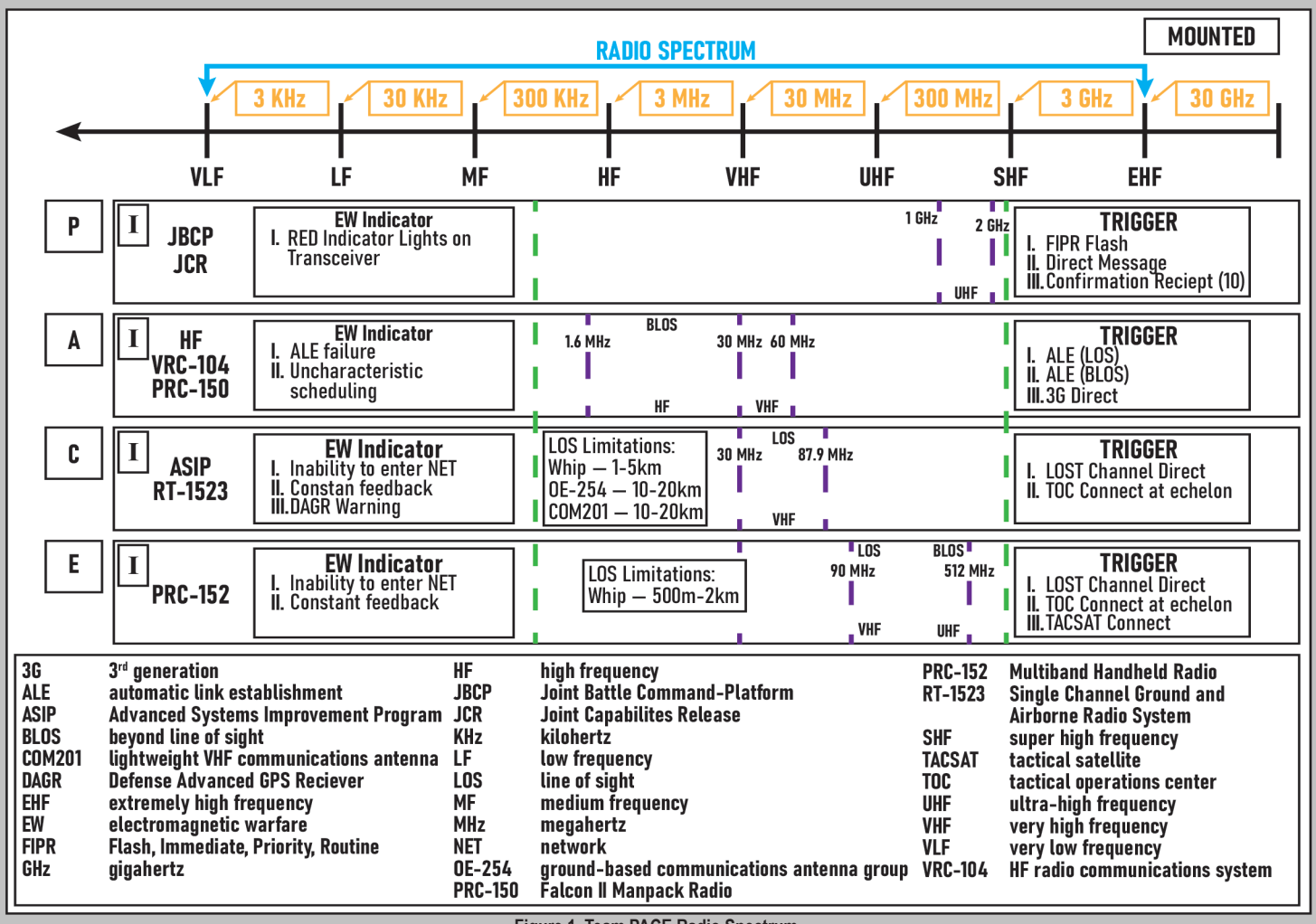
during peak hours or mandated transmission windows may indicate jamming. EW jamming or denial is one reason PACE plan development is so important. Every channel of the PACE plan should contain triggers—what occurrences cause a unit to move from one communications channel to another. This could be as simple as an individual encountering two out of three triggering activities causing the unit to transition from the primary communications channel to the alternate channel. For example, a leader is monitoring their PRC-160 and is unable to maintain a direct connection with the unit's higher command. The unit sends a ping to confirm a connection but does not receive a response. Each problem by itself does not pose a significant concern, but when they occur together, they force the leader to switch to another communications system. Leaders who consider the threat's EW capabilities and capture triggering events in their PACE plans are better equipped to create a functional system and process for communication. The threat is unlikely to have the EW capabilities to deny service or jam the entire radio spectrum simultaneously. Figure 1 provides an example radio spectrum PACE plan. It outlines the radio systems and where on the electromagnetic spectrum each radio operates. Additionally, the figure outlines EW indicators and triggers that force the unit to transition through the plan.

The Next Steps

After accomplishing the basics, commanders incorporate the PACE plan into training. Specifically, they develop and implement short, scenario-based training events that allow subordinate units to transition through the PACE plan channels without assistance from their higher command. Training must incorporate less than desirable terrain and distance to fully exercise transitions. Units that can communicate effectively and consistently will adapt and overcome real world obstacles.

Thus far, the discussion has centered on developing the PACE plan's voice communications between two individuals or units. Once a unit becomes proficient in these tasks, they can determine how to incorporate the transmission of data. Commanders can also separate their plans further to have a dismounted PACE plan and a mounted PACE plan.

Digital Intelligence Systems Master Gunners have a good method for grouping PACE plan elements using the acronym SPOT: sensor, processor, output, and transport. For example, if a unit is using an RQ-11 Raven unmanned aerial vehicle in support of target identification, using the SPOT method leaders would consider the following to develop the PACE plan:



3G	3rd generation	HF	high frequency	PRC-152	Multiband Handheld Radio
ALE	automatic link establishment	JBCP	Joint Battle Command-Platform	RT-1523	Single Channel Ground and Airborne Radio System
ASIP	Advanced Systems Improvement Program	JCR	Joint Capabilites Release		
BLOS	beyond line of sight	KHz	kilohertz	SHF	super high frequency
COM201	lightweight VHF communications antenna	LF	low frequency	TACSAT	tactical satellite
DAGR	Defense Advanced GPS Reciever	LOS	line of sight	TOC	tactical operations center
EHF	extremely high frequency	MF	medium frequency	UHF	ultra-high frequency
EW	electromagnetic warfare	MHz	megahertz	VHF	very high frequency
FIPR	Flash, Immediate, Priority, Routine	NET	network	VLF	very low frequency
GHz	gigahertz	OE-254	ground-based communications antenna group	VRC-104	HF radio communications system
		PRC-150	Falcon II Manpack Radio		

Figure 1. Team PACE Radio Spectrum

- ✦ Sensor: What is collecting the information? The Raven, or is the person controlling the system the sensor?
- ✦ Processor: How is the collected information processed for exploitation? The Raven sends video to the ground station which processes the information.
- ✦ Output: What product or information are you conveying? The operator sends a SALUTE[5] report to their higher command with the information collected.
- ✦ Transport: What medium is disseminating the output? The SALUTE report travels over FM radio.

Figure 2 shows an example of a unit's two separate PACE plans for sending data and voice to their higher command. Focusing on the submission of RAW data, the sensor for the primary channel is a Team. The team is the collector of information (Sensor) and will use Transverse (Processor), to capture the information for a SALUTE report (Output) and submit it through the T2C2 system (Transport).

Conclusion

This article only breaks the surface of PACE plan development and implementation. Development of an effective PACE plan starts with the commander's understanding of the process and influencing the plan's development. Leaders at every level must incorporate PACE plan development into operational planning. Effective and reliable communications allow leaders to disseminate guidance and receive updates at any time. Leaders at all levels will undoubtably have additional complications to contend with during hostilities, but units that can reliably communicate are able to adapt because they can maintain command and control.

Endnotes

1. Office of the Chairman of the Joint Chiefs of Staff, Joint Publication 4-0, *Joint Logistics* (Washington, DC: The Joint Staff, 4 February 2019), GL-6. Change 1 was published on 8 May 2019.

2. Amy Nordrum, "Millimeter Waves Travel More Than 10 Kilometers in Rural Virginia 5G Experiment," IEEE Spectrum, 7 Nov 2016, https://spectrum.ieee.org/millimeter-waves-travel-more-than-10-kilometers-in-rural-virginia#toggle-gdpr.

3. "Why AM Stations Must Reduce Power, Change Operations, or Cease Broadcasting at Night," Media Division, Federal Communications Commission, updated December 11, 2015, https://www.fcc.gov/media/radio/am-stations-at-night#:~:text=However%2C%20during%20nighttime%20hours%20the,phenomenon%20called%20%22skywave%22%20propagation.

4. Marcus C. Walden, "High-Frequency Near Vertical Incidence Skywave Propagation," *IEEE Antennas & Propagation Magazine*, December 2016, 16; and Harris Corporation, Radio Communications in the Digital Age Volume One: HF Technology, 2nd ed. (n.p.: Harris Corporation, 2005).

5. SALUTE is an Army acronym for size, activity, location, unit, time, and equipment. It is a quick way to remember what information is most important when assessing the threat.

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Contributors

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RAW DATA

	S	P	O	T
P	TEAM	CHAT/ TRANS-VERSE	5 W's	T2C2/ WIN-T
A	TEAM	Direct Message	S303	JBCP 1GHz-2GHz
C	TEAM	PnP	9 Line	HF 1.6MHz-30MHz
E	TEAM	PnP	9 Line	UHF
EE	TEAM	PnP	Brevity	Cell Network

SERIALIZED DATA

	S	P	O	T
P	TEAM	ATHENA	SERIALIZED OUTPUT	T2C2/ WIN-T
A	TEAM	SMDL	WORD	JBCP 1GHz-2GHz
C	TEAM	PnP	9 Line	HF 1.6MHz-30MHz
E	TEAM	PnP	9 Line	UHF
EE	TEAM	PnP	Brevity	Cell Network

GHz	gigahertz	PnP	point and [to] point	T2C2	Transportable Tactical Command Communications
HF	high frequency	S303	enemy observation report	UHF	ultra-high frequency
JBCP	Joint Battle Command-Platform	SMDL	Secure Mission Data Loader	WIN-T	Warfighter Information Network-Tactical

Figure 2. PACE SPOT Reporting

MILITARY INTELLIGENCE DOCTRINE

MI DOCTRINE

FM 2-0 represents an important step toward changing the Army culture and improving Army readiness by addressing the fundamentals and tactics associated with intelligence during large-scale combat operations. This publication describes the role of the commander and staff in intelligence, intelligence staff activities, and how military intelligence (MI) units conduct intelligence operations as part of information collection across the Armys strategic roles. FM 2-0 also contains the descriptions of the Army tactical tasks included in the intelligence warfighting function, doctrine on force projection, and doctrine on language support.

FM 3-0 OPERATIONS

FM 3-0 expands on the Armys capstone doctrine for multidomain operations described in ADP 3-0. It describes how Army forces contribute landpower to the joint force and integrate joint capabilities into operations on land to achieve military objectives and fulfill policy aims. FM 3-0 focuses on large-scale combat operations and their relationship to the full range of military operations that support joint campaigning.

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