A joint publication for U.S. Artillery professionals

September - October 2019

Fires

Achieving joint, multinational interoperability

Approved for public release; distribution is unlimited. Headquarters, Department of the Army. PB 644-19-5

CONTENTS

Editor: Jamie Southerland
Art Director: Rick Paape, Jr.
Assistant Art Direction: Judy Oman
Assistant Editor: Monica Wood

The Fires staff can be reached by email at usarmy.sill.fcoe.mbx.fires-bulletin-mailbox@mail.mil or by phone at (580) 442-5121.

Purpose

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

Cover: *Staff Sgt. Brandon Laureano, a launcher chief assigned to 1st Battalion, 14th Field Artillery Brigade, 75th Field Artillery Brigade, Fort Sill, Okla., ground guides an M142 High Mobility Artillery Rocket System (HIMARS) after being flown in by an Air Force C-130J Super Hercules during Operation Phantom Flight in Fort Chaffee, Ark., on April 12, 2019. (Sgt. Dustin D. Biven/75th Field Artillery Brigade)*

Maneuver Air and Missile Defense in multi-domain operations

By Col. Gary Beard

"The AMD force of 2028 must be many things such as agile, rapidly tailorable, scalable and able to fight multiple, complex and integrated attacks. To achieve that, we have to optimize our formations to see a mix of capabilities, integrated at all echelons."

—Lt. Gen. James Dickinson at an Association of the United States Army professional development forum

Current and future capabilities required

Joint Publication 3.0, Joint Operations, defines the purpose of AMD forces as:

> Countering Air and Missile Threats...integrates offensive and defensive operations and capabilities to attain and maintain a desired degree of air superiority and force protection. These operations are planned to destroy or negate enemy manned and unmanned aircraft and missiles, both before and after launch.[1]

This definition shows air and missile defense (AMD) takes multiple forms and is required to protect against all air threats an adversary can direct against the joint force. The evolving threat requires the Army to reverse the elimination of maneuver short range air defense (SHORAD). It is critical that integration take multiple forms, both technically and doctrinally. The U.S. Army must make use of the traditional pillars of active defense, passive defense and attack operations to ensure protection for maneuver forces, concepts that directly apply to current multi-domain battle doctrine.

Effective AMD requires both pre- and post-launch activities to defeat enemy air threats. U.S. and allied forces possess significant offensive counter air (OCA) and defensive counter air (DCA) capabilities as a means of defeating enemy air threats. In addition to OCA, the U.S. has heavily invested in cyberspace operations as a means of disrupting enemy communications, command and control networks and even launch commands from control stations to platforms. These capabilities could stop a platform from launching, negating the future need to deal with a threat as it never becomes active. Attack operations further nest with actions before launch, seeking to destroy enemy systems capable of launching air threats, such as missile launchers and unmanned aircraft systems ground stations, which would impact U.S. and allied forces. Once the threat is airborne, active defense provides the greatest likelihood of defeating the threat. DCA and ground-based air defense seek to destroy a threat platform, optimally prior to the threat impacting U.S. forces.

Maneuver AMD forces must possess the tools required to perform the full engagement sequence: detection, identification and engagement. This is supported by a robust communications and data-sharing structure that enables the exchange of information required to ensure accurate target detection, rapid correlation of detected targets, identification and threat decision made by an appropriate leader and engagement by a designated defeat mechanism. Operations in a complex anti-access/area denial (A2/AD) environment necessitate maneuver SHORAD forces with the ability to operate in coordination with adjacent AMD forces. However, forces must also protect associated maneuver forces if required to operate independently due to a communications-denied environment.

Interoperability and data sharing

AMD forces must effectively share information across the force and with coalition and allied partners. No force is capable of fully defending the large battlefields U.S. forces will compete on in the future. As such, the ability to share fire control data in a net-centric environment is critical to protecting the joint force. This requires SHORAD forces to possess the robust communications necessary to send and receive early warning and identification information. Only by effectively sharing all information about threats can the force take coordinated action to enhance protection.

That ability to share data must also take place within the contest-

1 *Jason Cutshaw, "Army's Senior Air Defender Talks Future of Air, Missile Defense," Army Online, 22 Mar 2019, https://www.army.mil/article/219177/armys_senior_air_defender_talks_future_of_air_missile_defense (Accessed 31 Mar 2019).*

ed environment likely to exist in the future. A significant aspect of A2/AD operations requires the adversary to impact information sharing and decision-making processes. While the ongoing development of the Integrated Air and Missile Defense Battle Command System (IBCS) is an important part of integrating AMD systems into the joint force, it is more important for the maneuver forces likely to be the target of disruption attempts to share information across the depth and width of the battlefield.

Technical interoperability between forces is necessary on the modern battlefield. Many of the platforms the joint force relies on require tremendous amounts of external data to effectively operate. The need to share real-time data across the battlefield is crucial for the success of AMD forces given the speed of targets and the risk if information is not shared both vertically and horizontally. Establishing such a robust communications package requires integration and interoperability, both internal and external to the organization. Having outside assets available, including the support provided by theater and division communications organizations, to ease that data sharing burden improves the ability of the force to establish the redundant communications means that protect the network, and the data resident in it. It is critical this integration occur at the lowest echelon possible to ensure integration into the communications, maneuver, protection and logistics plan for maneuver brigade combat team (BCT) operations.

Integration with joint force/allies/partners

The U.S. only fights effectively while operating in a joint environment. Additionally, U.S. military forces take great pride in only fighting "away games," necessitating operations be executed outside the U.S. in order to minimize disruptions to the national economy and keep conflict off American shores. Effectively fighting as part of combined forces to achieve military objectives requires the ability to operate alongside allies and partners; and that only happens with integration.

Integration of maneuver SHORAD forces into U.S./joint/partner forces is about much more than the technological capability of passing data. True integration requires complete involvement in the battlespace, including planning, entry, logistics, communications, command and control and operations. That integration requires relationships developed prior to mission execution and the development of tactics, techniques and procedures that facilitates SHORAD forces again becoming a part of the combined arms team.

Maj. Gen. John Rossi, then-commanding general of the Fires Center of Excellence, clearly stated maneuver forces did not want "an air defense battalion dragging behind, slowing it down with thin-skinned vehicles." While maneuver forces focus on forced entry and rapidly transition, SHORAD forces must be fully integrated enablers to those roles. The array of platforms under evaluation for addition to the Army make it clear that full integration with the scheme of maneuver and the speed of maneuver is a factor.

AMD forces also provide key enablers to U.S. partners and allies. The very strengths of integration and data sharing provide robust capabilities to partners and allies that otherwise might not exist. The communications infrastructure brought to the battlefield by AMD forces provides a significant boost to ally and partner situational understanding. Additionally, U.S. forces have tremendous ongoing innovation and technological development in the AMD fight. These capabilities, when shared with our allies and partners, enhance cooperation, provide security, demonstrate commitment to coalition warfighting and enhance integration between multinational forces.

Contribution beyond AMD

Rossi's comments regarding speed and integration demonstrate that maneuver SHORAD units must do more than "just" be AMD experts. To maximize their contribution to the maneuver fight, they must do far more than defeat air threats. Prior to 2006 when the last divisional SHORAD units were inactivated, SHORAD units routinely operated alongside their maneuver counterparts. Whether direct force-on-force operations, security missions or training foreign military forces, SHORAD units demonstrated proficiency on a variety of missions that went beyond protection from air threats.

Earning the confidence and trust of the maneuver commander that owns a battlespace is only achieved through interaction, integration and repetition. A maneuver commander always looks to maximize the ability to influence the enemy; the additional force structure of a robust SHORAD capability provides a boost to the combat power of a BCT. If that combat power is planned for, employed and executed, SHORAD forces become a capability multiplier for the maneuver commander.

Research and development to meet future threats

U.S. military forces cannot rely on current capabilities to defeat regional competitors, especially in an A2/AD environment. Ongoing development must provide a full range of technical solutions to defeat air threats. As enemy air threats increase in both quality and quantity, U.S. forces must seek budget-informed solutions for detection, identification and engagement. Further development for detection systems should include a wide array of radar, acoustic, visual and electromagnetic solutions. Only by

A Soldier from 5th Battalion, 4th Air Defense Artillery Regiment, stands next to their Avenger Weapon System during Shabla 19, a joint air defense live-fire exercise with short-range missiles at a range near Shabla, Bulgaria, June 11, 2019. (Capt. Aaron Smith/174th ADA BDE)

bringing in all potential detection methods, in a networked environment, can detection thresholds improve, providing the maneuver force with adequate protection. IBCS provides a powerful backbone for data exchange in a network-centric environment of sensors, shooters and command and control platforms. All future systems must operate on this network to enhance detection and engagement opportunities. A holistic approach to defeat mechanisms is also required for interceptors. All kinetic and non-kinetic defeat mechanisms must be considered, including high energy lasers, electromagnetic weapons, high-power microwave options, missiles and guns. Protection for maneuver forces is only possible with a threat-oriented mix of detection and defeat mechanisms that puts the optimal capability on target.

Conclusion

The continually evolving abilities and organization of potential peer adversaries demonstrates that they have studied the lessons of recent U.S.-joint force operations. The resulting growth of symmetric means to counter the technological advantages of the U.S. have led to a challenging A2/AD strategy. This strategy is supported by a robust capability to hold the U.S. joint force and allies at risk from the air, a significant threat the U.S. has not faced in recent memory. These threats must be countered to allow U.S. ground forces to execute operational and tactical maneuver. The multi-domain battle construct supports AMD operations, which in turn provides significant protection for and enhancements to the entire joint force. Only by bringing together robust maneuver, Fires, protection, mobility, cyber/electronic warfare and all other elements of U.S. military capability can we succeed on the modern battlefield.

Col. Gary Beard is a 1997 graduate of the U.S. Naval Academy and a career air defense artillery officer. He has served in a variety of SHORAD and HIMAD formations, including command of a separate Bradley Stinger Fighting Vehicle battery and a Patriot battalion. He is a former OC at the National Training Center and was an Office of the Secretary of Defense Joint Chiefs of Staff Army staff intern. He is also a graduate of Georgetown University and the U.S. Army War College. Beard assumed his current position as the TRADOC Capability Manager-ADA Brigade in July 2018.

ALLIED FIRES TRAINING NETWORK

BY LT. COL. MATTHEW R. ARROL

With the Army's renewed focus on Large Scale (Ground) Combat Operations (LSCO), the need for digitally enabled responsive Fires has never been more relevant. Furthermore, history suggests that, while the U.S. must remain capable of acting unilaterally in LSCO, the likelihood of conducting it without allies is extremely remote. Based on this assumption, allied Fires integration is not only desirable, but also necessary, and we should work toward optimizing an approach to allied digital Fires training that ensures our readiness for collective defense. While we have had some recent successes in episodic training events, this article will argue that it is time to augment the current exercise-based approach with an enduring digital Fires training methodology that improves our current state of readiness and promotes additional investment.

An assessment of our approach to digital training and readiness should begin with a review of those factors that influence what is collectively achievable. Generally, the development and effectiveness of allied digital Fires capability is bound by three factors. The first factor is the commitment of individual nations to modernize and digitize their fire support enterprise. The second is the degree of integration achieved nationally both vertically with digital fire support systems at each echelon, and horizontally across the technical systems of other warfighting functions that provide commanders with a fully automated approach toward decision-making. The final factor is the degree of technical interoperability that can be attained between the nations, opening the door for allies to leverage the capabilities of others. All three of these factors influence and are in turn influenced by tough, realistic training which builds and demonstrates readiness.

Fortunately, for our efforts in Europe, our allies in NATO largely share our desire for increased integration and acknowledge the challenges in the current regional and global security picture. They have watched, with growing concern, the resurgent threat posed by Russia and recognize that the possibility of LSCO against a peer competitor on the continent is possible. Russian activities over the last decade, punctuated by a series of provocations including; the 2008 invasion of Georgia, the 2014 annexation of Crimea, the 2015 intervention in Syria, the ongoing support to separatists in the Donbas and 'grey-zone' activity in the Baltics, as well as their numerous attempts to influence democratic elections world-wide, have reinforced the need for readiness. In response, they have demonstrated their resolve through investment in high-end capabilities like automated fire support and field artillery systems and through increased participation in multinational exercises, most notably from a Fires perspective, Dynamic Front, which has grown in scope and complexity since U.S. Army Europe introduced it in 2016.

The benefit of the Dynamic Front series is self-evident; it allows fire supporters, across the Alliance and the Partnership for Peace, the opportunity to focus on training the delivery of Fires in a multinational context without the need to meet the competing training priorities of the other branches. From an automated fire support and fire control perspective, national participants (including the U.S.) get the opportunity to work through digital challenges and devise procedures and technical solutions without the pressure to rush to less optimal outcomes. Since its inception, Dynamic Front has embodied that ideal of realistic Fires training in Europe, and has been that influencer to drive change and digital Fires development. From the standpoint of the constraints on effectiveness described earlier, Dynamic Front offers an opportunity for nations to "burden share" (increasing their willingness to commit), observe (increasing awareness of what is desirable and achievable), and define the requirements for integration and interoperability; allowing for experimentation with solutions in a relatively low-risk environment. Where Dynamic Front falls short, is that it requires the Alliance to assemble physically at a training site to accomplish its objectives, and thus, is very expensive both financially, and in terms of time; resources which could otherwise be dedicated toward modernization or other collective training. To maintain and accelerate the momentum of allied digitization and interoperability we will need to normalize the inherent benefits of that exercise into unit home station training for the participants of all nations.

To bridge this gap, nations investing in their digital Fires enterprises could establish an enduring Allied Fires Training Network (AFTN), which would build on the 'Fires-focused' success achieved through the episodic exercise-based approach, and normalize it, greatly reducing the cost by allowing participants to remain at home station while retaining much of the training benefit of the collective exercise. Under the umbrella of an AFTN, the collective strengths of the existing and future allied virtual, constructive and simulation capabilities could be leveraged to improve the practical skills of our Soldiers, as well as further the technical development of our allies. Within this context, the AFTN is both a physical network and a cognitive network, wherein subject matter expertise and Fires training knowledge are shared alongside firing data. While there are many possible applications for which an AFTN could be employed, there are three initial applications which would significantly improve allied Fires readiness almost immediately and yield a long-lasting impact.

First, it could be used to build and sustain the training gains made in digital Fires interoperability during Dynamic Front

by leveraging one of the cornerstones of those events, the Artillery Security Cooperative Agreement (ASCA) protocol. ASCA has been an unqualified success by any objective metric. As of Dynamic Front 19, the ASCA protocol has demonstrated its ability to pass critical mission data between signatory nations during simulations, live environments, and distributed operations across Germany, Poland and Latvia. ASCA's proven utility is borne out by the progressive expansion of signatory nations from the first Dynamic Front to today. What ASCA lacks, is a permanent networked presence to sustain training skills and familiarize others beyond exercises. Within the AFTN, the United States could link the Joint Multinational Simulation Center, in Grafenwoehr, Germany, with the Fires Centers of Excellence of all signatory members to create the opportunity for live digital sustainment training with allies relying on the ASCA protocol. This would be relatively easy to do since most of the signatories (to include Germany, France, Italy, the United Kingdom, Denmark and the Netherlands) already have digital training labs, with some even used for the purposes of on-site local area network -based ASCA training. Linking ASCA in steady-state training will reduce the need for large-scale training events and will allow discreet troubleshooting of the protocol among nations for new and emerging capabilities. A commitment to link signatories may, in itself, act as an informal catalyst to further promote ASCA amongst the remaining non-signatories and encourage our allies to develop their digital capabilities.

Second, an AFTN could open NATO Fires web-based systems of record to the U.S. on an enduring basis, familiarizing U.S. Soldiers with the protocol; a distinct advantage for those forces stationed in, or designated for rotation to, Europe. The ability to train on systems like the Joint Targeting System, Flexible Advanced C2 Services for Time-Sensitive Targeting, and the Air Integrated Command and Control System would be a force multiplier for those forces who might be expected to operate in a post Article 5 environment. This access would further allow Army program managers access to allied systems to ensure that all future development of U.S. systems were fully interoperable with our partners.

Finally, the AFTN could improve access to joint Fires training simulators increasing realism and training opportunities for U.S. and allied joint Fires observer (JFO) / joint terminal attack controllers based on FCoE accredited frameworks. JFO and joint fire support team simulation trainers are continuing to evolve amongst our allies and leverage realistic European environments in their scenarios. Many of these newer simulators utilize the same technology for their architecture as those used by the United States, such as Virtual Battle Space Simulation System, which would facilitate integration. Of note, the German Fires Center of Excellence in Idar Oberstein, has recently made significant gains in this area. In April 2019, the German Schoolhouse in collaboration with the private corporation ESG unveiled a new joint fire support trainer, which focuses not only on individual skills but on collective joint fire support team skills. This effort is an initiative taken under the multilateral mandate established by a burden-sharing agreement known as the 'Framework-Nation Cluster Joint Fires' which centralizes multinational Fires training resources, to include instructors and facilities, at a centralized location. If coupled with ASCA-enabled fire direction and control systems, simulators like these on an AFTN could allow sensor-to-shooter linkage like that achieved in Dynamic Front in an entirely virtual environment.

Looking to the future, the opportunities for AFTN to improve virtual, live and constructive training for Fires are limited only by the level of ambition of the signatories. Modern distributed gaming technologies, such as those found in most network enabled games, such as Fortnite, create the opportunity for entirely immersive experiences in expansive scenarios which can layer complexity and allow our fire support leaders to work distributed with their allies on a global scale. It would further create the opportunity for them to work collaboratively and simultaneously at echelon.

Having discussed some of the benefits of this idea, as mentioned, the conditions presently exist to put the Alliance on a path towards implementation. First, there is a shared sense of urgency, evidenced by expanded allied national defense spending in response to Russian actions. Second, strategic leaders across the Alliance have recognized that we need to accelerate the speed of innovation, as evidenced by the establishment of Army Futures Command and the increased importance placed on experimentation by Allied Command Transformation. Third, in the last five years, we have already witnessed an increasing trend toward improving integration with, and among, our European allies. Evidence of this can be seen, not only in exercise participation and in ASCA proliferation, but also in the production of a whole series of new NATO Allied Doctrine (including revisions to Allied Artillery Publications 1, 2, 3 and 5) aimed at procedural unification. This trend is further exemplified in the recent assignment of the first U.S. general officer into an allied national formation (deputy commanding general, 3rd French Armored Division). Lastly, potential contributors are already expanding their virtual, live, constructive and gaming capabilities independently; it only requires agreement and national will to have these systems grow together instead of growing apart. These conditions, while currently present, may not exist forever and the

Staff Sgt. Brandon Alborg, assigned to A Battery, 4th Battalion, 319th Airborne Field Artillery Regiment, 173rd Airborne Brigade, inspects a high-explosive ammunition round for a M119 105 mm howitzer during exercise Dynamic Front 19 at Torun, Poland, March 5, 2019. (Spc. Rolyn Kropf/U.S. Army)

further the Alliance grows from a visible reminder of overt military provocations, the greater the likelihood that the current sense of urgency will erode. If it does, the need for a low-cost alternative to collective exercises will be more necessary than ever to retain the gains made over the last half decade.

In conclusion, the U.S. has a unique opportunity to lead the Alliance into an enduring digital Fires training network. The first step in this would be engaging key allied nations, multilaterally, at the staff-to-staff level in the same manner that established the general officer Military Personnel Exchange Program, to work toward the integration of their existing and developing simulations capabilities. One key aspect of this process would be to devise a collaborative 'road-map' that established agreed upon requirements for future hardware and software upgrades to aid in product development. These requirements could include specifications for the layered development of cross domain solutions, expansion and linkage of existing fire support simulation software into ASCA-enabled fire direction/fire control software, and ensuring interoperability of scenarios and exercise designs into a single accessible database. Ultimately, the success of this venture would require a long-term managed strategy that sought to connect the distributed components of the Allied Digital Fires structure in a manner that promoted development and integration, while consistently and accurately replicating field conditions at reduced cost. The long-term benefits of adopting this enduring approach to training digital Fires would significantly enhance the ability of the United States by, with, and through her allies, to fight and win with responsive Fires in LSCO.

Lt. Col. Matthew Arrol is the Deputy Commanding Officer of the 19th Battlefield Coordination Detachment in Ramstein, Germany. He is a contributing member of NATO's Integrated Capabilities Group on Indirect Fire. He is a graduate of the Command and General Staff College. His civil schooling includes a Bachelor's Degree in History and Political Science from Michigan State University and an MBA from Eastern Michigan University. His previous assignments include Battalion Operations Officer and Executive Officer, 3rd Battalion, 16th Field Artillery Regiment, prior to which he was the G5 Fires Planner, 1st Cavalry Division.

Members of B Battery's Quick Reaction Force (QRF) respond to a ground attack from opposition force, played by D Battery (Markus Bach, Muna-Museum)

5-7th ADA executes Panther Shield to evaluate total readiness

By 1st Lt. Josef J. Danczuk

During the month of March, U.S. Patriot forces returned to the Illesheim Training Area, near Ansbach, Germany, for the first time in over eight years. The 5th Battalion, 7th Air Defense Artillery Regiment deployed A and B Batteries, E Company and Headquarters and Headquarters Battery (HHB) for a three-week period. The goals of the exercise were to complete Intermediate Gunnery Certifications (Table VIII) for A and B Batteries and then complete a battalion field training exercise (FTX). The FTX evaluated the battalion's ability to execute sustained Air and Missile Defense (AMD) operations against a near-peer adversary in an austere environment. It served as the final training gate prior to the battalion's deployment to its external evaluation in Romania this summer.

Throughout the first two weeks, A and B Batteries conducted Table VIII Gunnery Certifications, validating their ability to rapidly deploy to a new location, secure and establish the site and resume AMD operations. This included evaluation of the batteries' reconnaissance, selection and occupation of position crews, all equipment mobility crews, missile reload crews and air battle management scenarios.

As the Table VIII certifications ended, the battalion transitioned to the FTX portion of Panther Shield. This involved a dynamic and complex scenario in which the battalion was forward-deployed to provide AMD against a near-peer threat, while simultaneously defending themselves from a hybrid insurgent ground force. D Battery served as the opposing force for the scenarios, conducting surveillance, probes and full-scale attacks against the battalion's various locations. Key to the battalion's training was a focus not just on air defense training tasks, but many key movement and maneuver tasks. The training focus was on fundamentals of establishing a deliberate defense, hasty attack, route reconnaissance and integration of aviation to support the movements.

This training not only validated the battalion's ability to defend their sites, but also to coordinate effectively between units using various communications services. The battalion staff had to use creative techniques to continue the battalion's mission despite the ever-changing ground situation, complicated by "white-card" injects that affected the battalion's operations. These situations tested the battalion on all levels, including managing personnel and casualties, providing religious services, analyzing intelligence data and enemy actions, recommending adjustments to operations, providing logistical support and managing communications systems to allow the battalion to execute mission command.

1st Lt. Joseph Sierra, E Company's executive officer, served as the battalion Quick Reaction Force (QRF) officer in charge. In addition to reacting to enemy actions, his unit was still responsible for regular maintenance and logistics support requirements to allow the firing batteries to maintain their AMD mission. "We were tasked to maintain command post operations and logistics package missions while supporting QRF," said Sierra on his Soldiers' activities during the FTX. "They truly enjoyed the experience since they

were doing something normally out of their lane and having fun while doing it."

In addition to the ground scenarios, 5-7th ADA had the opportunity to coordinate training events with the 1st Combat Aviation Brigade stationed around Ansbach, Germany. Soldiers from A and B Batteries conducted aerial insertions and established listening posts/observations post using UH-60 Blackhawk helicopters. During one of the ground attacks, friendly forces sustained simulated casualties that required immediate aero-medical evacuation. HHB's medics and Role 1 Aid Station provided immediate care and ultimately evacuated the casualties by UH-60 Blackhawks to the proper medical facilities. For air scenarios, AH-64 Apaches serving as "Red Air" used terrain features around the ITA to try to avoid detection from the Patriot radars in order to attack them and their sites. Using the Live Air Trainer software in the Patriot system, the batteries, under the direction of the fire direction center, were able to detect, track, engage and destroy the Red Air Apaches, defending themselves and their assigned assets. Finally, a CH-47 Chinook conducted a reenlistment flight for eight Soldiers from the battalion. Ultimately, over 83 Soldiers from the Panther Battalion were able to fly in the Chinook as they trained hot and cold load operations.

Partnered with 5-7th ADA were eight members from the Swedish Armed Forces' Luftvärnsregementet (Air Defense Regiment) as observers. Sweden has decided to acquire the Patriot weapon system and these observers received a first-hand look at how the U.S. employs the battalion, sustains operations and conducts training and certifications. Some members of the observer team even had the opportunity to fight an air battle scenario and conduct emplacement and prepare for movement crew drills on a launching station.

"To get the opportunity to visit a Patriot unit such as 5-7th ADA has been a great experience, especially after some of us have attended the 14E and 14T classes in the fall of 2018," said Sgt. 1st Class Simon Bjurgard of the Swedish 61st Air Defense Battalion. "This visit provided a much-needed context to the things we were taught while in the U.S. The visit included lots of experiences and lessons learned which will help us in the process of moving forward as a future Patriot nation."

Lt. Col. Magnus Stegmark, 61st Air Defense Battalion commander, had an opportunity to shadow Lt. Col. Barry Carter, the commander of 5-7th ADA, during the exercise. "From my behalf, I see this as the starting point of coming events which can be conducted together," Stegmark said. "Battalions meeting each other and exchanging experiences will be the foundation of building friendship."

Overall, Exercise Panther Shield allowed 5-7th ADA to execute a wide range of operations, from finalizing the battalion's Intermediate Gunnery Certifications with A and B Batteries' Table VIIIs, to the battalion field training exercise. The unique training opportunities with 1st CAB allowed Soldiers from 5-7th ADA to test their AMD skills and train alongside Army aviation. Incorporating the Swedish observers strengthened the connection between our two nations, establishing key relationships that will help Sweden enhance the AMD capabilities and better integrate with allied systems in the future. Panther Shield, however, was just the precursor, as 5-7th ADA looks forward to deploying again this summer, this time involving the entire battalion with split operations between Astral Knight 19 in Slovenia and Saber Guardian 19 in Romania.

1st Lt. Josef "Polo" Danczuk is a tactical director in Headquarters and Headquarters Battery, 5-7th ADA, stationed in Baumholder, Germany. He is a graduate of the Patriot Top Gun and Air Defense Artillery Fire Control Officer courses and previously served as a platoon leader in A Battery, 5-7th ADA.

A Guided Missile Transport reload crew from B Battery disconnects a training interceptor for offload from a launching station as part of their reload drill. (Markus Bach, Muna-Museum)

Globally integrated Fires

By Capt. Natasha Fultz-Castro

(Judy Oman/FCoE CPG)

The 18th Field Artillery Brigade is tasked with conducting theater security cooperation to build partner capacity and improve joint interoperability with partnered nations while serving as the U.S. Army Central Force Field Artillery Headquarters. The brigade is taking the necessary steps to gain a common defense and a complementary capability with allies and partners with subordinate units participating in joint exercises with host nation militaries.

These exercises create a shared understanding between militaries which, ultimately increases lethality on the battlefield.

Recently, Wisconsin National Guard Soldiers of Alpha Battery, 1st Battalion, 121st Field Artillery Regiment High Mobility Artillery Rocket System (HIMARS) participated in a joint HIMARS Raid via Aerial Insertion cold-load training exercise with the 29th Royal HIMARS Battalion of the Jordanian Armed Forces (JAF) at the Marka Civil Airport in Jordan.

During the exercise, the two militaries worked together and compared methods and standard operating procedures. The two units jointly prepared the JAF launcher and trained on the proficiency of loading and unloading it onto a C-17 aircraft.

"The Jordanians have an extremely capable and highly proficient military, so we are not really teaching them anything, but learning and understanding their processes and them learning and understanding ours," said Capt. Ryan Victory, Alpha Battery commander.

According to Victory and his battery executive officer, 1st Lt. Jeffrey Hensley, both militaries stood to learn from the other in order to bridge their technical and tactical gaps.

The Jordanians complement our military because we are equally technically proficient; however, we do not share the same tactical experience, said Hensley.

Some of the challenges the two militaries faced were that they don't train according to the same doctrine nor do they train in the same manner. The U.S. military cross-trains its Soldiers to perform different tasks; whereas, the Jordanian Armed Forces trains its Soldiers to only perform one task, said Hensley. This could be foreseen as a potential issue, but in a combat capacity the two militaries would complement one another, he said.

Also, the Jordanians have deployments, but few have HIMARS deployments; so we were able to share with them a greater knowledge in that aspect, he said.

As units continue to conduct joint exercises and share processes with allies and partners, Fires will become more globally integrated across all domains.

Capt. Natasha Fultz-Castro is the public affairs officer for 18th Field Artillery Brigade.

INNOVATIVE THINKING: Looking behind 2 look AHEAD

By Maj. Timothy Heck

Author's Note: *Thanks to Margaret Harrison at Joint Forces Staff College, Col. William Wyman, and H.G.W. Davie for source material and translation assistance. Thanks to Maj. Craig Pachlhofer (USAF) for his editorial input and advice.*

Innovation remains a buzz word throughout modern military culture. Typically, the notion of innovation carries a requirement to develop new weapons, gadgets or munitions. However, innovation begins in the cognitive domain. Ideas are the birthplace for creating new solutions to old problems or finding new uses for old tools. When exploring ideas, reviewing the past, even analyzing a competitors' tactics, may provide readily available solutions without the necessity to procure new hardware. Reviewing the historical uses of Soviet and U.S. artillery brings to light the possibility of adding new tactics, techniques and procedures (TTP) to a commander's playbook: artillery as a breaching tool.

The use of artillery to clear obstacles has a lengthy history. In the American Civil War, large-caliber mortars and siege artillery were used during the Siege of Petersburg, Va., by Union forces to reduce Confederate earthworks and facilitate movement.[1] Similarly, the use of artillery to clear wire obstacles during World War I became standard practice and part of the lifting barrage. As demonstrated on the Somme in 1916, this was not always successful, but remained a crucial element in attacks later in the war.[2] The Soviets' historical artillery use brings more specific examples.

During the Great Patriotic War, the primary Soviet artillery manual, which is a combination of doctrinal instruction and how-to on artillery procedures, includes instructions on the use of artillery for minefield reconnaissance and breaching.[3] Giving indication of its use, former German officer Armin Scheiderbauer refers to the technique in his chapter on the Soviet Vistula-Oder offensive but, being on the receiving end, provides little in the way of details.[4] In the 1970s, Bernard F. Halloran described the method as "costly [but] generally effective."[5] In August 1975, Col. V. Selyavin published an article in *Soviet Military Review* explaining Soviet artillery procedures for breaching minefields.[6] During the Cold War, the U.S. Army's FM-100-2-1 *The Soviet Army: Operations and Tactics* lists artillery as part of Soviet tactics to breach minefields at the division and below level.[7] The premise, that indirect fire can

1 *Abbot, Henry L. "Siege Artillery in the Campaigns against Richmond, with notes on the 15-inch Gun, Including an Algebraic Analysis of the Trajectory of a Shot in its Ricochets upon Smooth Water." Professional Papers of the Corps of Engineers United States Army. No. 14. Washington, D.C.: Government Printing Office: 1867.*
2 *Hampton, Meleah. Attack on the Somme: 1st Anzac Corps and the Battle of Pozières Ridge, 1916. Solihull, United Kingdom: Helion & Company, Ltd., 2016.*
3 *Union of Soviet Socialist Republics. Manual of the Artillery of the Red Army: Rules for Gunnery for Land Artillery, 1942. Moscow: Red Army, 1943. See paragraphs 238-9, pgs. 110-12.*
4 *Scheiderbauer, Armin. Adventures in My Youth: A German Soldier on the Eastern Front, 1941-45. Solihull, UK: Helion & Co., 2003. See Chapter 10.*
5 *Halloran, Bernard F. "Soviet Land Mine Warfare." The Military Engineer. March-April 1972, pg. 118. Available online: https://www.jstor.org/stable/44566032*
6 *Selyavin, V. "Artillery Breaches Obstacles." Soviet Military Review. August 1975. pp. 28-29.*
7 *FM-100-2-1 The Soviet Army: Operations and Tactics. Washington, DC: Department of the Army, 1984. Pg. 5-27.*

Range	Firing Unit	Number of Rounds	Purpose
	PHASE 1		
X	Adjusting Piece	1 + Adjusting Rounds	Accurately Locate Leading Edge of Breach
X	Battery	4	Minefield Recon
X + 50	Battery	4	Minefield Recon
X + 100	Battery	4	Minefield Recon
X + 150	Battery	4	Minefield Recon
X + 200	Battery	4	Minefield Recon

Table 1. Example sequence of phase 1 fire (155 mm). (Judy Oman/FCoE CPG)

clear obstacles for maneuver forces, has historical precedent, but current doctrine barely mentions this idea as a possibility.

A review of current joint doctrine reveals artillery support in breaching operations is limited to providing suppressive and obscuring Fires. Breaching remains largely the domain of engineer units. A review of Engineer magazine contemporary to Selyavin's instructions reveals multiple articles where artillery is used to suppress or obscure an obstacle but only one which briefly introduces the idea of reducing a minefield with artillery:

Some U.S. commanders, realizing that they cannot rely on a capability that does not exist, have developed expedient breaching methods such as pushing disabled vehicles through the minefield, aiming unmanned vehicles at the objective, using engineer equipment to scrape the ground or employing indirect Fires in an attempt to provide a safe lane.[8]

Joint Publication 3-15: Barriers, Obstacles, and Mine Warfare for Joint Operations reiterates the importance of suppression and obscuration but does not assign artillery a role in reducing minefields in combined arms breaching.[9] Similarly, *JP 3-34: Joint Engineering Operations* discusses the importance of integrating engineering operations with fire and maneuver but does not express the complementary nature artillery can play in breaching minefields.[10] A modern-day American or NATO maneuver unit, when compared to Soviet units, is significantly lighter in terms of indirect fire assets. Nevertheless, the premise has potential application today should engineer assets not be available and bypassing the obstacle not be an option.

For this historic, yet innovative, idea to take hold, the following example describes how to use artillery to breach a minefield. Golf Company, 2nd Battalion, 6th Marines (G/2/6), a motorized Marine infantry company, is operating in restrictive terrain with limited maneuver space for their vehicles. G/2/6 is supported by an attached fire support team but lacks engineer assets. G/2/6 faces a Soviet-style enemy using Warsaw Pact equipment and doctrine. The enemy is known to follow Soviet templates for mine emplacement, with typical anti-tank minefields being placed on a 200-300 meter front by 60-120 meters in depth.[11]

Scenario

While conducting a deliberate movement toward an objective, G/2/6 loses one vehicle when it encounters an unexpected anti-tank minefield of indeterminate size and density. Due to terrain, G/2/6 is unable to bypass the minefield. Lacking attached engineer assets, the company commander asks his fire support team to breach using indirect fire. The company needs a lane 50 meters in width and an unknown depth along its route of march. The commander's primary concern is anti-tank mines.

In order to conduct a minefield clearance using artillery, two distinct phases occur. The first is minefield reconnaissance, in or-

8 *Hambric, Harry N. and Edwin L. Booth "A New Way to Breach Minefields." Engineer. Fall 1984. Page 28.*
9 *JP 3-15 Barriers, Obstacles, and Mine Warfare for Joint Operations. 6 September 2016. Pages III-2 through III-5.*
10 *JP 3-34 Joint Engineer Operations. 6 January 2016. Page I-2. Available online: http://www.dtic.mil/doctrine/new_pubs/jp3_34.pdf*
11 *Parker, Fred E. "Soviet Counter Mobility Operations." Engineer. No. 1, 1987. Page 15.*

Range	Firing Unit	Number of Rounds	Purpose
		PHASE 2	
X	Battery	8–16	Minefield Clearing
X	Adjusting Piece	2–3 Rounds	Confirmation of Clearing
X + 50	Battery	8–16	Minefield Clearing
X + 50	Adjusting Piece	2–3 Rounds	Confirmation of Clearing
X + 100	Battery	8–16	Minefield Clearing
X + 100	Adjusting Piece	2–3 Rounds	Confirmation of Clearing
X + 150	Battery	8–16	Minefield Clearing
X + 150	Adjusting Piece	2–3 Rounds	Confirmation of Clearing
X + 150	Battery	8–16	Minefield Clearing
X + 150	Adjusting Piece	2–3 Rounds	Confirmation of Clearing (No Explosions Noted)

Table 2. Example sequence of phase 2 fire (155 mm). (Judy Oman/FCoE CPG)

der to determine the depth of the minefield. The second is breaching the minefield.

Phase 1: Minefield reconnaissance

In Phase 1, the fire support team finds an observation post or asset that allows for observation of the entire suspected minefield. This could be from a physical observation post or through the use of available technology such as drones or aircraft with downlink capabilities. From this vantage point, the forward observer (FO) accurately plots the minefield's known or suspected boundaries, estimated depth and G/2/6's desired route of march. This becomes the breeching lane.

The FO requests one round in-adjust at the mouth of the breach. The battery adjust piece delivers a spotting round and is adjusted accordingly, similar to how a registration is conducted. Once the battery is adjusted, a battery four is fired in a converged sheaf to start the breach. After the conclusion of the battery's Fires, the adjusting gun fires another spotting round 50 meters beyond the initial round and salvo along the breach lane. Once accurately adjusted, the process continues throughout the depth of the breach lane.

At each range, the observer is looking for a smoke cloud that differs from the normal shell burst. If a different smoke cloud is observed (see Figure 1), the area is assumed to be mined and the process continues. If no mine detonations are observed, that range can be reasonably assumed to be mine-free. Once the maneuver commander determines the depth of minefield, the FO puts the battery in Phase 2.

Phase 2: Breaching the minefield

Returning to the mouth of the breach lane, the battery fires using time fuzes set to burst shells approximately 3 to 5 meters above the ground. Time fuzes produce downward shock waves and fragmentation in order to detonate the mines. After firing a battery 8 at each range, the adjust gun fires two or three check rounds while the FO observes for mine detonations. If none are observed, that segment is considered clear and

the battery shifts fire to the next point. This process is repeated until the breach lane is clear. See Table 1 for an example sequence of fire (Figure 1).

This example sequence of fire is designed around the 155 mm. This TTP is not limited to 155 mm; however, the ranges and rounds will vary for different caliber of artillery or even mortars.

Risks

Using artillery to breach a minefield is not without risk to the maneuver element or the firing unit.

i. By deliberately breaching the minefield using indirect Fires, the company risks losing the element of surprise. As such, the use of artillery eliminates the advantage of surprise inherent in an in-stride breach.[12]
ii. Enemy obstacles, including minefields, are likely under observation, putting halted elements at increased risk of being targeted by enemy direct and indirect assets.
iii. An enemy with counter-battery capabilities poses a significant risk to the firing battery.
iv. Ammunition consumption is quite high (between 90 and 180 rounds per 50 m increment of breach), possibly reducing the battery's ability to support follow-on calls for fire.

Using this TTP provides a foundational basis for an alternative means for fire supporters to assist maneuver commanders. Though draining on ammunition stocks and time-intensive, the use of artillery to breach a minefield gives maneuver commanders an alternative to risking their men and machines forcing a breach when traditional methods are unavailable or undesirable. Conversely, units observing Russian forces firing similar patterns into known or likely allied obstacles and minefields have an indication that the Russian maneuver unit lacks organic engineer support.

Innovation may mean more than the newest weapon, hardware or munition. In this case, an idea from the past sparked a new way to use artillery. This idea clearly is not meant to replace all other uses for artillery. Instead, this TTP offers fire supporters an additional tool to support maneuver commanders. Much like this example, the warfighter may benefit from reviewing the historical uses of their current tools to identify new uses. The limited number of tools available to commanders does not prohibit using ideas to innovate TTP.

Maj. Timothy Heck is a Marine Reserve field artillery officer currently serving as a brigade platoon commander at 6th Air/Naval Gunfire Liaison Company. Among other places, his writings have appeared in Fires, The Journal of Slavic Military Studies, Infantry and Armor. He recently authored a chapter on the Soviet Vistula-Oder Offensive of 1945 for the Large-Scale Combat Operations series published by Army University Press.

12 JP 3-15, pg. III-5.

U.S. Army Soldiers assigned to Brigade Engineer Battalion, 1st Brigade Combat Team, 1st Cavalry Division and Observer Coach Trainers assigned to Operations Group Sidewinder Team observe a mushroom cloud form from a Mine Clearing Line Charge detonation during Decisive Action Rotation 18-02 at Fort Irwin, Calif., Nov. 29, 2017. (U.S. Army photo by Sgt. Nathan Franco, Operations Group, National Training Center)

Warfighter 19.2

Targeting in America's tank division

By Maj. Joshua Herzog and Chief Warrant Officer 4 Steven Fernandez

"Targeting is the process of selecting and prioritizing targets and matching the appropriate response to them considering operational requirements and capabilities." At the beginning of Warfighter 19.2 (WFX), the 1st Armored Division's (1st AD's) targeting process used "focus areas" to synchronize intelligence collection, lethal and non-lethal delivery assets and conduct assessments. This technique was sufficient in determining the resources the division needed to request from corps and the Combined Forces Air Component Command during the 72-hour air tasking order (ATO) cycle. However, this process did not generate the requisite detail or synchronization of detection, delivery and assessment needed in current operations, nor target the commander's high payoff targets (HPT) effectively. This article describes the process the 1st AD targeting team developed by the end of WFX 19.2 that successfully synchronized assets in time and space, effectively contributing to the commander's mission.

The Army's targeting process is centered on the decide, detect, deliver and assess (D3A) methodology. This process allows commanders to identify "enemy resources (targets) that if destroyed or degraded will contribute to the success of the friendly commander's mission." Critical to D3A is the synchronization of information related capabilities, intelligence, maneuver, fire support systems, nonlethal effects and special operations forces to attack and destroy critical targets using the most effective means possible at a specified time and place. Although the targeting process lies predominantly in the hands of the division's fire support team, the entire staff must understand and contribute to the process for it to be effective at achieving the commander's targeting priorities. To achieve the collaboration necessary within the targeting process, the staff organizes a targeting working group to provide the essential analysis, prioritization and coordination to achieve the commander's objectives through the D3A methodology. Given this doctrinal framework, the 1st AD targeting team conducted their train-up for WFX 19.2 and subsequently refined their standard operating procedures.

Initial process

Due to the timing of the train up for WFX 19.2, the majority of the members on the 1st AD targeting team were new. During the command post exercises (CPXs) leading up to the WFX, the targeting team conducted initial training with the staff and participated in dialogue with the commanding general (CG) to obtain his broad targeting guidance. The targeting officers conducted a series of briefs to the staff to cover the basic targeting methodology, the targeting working group and the purpose and format for the targeting decision board, where the CG would approve the staff's recommendations by ATO day. This established a baseline understanding across the staff.

Additionally, during WFX academics, the fire support coordinator (FSCOORD) and targeting team dialogued with the CG to understand his intent for Fires. Through this dialogue, the CG and targeting team determined that the focus of targeting had to be on long-range artillery capable of affecting the division, the integrated air defense system (IADS), and reserve maneuver forces capable of conducting a counter attack. The CG frequently discussed the tension that would be necessary between shaping the division's deep area and supporting the brigades in the division's close area during critical events such as forward passage of lines and wet-gap crossings. The CG modified his guidance and the Fires team continued to balance the tension between deep and close throughout the division's CPXs and the military decision-making process for WFX 19.2.

The staff, led by the chief of staff, constantly updated and refined the battle rhythm to ensure that the targeting process nested with corps' battle rhythm. These adjustments facilitated the submission of ATO-based requests, and provided the touch points necessary for the CG to make decisions and publish guidance to the staff and subordinate units. The result was the battle rhythm seen in Figure 1. The targeting aspects of the battle rhythm were critical to the division's ability to synchronize the fight and simultaneously support the corps' targeting process and ATO cycle. The decision working group each night provided the CG a touch point with the planners and senior leaders in order to set the stage to view how the he saw the fight unfolding in the next 72 to 96 hours. This meeting was critical to the targeting working group the next morning and when necessary, allowed the targeting team

to refine previously submitted support requests based off changes to the plan. The division targeting working group then fed the corps targeting working group, allowing the deputy commanding general for maneuver (DCG-M) and FSCOORD to influence the corps' support to 1st AD. Similarly, the targeting decision brief fed the corps' joint targeting coordination board. These two meetings then flowed back into the decision-working group later that night with refined information on what the corps was doing in the next 24 to 96 hours, helping the CG visualize beyond 72 hours.

Throughout the division's CPXs, the targeting officers and FSCOORD trained the staff in more detail on the D3A process and conduct of the targeting working group. In order to do this the division used "focus areas" in the decide portion of D3A to focus the staff's planning efforts for detection, delivery and assessment assets. First AD's focus areas consisted of the unit and the high value targets (HVT) associated with that unit. During the TWG, the targeting team decided which HPTs within the focus areas should be targeted for the next ATO day (72 hours out), validated and refined the HPTs and asset requests for 48 and 24 hours out respectively. From here, the team discussed the detection assets required within each focus area and associated named areas of interest (NAI) or target areas of interest (TAI). Then, the team assigned delivery assets including cannon and rocket Fires from within DIVARTY, aviation assets from the combat aviation brigade, joint air assets and non-lethal effects to HPTs within each focus area. Lastly, assets were loosely aligned to assess the effectiveness of our targeting efforts on each HPT. Although this method allowed the staff to improve every day, it failed to enable the staff to understand the finite detail needed to synchronize the components of D3A and achieve the necessary effects.

Issues identified

Although the targeting method previously outlined allowed the staff to focus their efforts during the detect, deliver and assess portions of D3A in the TWG, there was no demand on achieving the

Figure 1. Warfighter Exercise 19.2 battle rhythm. (Courtesy illustration)

CG DCG-M DCG-O CoS DCG-S DIVARTY CDR

BATTLE RHYTHM CHANGES

NEW CORPS CORPS DIV WG DIVISION as of 30OCT18

WFX 19-2	
0200	DIV O&I
0400	CORPS DAILY INTSUM PUBLISHED
0600	DIV CUB
0700	DIV SHIFT CHANGE
0800	CORPS CG BUA
0800	DIV EFFECTS WG
0900	G5 OPT
0900	CORPS INTEL SYNC
1000	DIV TARGETING WG
1000	DIV PROTECTION WG
1100	DIV O&I
1100	DIV CEMA SYNC
1100	CORPS COLLECTION MANAGEMENT WG
1130	DIV LOG SYNC
1200	CORPS OPS / INTEL SYNC (G3/G2)
1300	DIV CUB (w/ LNOs)
1300	CORPS TARGETING & COLLECTION WORKING GROUP
1400	G2/S2 SYNC
1400	G6/S6 SYNC
1500	DIV DECISION BOARD
1600	CORPS SUSTAINMENT SYNC (G4 & Sust)
1700	G3/S3 SYNC
1700	CORPS CUB
1830	CORPS TARGETING BOARD (FSO, G2, TGTing Team)
1900	DIV STAFF INPUT TO DAILY FRAGORD DUE
1930	DIV CUB
2000	DIV SHIFT CHANGE
2030	CG DECISION WG G5/G35
2100	CORPS SUST DECISION BOARD
2100	DIV COLLECTION WG
2100	CG NIGHT EXPECTATIONS DISCUSSION (w/ STAFF)
2200	DIV DAILY FRAGORD
2200	CORPS PLANS HUDDLE
2300	DIV O&I
2330	CORPS DAILY FRAGO
0000	CORPS OPS / INTEL SYNC

REPORTS	
0400	GREEN-1 (INTSUM), GREEN-8 (INFORMATION COLLECTION REQUEST), RED-1 (PERSTAT), RED-1A (PRR)
0500	ORANGE-1 (COMSTAT), WHITE-1 (CBRNE SITREP)
0600	RED-5 (THEATER BLOOD REPORT)
0700	GREEN-2 (SENSITIVE ITEMS), YELLOW-1 (LOGSTAT)
1500	YELLOW-1 (LOGSTAT)
1600	GREEN-6 (DETAINEE/EPW STATUS), RED-1 (PERSTAT), RED-1A (PRR)
1700	ORANGE-1 (COMSTAT), BLUE-4 (ENGINEER SITREP), YELLOW-2 (COMBAT SLANT), RED-5 (THEATER BLOOD REPORT), RED-6 (MEDICAL EQUIPMENT READINESS REPORT), WHITE-4 (PAO SITREP)
1800	BLUE-2 (CDRs SITREP), WHITE-6 (RELIGIOUS SUPPORT SITREP), GRAY-6 (MISO SITREP), WHITE-3 (CA SPOTREP)
1900	GREEN-2 (SENSITIVE ITEMS), WHITE-1 (CBRNE SITREP)
WEEKLY	RED-4 (PREVENTIVE MED DNBI/MTBI REPORT) – FRIDAY 1500, WHITE-5 (PAO WEEKLY SITREP) – WEDNESDAY 1700

COMMANDERS' UPDATE (NO DEDICATED TIME) WILL BE CONDUCTED OVER VENTRILLO USING THE CPOF COP.

level of detail needed from the staff to effectively synchronize these requests and execute the plan within current operations. As a result, traditional fighting documents that are part of the division's fire support plan were not detailed enough to be useful to the field artillery intelligence officers (FAIO), G2, joint air ground integration center, chief of current operations or subordinate units. Lack of detail during the TWG and subsequent targeting products compounded the issue based on an incomplete intelligence picture, lack of holistic and detailed collection plan, lack of target refinement by the FAIO and an over-generalized process during the TWG that prevented the transition of a complete and synchronized plan to current operations for execution.

First, 1st AD's process could have improved with a refined intelligence picture. According to after-action reviews and final exercise reports, a more thorough process for understanding the enemy could have contributed to a more successful targeting process. Due to technical issues during the WFX, the G2 section was unable to exploit the distributed common ground station-Army (DCGS-A) capability that hindered intelligence fusion, the application of doctrinal intelligence tools and consistent assessments of the enemy course of action throughout the G2. According to the final exercise report, the fusion cell did not use the DCGS-A to develop intelligence products that would have aided in their situational understanding, and answer information requirements critical to targeting priorities. Additionally, the G2 did not integrate information collected and analyzed by the DIVARTY S2 and combined arms battalion S2 regarding enemy Fires and IADS systems into the division's intelligence estimate even though these subordinate units had the most accurate and relevant data on these target types. Additionally, the lack of doctrinal products such as an enemy event template prevented the intelligence targeting and collection management sections from developing detailed plans to help decide, detect and assess targets. Lastly, over the course of hours and various briefings and updates, the G2 section would brief slightly different battle damage assessments and assessments of the enemy course of action, leading to some confusion amongst the staff and targeting team. Overall, a lack of a cohesive, detailed and fused intelligence picture hindered the staff's ability to achieve the requisite level of detail necessary to decide on HPTs and synchronize detection, delivery and assessment assets requests for future execution.

The first step in putting this transformation into action was refining our process in the targeting working group.

Due to a lack of detail within the intelligence estimate and event template, it was difficult for the collection manager to align assets to detect the right target, in the right area, at the right time. Additionally, the information collection plan (ICP) did not leverage all of the division's information collection capability and often was not specific or layered to best support the ability to answer information requirements. In return, issues with the ICP led to issues with target refinement by the FAIO and the inability to execute planned targets synchronized with the maneuver plan.

Additionally, the FAIO within the division's aviation combat element did not have the appropriate level of focus on deliberate target refinement. Without a consistently produced and refined target synchronization matrix, the absence of intelligence fusion, and an incomplete, hand-waved collection plan, the FAIO struggled to focus on the prioritized high payoff target list and provide refined target data back to the targeting team in the TWG. As a result, accurate refinement of air support requests was nearly nonexistent and DIVARTY rarely received updated locations of the targets they planned to execute, creating an ammunition management nightmare. Lastly, due to the absence of accurate and detailed information that is a product of target refinement, the Fires team did not publish traditional fighting documents or provide them to the current operations section.

These issues can generally be traced back to the acceptance of unspecific information throughout decide, detect, deliver and assess steps of the targeting working group. During the mid-rotation after-action review, it became clear to the staff that their process had to change and that the level of detail had to increase to achieve synchronization and develop an effective and executable plan.

Refinement

During the mid-rotation AAR, the commanding general asked a simple question to the staff: "Are we a HPT or a HVT organization?" This simple question sparked a professional discussion about how the division was going to kill what was killing it. It was important for the staff to understand that although the enemy G6 artillery pieces were on the high payoff target list, a specific unit's associated G6s at a specific time and place were on the prioritized high payoff target list. More specifically, the division would continue to prosecute G6s found dynamically within current operations, but would focus collection, delivery and assessment assets on the prioritized G6s that could most

effectively disrupt friendly operations. By clarifying this difference, demanding more specificity during the targeting working group, refining the TWG agenda and producing documents that could transcend planning, synchronization, refinement and execution efforts, the 1st Armored Division was able to significantly increase its ability to target enemy HPTs off the prioritized high payoff target list (HPTL).

The first step in putting this transformation into action was refining our process in the targeting working group. Instead of using the term focus area, we simply used the doctrinal term, high payoff target. Once the G2 provided their assessment of the enemy course of action for the given ATO day and then the G35 described the friendly scheme of maneuver projected for that day. Given shared understanding of the enemy and friendly schemes of maneuver, the G2T outlined the enemy's high value targets. Next, the targeting team would decide what the specific high payoff targets were for that ATO. After identifying each HPT, the team would determine the detection asset(s), location for the asset(s) to focus (NAI/TAI), and the detection window based off event template and triggers. Then, the team determined the best available delivery asset(s) to achieve the desired effect and submitted any required asset requests necessary for execution during that ATO day, within the detection window. Lastly, the targeting team solidified the assessment plan in a similar fashion. Only then would the G2 move to the next HVT based on the enemy course of action, grounded in fused intelligence data from across the various intelligence domains.

The Fires team captured this information on a modified target synchronization matrix (TSM) and fire support execution matrix (FSEM). The FSEM was constructed on the decide, detect and deliver framework as seen in Figure 2. It also included close air support allocations, priority of fire, fire support coordination line and coordinated fire line. Within the decide portion of the document, the HPTs are listed in order of priority across the top in the fire support task format. This includes the task, purpose, method and effect the division is trying to achieve to support the friendly maneuver plan during that ATO. In the detect portion, all available assets are listed by type with specific HPTs and NAIs listed in the time blocks. Listed next are

Figure 2. Warfighter Exercise 19.2 fire support execution matrix. (Courtesy illustration)

FIRE SUPPORT EXECUTION MATRIX

ATO: KN — AS OF: 1317000NOV18

DECIDE

	T1:	T2:	T3:	T4:	T5:
P:	Prevent massed fires on 1/1 CAV in OBJ AZ	Prevent massed fires on 1/1 CAV in OBJ AZ	Prevent massed fires on 1/1 CAV in OBJ AZ	Prevent 13th Corps from protecting 675th maneuver	Limit 675th ability to conduct CATK after 1/1 CAV wet-gap crossing
M:	9A52: SCAR / XINT / ATACMS UAS: IRON CURTAIN/VAIL / GMLRS	G6: XINT (SAR) / MLRS / CAB (T) UAS: IRON CURTAIN/VAIL / GMLRS	2S19: SCAR / XINT 2S6: GMLRS	OPTIMA-3: ATACMS / GMLRS / XINT TRC-274: ATACMS / MLRS / XINT	T-90: XCAS / CAB
E:	9A52: 5 / 10	G6: 5 / 5	2S19: 4 / 15 2S6: 3 / 4	OPTIMA-3: 4 / 6 TRC-274: 1 / 3	T-90: 20 / 108

CAS ALLOCATION	1/1		2/1		3/1		1/101	2	1/1 CAV	3	MEB	2 (T)		POF	1/1 CAV	1/1	1/101	3/1	2/1	o/o CAB			
TIME (MST)	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500
TIME (ZULU)	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200
FSCL	FAITH																							
CFL	MCKINLEY																							

DETECT

COMINT	13th IFC 9A52 NAI I4040 / I4044																							
	11th DAG G6 NAI I4039																							
	672nd/675th 2S19 / 2S6 NAI I4033																							
	675th T-90 NAI A056 / A032 / A011																							
GMTI	13th IFC 9A52 NAI I4040 / I4044																							
	11th DAG G6 NAI I4039																							
	672nd/675th 2S19 / 2S6 NAI I4034																							
	675th T-90 NAI A056 / A032 / A011																							
PAN / IR/ SAR	Requested for all HPTs - several platforms available for cross cue - UGFs characterization																							
ELINT	672nd/675th 2S19 / 2S6 NAI I4034																							
	OPTIMA-3 NAI A056 / A032																							
GE 1	11th DAG G6 NAI I4039													13th IFC 9A52 NAI I4040 / I4044										
GE 2	672nd/675th 2S19 / 2S6 NAI I4034																							
GE CAB	13th IFC 9A52 NAI I4040 / I4044													11th DAG G6 NAI I4039										
HUMINT	OPTIMA-3 NAI A056 / A032																							
SOF	OPTIMA-3 NAI A056 / A032																							
	11th DAG G6 NAI I4039																							
	13th IFC 9A52 NAI I4040 / I4044																							
Q-53	11th DAG G6 NAI I4039																							
	13th IFC 9A52 NAI I4040 / I4044																							
	672nd/675th 2S19 / 2S6 NAI I4034																							
CEMA																								

DELIVER

SCAR									KNACR022					KNACR023										
AI		KNACI011		KNACI012		KNACI013		KNACI014		KNACI015		KNACI016		KNACI017		KNACI018		KNACI019		KNACI020		KNACI021		
														NACI024 UGF 23, 25, 30, 3										
CAS	KNACC001		KNACC002		KNACC003		KNACC004		KNACC005		KNACC006		KNACC007		KNACC008		KNACC009		KNACC010					
					KNAIC001								KNAIC002											
CEMA	KNACE001						KNACE002						KNACE003				KNACE006							
					KNACE005														KNACE004					
CAB					13th IFC 9A52 (EAs vic NAI I4040 and I4044)								11th DAG G6 (EA vic NAI I4039)											
							675th T-90s NAI A056 / A032 / A011																	
MLRS	13th IFC 9A52 NAI I4040 / I4044 (M30 / M39)																							
	11th DAG G6 NAI I4039 (M26A2)																							
	672nd/675th 2S19 / 2S6 NAI I4034																							
	OPTIMA - 3 / TRC-274 (M31 if required due to collateral concerns)																							
						SEAD 13th IFC CAB ATK																		
													SEAD 11th DAG CAB ATK										
ATACMS	OPTIMA - 3 / TRC-274 (M31 if required due to collateral concerns)																							
EFFECTS														IRON CURTAIN / VAIL IX (UAS GCS N.AZ & PYONGYANG)										

CAS supporting convoy security for SACP

ATO	KN: 14-15 NOV 18	0600-0559	TARGET SYNCHRONIZATION MATRIX			
T1:	Neutralize 13th IFC (CAG)	T2:	Neutralize 11th DAG	T3:	Neutralize 675th and elements of 672nd BAG	T4:	Destroy GPS Jammers	T5:	Disrupt 675th Tank BDE
P:	Prevent massed of fires on 1/1 CAV in OBJ AZ	P:	Prevent massed of fires on 1/1 CAV in OBJ AZ	P:	Prevent massed of fires on 1/1 CAV in OBJ AZ	P:	Prevent 13th Corps from protecting 675th maneuver	P:	Limit 675th ability to conduct CATK after 1/1 CAV wet-gap crossing

DECIDE					DETECT				DELIVER			ASSESS		
FOCUS	TGT CAT	TGT	LOC	TGT #	NAI / TAI	Assets	When	Time	Agency	Assets	Assets	MOE	Status	Comments
T1	FS	9A52 (13th CAG)		AH4011	I4040, I4044	SCAR/ COMINT / GMTI / GE / SOF /Q53	A	0600 - 0599	JAGIC	PRI: AI ALT: MLRS	SCAR/ COMINT / GMTI / GE1 / SOF	6/6 9A52 DESTROYED		
T2	FS	G-6 (11th DAG)		AH4026	I4039	COMINT / GMTI / GE2 / SOF / Q53	A	0600 - 0599	JAGIC	PRI: XINT ALT: CAB	COMINT / GMTI / GE2 / SOF	5/5 G6 DESTROYED		
T3	FS	2S19 (675th, 672th)		AH4016	I4033	GMTI / ELINT / GE / MQ9 / Q53	A	0600 - 0599	JAGIC	PRI: XNIT ALT: SCAR	GMTI / ELINT / GE / MQ9 / XINT	4/15 2S19 DESTROYED		
	ADA	2S6 (675th, 672th)		AH4021	I4034	ELINT / COMINT	A	0600 - 0599	DIVARTY	PRI: MLRS ALT: XINT	ELINT / COMINT	3/4 2S6 DESTROYED		
T4	C4I	JAMMER OPTIMA 3		AH4036	A056, A032	ELINT / SOF	A	0600 - 0599	DIVARTY	PRI: ATACMS ALT: M31A1	ELINT / SOF	4/6 Jammers DESTROYED		
T4	C4I	TRC-274 JAMMER		AH4040	A056, A032	ELINT / SOF	A	0600 - 0599	DIVARTY	PRI: ATACMS ALT: M31A1	ELINT / SOF	1/3 Jammers DESTROYED		
T5	MNVR	T-90 (674th)		AH4045	A056, A032, A011	COMINT / GMTI / GE2 / SOF / Q53	A	0600 - 0599	JAGIC	PRI: XCAS ALT: CAB	COMINT / GMTI / GE2 / SOF	20/108 T-90 DESTROYED		

SCHEME OF MANEUVER

FRIENDLY FORCES NEXT 24 (KN)

III Corps Set
2x DIV attacking in zone IOT seize key OBJ.
- 3 ID attacks in zone to seize OBJ HORSE and OBJ HYENA
- 1 AD attacking in zone to seize OBJ ARIZONA
- 82 ABN conducting a screen along 1 AD's boundary

Major Event
1 AD Attack in zone along a southern axis to isolate and seize OBJ ARIZONA

Subordinate Unit Tasks
1/1 CD: T: Conduct FPOL with 1/1 AD and attack in zone from south to north in order to seize OBJ ARIZONA
1/1 AD: T: Secure key terrain IVO OBJ YUMA and fix enemy IVO OBJ ARIZONA
T2: BPT conduct a screen IVO OBJ ARIZONA oriented Southwest
2/1 AD: T: Transition to consolidation activities in preparation for follow on operations beyond OBJ ARIZONA
3/1 AD: T: Follow and assume 1/1 CD
T2: BPT seize OBJ PHEONIX and isolate OBJ ARIZONA
T3: BPT conduct a screen IVO OBJ ARIZONA oriented Southwest
1/101 IBCT: T: Fix EN elements along MSR Washington

KM ATO FLOW		
XINT	0653 - 0905	
SCAR	0754 - 1005	
XINT	0853 - 1105	
SCAR	0954 - 1205	(XCAS) HOG 31 (A-10s)
XINT	1040 - 1305	
SCAR	1053 - 1305	
	1154 - 1405	(XINT) GUN 25 (F-16)
	1253 - 1505	
	1354 - 1605	(XCAS) HOG 43 (A-10s)
	1554 - 1805	
	1453 - 1705	
	1653 - 1905	
	1705 - 0155	
	1754 - 2005	
	1853 - 2105	
	1954 - 2205	(XINT) GUN 01 (F-16)
	2154 - 0005	
	2315 - 0205	
	1000 - 1030	
	1200 - 1400	
	1400 - 1600	(XCAS) REBEL 21 (A-10s)
	1500 - 1700	
	1600 - 1800	(XCAS) GUN 13 (F-15E)
	1600 - 1630	
	1800 - 2000	
	1820 - 1920	
	1800 - 2000	
	2000 - 2200	(XCAS) GUN 23 (F-15E)
	2200 - 2400	(XCAS) REBEL 25 (A-10s)
	2300 - 0100	
	2300 - 2320	
	2320 - 0020	
	0000 - 0200	
(XINT) STEEL 03 (F-16)	0100 - 0300	
(XINT) STEEL 05 (F-16)	0200 - 0400	
(AI) BUFF 71 (B-52)	0400 - 0559	
(XCAS) REBEL 11 (A-10s)	0508 - 1900	

SPECIAL INSTRUCTIONS

PLANNED FSCL: FAITH
PLANNED CFL: MCKINLEY

HPTL	
1	FS
2	ADA
3	C4I
4	MVNR
5	ENG

POF	
1	1/1 CAV
2	1/1 AD
3	101 BCT
4	3/1 AD
5	2/1 AD

Figure 3. Warfighter Exercise 19.2 target sync matrix. (Courtesy illustration)

the delivery assets available with specific allocation windows and HPTs identified. Overall, the colors throughout the document are used to associate detection and delivery assets with HPTs listed in the decide portion. This color-coding allows the staff to see the synchronization of targeting efforts across the D3A framework.

Additionally, the targeting team used the FSEM in conjunction with the Command Post of the Future (CPOF) overlays to brief the CG or DCG-M during the targeting decision board. This helped the CG/DCG-M see the synchronization and associate targeting efforts between the map and CPOF graphics. It also prevented duplicate work from the staff by demanding the creation of only one product for planning, briefing and execution. Following approval in the decision board, the G35 published these two products in the daily fragmentary order (FRAGO) at 72 hours out from execution. The FAIO used the TSM (Figure 3) to focus target refinements between 48 and 72 hours out from execution. The FAIO and G2T brought refinements to the TWG on subsequent days and the targeting priorities would be either refined or revalidated based off the most current information. The targeting team distributed and briefed finalized versions of the TSM and FSEM to current operations the night before execution that included the approved ATO and updated timelines.

Lastly, after execution, the operations research/systems analyst and G2T used the information in the effect portion of the fire support task in conjunction with battle damage assessment collected to determine if reattack of a particular HPT was necessary. As required by a re-attack decision by the FSCOORD, the team refined priorities in the TWG for the next 24 and 48-hour ATO cycles. Overall, the production of these simple, yet effective products in conjunction with the refined TWG framework, allowed the division to obtain the level of specificity required to meet the CG's targeting objectives in a near peer fight.

Conclusion

This article highlights that specific detail in the targeting process is required to request, synchronize and execute the division's high payoff target list. The allocation/request of assets is not enough to efficiently or effectively target multiple targets that support the division's fight in time and space. The use of fighting documents such as the FSEM and TSM improve the synchronization and effects achieved during the targeting process, allowing the division to maximize their available combat power through time, space and purpose at a decisive time and place. Continuous refinement of the targeting process outlined in doctrine is required in an ever-changing environment with a near peer or peer enemy threat.

Maj. Joshua Herzog is currently the battalion operations officer for 2nd Battalion, 3rd Field Artillery. He previously served as the Fires and Effects Planner for 1st Armored Division.

Chief Warrant Officer 4 Steven Fernandez is currently the senior targeting officer, 1st Armored Division. He previously served as the senior targeting officer for 1st Infantry Division.

The fire support dilemma in cavalry and armor units

'A way' to conduct company-level fire support without forward observers

By Capt. Ellen Loran

In frustration, the cavalry scout asked his troop fire support officer, "But why can't we just have our old observers back?" If only it were this easy. In 2014, the Modified Table of Organization and Equipment (MTOE) for dismounted cavalry troops was updated, eliminating forward observers (FOs) at the platoon level. Instead of a fire support team (FIST) headquarters, and a FO for each platoon, the cavalry troops found themselves with only a FIST.

By summer 2016, all of the previously assigned FOs had left Bulldog Troop, 1st Squadron, 91st Cavalry Regiment leading myself, as the troop fire support officer (FSO), and my fire support non-commissioned officer (FSNCO) to realize that the troop's ability to employ fire support was significantly degraded. During troop situational training lanes, not one element called for fire—even when the best way to prosecute a target was through indirect fire. No one refined pre-planned targets that the FIST had created. No one was on the fire support net (except the FIST). The troop's mortar team sat in position ready to fire but did not receive a single fire mission. Speaking to fellow fire support officers, B/ 1-91st CAV was not alone; all dismounted cavalry troops in our squadron were dealing with the same issue. We had to find a way to employ fire support without any FOs.

This article provides case study on B/ 1-91st CAV's experiment to find the best way to employ indirect fire in an organization without any dedicated observers. At first glance, the answer is glaringly simple: the scouts call for fire. This was presumably the logic behind the MTOE change. Why should we have FOs when calling for fire is a scout skill level one task?

After working with the Soldiers in B/ 1-91st CAV, we found that their fire support knowledge and ability to call for fire were extremely weak. Talking to other FISTs across the formation, we found that this weakness existed in all the troops. Of course, this weakness could be addressed with more training—this was the easy problem.

The more complicated issue was: What does "having the scouts call for fire" look like from a technical standpoint? Who is on the fire support net? Who refines the fire support execution matrix (FSEM) and target list worksheet (TLWS)? Who carries the lightweight laser designator rangefinder? The list of details is endless—and these were the details killing us in execution.

To conduct our experiment, we evaluated several FIST employment options and tried each of them in the virtual battlefield simulator.

FIST employment option 1

The first employment option was pushing out the FSNCO and fire support (FS) specialist to two platoons and leaving one platoon without a dedicated observer. This platoon could still employ indirect Fires from their scouts as needed. The FSNCO and FS specialist both functioned as platoon FOs for those missions. They refined targets with the platoon leaders, carried TLWSs and FSEMs, and advised the platoon leaders throughout the extent of the battle. They carried two radios each, one on the troop Fires net and one tactical satellite (TACSAT) and ultra-high frequency (UHF) capable for air assets that would be pushed to them. Calls for artillery support were run centralized through the FIST (just me as the FSO) and subsequently to squadron. I was co-located with the troop commander. I carried two radios, one for troop Fires, and one for squadron Fires that was additionally TACSAT and UHF capable. Initially, this system worked well. With the FSNCO and FS specialist at the platoon level, all the reports, refinements and calls for fire were in the correct format and easy to send to the firing unit. Additionally, as both observers were JFO qualified, I was able to send them aircraft and rotary wing with ease.

As the enemy battalion disruption elements started moving through the engagement area, this system began to fail. It became impossible for one person to collect reports, monitor calls for fire to artillery and mortars, check coordinating altitude, update the situation map, push air assets, and track and update the commander to standard. We quickly realized that the traditional method of having the FSO and FSNCO together at the command post (CP) was needed to handle the amount of information flowing through the troop CP. Additionally, the one platoon without a FO became a liability to the troop since the platoon was unable to process any fire missions in time to have any effect on the enemy. The enemy realized that this was the weak point on our screen and sent its exploitation force through that sector.

A scout observer conducts crater analysis during a squadron fire support team certification. (Courtesy photo)

FIST employment option 2

Our next planned employment option was to keep the FSNCO and FSO together in the FIST and still push the FS specialist to the platoon that was most likely to use air assets—the decisive operation for the troop. The obvious downside was that only one platoon could call for fire with a trained observer. However, the MTOE change was designed for scouts to employ Fires. We reset the battlefield and impressed upon the scouts that they were the only ones who had the ability to see targets and that they had to initiate all calls for fire.

The largest issue was the practical application of nets on the battlefield. When a scout saw a target, what net would he use to call for fire? We talked through several options. One option was to send the mission on the platoon net for approval and then switch to the Fires net. The scout would send his grid to the troop FIST before the fire mission in order to ensure we had an updated observer location since we did not have any updated OP locations. But how would the platoon leadership be tracking the fire mission? One option was that the platoon leader could also move his troop command radio to the troop Fires channel. However, this was not ideal, since he would then lose contact with the commander. Switching his other radio meant losing contact with his sections.

In addition to nets issues, we also had difficulty understanding and processing the calls for fire. Many times, we received the friendly unit location as the intended target location—an obviously disastrous situation in a live-fire scenario. In the previous weeks we had conducted multiple skill level one call-for-fire classes, but little of the information was retained. We soon realized that continuing with the status quo meant fighting in a troop whose eyes on the ground could neither correctly employ shifts, understand target-to-fuse pairing, call for smoke or illumination, nor could effectively employ any air asset. This lack of ability was not the fault of the individual scouts, but simply was that these skills are perishable and demand a great deal of consistent training.

Planning Fires was another pressing issue. For each mission, the FIST developed a troop-level Fires plan, pushed out the fire support overlay, TLWS and FSEM to the platoon leaders, but these products were filed away and not employed during the battle. This was not simply forgetfulness on the behalf of the platoon leaders. Their mind was not, nor could it have been, on refining the preplanned targets on the TLWS, tracking when the fire support coordination measures needed to be changed, or any of the required tasks for fire support. They needed to be leading their platoon during the fight.

The result of this configuration was that updates and calls for fire came from the one element with the 13F FS specialist and the other two platoons were quiet. This result made sense. Who was taking responsibility for passing Fires reports or updating pre-planned target locations? No one. If everyone in the platoon was supposed to be thinking of Fires, no one was thinking of Fires.

From these two less-than-ideal situations the troop realized that we needed another solution—we needed Soldiers in each platoon who would specifically be thinking about Fires. From here we developed and employed the concept of the scout observer.

The scout observer

A scout observer is an MOS 19D scout that receives significantly more Fires training than the rest of his platoon and is the one responsible for specifically employing Fires for the platoon.

For each platoon, we trained one senior and one junior scout. The senior scout observer is usually a senior specialist, while the junior scout observer is generally a private and in the opposite section of the senior scout, and usually serving as a dismount.

The advantage of this system is that there is always someone in the platoon who is fully trained and someone who is beginning the Fires training process. Additionally, when the senior specialists are selected as team leaders, they already have a solid understanding of indirect Fires and are more likely to think of employing indirect Fires in their team. While scout observers have many functions like that of 13F FOs, they do not fulfill all the 13F functions. Whereas dedicated FOs always train with the FIST, the scout observers still have their primary positions to fulfill. In 1-91st CAV, we had one dedicated day every other week for the scout observers to train exclusively on Fires. Even this abbreviated amount of time yielded immense improvements on battlefield Fires execution during multiple NATO named exercises.

The scout observers were trained to the standards expected of a skill level one 13F. Each scout observer was able to doctrinally call correct fire missions within 45 seconds and make adjustments within 10 seconds. The scout observers participated in the bi-annual squadron FIST certification and faired remarkably well. After a year of trial at B/ 1-91st CAV, the scout observer program was expanded across the squadron and produced the same results across all troops. During the last certification at 1-91st CAV, roughly one-third of the scout observers outscored the average FO score.

In terms of planning, the scout observers took a role like that of any skill level one 13F. During the planning process, the troop FSO worked directly with the platoon leaders to integrate indirect Fires into the platoon's scheme of maneuver. Once the plan was developed, the FIST team made all the products to distribute to the scout observers before meeting with them. Scout observers learned how to read TLWSs and FSEMs and refine them, but did not make the products themselves. This ensured that the observers had adequate time to conduct their primary scout mission preparation activities. The scout observers participated in the fire support rehearsal and fire support technical rehearsal during which they explained their piece of the plan and reacted to contingencies, just as their infantry company FO counterparts did.

The most complicated aspect of employing indirect Fires with scout observers still involved nets and radios. As a FIST, we kept three radios at the troop level and distributed three to the senior scout observer of each platoon. If a platoon had extra radios available, the junior scout observer would also get one. The scout observers were always on the Fires net, and would pass size-activity-location-time reports, observer locations and fire support coordination measures to the troop FIST, just as a FO would do.

This stream of information also helped the commander maintain situational awareness of the battlefield. Through trial and error, the platoons found that the best place for the scout observer on the battlefield was to co-locate them with their associated team leader. This co-location additionally helped enable a dual information flow to the platoon leader, enhancing his situational awareness.

Upon identifying a target, the team leader would send the report to the platoon leader via the section sergeant. The platoon leader would then make a recommendation for prosecution to the troop commander based on the high payoff target list (which we put on the FSEM). Meanwhile, the scout observer would pass a call for fire and the FIST would begin coordination and building the fire mission in the lightweight forward entry device. If the commander approved the target for indirect fire, the FIST team would send the mission to the firing unit and a message to observer then to the scout observer. This dual-communication process significantly reduced the total mission processing time.

I hope this article sparks a conversation throughout the field artillery and armor communities about indirect fire employment in company-sized elements that lack dedicated FOs. It is very simple to say, scouts or tankers will call for fire, but the practical application of this idea is difficult and involves careful planning in terms of equipment, training and readiness. "Sharing Soldiers" between platoons also becomes difficult and requires an established relationship between the fire support officer and the platoon leaders. Using this article as a blueprint, new fire support officers can try a system that worked for one unit and improve fire support employment in cavalry organizations across the Army.

Capt. Ellen Loran is a field artillery officer currently serving as an assistant operations officer at 1st Armored Division, Division Artillery. She previously served in multiple positions in Chaos! Battery, 4th Battalion, 319th Field Artillery Regiment and as the squadron fire support officer for 1st Squadron, 91st Cavalry Regiment. Her Army education includes the U.S. Army Ranger School and Maneuver Captains Career Course.

Aggressive counterfire with ground moving target indicator in large-scale combat operations

By Chief Warrant Officer 2 Timothy J. Porritt and Maj. Calvin P. Roe II

Counterfire + GMTI targeting = aggressive counterfire

This is what the 1st Infantry Division Artillery (DIVARTY) calls "Aggressive Counterfire." Aggressive counterfire fits in the space between the doctrinal reactive counterfire and proactive counterfire. It is reactive in nature yet includes a visual to the enemy's next move. Additionally, the process is not as slow as targeting or proactive counterfire. Acquiring a target with one system and tracking it through another maximizes the shared understanding of how the enemy moves, fires and hides thus enhancing the DIVARTY's ability to rapidly strike enemy indirect fire systems, increasing our overall lethality.

The 1st ID DIVARTY's aggressive Counterfire Battle Drill leveraged organic assets and allocated resources to defeat the adversary in Warfighter 19-04. Although not part of the Mission Table Organization and Equipment (MTOE), the DIVARTY was able to receive a ground moving target indicator (GMTI) feed on the current operations floor of the tactical operations center. This provided the DIVARTY a notional tactical ground station and processing, exploitation and dissemination (PED) cell. Which enabled the unique cross-cueing of the two intelligence, surveillance and reconnaissance platforms that DIVARTY had direct access to, mitigating each other's weaknesses.

Establishing positive identification (PID) through the AN/TPQ radar is a single event. The weapon locating radar has been and most likely will always be an authorized single source PID producing platform. Although it never actually tracks or sees the target on the ground, it tells units where enemy weapon systems are currently located based on the mathematical trajectory of the incoming rounds. Unless the radio detection and ranging detects another munition in the air, we have lost the current position of the adversary's indirect fire assets. In contrast, GMTI does not offer PID however, it does provide the unique ability when paired with a PID producing platform, to maintain PID and track the enemy's indirect fire assets after the AN/TPQ radar loses the acquisition. Reaching a decision point, the commander weighs the risks associated with the PID transfer of enemy indirect fire assets. One could think of this as a reconnaissance and surveillance handover between two systems.

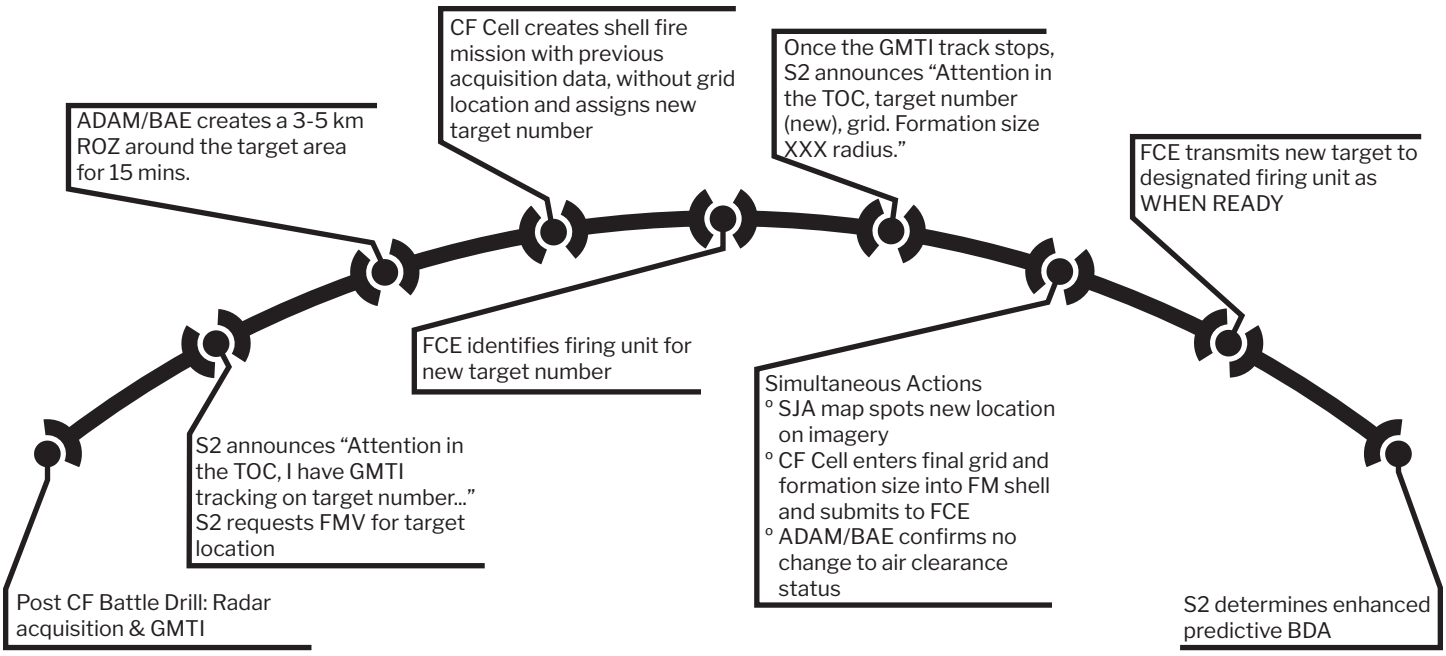
Forming an aggressive counterfire battle drill and adjust to fit any staff. The key players associated with the drill include the counterfire officer, GMTI analyst, air defense airspace management/brigade aviation element (ADAM/BAE) and any fire control element or fire direction center. The battle drill needs to be set up with every system prepared and everyone on standby for the final piece of data in order to engage the target. That final piece of data should only be the location of where the adversary stopped their movement and physical size of their formation. Another significant portion of the battle drill is air clearance. Requesting air clearance over an area large enough to where the enemy will conduct survivability moves is imperative. Additionally and equally important is keeping that air open as long as your commander deems is acceptable to maintain PID through GTMI tracking. Below is the battle drill designed when going into Warfighter 19-04.

There were three enhancements to the aggressive counterfire battle drill: The first is that the ADAM/BAE section created an area of air space around the original point of origin for a specified amount of time. Although the amount of time varied throughout the exercise, it normally equated to the adversary's displacement time, movement speed and distance to the next logical terrain feature from which artillery could fire. This enabled responsive Fires in reaction to the enemy conducting survivability moves within their respective artillery maneuver area (AMA).

The next enhancement was the GMTI analyst measuring the size of the formation. The analyst was already determining the number of vehicles for the strength input on the Advanced Field Artillery Tactical Data System. Measuring the formation area enabled a more precise target engagement and weaponeering solution for the fire control element. Thus, providing better ammunition management throughout the DIVARTY firing units.

The final change was that the S2 performed enhanced predictive battle damage assessment (BDA). Enhancing this predictive BDA due to it being much more than the sum of a short equation, friendly indirect fire response time plus adversary displacement time. The DIVARTY was able to see emplacement of the enemy's assets when the friendly indirect Fires would strike a target. GMTI also provided an excellent indicator of how many vehicles were able to disperse from a target area versus how many entered just moments before.

There are limitations when implementing the aggressive counterfire battle drill. The 1st ID DIVARTY did not and does not have 35G geospatial intelligence analysts authorized on its MTOE



Utilizing the lessons learned from the Warfighter and adapting our resources to better understand the fight we evolved the battle drill into this. (Rick Paape/Courtesy information)

therefore, the DIVARTY was required to cross train our 35F all-source intelligence analysts to monitor a GMTI feed. GMTI itself does not identify a vehicle by type beyond whether it is wheeled or tracked. Cross-cueing an observation platform such as an MQ-1 Gray Eagle will greatly enhance identification of the adversary's fire support system and will assist in refining BDA. During WFX 19-04, the DIVARTY requested an allocation of a notional tactical ground system and associated PED platoon as this system and personnel are not organic to the organization.

Understanding what level of risk the commander is willing to accept and whether they have enough information to formulate a decision, is an important factor within the process. Technically speaking, PID is no longer being produced, only maintained through GMTI platforms. Some commanders may not accept that risk. If this kind of counterfire is presented, framed as counterfire or counterbattery and a specific enemy who is only currently maneuvering to their next firing location currently engages us, then we can become comfortable with this kind of battle drill.

Some battlefield effects are tangible while others will never be. There are other effects besides lethal effects. Although you may never receive any confirmed or predictive BDA, you can get into the enemy's decision cycle by targeting their planned AMA's. It is intangible and hardly measurable with how much you have disrupted enemy Fires by the lull created in between enemy fire missions.

GMTI can offer a digital and visual beginning of target pattern analysis (TPA). With the proper analysts in place, GMTI can show you the boundaries of enemy indirect fire AMA's, where they go to rearm, refuel and resupply. It can also demonstrate when the adversary moves about the battlefield. Layering GMTI with your own TPA can create a greater and confirmed understanding of how the enemy fights.

With the correct package of equipment and personnel in place, a DIVARTY and division staff can get aggressive with their counterfire. It will increase the lethality of a DIVARTY and maneuver elements by striking the targets the commander needs to engage on a high payoff target list as soon as they attempt to fire at friendly forces. Additionally, it alleviates some of the burdens of a Joint Air Ground Integration Cell and division Fires cell by fully utilizing the ability to prosecute targets within the DIVARTY staff. GMTI is an underused and underrated resource in the artillery fight and when paired with the proper assets, it begins to paint the picture of the adversary's intent and allows friendly forces to disrupt that intent.

Chief Warrant Officer 2 Timothy Porritt served as a division artillery counterfire officer for the 1st Infantry Division. Additionally, he served as part of a regionally aligned forces deployment with 1st Battalion, 7th Field Artillery Regiment.

Maj. Calvin Roe served as the intelligence officer for the 1st Infantry Division Artillery. Prior to serving in the DIVARTY, he was the collection manager for 1st Infantry Division.

References

DoD, 1ID DIVARTY TACSOP, 15 MAR 2019, Accessed 15 March 2019,

HQDA, Division Artillery Operations and Fire Support for the Division, ATP 3-09.90, Accessed 09 January 2019, https://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/ARN5999_ATP%203-09x90%20FINAL%20WEB%201.pdf

HQDA, Tactics, Techniques, and Procedures for the Field Artillery Battalion, FM 3-09.21, 22MAR 2001

Kasserine Pass lessons for the reemergence of SHORAD

By Capt. Joshua Urness and Capt. Abigail Carter

The reemergence of Short-Range Air Defense (SHORAD) provides an important opportunity to examine lessons learned about developing highly technical capabilities and rapidly building force structure and training programs at other periods in Air Defense history. Anti-Aircraft Artillery (AAA) experience's during the period leading up to World War II, and AAA's first "trial by fire" at the Battle of Kasserine Pass is especially relevant for this reason. This paper identifies lessons learned from those AAA experiences and considers them in the context of challenges the Air Defense Artillery (ADA) branch may face with the reemergence of SHORAD enabled maneuver today. The purpose of this paper is to highlight lessons before an outbreak of conflict to mitigate as many potential challenges that the branch may face in its next "first battle."

Prelude to war and the Battle of Kasserine Pass

The anti-aircraft artillery downsized almost entirely, separating from the rest of the army under the Coastal Artillery Corps after World War I.[1] U.S. Anti-aircraft artillerymen continued to develop doctrine, tactics and materiel solutions to anti-aircraft problems. However, their efforts made a limited impact due to a lack of funding and hollow. One of the most important of these materiel developments was the improvement of World War I era mechanical predictors, which predicted locations of detected aircraft as they moved. Mechanical predictors were iteratively advanced to become mechanical "directors" capable of computing and transmitting firing solutions directly to AAA guns (similar to modern fire control).[2] By the late 1930s, it was clear from the exploits of the German Luftwaffe in the Spanish Civil War, and The Japanese Army Air Service in China, that "aviation technology had taken a quantum leap forward."[3] Out of concern for the threat, the War Department attempted to make up for years of financial and personnel "neglect" by prioritizing anti-aircraft capabilities beginning in 1937 and 1938.[4] That may have been too late. By 1940, there were still only eight active duty AAA regiments and 10 National Guard AAA regiments.[5] National Guard regiments were reasonably well equipped but lacked the personnel, and some active duty regiments were described as "skeletal," consisting of only headquarters batteries.[6]

On Dec. 7 and 8, 1941, the Japanese surprised the United States, attacking Pearl Harbor and the Philippines. With little notice, the United States was at war. Through rapid training and mobilization, the anti-aircraft artillery field grew 1,750 percent by 1943.[7] Rapid growth presented materiel challenges in equipment availability for training and deployment. Intense lobbying focused on modernizing obsolete World War I era AAA equipment. However, many AAA units did not receive new equipment, such as new mechanical predictors, until late 1942, just as they staged for the invasion of North Africa.[8]

Anti-aircraft Soldiers deployed with maneuver forces to North Africa in November 1942. Then, from Feb. 19 to 25, 1943, new U.S. recruits faced an experienced German Army at Kasserine Pass. U.S. forces lost badly. The specific events of the battle fall outside the scope of this examination but The Hammer of Hell, by Col. (ret.) Paul Semmens provides an excellent AAA focused history. Semmens' research highlights several key factors that led to challenges experienced by AAA forces at Kasserine Pass. These factors include 1) AAA junior officers not understanding combined arms tactics; 2) Anti-aircraft artillerymen lacking sufficient weapon system integration and mobility to perform their mission on a dynamic and shifting high-tempo operation; and 3) Anti-aircraft artillerymen losing situational awareness for

1 *Hamilton, John. Blazing Skies. Dept. of the Army, 2009. Page 27.*
2 *Crabtree, James. On Air Defense. Wesport, CT: Praeger, 1994. Page 44.*
3 *Hamilton, page 34.*
4 *Crabtree, page 44.*
5 *Hamilton, page 33.*
6 *Hamilton, page 34.*
7 *Hamilton, page 34.*
8 *Crabtree, page 44.*

the sake of mobility which led to fratricide and ineffectiveness.[9] We generate the following lessons from those factors:

i. The air defender must understand the ground tactical plan.
ii. Integration and mobility are essential to supporting the maneuver fight.
iii. Situational awareness and early warning are the cornerstones of the SHORAD fight.

These lessons are relevant today because of similarities between the AAA experiences during the interwar period and the prelude to World War II, and our current "prelude" to war. Now, through additional information about each of those factors, the following sections apply Kasserine Pass lessons to important considerations for the reemergence of SHORAD enabled maneuver.

The air defender must understand the ground tactical plan

AAA Soldiers found themselves on the forward line of troops throughout the battle at Kasserine Pass. One of the opening stories shared by Semmens in the Hammer of Hell account of the battle highlights AAA units remaining emplaced at their fighting positions while multiple brigades passed them in retrograde. Soon, those AAA units were alone, and the next thing they saw were enemy troops.[10] In hindsight, it probably seemed obvious that they should have followed the American units they were supporting. However, this story shows the poor level of integration these troops experienced with maneuver forces. Poor integration, combined with a limited understanding of maneuver tactics and combined arms warfare, resulted in failures by AAA units to anticipate locations and timing of decisive points on the battlefield. These experiences led to three primary lessons: 1) "Kasserine Pass demonstrated that Anti-Aircraft Artillery junior officers had to understand the situation on the battlefield;" 2) "To provide effective support, Anti-Aircraft Artillery Soldiers had to understand combined arms tactics..."[11] and 3) "Anti-Aircraft Artillery Soldiers had to be just as tough as the infantry because they were operating along the line of contact and enduring the same German [sic] artillery fire, enemy probes and physical and mental hardships."[12] AAA Soldiers at Kasserine Pass learned these lessons the hard way and eventually developed an understanding for maneuver and combined arms tactics through experience. Importantly, training programs back in the United States were allowed the unfortunate benefit of their predecessors "trial by fire."

The crew of 105 mm howitzer, B Battery, 33rd Field Artillery with gun set in Arabic mud-block abode for firing in defense of the Kassserine Pass, North Africa. (Library of Congress)

As the ADA branch pivots toward missions supporting maneuver forces with SHORAD in large-scale combat operations (LSCO), ADA must develop air defender maneuver competencies and understanding. The goal should be to develop the intuition of the Air Defender to comprehend the shifting elements of a dynamic LSCO battlefield quickly. Then, equipped with understanding and intuition, be able to make decisions, anticipate decisive points and take action that reflects the fullest expression of their capacity to achieve their "support" mission. Additionally, Air Defenders must develop a healthy relationship with their supported maneu-

9 Semmens, Paul, COL (R). Hammer of Hell. Self-Published, 1990. This book is also reprinted from the ADA Magazine and available online at: http://www.skylighters.org/hammer/Semmends.
10 Semmens, page 31.
11 Semmens, page 61.
12 Semmens, page 61.

ver commander. A healthy relationship is based on mutual trust and shared understanding. To achieve mutual trust, maneuver commanders must value the air defense contribution to their operations and find their supporting capabilities credible. James Mcdonough's 1980s maneuver classic The Defense of Hill 781 describes the ideal maneuver commander to air defense relationship using the verb "husband."[13] To husband the ADA capability means to safeguard it, conserve it or value it very intentionally. To attain this value and credibility, we must achieve a shared understanding by telling the "Air Defense Story." The air defense story should be told by accurately describing ADA system capabilities and limitations to support a maneuver commander's ground tactical plan, cased in doctrinally correct and maneuver tactics informed language, resulting in the communication of a meaningful ADA effect on the battlefield. The best way to tell the air defense story and build healthy relationships is in person. The branch can achieve both of these objectives through increased ADA attendance of maneuver-oriented professional military education courses and dogged integration into maneuver exercises. In turn, these efforts will address the "just as tough" observation from Kasserine Pass.

Integration and mobility are essential to supporting the maneuver fight

Equipment was a key limitation for AAA mobility at Kasserine Pass. The AAA "system" was composed of weapons/guns (without on-board fire control), mechanical directors (like our modern fire control and radar), displaced observers and binoculars. Together, elements of the system enabled the optimal use of the AAA capability. The capability was doctrinally planned to defend static points. However, Kasserine Pass showed that static points, in a high-tempo maneuver fight, frequently moved due to shifts in lines.[14] Frequent movement of "static points" generated a significant unanticipated mobility requirement during the battle. The solution to this requirement for many AAA fire units was to leave mobility-limiting equipment and elements of their systems behind. Many fire units "abandoned their directors because they slowed them down so much."[15] Mechanical directors were the only means of efficiently and accurately targeting an aerial threat because their AAA weapons did not have fixed-to-the-barrel sights. Thus, loss of mechanical directors dramatically diminished AAA system effectiveness.

Mobility is the kind of discussion topic that often generates "if-only-we-had" materiel solutions. Decisions to leave mechanical directors behind were attempts to gain time, which enhanced mobility. However, if we consider that the desperation leading to discarding critical equipment was a symptom of constantly chasing the momentum of the battle without direction or guidance, the root cause of the "mobility problem" is integration. Therefore, the mobility problem could have been solved with realistic expectations of mobility requirements, contextualized through an understanding of combined arms maneuver, and nested in the support commander's ground tactical plan. The anticipation of mobility requirements should lead to pre-planned and pre-coordinated primary, alternate, supplementary and subsequent battle positions for the base plan (as well as branches and sequels).

Furthermore, ADA leaders and Soldiers must understand the supported commander's decision support template and matrix. Better yet, they should assist in producing these products while telling the ADA story during participation in the supported unit's military decision-making process. The decision support template illustrates the flow of the battle and movement of forces executing a friendly course of action. The decision support matrix is developed from wargaming the template and course of action decision points, decision point locations, actions taken when reaching those points, and units with responsibilities to take action at those points.[16] In combination, these products provide road maps and intent for ADA capabilities to enable maneuver. Astute, combined arms maneuver informed Air Defenders could use them to achieve necessary effects, regardless of the state of communications with the higher unit.

Materiel solutions contributed to enhancing AAA support to maneuver commanders following Kasserine. To solve the mobility problem, AAA leaders rapidly equipped each AAA weapon system with "on-board" weapon sites and targeting equipment.[17] On-board weapon sights allowed AAA fire units to perform their mission, in a less than optimal way, without needing time to emplace the mechanical predictor. This concept of flexible methods for targeting is informative for today. Not because of targeting specifically, but more because the AAA experience at Kasserine Pass demonstrates that realities of LSCO often lead to operating in less than optimal situations. ADA leaders and Soldiers must consider that reality. Consideration means taking a hard look at the balance between optimal system use in the context of risk acceptance. Conventional wisdom holds that individuals operating in SHORAD units frequently deride tightly controlled high-to-medium air defense (HIMAD) kill chains and

13 *McDonough, James. The Defense of Hill 781: An Allegory of Modern Mechanized Combat. Presidio Press, 2010. Page 54.*
14 *Semmens, page 61.*
15 *Semmens, page 61.*
16 *United States Army. ADRP 5-0: The Operations Process, 2012. Page 4-4.*
17 *Semmens, page 36.*

the cautious, top-heavy elements of "HIMAD culture." Conversely, individuals in HIMAD units frequently deride what they view as the dangerous, unknowledgeable, cowboy-esque elements of "SHORAD autonomy." However, in rebuilding SHORAD formations, choosing between these two extreme modes of operating is a false dilemma.

Just as HIMAD units operate less optimally when divorced from higher intelligence and early warning, SHORAD units cannot operate in a fully effective manner when not integrated with air defense early warning systems. Both voice and data early warning systems enable SHORAD teams to properly emplace to engage threats, to slew engagement systems to threat azimuths, and to scan appropriate sectors for threats. Given the short range of current SHORAD interceptors and the increasing effectiveness of enemy air threats, these capabilities are essential. The "Mark-1 Eyeball" is not sufficient to effectively operate in todays' near-peer threat environment. Yet, elevating engagement authorities to higher echelons and removing the authority of the SHORAD team chief to engage hostile targets would render SHORAD capabilities ineffective. There must be a balance. Ideally, that balance is determined, thoroughly evaluated and proven in a realistic LSCO environment, with necessary materiel solutions available, before our next "first battle."

Situational awareness and early warning are the cornerstones of the SHORAD fight

On Feb. 21, following an enemy Stuka air raid, AAA Soldiers engaged two American flights-of-attack aircraft. Seven total aircraft were engaged, and five damaged beyond repair. The maneuver commander was so "furious," he ordered AAA not to "engage any aircraft until after it had attacked."[18] This condition "relegated the anti-aircraft artillery to a revenge weapon."[19] Investigation after the fact attributed the fratricide to poor fire unit situational awareness and specifically, not using observers. The role of observers was, in addition to situational awareness and early warning, to perform identification of aerial targets as friend or foe. Fire units stopped deploying displaced observers to attain higher mobility through speed. Events such as this led to a key lesson learned from Kasserine Pass: "[AAA units] had to be in touch with higher AAA headquarters to integrate their operations with those of the Anti-Aircraft Artillery command."[20] The purpose of this key linkage, beyond integration with the ground tactical plan and situational awareness, was to provide advanced warning of both friendly and enemy air attacks. Advanced warning assisted in the coordination of AAA Fires, enhancement of fire unit identification of aerial targets (identification friend or foe), and direction to optimal locations to engage potential threats. These advantages reduced dependence on the speed and mobility thought necessary to accomplish the AAA mission.

Brigade Combat Team (BCT) Air Defense Airspace Management/Brigade Aviation Element (ADAM/BAE) cells perform the essential role of the "higher air defense command" today. However, ADAM/BAE cells are systemically undermanned and undertrained. As SHORAD capabilities left maneuver formations, ADAM/BAE personnel were often farmed out to perform additional duties for maneuver leaders who no longer viewed management of airspace or air defense as priorities. Although airspace and air defense are now broadly understood as priorities, rebuilding these competencies and capabilities will take time. As a community, we should take a hard look at whether or not the ADAM/BAE's current composition, both regarding personnel and equipment, will enable success in a LSCO environment. Managing a complex, difficult air battles and accurately providing early warning to units is an arduous task. Therefore, ADAM/BAE cells must not get left behind in materiel and non-materiel solutions to overcome the SHORAD capability gap.

Conclusion

The Battle of Kasserine Pass was the first combat experience of many years of war for AAA Soldiers. Within two years, AAA Soldiers successfully defeated V-1 and V-2 rocket attacks targeting Antwerp, Belgium. They also valiantly defended the bridge to Germany at Remagen from countless Luftwaffe dive bomber and jet aircraft attacks. Lessons learned from each of these experiences can inform decisions during the critical years of rebuilding ADA capacity to support maneuver forces. While some of these lessons focus on understanding maneuver tactics, many require dedication to developing effective materiel solutions and efficient non-materiel solutions. The successful execution of these efforts will prepare ADA leaders and Soldiers for the next "first battle."

Capt. Joshua Urness is currently a student conducting Intermediate Level Education. He has served as an Avenger platoon leader in a Short Range Air Defense Artillery battalion and a Patriot battery commander.

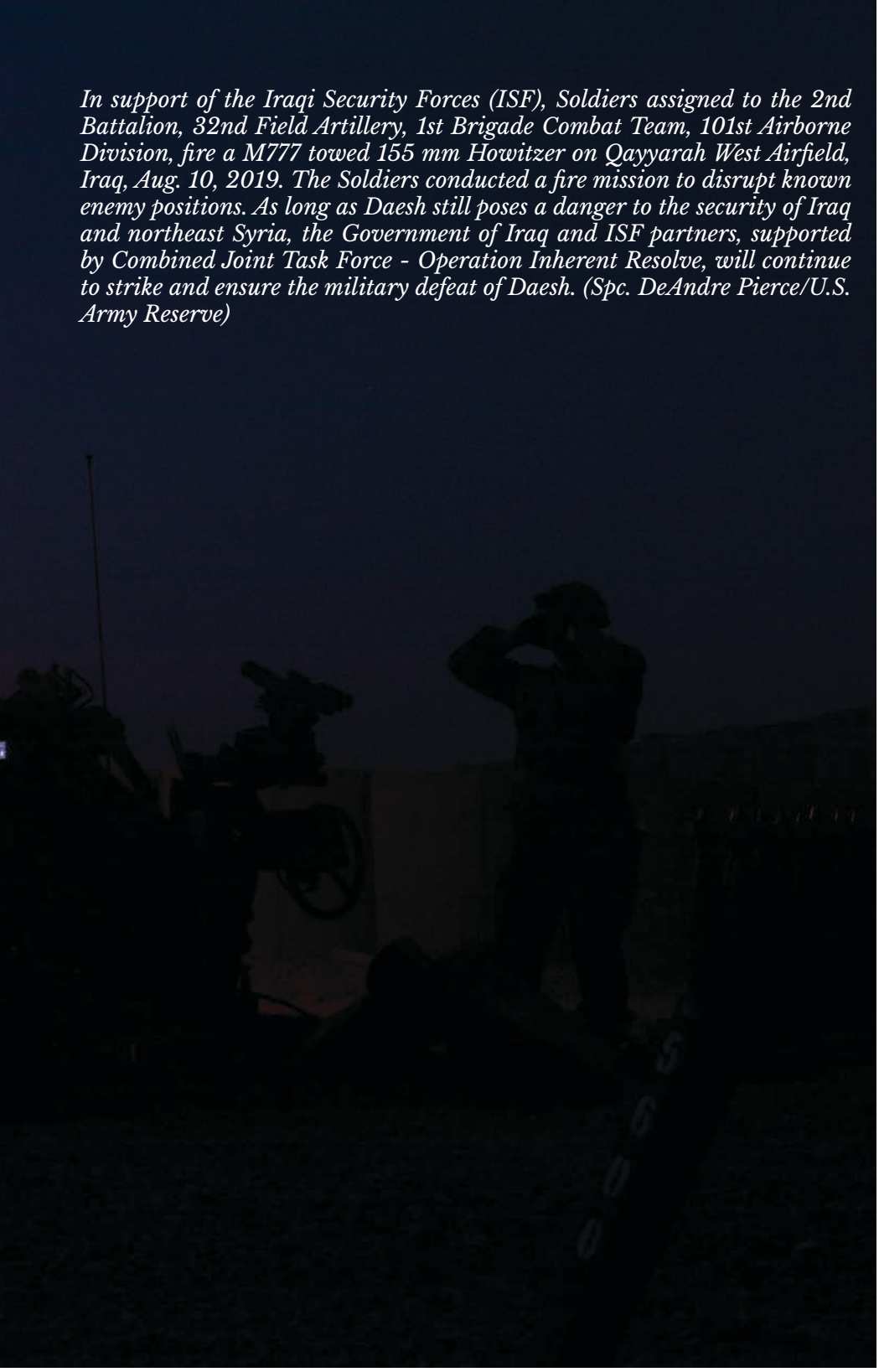
Capt. Abbey Carter is currently an instructor at the Air Defense Artillery Captain's Career Course. She served most recently at the National Training Center as the division air defense officer and an observer coach/trainer at the brigade level. She also served as a Patriot and THAAD battery commander.

18 *Semmens, page 33.*
19 *Semmens, page 34.*
20 *Semmens, pages 16-62.*

The King of Battle and the defeat of the ISIS Caliphate

Lessons learned from Operation Inherent Resolve 18-19

By Capt. Mathew J. Sullivan



In support of the Iraqi Security Forces (ISF), Soldiers assigned to the 2nd Battalion, 32nd Field Artillery, 1st Brigade Combat Team, 101st Airborne Division, fire a M777 towed 155 mm Howitzer on Qayyarah West Airfield, Iraq, Aug. 10, 2019. The Soldiers conducted a fire mission to disrupt known enemy positions. As long as Daesh still poses a danger to the security of Iraq and northeast Syria, the Government of Iraq and ISF partners, supported by Combined Joint Task Force - Operation Inherent Resolve, will continue to strike and ensure the military defeat of Daesh. (Spc. DeAndre Pierce/U.S. Army Reserve)

On March 22, 2019, Syrian Democratic Forces (SDF) announced that the village of Baghouz, Syria, had finally been liberated from ISIS. Many fighters remain dispersed throughout Iraq and Syria, the fall of this last sliver of territory within the Middle Euphrates River Valley (MERV) mark the territorial defeat of the Caliphate. Over the last year, cannon artillery played a tremendous role in attaining this victory. From April 2018 to January 2019, troopers from the Field Artillery Squadron "Task Force Steel," 3rd Cavalry Regiment, deployed to Iraq and Syria in support of SDF. The purpose of this article is to share some select experiences and lessons learned in employing expeditionary Fires in an austere environment. First, we will provide an overview of how cannon artillery impacted the fight against ISIS. Then, we will provide some artillery tactics, techniques and procedures (TTPs) artillery precision-guided munitions (PGMs), operations in an expeditionary setting and maintenance and sustainment in an austere environment.

When TF Steel deployed, ISIS still controlled a 1,200-square kilometer area surrounding Dashisha, a town near the Iraq-Syria border, as well as numerous cities and towns within the MERV. Over the course of nine months, TF Steel supported SDF as part of the Combined Joint Task Force – Operation Inherent Resolve (CJTF-OIR). Second Platoon, A Battery, "King," supported the fight from over 15 expeditionary fire bases within Syria, while B Battery, "Lion," provided cross-border Fires from Iraq.

Throughout June 2018, the platoons provided Fires in support of the Dashisha clearance operation. This operation only lasted a few weeks as the massed Fires from air assets, artillery and mortars quickly pushed ISIS to their last stronghold in the MERV. In the coming months, ISIS prepared a defense-in-depth for the upcoming SDF clearance of the MERV by placing improvised explosive devices (IEDs) along suspected SDF axes of advance. Just prior to the offensive, 2/A targeted one of these axes with M825A1 smoke, detonating no less than five IEDs and permitting the SDF to begin their operation unimpeded the following day.

With the beginning of the SDF clearance of the MERV, the onset of fall brought frequent rain and sandstorms. This severely inhibited the ability of intelligence, surveillance and reconnaissance (ISR) and fixed-wing platforms to support SDF and, unfortunately, the enemy knew this. With coalition aircraft unable to see, ISIS launched a massive counteroffensive. While the enemy attacked SDF battle positions in the MERV,

ISIS cannons, rockets and mortars targeted 2/A's howitzers. It was at this time that the all-weather capable King of Battle excelled. Over the course of three days in mid-October, the platoon endured over 70 rounds of indirect fire (IDF), all while continuing to support SDF at the forward line of troops (FLOT) and respond with counterfire. The co-located target acquisition platoon (TAP) from the Utah National Guard's 65th Field Artillery Brigade played a critical role in the counterfire process by providing accurate targeting data from their Q-53 Radar System. The combined efforts of 2/A, the TAP and Marine Corps mortars ultimately halted the enemy's advance. Over the course of those three days, approximately 400 rounds were shot and dozens of ISIS targets were destroyed, neutralized or suppressed to include enemy IDF assets, vehicle-borne improvised explosive devices (VBIEDs), command and control (C2) nodes, and troops in the open.

As the fight pushed deeper into the MERV, 2/B established Fire Base Sa'hem across the border while 1/B conducted "Operation Swift" in December, an air assault to establish a fire base in Makhmur, Iraq. From these locations, Lion prosecuted deep targets within the MERV while 2/A continued to support SDF at the FLOT. By January 2019, ISIS was contained to a few small villages in the MERV, and the platoons were replaced by C Battery, "Carnage," 2nd Battalion, 32nd Field Artillery Regiment, 1st Brigade Combat Team, 101st Airborne Division (Air Assault). Carnage continued to support the fight until the enemy was contained to the village of Baghouz. In total, TF Steel fired nearly 4,000 conventional and precision-guided munitions (PGMs) in support of SDF.

The precision-guided M982A1 Excalibur and the near-precision M1156 Precision Guided Kit (PGK) were heavily employed in support of SDF, with TF Steel shooting the entire theater's stock of PGK. There are many nuances to employing Excalibur (EXCAL) and PGK, and expertise is hard to attain in training given the financial burden associated with the cost of these munitions. Section and platoon-level leadership should start by familiarizing themselves with the Quick Reference Guide for M1156 Precision Guide Kit. While this publication focuses on PGK, the steps provided to ensure a howitzer is PGM capable is 90 percent of the work in employing these types of munitions. The most frequent issue encountered in maintaining PGM capability was simple key loaders (SKLs) dropping "black" keys. In an expeditionary environment, it is absolutely critical to establish a process for receiving keys remotely from the battalion or brigade S6, and to bring multiple SKLs forward. No matter how well SKLs were maintained, stored and powered down following the proper sequence, over the course of deployment they still occasionally dropped fill. Therefore, having these measures in place will ensure PGM capability is maintained despite issues with a SKL. In addition, units should coincide daily maintenance with a PGK or EXCAL dry-fire mission in order to consistently verify the PGM capability of the howitzers.

With PGK's threshold Circular Error Probable (CEP) of ≤ 50 meters, this fuze played a critical role in supporting friendly forces in suburban environments. Given its CEP, it also reduced the total number of rounds needed to achieve the desired effects on target. PGK serves as an effective and cost-efficient alternative to EXCAL, and it is important to keep the following considerations in mind regarding how and when to employ the fuze. Not only must the Five Requirements for Accurate Fire be carefully managed, but MET should be updated ideally every 30 minutes instead of the standard four hours. Failure to do so may result in the fuze not being able to correct its flight path sufficiently and deciding not to arm during the "command arm decision" in the last five seconds of the flight path. When transporting PGK, special care and attention must be paid to the fuze's canard covers. These covers often lost pins and proved feeble in an austere environment, which meant that canard covers had to be replaced in order to set the fuze. PGK should be applied to M549A1 Rocket-Assisted Projectile whenever the rocket will be utilized, and whenever friendly forces are along the gun-target line (note that PGK is not compatible with the older M549 model). This will help mitigate dispersion from the high probable error in range, as well as account for any inconsistencies in the rocket's burn rate. When able, PGK can also be utilized to mitigate the effects of a cold tube. We found that doing so prevented the first two rounds from landing short, and permitted the following rounds to achieve effects on target with a standard point-detonating fuze.

Throughout the deployment, TF Steel fired over 40 EXCAL with outstanding results. This PGM was utilized on multiple occasions to destroy ISIS C2 nodes, stationary VBIEDs, construction equipment, as well as enemy in buildings. It was especially useful during Danger Close engagements. On one occasion, SDF were cut off and pinned down by ISIS machine gun fire originating from a building only 50 meters away. An EXCAL with a delay setting penetrated the building and destroyed the threat, permitting SDF freedom of maneuver. Even when fired past 37 kilometers (near its maximum range), all rounds landed within their CEP of ≤ 10 meters. Oftentimes, firing the round high angle is not ideal given airspace coordination considerations. It is important to note that with updated Advanced Field Artillery Tactical Data System (AFATDS) software, the M982A1 version of EXCAL can be fired at low angle to reduce its maximum ordinate. No matter how much the projectiles were taken in and out of their casing or transport-

ed, they proved very durable and performed flawlessly. The weight of the projectile is 104.1 pounds (roughly equivalent to the weight of a fuzed M795 high explosive round). When transported in its casing the projectile weighs 156 pounds and consumes a considerable amount of space. In an expeditionary environment, this was its most significant drawback. However, this was mitigated by factoring it into planning considerations and load-out plans.

Given constant fluctuations in the FLOT, load-out plans were extremely important. At a moment's notice, the platoons could be required to transport howitzers, vehicles, personnel, ammunition, containers and personal belongings to a new location. There was often only time to conduct a map recon instead of performing doctrinal reconnaissance, selection and occupation of position. With this expeditionary mission set, there were some key considerations that enabled success when hastily moving to a new fire base. First, whether a unit is providing its own organic security or has a dedicated security attachment, it is important to both perform sweeps and create a hasty security plan for the new location. Oftentimes the location might only have a relatively small space that is tenable for artillery. Howitzers should be dispersed as much as possible (at least 75 meters) from each other while avoiding any obstacles in front of the gun. This will ensure the howitzers' Muzzle Velocity Systems don't conflict and will avoid potential site-to-crest issues. Finally, in case of the need to rapidly exfiltrate, it is important to ensure that there is not excess ammunition on ground so as to prevent use by the enemy. While there are many other things that will be refined during position improvement, these considerations will allow a unit to safely and rapidly establish a new fire base, employ as many howitzers as possible and provide Fires despite inadequate conditions.

Staying well-supplied on projectiles, fuzes, propellants and primers proved challenging. After sending the ammunition request it would take a minimum of two weeks for the rounds to arrive at the fire base. This was due to the fact that that ammunition had to be procured from Kuwait, then transported to Iraq, and from there to Syria. Therefore, it was imperative that fire direction officers and platoon leaders closely monitored their ammunition consumption and forecasted upcoming requirements. Obtaining parts for the M777A2s at these austere locations proved to be even more of a challenge.

Sustaining the required rate of fire at high charges, all while constantly relocating in a sandy, desert environment proved exacting on the howitzers. Despite thorough and frequent preventive maintenance, checks and services, over time there were still issues with the primary feed mechanism lever, obturator spindle group, dog coupler, elevation belt, power conditioning and control module as well as the DAGR and antenna cables. Depending on whether theater had the part on hand, it could take upwards of a month to receive parts. At certain points in the deployment, 2/A in Syria was forced to employ temporary solutions to keep firing and eventually could only sustain firing capability by rotating between two theater-provided and three organic M777A2s. In order to mitigate these problems, it was imperative to have an experienced, resourceful small arms/artillery repairer capable of creative solutions to keep howitzers in the fight, to establish a relationship with the program manager – towed artillery systems for both assistance in troubleshooting rare/infrequent issues and expediting parts forward, and to bring as many spare howitzer parts forward ahead of time. For any artillery unit that might assume a similar mission set, commanders and executive officers should begin working with their battalion staff to refine the supply process for ammunition and howitzer parts as early as possible.

While there are many other topics that could be discussed, the abovementioned were some of the most important lessons learned while employing expeditionary Fires against the enemy in Iraq and Syria. The defeat of the Caliphate is the culmination of five years of effort by both the SDF and CJTF-OIR. While thousands of men and women across all services and many nations contributed to the fight against ISIS, it is certain that U.S. Army cannon artillery played a decisive role in its territorial defeat.

As the Army continues to shift focus from the counter-insurgency fight to potential conflicts with near-peer adversaries, field artillery has become a top modernization priority. Recent innovations include the capability to effectively double the maximum range of the M777A2 howitzer, as well as the creation of new self-propelled artillery platforms such as the 105 mm "Hawkeye" and 155 mm "Brutus." As the modernization effort continues, special attention and effort should be paid not only to increasing range and mobility but also to tackling the challenges associated with operating in an austere and expeditionary environment.

References

Tactics, Techniques, and Procedures for Excalibur 155 mm Families of Munitions.

Quick Reference Guide for M1156 Precision Guidance Kit (PGK) ATP 3-09.50; The Field Artillery Cannon Battery.

https://www.state.gov/secretary/remarks/2018/07/284287.htm

Capt. Mathew J. Sullivan is currently a student at the Field Artillery Captains Career Course at Fort Sill, Okla. He held all key artillery lieutenant positions and most recently served as the platoon leader for 2nd Platoon, A Battery, Field Artillery Squadron, 3rd Cavalry Regiment in Syria.

E-62 THAAD Soldiers return home after crucial role in FTG-11

By 1st Lt. Anthony Ross

Soldiers from Echo Battery, 62nd Regiment, 69th Air Defense Artillery Brigade returned to Fort Hood, Texas, recently after another groundbreaking test at Wake Island, Flight Test Ground-11 (FTG-11). On March 25, 2019, AN/TPY-2 radar and Prime Power Unit (PPU) operators enabled the radar to successfully track and discriminate an Intercontinental Ballistic Missiles (ICBM) launched from Regan Test Site at Kwajalein Atoll. After the acquisition of the ICBM, the AN/TPY-2 radar successfully cued the Sea Based X-Band (SBX) radar via satellite communications links with command and control, battle management and communications (C2BMC) oversight. The SBX radar provided cuing data to the ground fire control unit in order to launch two ground based interceptors (GBIs) from Vandenberg Air Force Base, Calif. Both the GBI-lead and GBI-trail effectively engaged both the kill vehicle and the next lethal target in the debris field, proving the Ground-based Midcourse Defense's (GMD) salvo engagement accuracy.

FTG-11 was a crucial step forward for the Ballistic Missile Defense System (BMDS) and the reliability and trust of the United States' homeland defense. The test was the culminating event of previous flight tests over the past two decades. The $244 million test had high visibility from three major combatant commands and the United States Congress; the importance of the flight test cannot be overstated. Air Force Lt. Gen. Samuel A. Greaves, director of the Missile Defense Agency (MDA), said"This was the first GBI salvo intercept of a complex, threat-representative ICBM target, and it was a critical milestone...The system worked exactly as it was designed to do, and the results of this test provide evidence of the practicable use of the salvo doctrine within missile defense. The Ground-based Midcourse Defense system is vitally important to the defense of our homeland, and this test demonstrates that we have a capable, credible deterrent against a very real threat."

FTG-11 represents many future opportunities regarding the strategic footprint of the United States Joint Forces across the globe. The test gained confidence in the operability of the BMDS and the ability for warfighters to operate the complex systems involved.

Operators of the AN/TPY-2 radar at Wake Island played a crucial role in the emplacement, calibration, maintenance and operation of the highly valued sensor at Wake Island. The operators from E-62nd ADA, Terminal High Altitude Area Defense Battery included Sgt. Andrew Steffes, Sgt. Tyler Currie, Spec. Joseph Thannisch, Spec. Timothy Broders and Spec. Dustin Maas. The mission started in January 2019 at Fort Hood, Texas, where the group completed new equipment training for the X86 platform and CX 3.0 Software upgrades for the AN/TPY-2 radar. In early February the team deployed to Wake Island to operate the radar in forward based mode (FBM). The operators manually emplaced the radar within tolerance on the first try after a near perfect primary target line alignment and antenna equipment unit elevation. Soldiers overcame obstacles with the tropical climate to successfully calibrate the system without any longstanding or significant issues, logging over 75 hours of satellite tracking. Soldiers put a strong emphasis on maintenance, along with the civilian contractor logistics support team, working hard to ensure the AN/TPY-2 FBM radar remained fully mission capable throughout the flight test. Their efforts set them up for success on test day.

Soldiers from E-62nd ADA Battery pulled shifts to man the

Back row: Spc. Timothy Broders, Sgt. Shane McKenzie, Sgt. Tyler Currie, Sgt. Andrew Steffes, Sgt. 1st Class Cephus Wells; Front row: 1st Lt. Anthony Ross, Spc. Dustin Maas, Spc. Joseph Thannisch, Staff Sgt. Endetayew Lemma; Upon mission completion the AN/TPY-2 radar team pose for a picture in front of their Antenna Equipment Unit (AEU) in an unclassified area of Wake Island, a small island utilized for missile defense testing and exercises. (1st Lt. Anthony Ross/U.S. Army)

system once mission operations began in early March. They were given a Road to War by Strategic Command, simulating a real world scenario; the anticipation of an ICBM launch continued to build with each update. This gave Soldiers a sense of the normal operability of the BMDS for homeland defense against an ICBM. Without knowing the test date and time, Soldiers were forced to operate the AN/TPY-2 radar as if deployed to a wartime location. On March 25, 2019, the sensor manager at the 94th Army Air and Missile Defense Command established positive communications with the AN/TPY-2 operators to warn of an incoming track. The track was the ICBM launched from Kwajalein, and the operators successfully acquired, identified, recorded and reported the ICBM. Reporting procedures from the operators to the mission operations center (MOC) and the warfighter officer in charge were flawless. Soldiers followed the track from acquisition of sight to loss of sight. The successful intercept of the ICBM with a GBI salvo engagement was observed from the MOC, made possible by accurate AN/TPY-2 cuing data of the ICBM. The mission was a success.

While the AN/TPY-2 operators were the main effort, one must not forget the importance of a major supporting element. Sgt. Shane McKenzie and Staff Sgt. Endetayew Lemma, the PPU operators at Wake Island, were critical to mission success. In support of FTG-11, the operators and civilian engineers labored to provide continuous system power for specific mission needs. Scheduled maintenance and complex system upgrades were conducted throughout the mission timeframe, and detailed diagnostics were completed to enhance the AN/TPY-2 team's reliability and mission readiness. Special emphasis had to be given to environmental concerns in the tropical environment for the duration of the flight test. Flash rusting of exposed metals and electrical connections, in close proximity to salt air and sea water, required detailed preventive maintenance care in order to prevent poor electrical connectivity or structural deterioration.

Overall, the Soldiers from E-62nd ADA Battery gained a lot of experience and useful information regarding the operation of the AN/TPY-2. When not conducting mission operations, Soldiers learned in-depth knowledge from their MDA, Operational Test Agency, Raytheon and sub-contractor counterparts. The Army personnel at Wake Island gained experience working in a joint environment with all major sensors and components to the BMDS to include C2BMC, Aegis Combat System, SBX, Space Based Infrared Surveillance, and GMD. They enhanced their unit's readiness, validating the ability to deploy with the AN/TPY-2 radar in an extremely isolated area.

1st Lt. Anthony Ross is currently the sensor platoon leader and Crew 2 tactical control officer for E Battery, 62nd Air and Missile Defense Regiment, 69th Air Defense Artillery Brigade. He commissioned from the United States Military Academy at West Point.

U.S. Army troopers assigned to the Field Artillery Squadron, 3rd Cavalry Regiment, fire their M777 Howitzer on Firebase Saham, Iraq, Dec. 3, 2018. The 3rd Cav. Regt. is deployed in support of Operation Inherent Resolve, working by, with and through the Iraqi Security Forces and Coalition partners to defeat ISIS in areas of Iraq and Syria. (Capt. Jason Welch/ 3rd Cavalry)

Firebase Saham

A day in the life of joint-artillerymen securing the Iraq border

By Capt. Jason Welch

The crackle of machine gun fire and the dull thuds of distant explosions reminded 3rd Cavalry Regiment troopers at Firebase Saham that the battle against ISIS was not far away.

Troopers assigned to the Field Artillery Squadron, "Steel," and 3rd Squadron, "Thunder," helped establish the temporary firebase Nov. 8, near Iraq's border with Syria, incorporating Iraqi M109 Paladin and French Caesar 155 mm self-propelled howitzer units.

Their mission: to prevent ISIS fighters from crossing the Syrian border into Iraq to escape the offensive in the Middle Euphrates River Valley (MERV) by providing coordinated and lethal artillery Fires against the fleeing ISIS members.

"Not today ISIS!" said Sgt. Doug Moran, 3rd Cav. Regt., Steel Squadron, gun crew chief, after his crew unleashed a volley of 155 mm high-explosive shells from their M777A2 Howitzer.

The sound of their rounds impacting hadn't faded before the crew was already prepared for the next volley. Fire missions came with little to no notice, and gun crews scrambled to provide immediate fire support.

The Steel troopers brought their M777s to the fight, while the Thunder troopers established the layout of the base and provided security and logistics for the Iraqi, French and U.S. troops.

"The first couple days were pretty austere," said 1st Lt. Michael Roberto, Thunder Squadron troop executive officer. "Guys were sleeping in their kit, sleeping in their trucks."

Roberto's troops were responsible for developing the base plan that decided where everything on the firebase would go. They also coordinated with the Iraqi and French units to incorporate everyone into the base plan.

The Iraqi and French firing units were an integral part of the firebase, providing three dis-

tinct artillery units to support cross-border strikes against ISIS.

"I don't think there's a single artillery battery in the Army doing what we're doing right now," said Capt. Frank Thompson, 3rd Cav. Regt., Steel Squadron, field artillery battery commander.

"We've jumped to four totally unique locations in the last few months, establishing new firing points from scratch in some very austere locations," Thompson said.

Thompson's battery also coordinated with the French Caesars and Iraqi Paladins to synchronize their Fires, delivering fire support across the border into Syria in support of the fighting against ISIS and bolstering the Iraqi border security posts.

"No one else is doing all that," added Thompson.

The Iraqi troops named their firebase "Saham" for the Arabic word "arrow." It was established miles away from civilian populations and postured to provide effective Fires against ISIS fighters attempting to cross the border into Iraq.

Logistics are delivered by air and ground, providing the Iraqi, French and U.S. troops with much needed water, food and ammunition.

"The coolest part of establishing this location was the logistical demand and how we sourced the needs of our troopers on the ground," said Roberto. "We did whatever we had to in order to enable our sister units to provide effective Fires into the MERV."

The priority on their deployed mission was to secure the perimeter of the firebase and ensure the Iraqi, French and U.S. guns were ready to support fire orders that came their way.

"Because of our proximity to the border with Syria, we're very cognizant of the risk," said Capt. Jordan Marks, a troop commanding officer with Task Force Thunder. "This is what the U.S. Soldiers signed up for – to operate in austere locations like this and support the multinational coalition fighting ISIS."

The French Caesars and U.S. howitzers sat side-by-side at one end of the firebase, barrels pointed across the Syrian border into ISIS territory, the Iraqi Paladins nearby with their barrels arrayed to protect Iraqi Security Forces border positions.

The U.S. Army gun crews of "Bull Head" and "Big Rich" lived with their guns. During the day they did their laundry by hand, conducted physical training, maintenance, crew drills and ate their meals on the gun line.

At night, they awoke to the firing of the French Caesars and watched tracer fire along the border where Iraqi Security Forces prevented ISIS fighters from fleeing into Iraq.

The sounds of strikes against ISIS positions in Syria echoed across the border 24 hours a day.

"I think about it every day, every night, when I hear the explosions right across the border," said Staff Sgt. Brandon Cass, Big Rich, Steel Squadron. "The anxiety is definitely there."

"I've been in combat situations before, been in much more dangerous situations than this. But most of these guys have never deployed. This is their first time," said Cass.

After the first jump to establish Firebase Saham, the gun crews went to work immediately with multiple fire missions to stop ISIS militants on the move toward the border.

"Five days straight we shot," said Cass. "It was non-stop."

Calls for fire came around the clock, and the gun crews executed fire missions night and day, with little to no sleep and the occasional Meals Ready to Eat (MREs) to sustain them.

"That's all these guys wanna do is shoot," said Cass.

In between fire missions, troopers took advantage of the relative calm to improve their living areas, setting up expeditionary gym equipment, improving dining areas and stringing out hand-cleaned laundry on makeshift clotheslines.

The initial air drops brought supplies that were needed, but not always the supplies the troopers wanted.

"Early on, we got dropped a bunch of "Case A" MREs, which we didn't think was possible," said Roberto.

There are a total of 24 different styles of MREs, divided into Case A and Case B. Each type of case holds a specified menu of 12 MREs.

"When we looked into our MRE holding area there was only Case A," said Roberto. "Even if you had one different MRE for each meal, that still only gets you through four days before you start to repeat."

"You know how you try to get creative with how you prepare and mix and match MRE contents? Well, we had to get even more creative," said Roberto.

With no cell phone signal reception and limited internet connectivity, troopers turned to one another during their downtime and formed stronger bonds without the distractions of social media and the internet.

"They have each other," said Roberto. "They play cards, they work out together, spend all day together. And when they get back from the firebase and have better internet, they have more to talk about with their families."

They also reminisced about their experiences from the deployment and their time at Firebase Um Jorais, the first temporary firebase established by Iraqi and U.S. troops in June to support clearance operations in Dashisha, Syria.

"I don't think I've ever been in a more austere place," said Cass. "The heat, there were sand storms, it rained and our only protection from the elements was our camo net."

"We slept, ate, shaved and did everything outside. We put up a shower -- just a pallet with two pieces of plywood against a con-

nex box and water bottles," said Cass.

Firebase Saham had some luxuries, like showers and tents, but it was still a firebase and the artillerymen were anxious to get to work.

"If you forget why you're out here, the guns firing at two in the morning will remind you," said Roberto.

During lulls between missions, troopers expressed their frustration of not firing against the enemy and couldn't wait to contribute to the fight which was raging miles away.

"I think it's going to pick up soon," said 1st Lt. Brendan Moreira, the artillery battery fire direction officer.

Moreira led the fire direction center, responsible for coordinating all Fires between the three different artillery units and ensuring airspace was cleared before fire missions and commands were passed to the gun crews.

He also coordinated training with the Iraqi Paladin crews, many of whom were familiar faces to the Big Rich gun crew from their time at Firebase Um Jorais.

When the Iraqi and U.S. artillery units met at Firebase Saham, the gun crews immediately recognized each other, waving and shouting out names of their fellow artillerymen. They broke out their cell phones to share pictures with each other, asking about different Soldiers and Marines that they hadn't seen in months.

The Iraqi battery fire direction officer, Maj. Hassan, also served alongside the U.S. troops at Firebase Um Jorais. Once he arrived at Saham, he began inviting the U.S. leaders to eat breakfast with their Iraqi counterparts. They met almost daily and discussed training opportunities, local intelligence reporting and each other.

In the Iraqi tent, everyone sat huddled around a steaming tray of chai tea, boiled eggs and fresh naan bread, baked on site by one of their partner Iraqi Soldiers.

Hassan talked about his life as an Iraqi army officer before 2003, then looking for work and finding it in the laundry facility of a contractor supporting coalition forces in Iraq in 2004. He later joined the Iraqi Security Forces as an artillery officer.

At Firebase Saham, he stood shoulder-to-shoulder with U.S. and French artillery units defending his country's border against ISIS.

Intelligence reports on ISIS activities were shared by Iraqi, French and U.S. leaders.

During one breakfast meeting, Hassan said that one of the nearby border security positions saw ISIS movement during the previous night.

"We conducted strikes and small-arms fire, and kept them from getting close to the border," said Hassan.

The border positions were often probed by ISIS elements seeking to flee the fighting in the MERV by escaping into Iraq, but the Iraqi Security Forces sent several thousand troops to the border in October and routinely conducted strikes and direct fire from established border positions.

When the firebase was initially occupied, everyone could see tracer fire from interlocking security positions all along the border, said Thompson.

That was in early November, during intense fighting that forced large numbers of ISIS fighters fleeing toward the Iraqi border where they were met by a line of defensive positions and Coalition-led Fires.

Hassan worried that ISIS fighters would throw down their arms, change clothes and try to infiltrate groups of refugees fleeing across border checkpoints.

"[ISIS] have nowhere to go; if they stay, they will die," Hassan said.

The Iraqi artillery officers were anxious to get their Soldiers into the fight and asked to train with the U.S. troopers as often as possible. Their M109 Paladin self-propelled howitzers were very familiar to many of the U.S. artillerymen.

"The fundamentals are the same, and we use a lot of the same equipment and ammunition," said Moreira.

The Iraqi and U.S. artillery troops trained together on fundamental tasks, sharing best practices on crew drills, equipment calibration and Fires coordination.

Their training paid off as the Iraqi, French and U.S. guns conducted coordinated fire missions, delivering their firepower across the border as weather limited the number of air strikes against ISIS targets.

"If weather is poor and air forces cannot fly some of their missions, we are prepared to support the fighting across the border with our own Fires," said French Army Capt. Clem, the Caesar Battery commander.

"We are here together to face the same enemy with U.S., French and Iraqi units on the same firebase," said Clem.

Across the border, in the MERV, loomed the last significant number of ISIS fighters looking for an escape route from the Coalition-led offensive. At Firebase Saham, the gun crews of Big Rich and Bull Head, along with batteries of Iraqi and French artillery, patiently wait, standing ready, to deliver lethal Fires at a moment's notice.

"I would never have wanted to go home without coming here, to this firebase," said Moreira. "This is what we trained for."

Capt. Jason Welch, U.S. Army, is the public affairs officer with the 3rd Cavalry Regiment. He previously served as a plans and operations officer with U.S. Army Africa Public Affairs. He holds a BFA from the University of Kansas and an MLS from the University of Texas, El Paso. He initially served as an air defense artillery officer in both Terminal High Altitude Area Defense and Patriot units before graduating from the Defense Information School as a public affairs officer. He is currently deployed with the 3rd Cav. Regt. in Iraq, supporting Combined Joint Task Force - Operation Inherent Resolve and the Joint Operations Command - Iraq.

Task Force Wagram emplace the CAESAR weapon system. (Courtesy image)

Lessons learned from CAESAR deployment in Iraq

By Col. Olivier Fort

From August 2016 till April 2019, the French Army has been committed, alongside with the U.S. Army, in Operation Inherent Resolve (Chammal for France) with Task Force (TF) Wagram and its CAESAR guns. More than 1,100 French Soldiers have been deployed within this TF in Iraq to support ground troops in the liberation of territories under Daesh control, with a record of more than 2,500 fire missions conducted. This article deals with the lessons learned by the French Army on the longest commitment of CAESAR guns in operations. One has to wonder if when the new gun was dubbed CAESAR, its designers had in mind the famous line from Gladiator, "at my signal unleash hell."

Since 2008, when it was fielded in the French artillery, the CAESAR gun has been, almost constantly, deployed in operations: 2009-2012 in Afghanistan, 2013-2018 in Mali/Sahel area of operations, 2016-2019 in Iraq. From these operations, in differ-

ent circumstances, many lessons have been learned. The French artillery itself has gained a great deal of useful knowledge from Iraq, in a near high-intensity context. Alongside the "Redlegs," the French gunners unleashed 16,000 rounds on the Islamic state of Iraq and the Levant (ISIL) from September 2016 to December 2018, living up to all expectations of them. The French artillery commitment was decided by President François Hollande, in the aftermath of the terror attack, in Nice, on July 14, 2016. Since then all the artillery regiments from the combined arms brigades have deployed at least once for a five-month tour.

The originality of Operation Chammal for us, is double. First, only artillery and no infantry or cavalry troops were deployed. Second only the gun end, with a minimal logistic autonomy, and artillery C2, were deployed (no forward observers, radars or unmanned aerial vehicles (UAVs) were deployed). UAVs and radars were part of the U.S. battalion. The French artillery force was called TF Wagram. Initially there were six guns and then from April 2018 this changed to three guns. The mission was similar to that of the U.S. gunners, to support the Iraqi army and liberate its territory, and the CAESAR detachment was therefore integrated in the U.S. artillery battalion.

The rapid evolution of this pattern of operations uniquely enabled all artillery regiments to operate in different circumstances, and bring different lessons to the fore.

Long-range artillery: 68th Régiment d'Artillerie d'Afrique. August 2016 - February 2017

This mandate took part in the move toward Mosul, and the liberation of East Mosul. As the Iraqi forces were closing in on Mosul, CAESAR's 52-caliber gun provided long-range capability to the artillery force. The rate of progression was fast and the long-range gun was quickly needed. The clearance to deploy the gun further north, closer to the front-line, took time at the national level. Consequently 75 percent of the fire missions were fired at charge five and six above the M777 or Paladin maximum range (with classic munitions). The maximum range achieved on a mission was 37,608 meters (versus 29,090 meters in Afghanistan).

This operation marked the return of high-intensity operations for the ground troops, supported by our artillery, not seen since the campaign in Indochina. The Iraqi infantry showed impressive bravery, but they sustained very high losses fighting in an urban environment combined with ISIL fanaticism. For that reason direct support to the infantry regained all its importance beyond just destroying the enemy: to also prevent them from moving, to conceal our allies, and to boost the morale of those who risked their lives at close range with powerful strikes at the right time. A long forgotten aspect of the covering mission by the artillery was particularly necessary, ISIL sometimes used UAVs so that the Iraqi infantry would waste their ammunition firing against them. ISIL would then assault these units with less combat power. In that circumstance, artillery firepower became even more critical.

Near high intensity rates of fire: 11th Régiment d'Artillerie de Marine. February - June 2017

This mandate was the liberation of West Mosul. During this period 11th RAMa fired 5,366 rounds, which doubled the previous and the following mandate. The rate of fire was 200 rounds per gun per month, a steep change from the Afghanistan operations between 2009 and 2012 (13 rounds per gun per month) and Mali in 2013 (52 rounds per gun per month). Direct support missions continued with an accelerated pattern, a 45 minute long smoke fire mission, conducted to mask the maneuver of the Iraqi infantry. During this phase the French artillery was used intensely to prevent moves to and from the dense urban areas and to fix the enemy infantry and it did so with a noticeable efficiency.

The use of our artillery in urban areas was not allowed, due to the absence of a guided 155 mm munition to avoid collateral damage, a major capability lesson from this conflict. Tests are currently being undertaken to qualify the Excalibur on the CAESAR. The French gunners were impressed by the clever, and very efficient, counter, indirect fire tactics, displayed by the U.S. gunners, using guided 155 mm. Above all, the rules of engagement took into account the threat posed by ISIL indirect Fires to the coalition troops and civilians.

According to a United Nations report by United Nations Assistance Mission for Iraq/Office of the United Nations High Commissioner for Human Rights, among the Ninawa governorate civilian victims in Mosul, between Oct. 17, 2016, and July 10, 2017, of the 3,486 casualties that had an identified cause of death or injury, 41 percent were due to artillery strikes , of which 95 percent were due to ISIL artillery. Although in an urban area this artillery was quickly silenced.

11th RAMa cleverly decided to use artillery deception in combination with the U.S. gunners

In order to localize ISIL mortars, some fake smoke fire missions were activated by the French gunners, so ISIL, expecting an attack, shot a defensive mortar fire mission. The mortars were detected and swiftly destroyed by guided munitions. This tactic was regularly conducted with warning rounds, as the ammunition of choice, to elicit an enemy artillery response. This ammunition had already been used in Afghani-

Task Force Wagram fires the CAESAR weapon system. (Courtesy image)

stan with the same effect. It gives the advantage of having a ballistic identical to the high explosive (HE) round, and a very limited amount of explosive. It is therefore possible to use it in urban areas without risks of collateral damage.

High intensity missions in very hot temperatures: 93rd Régiment d'Artillerie de Montagne. June - October 2017

Operations became more mobile after the liberation of Mosul. In this situation CAESAR again displayed the impressive qualities previously demonstrated during the Mali campaign in 2013. However, in the Iraqi summer of 2017, the combination of extreme temperature of up to 47 degrees Celsius, and high-intensity fire missions tested and proved the extreme resilience of the gun. CAESAR is the only 52-caliber gun in the world that has been used in operations near to high intensity, and in such extreme conditions. The 52-caliber guns logically have higher pressures in the tube, and at high temperatures the pressure further increases. CAESAR passed the test very well, vindicating the extensive trials taken in Djibouti a decade ago.

In this mobile phase the mountain gunners operated their three-gun platoons far from each other, in different trajectories. This also outlined the limits of very small artillery platoons for deployments (a normal French artillery platoon has four guns). In fact, on occasion, the extreme temperatures would have required time to let a gun cool down, and this could have been a challenge with only three guns at hand. Despite these extreme conditions, CAESAR again proved its reliability, as once more, no gun-related accidents occurred. This is often a much underrated quality.

High mobility operations: 40th Régiment d'Artillerie. October 2017 - February 2018

The following mandate saw another change of scene, and greater mobility. The 40th Régiment used CAESAR in an artillery raid, at night, to destroy enemy positions from an extremely unexpected direction, creating a state of uncertainty. The enemy defensive positions, part of an outer defensive ring, were destroyed at long range from the rear. Once more this operation was the outcome of a close cooperation between French and U.S. gunners.

The French guns were under the direct support from Paladins, deployed in the forward operating base that they departed from. More mobile operations needed more mobile logistics. The logistical autonomy of TF Wagram had to be reinforced as it could not rely as much as it had previously on the convoys close to the theatre depots.

First missions near Syrian border: 3rd Régiment d'Artillerie de Marine. February - June 2018

For a while TF Wagram remained the only artillery to support ground operations close to the Syrian border. During these operations in the desert, collateral damage risks were nonexistent. Fire missions were called to destroy small targets, to deny enemy movements and to harass and to destroy dug-in munitions caches. In the last case it combined the gun's accuracy and the deep penetration of FRAPPE fuzes.

During this mandate, the very rough conditions of living in the western desert frontiers, brought to light the well balanced structure of our artillery detachment, particularly the gun crew. The five-man crew are necessary for regular, tactical, gun maintenance operations, in a very hot and dusty environment. Moreover, for a time poor sanitary conditions affected the crew, and lesser numbers could have had consequences on the operational availability of the gun detachment. Also taking into account that a truck-mounted gun, has far less maintenance requirements than a tracked gun with a turret. These examples are invaluable for capability development.

Danger close fire missions: 35th Régiment d'Artillerie Parachutiste (RAP). June - October 2018

More than the previous deployments, the 35th RAP had to support troops in close contact. Once again, (regardless of the great ac-

curacy of CAESAR), guided munitions are key, especially in urban environments. However, standard HE are critical to keeping the enemy's head down and destroying them at a distance when possible. This would not be achievable with a guided 155 alone.

First operational mission for BONUS anti-armor shell: 68th Régiment d'Artillerie d'Afrique (RAA). November 2018

On Saint Barbara day 2018, 68th RAA was able to use BONUS ammunitions for the first time in war operations. A column of 40 makeshift ISIL armored vehicles was sent to assail an allied Arab forces position. A fire mission of four BONUS shells destroyed eight vehicles, thus achieving a 100 percent hit rate. This fire mission was of primary importance, because standard training conditions cannot easily replicate realistic combat conditions for such ammunitions that are able to hit moving targets. In total 17 BONUS have been fired before Jan. 11. This mandate also signals itself by the very important battle damage assessment (BDA) inflicted on the enemy. Since ISIL bands liked to break enemy encirclement, the creation of a sizeable buffer zone encouraged them to gather for counterattacks, a trap into which they often fell.

This munition has proved invaluable and could be of primary importance in a conventional warfare situation.

Concluding a decade of operational commitments, artillery operations in Iraq have further strengthened the technical and tactical expertise of the French artillery. Closer from conventional operations, this particular operation enabled our gunners to have a very powerful physical impact on ISIL, and also to reiterate that the efficiency of artillery support isn't exclusively measured in BDA, nor on the number of ammunitions fired. Artillery as general support fixing the enemy movements at a distance, and at close range smoothed the maneuver of the supported infantry.

Regarding urban warfare, and particularly counterbattery in this context, a lot of lessons have been identified and at first hand the necessity to field guided 155 mm ammunition. In extreme terrain and operational conditions, this operation has once more vindicated the capability choices made in the past 15 years, particularly regarding CAESAR gun and BONUS. The range of 52-caliber munitions will shortly be extended to smoke and illuminate. More CAESARs have now been ordered to replace our armored self-propelled gun, the AUF1.

Finally, despite initial procedural and technical constraints due to the fact that France is not a Five Eyes member, interoperability with the U.S. artillery has worked very well, and will be further developed during the NATO exercises in Europe. This interoperability is both technical, and cultural and spans through C2 systems to munitions and tactical understanding.

Col. Olivier Fort is with the French Army, Artillery School and former director of doctrine and capability. He graduated from the Military Academy of Saint-Cyr (1988-1991), served in the artillery for 30 years in 12th Artillery Regiment (MLRS), 93rd Mountain Artillery Regiment (towed 155), and 35th Parachute Artillery Regiment. He served during six years in two iterations at the artillery doctrine and capability directorate where he drafted the CAESAR, BONUS and counterbattery doctrines, which he is currently leading. When assigned at the French Army Doctrine Command, he drafted the French Army Afghanistan lessons learned report. He has been deployed in Kosovo (1999), Bosnia (2003) and Afghanistan (2005), the last one as a liaison officer with CJTF 76. He also served twice within the British Army, once at the artillery school at Larkhill and once at Army headquarters. He is the author of a book "L'artillerie des stratagèmes" published in 2016 dealing with artillery deception tactics.

Task Force Wagram emplaces the CAESAR weapon system. (Courtesy image)

Theater Security Cooperation Week

Patriot battalion forges bonds with UAE air defenders

By 1st Lt. Jessica Beatty

The concept of Theater Security Cooperation seeks to integrate key U.S. and partner nation capabilities to create a much stronger defense capability with less reliance on U.S. assets and resources. The 1st Battalion, 43rd Air Defense Artillery Regiment hosted a Theater Security Cooperation (TSC) Week with the United Arab Emirates (UAE) Air Defense Forces from April 30 to May 2 in Abu Dhabi. The Cobra Strike Battalion's TSC Week involved events that incorporated tactics, maintenance and social events. This week strengthened relationships, built interoperability and further developed combined tactics, all to enhance mutual readiness within the theater.

With the changing geopolitical landscape and subsequent refocus of U.S. military posturing towards near-peer adversaries such as Russia and China, the Central Command area of responsibility is in transition. For the past decade, U.S. forces have maintained a robust and constant presence throughout the Middle East. United States Army Air and Missile Defense battalions have continued to deploy to the CENTCOM theater regularly with no reduction in operation tempo despite the overall drawdown of Army forces in the region. Patriot units are a low-density force and the demand for their capabilities to defend against air and missile threats is increasing, which means that they will continue to deploy across the globe.

In the past decade the increase of Patriot foreign military sales has resulted in many of our partner nations being able to provide for their own defense, potentially lessening the strain on U.S. Air and Missile Defense (AMD) systems. TSC Week contributed to this effort by furthering tactical and maintenance knowledge while executing key leader engagements and numerous combined social events.

"The working group helped us find a common ground with our counterparts, and helped us build off each other's successes."

The Cobra Strike Battalion's tactical operations section hosted an Integrated Air and Missile Defense (IAMD) working group early in the week. During the IAMD working group, tacticians from both nations discussed the potential of bilateral cooperation and the advantages of effective theater security cooperation through mutual defense. They also agreed to regular tactics seminars and exchanges, designed to expose each side to tactics, techniques and procedures used by each force, as well as discuss lessons learned.

"I think the working group helped us find a common ground with our counterparts, and helped us build off each other's successes," said Chief Warrant Officer 2 Ron Steeg, 1-43rd ADA standardization officer in charge, as he explained the success of the IAMD working group. "In the future, we plan to conduct combined Reconfigurable Table Top Trainer exercises, tactical seminars and defense design sessions in order to maintain efficient theater security cooperation established with the Emirati Air Force."

Extending integration to the operator, Cobra Strike held a launching station reload and maintenance competition on the U.S. Patriot site. The event consisted of two teams mixed with Emirati and U.S. launcher operators working together to accomplish missile reloads and conduct maintenance checks and conventional repairs. The Soldiers demonstrated their proficiency on fault identification and movement of canisters on and off the launching station while comparing tactics, techniques and procedures unique to both sides.

"The combined reload exercise was an awesome experience for our Soldiers to build relationships with our Emirati counterparts, an opportunity that the average Soldier would not otherwise have," said Sgt. 1st Class Jared Pointer, 1-43rd ADA battalion master evaluator. "This friendly competition helped the Soldiers gain different perspectives on training while also improving the readiness of both organizations."

A key objective of TSC Week was developing and finalizing a plan that continues to increase the frequency of combined events and knowledge exchanges. To this end, key leaders participated in a combined Senior Leader Forum (SLF) in order to discuss the way forward for this partnership. U.S. leaders that participated in this forum were Maj. Gen. Benjamin Corell, commander, 34th Infantry Division, Brig. Gen. Clement Coward, commander, 32nd Air and Missile Defense, Col. Jason Hokaj, commander, AFCENT Air Warfare Center, and Lt. Col. Michael Rodick and Command Sgt. Maj. Arthur Jones, the 1st Battalion 43rd Air Defense Artillery Battalion commander and command sergeant major. The command-

"The NCO Induction Ceremony was a great success in not only recognizing our new junior non-commissioned officers, but also in sharing the tradition with our Emirati counterparts and coalition forces."

ing general of UAE's Air Defense forces was also in attendance, as well as several other key leaders from our partner nation.

The Senior Leader Forum began with in-depth conversation about the importance of theater security cooperation and adaptation to the constant security fluctuations in the region. Lt. Col. Joseph Westerman, Air Warfare Center's IAMD director, explained the CENTCOM Statement of Principles in order to reinforce the guiding philosophy for IAMD in theater. The dialog included possible avenues of information sharing, bilateral training exercises and combined live Fires to increase integration.

Rodick commented that the SLF was "true progress toward combined enhancement of our air and missile defense readiness. I believe that this week of security theater cooperation with our Emirati Air Force counterparts is paramount to the legacy of combined partnership within theater."

In addition to tactical exchanges and working groups, a priority was improving social interaction and esprit de corps of all air defenders, regardless of nationality. To that end, Cobra Strike hosted a combined Noncommissioned Officer Induction Ceremony, as well as a Sports Day and Saint Barbara's Dining In for U.S. and Emirati Soldiers alike. The NCO Induction Ceremony celebrated 20 newly promoted U.S. Army NCOs while emphasizing the future leadership within the Air Defense Artillery Branch. The unique facet of this ceremony was the recognition of 10 Emirati NCOs in a ceremony that has no counterpart in their organization.

"The NCO Induction Ceremony was a great success in not only recognizing our new junior non-commissioned officers, but also in sharing the tradition with our Emirati counterparts and coalition forces," said Sgt. Maj. Albert Fletcher, 1-43rd ADA operations sergeant major. "The ceremony is meant to express that there is more of a crossroad to becoming a noncommissioned officer than just a rank. It is a transition to a higher level of responsibility and duties to our formation. I believe that this combined induction ceremony will pave the way for the Emirati Air Force and Air Defense to adapt in the future."

The Sports Day, held at the UAE Air Defense Headquarters, was the epitome of a team-building exercise. Volleyball and soccer matches featured combined teams that learned to work together on the field. Additionally, the U.S. forces introduced their Emirati counterparts to Ultimate Frisbee and participated in a joint Jiu Jitsu training session and demonstration.

Pfc. Clarence Allen, who played volleyball with the Emirati team, said "I enjoyed playing with the Soldiers and getting to know them on a personal level. I also received an awesome gift at the end of the game. The gift was very sentimental, which showed me the importance of our relationship here in UAE."

The capstone event was the St. Barbara's Dining In, where 1-43rd ADA exposed the UAE forces to all the customs and traditions of a formal U.S. Army celebration. In turn, Emirati cuisine was served, with U.S. attendees raving about the great taste and plentiful quantity. Coward served as the guest speaker and host for the evening. After an entertaining grog ceremony celebrating the 43rd ADA Regiment's lineage, a Regimental Affiliation and Honorable Order of St. Barbara Induction Ceremony capped off the evening, with many U.S. Army, Air Force and UAE contributors being presented their medals.

"The [St. Barbara's Day] dining in was an event that exceeded our expectations. It was the culmination of a groundbreaking TSC week working with our Emirati counterparts and everyone had a great time and enjoyed the terrific food," said Capt. Derek Sanchez, 1-43rd's TSC officer.

The 1-43rd ADA "Cobra Strike" Battalion's Theater Security Week was a remarkable opportunity for leaders and Soldiers to gain a better understanding of the importance of their allied partnership in UAE. From friendly competition on the Patriot System and sports fields, the Cobra Strike and Emirati Soldiers shared the experiences and laughter that solidified relationships and enhanced tactical readiness in theater. Through this successful "TSC Week" and increased interoperability with partner AMD forces, the lethality and operational readiness of the Air Defense Artillery Branch will only become stronger across the globe.

1st Lt. Jessica Beatty is an Air Defense officer currently stationed at Fort Bliss, Texas. She has served as a fire control platoon leader and a Patriot battery executive officer. She currently serves as the Headquarters and Headquarters battery executive officer for the 1-43rd Air Defense Artillery battalion.

The Joint Air Ground Integration Center included multinational service members who participated in the Joint Warfighting Assessment 19. (Courtesy photo)

Multinational Fires in a multi-domain environment

JAGIC chief in Joint Warfighting Assessment 19

By Lt. Col. Nicolas Konieczny

After more than a decade dedicated to counterinsurgency operations, the Western armies are reviewing their structures, organizations and missions and modernizing their equipment to be able to face another kind of threat that can compete with the national capabilities and create strong challenges; especially regarding stand-off and anti-access air denial.

In this new environment, the French Army has issued a new concept, "future land action," while the U.S. Army is focused on "multi-domain operations (MDO)," both pointing out the requirement to better coordinate their capabilities in the different domains. This also includes the requirement to interact more with the multinational partners in order to provide additional capabilities, authorities and different tactical possibilities on the battlefield to deceive and defeat an enemy that will never be able to adapt to multiple approaches and unexpected combined effects.

Therefore multinational interoperability is key more than ever. For the "Fires" warfighting function it was the opportunity to test it during Joint Warfighting Assessment (JWA) 19, especially within the JAGIC of the 7th Infantry Division commanded by Lt. Col. Nicolas Konieczny, the

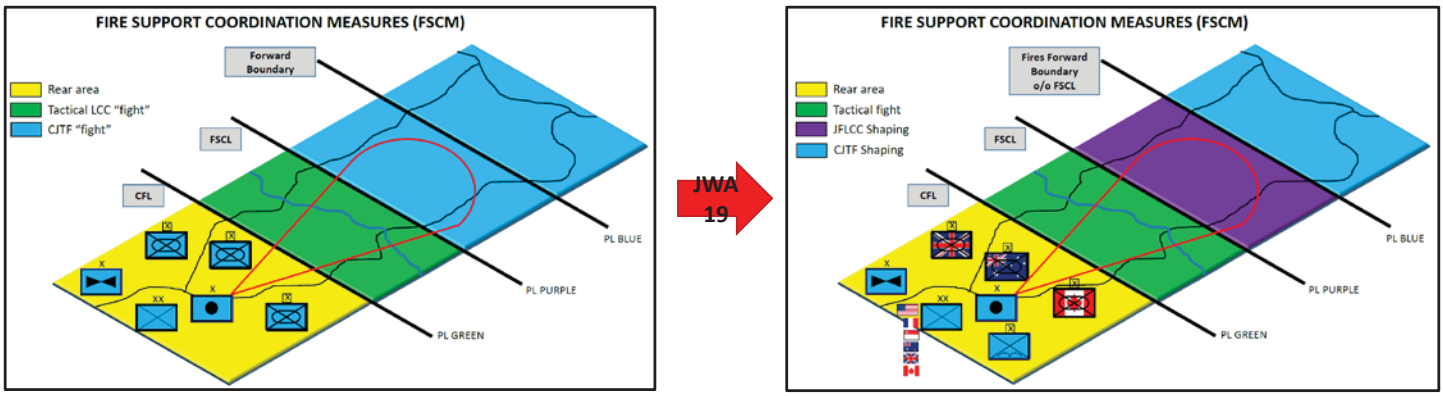


Figure 1. Fire support coordination measures developed for the Joint Warfighting Assessment 19. (Courtesy illustration)

French liaison officer to the Fires Center of Excellence with a team composed of the U.S. Army, Marine Corps (1st Anglico), Navy, Air Force, Australian and Singapore officers and NCOs.

1. Joint Warfighting Assessment 19

The JWA is the Army's capstone, multi-echelon exercise intended to demonstrate and assess future force concepts, capabilities and formations required to operate on the battlefield of the future. JWA 19 incorporated training formations from I Corps, 7th ID, Australia, Canada, New Zealand and the United Kingdom and personnel augmentation from France, Singapore and joint forces operating in a live, virtual and constructive environment to assess the implementation of MDO captured in Training and Doctrine Command Pamphlet 525-3-1.

During this exercise, the 7th ID became a multinational U.S.-led division augmented by French, Australian, Singapore, British and Canadian officers and NCOs and had to fight as a Joint Forces Land Component Command (JFLCC) under a Combined Joint Task Force (CJTF, I Corps).

The JWA 19 operational environment was focused on the 2028 future environment integrating future capabilities (Multi-domain Task Force, hypersonic weapons, strategic long-range cannon, precision-strike missile and extended-range cannon artillery for the U.S. Army, 1st Strike Brigade with Ajax and future equipment for the United Kingdom). The scenario depicted was aimed to challenge a coalition led by the U.S. Army against a peer-threat competitor equipped with a large amount of long-range artillery assets (both field and air defense artillery) and able to use non-lethal Fires (mainly cyber and electronic warfare).

In this multi-domain environment and in close cooperation with the multinational partners, the "Fires Enterprise" was the main pillar to enable freedom of maneuver for the 7th ID commanding general and his subordinates, while contributing to the exploration of new procedures and policies in order to create more lethality and efficiency on the battlefield.

2. Joint Air-Ground Integration Center evolution in a multi-domain environment

The U.S. Army in MDO in 2028 states that no single service component alone can overcome the layered standoff from a peer adversary. Consequently the joint force needs to converge capabilities to generate synergistic effects to counter the enemy's standoff capability.

Delineation of responsibilities and adaptation of coordination measures

The challenge for the coalition was first to delineate the responsibilities between the operational and tactical commands and define the successive areas of operations in order to attrite the high priority targets at echelon and create the conditions of transition between echelons. Therefore, due to the lack of global air superiority, the Fires Enterprise was in charge of degrading, denying, disrupting and destroying the enemy capabilities to enable the commitment of the maneuver forces.

To enable this delineation, the traditional fire support coordination measures (FSCM) and air control measures (ACM) had to be adapted before and during the exercise. In addition to the fire support coordination line and coordination fire lines, the JFLCC area of operations forward boundary became a FSCM between the JFLCC and CJTF. For the air coordination measures, the coordinating altitude had to be raised up to 35,000/40,000 feet (instead of the 20,000 feet initially planned) to leverage the commitment of multinational long-range Fires assets.

Lethal and nonlethal Fires

The high number of targets (the opposite forces were almost double our forces) and the multinational capabilities/authorities required to process the Fires planning/coordination through the Targeting Decision Board (TDB) led by CJTF commander. This TDB integrated not only the lethal capabilities (surface-to-surface, air-to-surface) but also the nonlethal capabilities (space, cy-

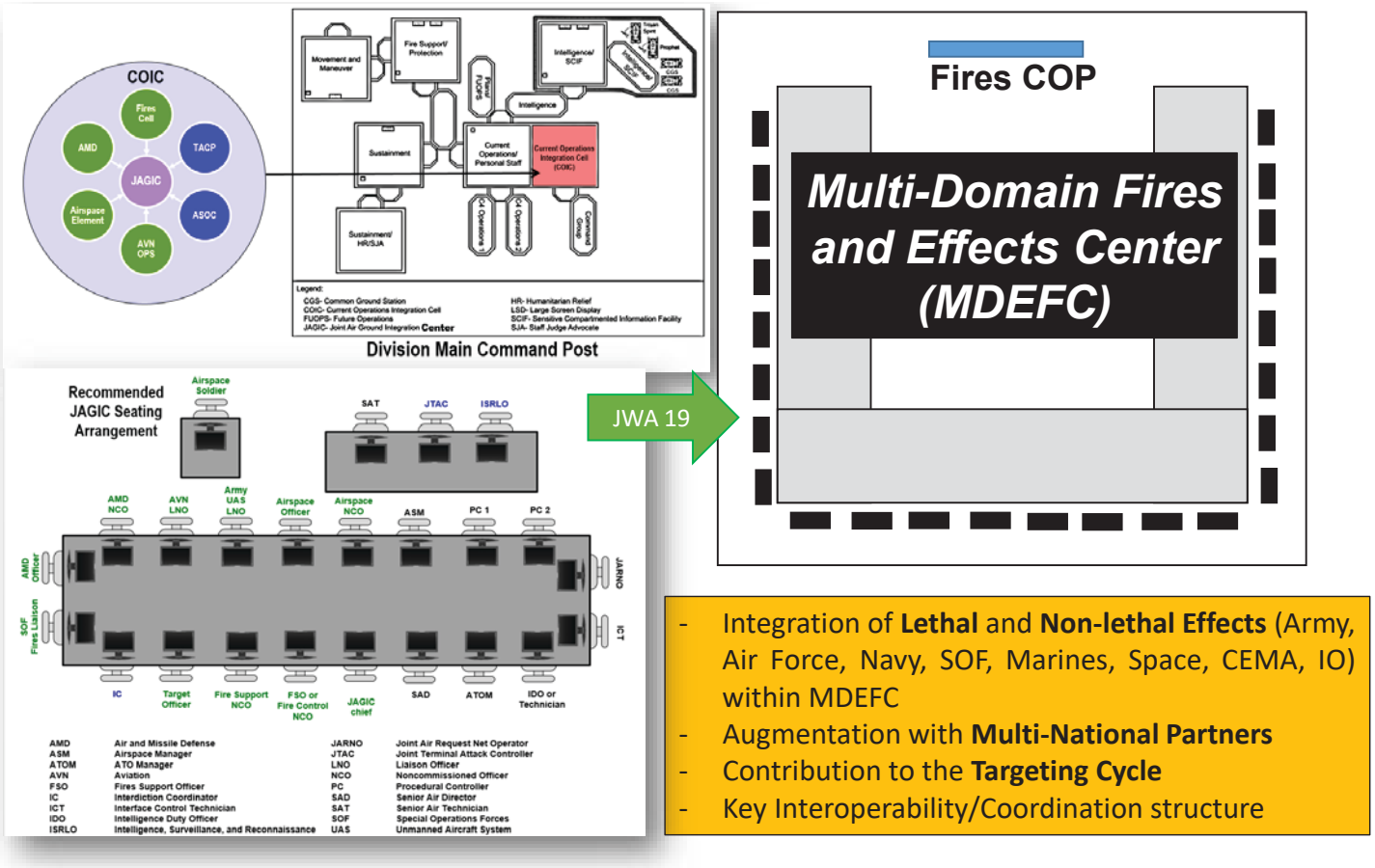


Figure 2. Multinational Joint Air Ground Integration Center in multi-domain operations during Joint Warfighting Assessment 19. (Courtesy illustration)

ber, electronic warfare, Military Information Support Operations, Public Affairs/Civil Affairs). At the JFLCC level, the decision was made to adapt the Army targeting cycle into a reviewed joint targeting cycle in order to include these additional capabilities and create multi-domain effects-based operations (MDEBO). These were a combination of effects throughout the use of space, cyber, EW, surface-to-surface Fires, close air support, unmanned aerial system, attack helicopters aimed to deceive/disrupt the enemy capabilities and protect the coalition forces.

Multi-domain and multinational integration

The multi-domain environment determined the JAGIC:

- To operate more with the foreign liaison officers within the JFLCC in order to synchronize the Fires support with the different steps of the multinational brigades operations (forward passage of lines, wet-gap crossing);
- To engage directly with the Multi-domain Task Force and adapt if required by the MDEBOs according to dynamic targeting processes.

More than ever the multinational JAGIC became the central core of the coordination and execution of all the Fires, lethal and nonlethal. The JFLCC was in charge, in close coordination with G2 and G3, to assess the Go/No Go conditions and then the applicability of the MDEBOs to support the maneuver units. It also muted to become a larger entity integrating some aspects of a NATO joint fire support element or a French fire support coordination cell (designation of a deputy to the JAGIC chief, JAGIC commitment in the Targeting Working Groups) and more important synchronizing the MDEBOs throughout the entire exercise. This adaptation was made possible thanks to the experience of all the joint and multinational actors and created the conditions of success for the JFLCC.

3. Interoperability with multinational partners

During the whole exercise, the main challenge was to get the appropriate level of interoperability between all the joint and multinational entities throughout the Multi-domain Command and Control tools in order to operate between the JAGIC and the subordinate commands. In order to harmonize the processes, the decision was made to use the U.S. procedures primarily even if every country had to comply with its own national Fires doctrines and rules of engagement.

Technical interoperability

In a NATO environment, the Digital Fires Systems rely mainly on Artillery Systems Cooperation Activities (ASCA) to enable

Multinational partners participate in a discussion during the Joint Warfighting Assessment 20. (Courtesy photo)

a full compatibility between the multi-national partners, like in Dynamic Front or Joint Warfighting Assessment 18.1 with the French 7th Armored Brigade and the German 23rd Mountain Infantry Brigade under the 1st ID.

During JWA 19, the Digital Fires Systems used at the JAGIC level with the multinational brigades were mainly U.S.: Advanced Field Artillery Tactical Data System (AFATDS), Tactical Airspace Integration System and Air and Missile Defense Workstation. The 1st Strike Brigade tried to connect Fire Control Battlefield Information System Application to AFATDS via ASCA but unfortunately the connectivity was not permanent. Some technical difficulties appeared as well with the Australia and New Zealand Brigade due to a different version of AFATDS. Finally almost all the countries got U.S. Army Digital Liaison Detachments to operate the three systems.

In the future, Defender 20 in Germany will demonstrate the requirement to enhance the use of ASCA and possibly variable message format to get a full connectivity between the different national Fires systems. For airspace control and air and missile defense systems, there is still room for improvement to get a full interaction between NATO and other systems as pointed out during this exercise.

Procedural interoperability

As mentioned previously the procedures were mainly connected to U.S. standards but the multi-domain environment and the requirement to experiment the MDO concept allowed the JAGIC to develop additional tactics, techniques and procedures in order to cover the nonlethal Fires applicability as well as a deeper involvement in the planning phase. The NATO and ABCANZ (America, Britain, Canada, Australia, New Zealand, also known as Five Eyes) procedures and standards were used to develop new approaches like the targeting process, which – from the initial Army targeting cycle – became more joint and even almost NATO (question on the redefinition of the target to include the "key leaders").

One major point to be covered at the JAGIC level with multinational partners is related to the rules of engagement and caveats. Every country was in charge to identify a "Red Card Holder" within their own headquarters but it never happened during the exercise that he had to intervene due to the fact that the CJTF and JFLCC rules of engagement were very clear and there was always a constant dialogue between the key leaders (ABCANZ) and within the Fires Enterprise.

Human interoperability

More than fully compatible systems and well managed standard operating procedures, JWA 19 success relied primarily on the excellent human interaction. The integration of a French officer as the JAGIC chief of a multinational division was initially a gamble but proved to be an overall success emphasized by Maj. Gen. Willard M. Burleson, 7th ID commanding general, at the end of the exercise.

This multinationality triggered a lot of discussions in order to adapt and review the structures, organizations and missions in a new operational environment. It also facilitated the exchange of information in the G3 and JAGIC with a better understanding of the operations conducted by the multinational brigades according to their doctrine and rules of engagement and then an appropriate Fires support fitting their requirements.

As NATO Secretary Gen. Jens Stoltenberg mentioned at the NATO summit in Brussels, July 2018, the Alliance is "stronger together." This applies perfectly to the MDO concept and the new threats which require enhanced interoperability, to mutualize the efforts, to combine the capabilities and to share different approaches in order to more efficiently degrade, deny, disrupt and destroy the potential adversaries.

Lt. Col. Nicolas Konieczny, the French liaison officer to the Fires Center of Excellence, has been involved in the major exercise Joint Warfighting Assessment 19 (May 2019) as Joint Air Ground Integration Center chief for the 7th Infantry Division (7th ID).

Sgt. Henry Kauffet, a cannon crewman with A Battery, Field Artillery Squadron, 2nd Cavalry Regiment, receives instructions during a firing exercise as part of Dynamic Front 19, March 5, at Grafenwoehr Training Area, Germany. Dynamic Front 19 is a multinational conducted by the U.S. Army in Europe designed to improve allied and partner nations' ability to deliver long-range capabilities. (Sgt. Gabrielle Weaver/U.S. Army)

Bold developments in the Field Artillery

Why Exercise Dynamic Front (DF) and Artillery Systems Cooperation Activities (ASCA) matter!

By Robert Keith Gunther

United States Army Europe executed the U.S. military's premiere joint and combined artillery centric Exercise Dynamic Front 2019 (DF19), from March 2-8, 2019, with 2,673 participants from 27 countries firing 4,244 field artillery rounds and 200 rockets via 100 multinational artillery pieces from three different countries simultaneously at Grafenwoehr Training Area, Germany, Riga, Latvia and Torun, Poland.

The Dynamic Front (DF) exercise series is the match to the Artillery Systems Cooperation Activity's (ASCA) kerosene that ignites North Atlantic Treaty Organization (NATO) and allied joint Fires processes and procedures to rapidly and significantly

implement NATO multinational Fires interoperability. DF19 continued the DF exercise series' habit of pushing the envelope of joint Fires interoperability in Europe.

The key conduit to achieving joint Fires interoperability is the ASCA interface. ASCA is the digital interface that allows all components of the shooting solution (observers, fire direction centers and fire platforms) to interact with each other as if they were operating with their own country's systems. NATO has two official languages and 27 individual languages. ASCA is the digital language of NATO Fires.

The DF Exercise series is "designed to increase readiness, lethality and interoperability by exercising allied and partner nations' ability to integrate joint Fires in a multinational environment at both the operational and tactical levels ." The exercise has grown so much in the few years since its inception that it now requires multiple countries and training areas to meet its training objectives. DF matters because it produces bold developments in the field artillery (FA) and Fires community while expanding the relevance, use and improvement of the ASCA digital interface.

ASCA is crucially important to the NATO Fires community. It is the Rosetta Stone technical interface to achieve multinational Fires interoperability. ASCA is a coalition-derived set of fire support command and control (FSC2) digital messages that each participating nation has implemented into their national FSC2 system. These derived digital messages enable each country's system to send specific information (such as fire missions, ammunition status, etc.) between all other systems on a common Mission Partner Environment/Federated Mission Network. Successive DF exercises have perpetually enhanced ASCA usage in Europe and future DF iterations will continue down that path.

DF is unique in that it brings together all ASCA participating nations intended to help and puts them together in a Fires-specific think tank and laboratory where multinational solutions result in bold developments for NATO joint Fires. This sets the example for NATO, partner and Allied nations that communication capabilities for the Fires community is more efficient and lethal. Without ASCA, delays and large work force requirements for liaison officer (LNO) packages and translators are required. The ASCA protocol does this for you. ASCA lessens the work force footprint of the LNO team, but doesn't completely eliminate the need for LNOs. These bold developments include counter fire doctrine, revitalization of a theater-level Fires command structure, ASCA training, implementation and advancement, and exercising multinational Fires command and control across multiple nations in Europe simultaneously.

DF19 tested NATO Counterfire doctrine developed during Dynamic Front 2018 (DF18). U.S. Army Europe's Joint Multinational Readiness Center (JMRC) Fires observer/control team (Vampire) developed the NATO Counterfire doctrine and moved it through the approval process. The need for an overarching FA headquarters (HQ) to command and control all theater Fires in Europe occurred by testing the USAREUR Theater Surface Fires Command (TSFC) concept in DF18 and DF19. The TSFC concept used a U.S. FA brigade as the core of theater-level artillery HQ that integrated multinational Fires across the three countries. TSFC lessons learned have paved the way for the future development and refinement of the Fires Center of Excellence Theater Fires Command (TFC) concept.

DF was a major platform for demonstrating the operational capabilities of ASCA, bringing it beyond mere theory. DF19 demonstrated FA interoperability across all three domains: human, procedural and technical. The human domain used augmentation

within every HQ from battalion to Land Component Command level. The procedural domain implemented and utilized counterfire doctrine and LNO teams. While the technical domain used NATO's digital Fires language: ASCA. Consequently, frequent multinational tactics, techniques and procedures (TTP) exchanges also occurred for common gunnery problems and other associated issues, such as extreme cold weather operations and their effects on the gunnery solution. DF19 was the first time DF occurred simultaneously in multiple countries.

The Dynamic Front exercise series is critically important for multiple reasons. It is a joint and

Soldiers with A Battery, Field Artillery Squadron, 2nd Cavalry Regiment, fire an M777A2 Howitzer during Dynamic Front 19, March 5, at Grafenwoehr Training Area, Germany. Dynamic Front 19 is a multinational exercise conducted by the U.S. Army in Europe designed to improve allied and partner nations' ability to deliver long-range capabilities. (Sgt. Gabrielle Weaver/U.S. Army)

combined test bed and experimentation site for NATO artillery munitions, systems, and artillery-specific tactical concepts. During DF19, coalition exercise threads were developed and executed during a command post exercise (CPX) portion, then executed during the LFX. The exercise enhances NATO members and allied FA modernization efforts of aspiring future members in fire support, gunnery procedures and modernization of systems.

The DF series is a constant in affirming and assessing the operational capabilities of the ASCA interface, and is a major recruitment tool. It showcases NATO artillery capabilities and is a show-and-tell comparison that influences newer NATO member countries on modernization of their fire support systems. The exercise also refines the ability for a FA HQ to command and control (C2) multinational artillery units. In DF19, a U.S. Division Artillery (DIVARTY) controlled six multinational firing battalions (no U.S. battalions). A Canadian DIVARTY, with a U.S. Digital Liaison Detachment (DLD), controlled three multinational battalions and one U.S. battalion. Other unintended training opportunities included a M777 Cold Weather TTPs exchange. The DF Exercise series is the key U.S. military opportunity to identify Fires interoperability gaps and implement solutions in rapid order.

Soldiers with A Battery, Field Artillery Squadron, 2nd Cavalry Regiment, reload an M777A2 Howitzer during a rapid fire exercise as a part of Dynamic Front 19, March 5, at Grafenwoehr Training Area, Germany. Dynamic Front 19 is a multinational exercise conducted by the U.S. Army in Europe designed to improve allied and partner nations' ability to deliver long-range capabilities. (Sgt. Gabrielle Weaver/U.S. Army)

Bold developments

DF19 was an international platform for emerging NATO Fires interoperability developments and doctrine. It brought together 27 nations to work in the three domains of interoperability.

"This exercise is enabling the artillery community across multiple nations, NATO and non-NATO, to come together and work through the frictions of our interoperability in human, procedural and technical domains," said Maj. Andrew Champion, DF 19's exercise officer in charge.

The exercise experimented with new C2 doctrine, specifically the need for a theater-level command and control node to synchronize and coordinate multinational joint Fires and NATO counterfire.

Col. Joe Hilbert, JMRC commander said, "Counter artillery is a critical doctrine for any military. The ability to take out the artillery of the opposing force, removes a strategic capability that they need, and gives you an advantage."[1]

This is a significant development as the NATO alliance has lacked a cohesive counterbattery fire doctrine in its game plan until now, military officials said.[2] In DF19, this new doctrine was applied to a large joint and multinational artillery exercise spread across three countries simultaneously.

During the exercise, Champion said, "The U.S. has its own counter battery fire doctrine, and individual NATO allies have their own doctrine, but NATO doesn't have a specific doctrine in place,"[3] until now.

Why Exercise Dynamic Front is important

DF started in 2015 as a non-com-

1 *Europe's largest annual U.S.-led artillery war games underway in Germany, Martin Egnash, Stars and Stripes, March 9, 2019.*
2 *Ibid.*
3 *Europe's largest annual U.S.-led artillery war games underway in Germany, Stars and Stripes.*

petitive training event focused on technical interoperability and a benchmark exercise of technical FA data exchange within ASCA. Dynamic Front Two, in 2017, saw a rapid transformation of the exercise to 1,400 U.S. and multinational personnel, 32 howitzers, and two Multiple Launch Rocket System (MLRS), and four radars from three nations. DF18 once again increased to 3,500 personnel, 94 howitzers, seven MLRS and 16 radars.

This exercise provides an intense, realistic training environment that takes advantage of U.S. Army Europe's unique training resources to seamlessly coordinate Fires in support of U.S. and allied operations.[4] As an example, DF19 made use of more than triple the amount of the long-range MLRSs as last year (2018), with 24 MLRS vehicles supporting 62 howitzers.[5]

The DF exercise series will continue to be the key Fires exercise for U.S. and NATO Fires doctrine, ASCA interoperability of fire control systems, new munitions and other aspects of interoperability. This is due to the necessity to evolve and expand NATO Fires capability across Europe, USAREUR's close relationship with nations in its area of operations, and DF has emerged as a major platform for NATO allies and partners to train with and observe other NATO members, and eventually modernize and expand their Fires capabilities, if required.

To clearly describe the success of DF19, one must use the old saying "the proof is in the pudding."

"We massed all of the units across all three locations at one time on target so every firing unit fired onto one location, at each location," said Champion. "We are able to take multinational firing units and coordinate those mass destructive Fires."[6]

Theater Surface Fires Command (TSFC)

The TSFC was a U.S. Army Europe concept to plan, coordinate and execute joint and allied Fires through organizational mission command. DF19 had the TSFC headquartered at Grafenwoehr, Germany, by the 197th Field Artillery Brigade (New Hampshire National Guard), coordinating Fires to 1st Cavalry Division DIVARTY and additional multinational DIVARTYs in Poland and Latvia.[7]

The TSFC concept addressed the need for TFC and control in order to synchronize multinational Fires and counterfire operations. It was designed to coordinate Fires information between the land command and the firing units. The TSFC took both the digital and analog systems of communications from the firing units and coordinated firing plans for the land component commander.[8]

An overarching Fires command is significantly required in Europe "to face the increasingly lethal threats of today and tomorrow.[9] Such an organization, at the theater echelon, would ensure "the seamless integration and synchronization of cross-domain Fires throughout the depth of an expanded and contested battlefield."[10]

The concept emerged due to necessity. "We need to be able to synchronize our widely dispersed units to get the right effects at the right target at the right time," said Col. Andrew Anderson, commander of the TSFC.[11] It coordinated Fires alongside allied and partner nations for several multinational division artilleries in Poland, Germany and Latvia. "The TSFC is designed to synchronize and integrate Fires across the entire theatre on behalf of the [Coalition Forces Land Component Command]," said Anderson, brigade commander of 197th FAB and deputy commander of the TSFC. "It allows allies and partners to work alongside us."[12]

Recognizing the importance of such an organization, the TSFC inspired and helped shape the emerging TFC concept that will replace the TSFC concept that will be tested in DF20.

According to the chief of Concepts Development Division, Capabilities Development & Integration Directorate, at the Fires Center of Excellence, "The TFC preserves the TSFC's design to synchronize multi-national Fires and control counterfire opera-

4 *Poland hosts Dynamic Front for the First Time, Christina Wetover, March 6, 2019, https://www.dvidshub.net/news/313368/poland-hosts-dynamic-front-first-time*
5 *Europe's largest annual U.S.-led artillery war games underway in Germany, Stars and Stripes.*
6 *7th ATC hosts DF19 in three locations, https://www.dvidshub.net/news/314086/7th-atc-hosts-df-19-three-locations.*
7 *Multinational interoperability to forefront during Dynamic Front 19, Gabrielle Weaver, March 7, 2019, https://www.army.mil/article/218259/multinational_interoperability_to_forefront_during_dynamic_front_19*
8 *7th ATC hosts DF19 in three locations, https://www.dvidshub.net/news/314086/7th-atc-hosts-df-19-three-locations.*
9 *The Fires Complex: Organizing to win in large-scale combat operations, Fires Bulletin, May-June 2018, Compton, Christopher and Boothe, Lewis L.*
10 *Ibid.*
11 *7th ATC hosts DF19 in three locations, https://www.dvidshub.net/news/314086/7th-atc-hosts-df-19-three-locations.*
12 *Dynamic Front 19: Minds behind the blasts, SGT Gabrielle Weaver, March 7, 2019, https://www.army.mil/article/218244/dynamic_front_19_minds_behind_the_blasts*

tions across the theater, but also provides a true fire support coordinator to the land component commander and adds significant targeting and fire support planning capability that allows the Army to be an equal player in joint targeting," said Col. Christopher Compton.

ASCA

The ASCA interface allows broad inclusion of multinational allies and partners into a single synchronized Fires network spread across multiple echelons. This enables the echelonment of multinational Fires across the battlefield by leveraging the most capable firing unit available, regardless of nationality. It also requires our adversaries to analyze systems and capabilities of 29 NATO and select Partner for Peace nations, not just one.

The ASCA Software interface allows nations to digitally link and exchange operational data between participating nations FA and fire support systems, enabling faster, more-effective firing missions among allied and partner FA units.

The ASCA program is a HQ Department of the Army (DA) Security Cooperation program authorized by the office of the Secretary of Defense (OSD). The ASCA memorandum of understanding is negotiated by HQ DA. It is signed between the participating nations equivalent. It is executed by the Program Executive Office Command Control Computers, Tactical, Product Manager Fire Support C2. The ASCA interface was ratified by NATO Standard Agreements (STANAG) 2245 (FA and Fire Support Data Interoperability), and is further shaped by the following documents and Artillery Publications (AArtyP): AArtyP 1 - NATO Land Based Fire Support, AArtyP 2 - NATO Counter Battery Fires, AArtyP 3 - Artillery Procedures for Automatic Data Processing (ADP) System Interoperability, and STANAG 2484 (AArtyP-5): NATO Fire Support Doctrine, and ATP-04: Allied Naval Fire Support.

During DF19, Canada's participation provided a verifiable example. "The Canadian Army's contribution to Exercise DF19 helped refine our role as an integral member of the ASCA network, while strengthening our relationships with gunners serving with our allied nations. Interoperability and joint readiness is all about getting to know your Allies, ensuring you can speak the same language on the battlefield in order to execute operational effects when it truly counts," said Lt. Col. Paul Williams, commanding officer, 4th Regiment General Support.[13]

DF19 included numerous ASCA training priorities. First, air coordination measure dissemination (either on live fire or simulated). Second, sensor-to-shooter link using multiple options – any sensor, best shooter regardless of nation. Third, a minimum of three nations had to be interoperating digitally rather than by multiple bi-lateral strands. Fourth, radar deployment orders dissemination. Fifth, deployment orders for other assets. Sixth, the network had to support fire mission initiation and allocation at corps level. Seventh, the fire direction database design was provided to participants at the planning conferences. Eighth, meteorological data sharing. Next, main planning conference input from participants into the requirements for the "ASCA University" to take place before start of the exercise. Then, the development of the Effects Guidance Matrix and dissemination through ASCA, and finally, validation of AARTY-P 1, 2, 3, and 5.

According to Dana Hatcher, project manager, Mission Command Fort Sill, "Dynamic Front (exercise series) is a reality check on just how well the ASCA interface works operationally between the participant's as well as helping to define the voids and vacuums for the ASCA community to try and close/minimize."

ASCA University

The use of ASCA related procedures and key strokes on Advanced Field Artillery Tactical Data System (AFATDS) and other allied fire control systems to process multinational fire missions and joint Fires requests is a unique knowledge set not fully proliferated to the U.S. military services. Problems experienced by fire direction operators are not new problems. They are problems the operators have either not been trained upon or not repeated enough to be part of their professional knowledge. The short-term fix to this training impediment is the ASCA University.

The ASCA University is a block of instruction developed by JMRC to resolve this deadlock. JMRC (Vampire Team) provides a week-long block of instruction to all DF exercise participants operating fire control systems in order to increase ASCA-related knowledge prior to the start of any DF exercise. For many, it is the first time they have ever heard of ASCA or utilized it during a major exercise or operation.

During DF19 ASCA University, all ASCA member nations were linked and digitally connected via a mini-CPX. It also included the 14th Marine Regiment and active participants from several sponsored, observer nations and interested nations from all three locations.

Interoperability

NATO defines interoperability as "the ability to operate in synergy in the execution of assigned tasks." Even after many years of emphasizing interoperability and NATO STANAG to foster it, recent missions have shown the limits of interoperability.[14] To standardize

13 Canadian Gunners train with international counterparts at Exercise DYNAMIC FRONT 19 in Europe, Jaimie Tobin, March 15, 2019.
14 Enhancing interoperability: the foundation for effective NATO operations, https://www.nato.int/docu/review/2015/also-in-2015/enhancing-interoperability-the-foundation-for-effective-na-

Lt. Col. Charles Knoll, commander of Field Artillery Squadron, 2nd Cavalry Regiment, inspects an M777A2 Howitzer with Soldiers from A Battery, FA Squadron, 2CR during Dynamic Front 19, March 5, at Grafenwoehr Training Area, Germany. Dynamic Front 19 is a multinational exercise conducted by the U.S. Army in Europe designed to improve allied and partner nations' ability to deliver long-range capabilities. (Sgt. Gabrielle Weaver/U.S. Army)

interoperability planning, the U.S. Army recognizes four levels of interoperability. They are Level 0 (Not Interoperable), Level 1 (Deconflicted), Level 2 (Compatible), and Level 3 (Integrated). The DF exercise series maintains various levels of interoperability from levels 1-3 with the various NATO and allied partners as they continually improve and upgrade their artillery systems and capabilities. The DF exercise series continually proves that "we can no longer allow ourselves the luxury of using equipment that doesn't work together."[15] As a result, the DF exercise series was designed to increase readiness and interoperability by exercising allied and partner nation ability to integrate joint Fires in a multinational environment at both the operational and tactical levels. [16]

ASCA interoperability of fire control systems easily allows the command and control of multinational forces spread across multiple countries at once.

"This is a multinational FA formation consisting of seven battalions from seven different nations," said U.S. Army Col. Brett Forbes, commander of Force Field Artillery HQ for Dynamic Front 19. "We take those seven different formations, put them all together and fight as one cohesive unit."[17]

DF19 integrated participating nations into every echelon of the exercise's structure to develop interoperability between all participants from the simulated land command to the individual units conducting the live Fires in the training areas.[18] Col. Patrick Macklin, commanding officer of the 53rd Digital Liaison Detachment said, "This training builds joint readiness by enabling staffs to network infrastructure and doctrine with this common language. Interoperability is a fundamental condition of how our armies plan to fight tonight, tomorrow and in the future." [19]

DF19 significantly enhanced NATO Fires interoperability and built upon successes in previous DF iterations. Enhancements oc-

to-operations/EN/index.htm
15 For NATO, True Interoperability is no longer optional, Hans Binnendijk and Elisabeth Braw, Dec. 18, 2017.
16 Poland hosts Dynamic Front for the First Time, Christina Wetover, March 6, 2019, https://www.dvidshub.net/news/313368/poland-hosts-dynamic-front-first-time
17 Multinational interoperability to forefront during Dynamic Front 19, Gabrielle Weaver, March 7, 2019, https://www.army.mil/article/218259/multinational_interoperability_to_forefront_during_dynamic_front_19
18 7th ATC hosts DF19 in three locations, https://www.dvidshub.net/news/314086/7th-atc-hosts-df-19-three-locations.
19 Canadian Gunners train with international counterparts at Exercise DYNAMIC FRONT 19 in Europe, Jaimie Tobin, March 15, 2019.

curred across the three domains (human, technical and procedural) of interoperability. Key interoperability milestones were enhanced and roadblocks to further interoperability were identified.

Interoperability successes

ASCA protocols significantly enabled digital fire mission processing from the Combined Joint Forces Land Component Command (CJFLCC) to a multinational firing unit. The use of an ITN cross-domain solution was tested and proven. The TSFC utilized Joint Air Defense Operation Centers to track, coordinate and assign fire missions on behalf of the CJFLCC commander. For non-ASCA countries, the use of LNO teams in the lowest HQ of interoperability enabled them to input fire mission data into their systems directly and transmit to the firing units over their national means.[20]

International agreements

DF19, and multinational Fires interoperability, were successfully established due to the hard work and behind-the-scenes work of numerous specialized subtasks. A key element is negotiating and signing intricate and detailed international agreements with all participating nations. The USAREUR International Agreements Divisions (IAD) not only codified handshakes and promoted economy and efficiency, but also protected Army equities, eliminated redundancy and protected against violations of U.S. Law.

DF19 required 11 international agreements with participating nations. As a rule, agreements and arrangements are intended for the primary purpose of recruiting, organizing, supplying, equipping, training, servicing, mobilizing, demobilizing, maintaining, outfitting and constructing Army forces, equipment and facilities.

Stefanie Bivins, USAREUR G8, IAD lead agreements specialist for DF19 said, "The agreements we concluded are necessary to identify and clarify responsibilities on both sides and to capture vital provisions like entry and exit, force protection and financial matters. Stakeholders might not want to deal with the bureaucracy, but are happy they did, if questions arise."

Codifying and enacting such agreements allowed all DF19 multinational partners to fully focus on the interoperability tasks at hand.

Keen interest ASCA and Dynamic Front

The Dynamic Front Exercise series sees significant interest in not only multinational participation but also significant interest by multinational military leadership. The DF19 Distinguished Visitor Day was no different. Key visitors included, the USAREUR commander, Lt. Gen. Christopher G. Cavoli, French Lt. Gen. Vincent Guionie, the French Land Forces commander and U.S. Army Lt. Gen. John Thomson III, the NATO-U.S.A. Allied Land commander. Various other general officers from NATO, Turkey, Romania, United Kingdom, Italy, Belgium and Czech Republic (Czechia) attended. The myriad of nations participating in this annual exercise signals its importance and usefulness to attending nations.

Way ahead

The Dynamic Front Exercise series is an enduring USAREUR exercise that will continue to expand and execute in various countries in Europe. It will continue to be "THE" exercise for NATO Fires interoperability, emerging doctrine, ASCA expansion and interface improvement, and a myriad of other ideas, doctrine and concepts still to be developed. To facilitate this learning lab of NATO Fires, several things need to occur to assist in future iterations of the exercise.

First, All NATO members and Partnership for Peace nations must gain ASCA membership or affiliated status. Second, all U.S. FA units must continually train upon ASCA TTP's. ASCA TTP's should be taught to all U.S. AFATDS operators as part of their core curriculum for interoperability purposes, noncommissioned officers associated courses, and as a pre-deployment training required for inbound Regionally Aligned Forces to Europe. Third, add ASCA tasks to the Joint Task List. Fourth, establish a permanent "ASCA University" to facilitate ASCA implementation. Fifth, NATO should consider establishing a NATO Fires Center of Excellence (NFCoE) to run a permanent "ASCA University" and take charge of all other fire support-related training (targeting, concept, development and experimentation, etc.) currently being taught by NATO. This NFCoE would be the proponent for all NATO Fires related-standardization agreements and doctrine. Finally, NATO doctrine and terminology is the doctrinal bridge that brings together all the nations. Training and understanding of those terms is essential in working in multinational operations involving primarily NATO nations.

Mr. Robert K. Gunther is the U.S. Army Europe lead planner for the Dynamic Front (DF) exercise series. Additionally, Gunther plans and executes all USAREUR joint Fires related exercises. He is a retired artillery officer with 22 years of service and served in artillery positions in Bosnia-Herzegovina, Kosovo, South Korea, Iraq and Afghanistan.

Reference

Dynamic Front 19 to Integrate Multinational Fires Capabilities, 7th Army Training Command, March 1, 2019.

20 *White Paper: Dynamic Front 19 Interoperability Lessons Learned, 25 MAR 19, USAREUR G3/3 Fires.*

Toward understanding Fires on near-peer battlefield

By Steven Yeadon

Editor's note: *This article is the first in a series of two articles considering the serious aspects of the near-peer competition.*

The world witnessed in the ongoing conflict in Ukraine the use of Russian massed area Fires assisted by overhead surveillance. This reconnaissance-strike model was central to the Zelenopillya Rocket Attack that destroyed most of two Ukrainian mechanized battalions in the open in July 2014.[1] [2] The increased availability of overhead surveillance combined with massed area Fires have produced a new level of intensity in modern conventional combat.[3]

As Maj. Amos Fox explains, "Russia's actions in Ukraine have revealed several innovations, most notably the employment of the semi-autonomous battalion tactical group, and a reconnaissance-strike model that tightly couples drones to strike assets, hastening the speed at which overwhelming firepower is available to support tactical commanders."[4] This reduced sensor-to-shooter time cycle combined with the use of rockets and artillery dominates Russia's approach to land warfare. To maximize this capability, most firing units are organic to Russian battalion tactical groups.[5] However, "Russian forces are not concerned with precision application of strike capability, nor are they concerned with collateral damage."[6]

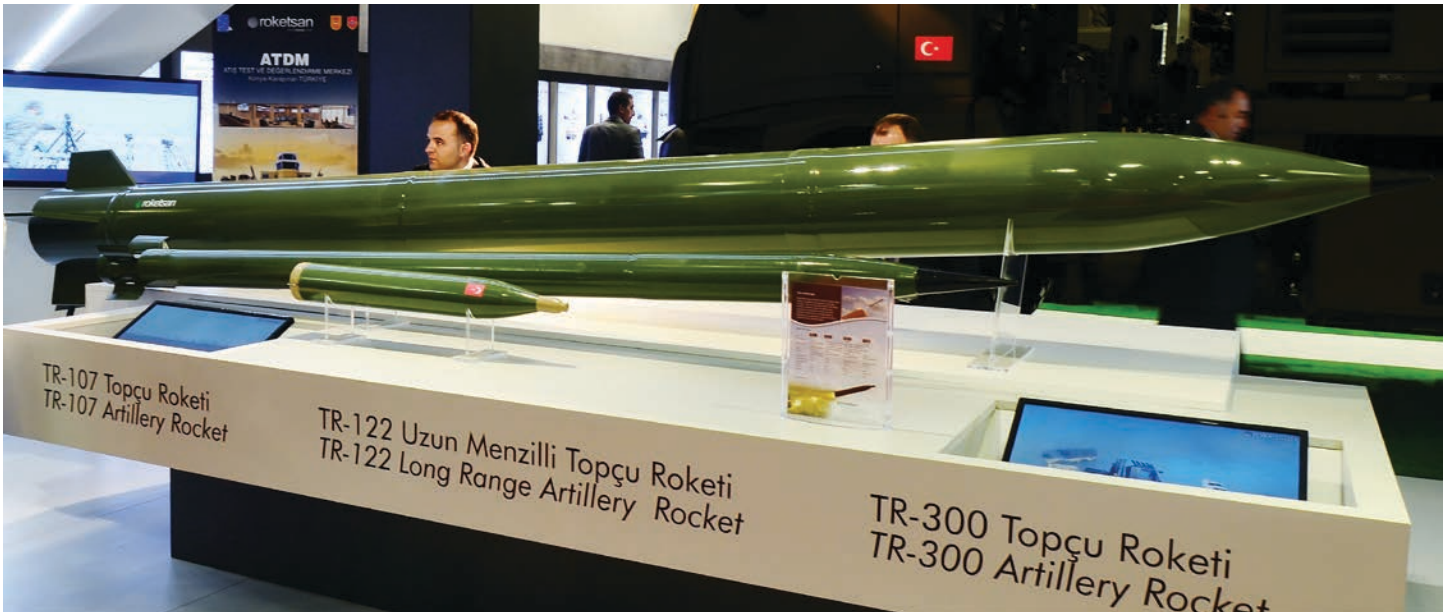
Data from the Ukraine conflict show that artillery is producing approximately 80 percent of all casualties, and because of high troop losses Ukrainian Soldiers prefer to ride on top of armored vehicles and assault while dismounted.[7] British Maj. Gen. J. B. A. Bailey said, "the possibilities for artillery equipments and their employment are hard to limit except by lack of imagination and the resources needed to realize them."[8] It appears the Russian Federation and its proxies are all too aware of this reality. Ukraine's percentage of troops lost in combat to artillery is on a scale of the Second World War, which saw 60 percent of losses to artillery, 75 percent of losses to artillery on open terrain.[9] These facts may indicate that field artillery may be the decisive arm and shaper of land warfare against near-peer powers.

The goal of this analysis is to better understand near-peer technologies and doctrine in relation to Fires and some supporting units, such as Russian electronic warfare capabilities. This will explain the nature of the threat against U.S. and multinational forces. From this understanding, in the next article in this series, it can be assessed how battlefields of the future are changing because of near-peer Fires.

Near-peer field artillery capabilities

A comparison of the military capabilities of Russia and China, compared to advanced U.S. weapons, reveals both powers have a mature technological capability that is more advanced than U.S. or allied counterparts. In the case of Russia, first, Russia possesses the new 2S35 Koalitsiya-SV 152 mm self-propelled howitzer, which can fire eight precision-guided rounds per minute a range of 70 kilometers (km).[10] Russian ordnance also includes a variety of munitions such as high-explosive precision-guided munitions, jammer carrying projectiles, cluster projectiles with anti-tank sub munitions, as well as standard and rocket-assisted high explosive-fragmentation (HE-FRAG) projectiles.[11] This modern self-propelled howitzer can be expected to replace Russia's current Soviet-era self-propelled howitzers. This range is significantly greater than the range of the new U.S. M109A7 Paladin 155 mm self-propelled howitzers, which can use a 155 mm precision-guid-

1 *Phillip Karber and Joshua Thibeault, "RUSSIA'S NEW-GENERATION WARFARE," Association of the United States Army, May 20, 2016, https://www.ausa.org/articles/russia%E2%80%99s-new-generation-warfare.*
2 *"Ukraine conflict: Many soldiers dead in 'rocket strike,'" BBC News, July 11, 2014, https://www.bbc.com/news/world-europe-28261737.*
3 *Phillip Karber and Joshua Thibeault, "RUSSIA'S NEW-GENERATION WARFARE," https://www.ausa.org/articles/russia%E2%80%99s-new-generation-warfare.*
4 *Amos Fox, "THE RUSSIAN–UKRAINIAN WAR: UNDERSTANDING THE DUST CLOUDS ON THE BATTLEFIELD," Modern War Institute at West Point, January 17, 2017, https://mwi.usma.edu/russian-ukrainian-war-understanding-dust-clouds-battlefield/.*
5 *Ibid.*
6 *Ibid.*
7 *Phillip Karber and Joshua Thibeault, "RUSSIA'S NEW-GENERATION WARFARE," https://www.ausa.org/articles/russia%E2%80%99s-new-generation-warfare.*
8 *J.B.A. Bailey, Field Artillery and Firepower (Oxford: The Military Press Oxford, 2009), 18. Google Play Books.*
9 *James F. Dunnigan, How to Make War. ed. Fourth (New York: HarperCollins, 2003), 105-106.*
10 *"2S35 Koalitsiya-SV 152mm Self-Propelled Howitzer," Army Technology, accessed January 29, 2019, https://www.army-technology.com/projects/2s35-koalitsiya-sv-152mm-self-propelled-howitzer/.*
11 *Ibid.*



A display for the TR-107, TR-122, and TR-300 rockets used in the Weishi (WS) family of artillery rocket vehicles is displayed at a trade show.(CeeGee/Wikimedia)

ed projectile called Excalibur, which has a range of 40 km.[12]

Second, Russia possesses laser-guided artillery projectiles for its older self-propelled howitzers and towed howitzers. This includes both the precision-guided Krasnopol projectiles, which are marketed as capable of engaging moving targets[13] at a range of 25 km,[14] and the smaller Kitolov-2M 122 mm laser-guided artillery projectile, which has a range of 11.5 km.[15] These projectiles are currently used against pinpoint targets, such as battle tanks, infantry fighting vehicles, and field fortifications, with a high probability of a first-round kill.[16] A major shortcoming of employing the Krasnopol (as well as other laser-guided munitions) is the requirement to illuminate the target with the laser beam for five to fifteen seconds.[17] If a targeted armored vehicle has a laser detection capability, then this allows the employment of countermeasures against laser-guided weapons, such as smoke grenades that obscure the vehicle from laser light.[18] However, a well-trained spotter can use a laser designator to paint an area close to an armored vehicle, and several seconds later paint the armored vehicle when the projectile reaches its terminal phase.[19]

Third, Russia possesses the Tornado-S Multiple Rocket Launcher (MRL), which fire satellite guided rockets with a range of 120 km.[20] This is superior to the range of current U.S. GMLRS guided-rockets, which have a range of 70 km.[21] Although, because the guided-rockets of the Tornado-S are satellite guided,[22] they are unlikely to be able to hit moving targets, since similar U.S. GMLRS guided-rockets lack the capability to strike moving targets.[23] However, this may not be a problem, because the Tornado-S has the ability to blast an area of 2.6 square miles.[24] The smaller Russian Tornado-G MRL has also proved useful in the role of massed area Fires, since the Soviet-era BM-21 Grad MRL, the predecessor of the newer Tornado-G MRL, was responsible for the devastation of the Zelenopillya rocket attack.[25] The Tornado-G can launch rockets armed with antitank submunitions a range of 40 km.[26]

Fourth, Russia possesses the Hermes line of Antitank Guided Missiles (ATGM) with a publicly disclosed range of 30 km, which can be fired from ground vehicles, ships, or aircraft.[27] If a war with Russia occurs, then these

12 *"Excalibur Projectile," Raytheon, accessed October 15, 2018, https://www.raytheon.com/capabilities/products/excalibur.*
13 *"Krasnopol-M2," KBP, accessed October 14, 2018, http://www.kbptula.ru/en/productions/artillery-guided-weapon-systems/krasnopol-m2.*
14 *Ibid.*
15 *"Kitolov-2M," KBP, accessed October 14, 2018, http://www.kbptula.ru/en/productions/artillery-guided-weapon-systems/kitolov-2m.*
16 *Walter Williams, "Threat Update Krasnopol--A Laser-Guided Projectile for Tube Artillery," Red Thrust Star, Federation of American Scientists Military Analysis Network, accessed January 29, 2019, https://fas.org/man/dod-101/sys/land/row/krasnopol.htm.*
17 *Walter Williams, "Threat Update Krasnopol--A Laser-Guided Projectile for Tube Artillery," https://fas.org/man/dod-101/sys/land/row/krasnopol.htm.*
18 *Ibid.*
19 *Ibid.*
20 *Michael Peck, "Why Russia's Most Deadly Rocket Launcher Could Soon Be a Threat to U.S. Troops," National Interest, July 7, 2018, https://nationalinterest.org/blog/buzz/why-russias-most-deadly-rocker-launcher-could-soon-be-threat-us-troops-25212.*
21 *"Guided Multiple Launch Rocket System (GMLRS) Dual-Purpose Improved Conventional Munition (DPICM)/Unitary/Alternative Warhead," U.S. Army Acquisition Support Center, accessed October 15, 2018, https://asc.army.mil/web/portfolio-item/guided-multiple-launch-rocket-system-gmlrs-dpicmunitaryalternative-warhead/.*
22 *Michael Peck, "Why Russia's Most Deadly Rocket Launcher Could Soon Be a Threat to U.S. Troops," https://nationalinterest.org/blog/buzz/why-russias-most-deadly-rocker-launcher-could-soon-be-threat-us-troops-25212.*
23 *Joseph Trevithick, "Army Plans to Double Guided Artillery Rocket's Range by Putting Control Fins on Its Tail," The Drive, June 22, 2018, http://www.thedrive.com/the-war-zone/21708/army-plans-to-double-guided-artillery-rockets-range-by-putting-control-fins-on-its-tail.*
24 *Michael Peck, "Why Russia's Most Deadly Rocket Launcher Could Soon Be a Threat to U.S. Troops," https://nationalinterest.org/blog/buzz/why-russias-most-deadly-rocker-launcher-could-soon-be-threat-us-troops-25212.*
25 *"Ukraine conflict: Many soldiers dead in 'rocket strike,'" BBC News, https://www.bbc.com/news/world-europe-28261737.*
26 *Michael Peck, "Why Russia's Most Deadly Rocket Launcher Could Soon Be a Threat to U.S. Troops," https://nationalinterest.org/blog/buzz/why-russias-most-deadly-rocker-launcher-could-soon-be-threat-us-troops-25212.*
27 *Nikolai Litovkin, "Russia to test new anti-tank guided missiles in Syria," Russia Beyond, October 28, 2016, https://www.rbth.com/defence/2016/10/28/russia-to-test-new-anti-tank-guided-missiles-in-syria_ 642965.*

Russian missiles may be used on U.S. armored forces from over-the-horizon (OTH). Such weapons could, even in small numbers, suppress, neutralize, or destroy U.S. armored units.

Fifth, it is important to note that the range of the Russian Iskander-M tactical ballistic missile is 500 km, 200 km greater than the range of the U.S. ATACMS tactical ballistic missile. This allows Russia to strike deeper than U.S. artillery.[28] [29]

Russia has several advantages for their electronic warfare and as observed in Ukraine,

Russia uses electronic warfare for four primary roles:

- Denying communications: There are regions in [the Ukrainian] Donbass where no electromagnetic communications—including radio, cellphone and television—work.
- Defeating unmanned aerial systems: Electronic warfare is the single largest killer of Ukrainian [unmanned aerial] systems by jamming either the controller or GPS signals.
- Defeating artillery and mortars: Russian electronic warfare predetonates or duds incoming artillery and mortar rounds that have electronic fusing.
- Targeting command and control nodes: Russian electronic warfare can detect all electromagnetic emissions, including those from radios, Blue Force Tracker, Wi-Fi and cellphones, which can then be pinpointed with unmanned aerial systems and targeted with massed artillery."[30]

Lastly, Russia possesses advantages to its Fires as demonstrated in Ukraine. Before continuing, it is best to explain that an important factor in modern Fires is counter-battery radar. This is because radar can detect artillery and trace it back to its source, which allows for counter-battery Fires.[31] Additionally,

- Russia employs a combination of dual-purpose improved conventional munitions, scatterable mines, top-attack munitions and thermobaric warheads that have catastrophic consequences when used in preplanned, massed fire strikes. The U.S. has removed all of these warheads from its inventory.
- Ukraine and Russia are using direct fire artillery at a range of 1 to 6 km as overwatch systems, to suppress anti-tank defenses, and as anti-tank weapons.
- The pursuit of increased artillery range is a trend necessitated by greater dispersion on the battlefield and made possible by a combination of unmanned aerial vehicles on the battlefield and the increased capability of counter-battery radar.
- Increased emphasis on counter-battery radar and Fires disrupts opposing fire missions by forcing the enemy to move.[32]

Russian artillery maintains an approximate 3:1 size advantage over the [U.S.] Army's artillery."

Thus, Russia possesses a longer ranged and more robust anti-armor and deep strike capability with its artillery than the U.S. military and comparable allied militaries possess. Russia also possesses a powerful and mature electronic warfare capability. Given, events in Ukraine, which better model a near-peer war than the insurgency in Syria, continued Russian investment in the development of and procurement of precision-guided ordnance, area-effect munitions and artillery equipment will give it a powerful OTH, anti-armor warfare capability greater than U.S. or allied capabilities to prosecute the same type of warfare. This means that Russia may possess a significant advantage over U.S. and allied ground forces.

Again, Fox said, "The Russian forces' capability to find and fix an opponent beyond the range of their adversaries' ability to do the same cannot be brushed aside, especially when considering the associated ability to deliver massive quantities of rocket and artillery fire almost instantaneously."[33] A key point to remember about Russian operations in Ukraine is that they are not joint, because there are no Russian air force or army aircraft in the air. This is ingenious since it negates the need to get clearance of airspace, making fire-support requests timelier than they would otherwise be.[34]

One way the U.S. military is trying to work around this problem is through new military concepts such as multi-domain operations 1.5 and Brigade Deep Battle 2.0. To explain just one of them, Brigade Deep Battle 2.0, infiltrating SUAS teams and forward observers supported by artillery assets hunt and destroy strategic targets, most especially enemy air defense artillery. This allows a handoff to rotary-wing and fixed-wing aircraft that can then hunt and destroy enemy armor in a permissive environment.[35] These concepts are ingenious and hold great promise, yet the fact remains that U.S. ground forces will find it difficult to match Russia's massed artillery raids head-on with their current field artillery technologies.

Other nations than Russia also stand to benefit from Russian exports of its military technologies. This could result in a proliferation of weapons aimed at destroy-

---

28 *"ATACMS Long-Range Precision Tactical Missile System," Lockheed Martin, published 2011, accessed October 14, 2018, https://www.lockheedmartin.com/content/dam/lockheed-martin/mfc/pc/army-tacticle-missile-system-block-ia-unitary-atacms/mfc-atacms-block-1a-unitary-pc.pdf.*
29 *Dave Majumdar, "Why Russia's Iskander Missile is a Killer," National Interest, July 19, 2018, https://nationalinterest.org/blog/buzz/why-russias-iskander-missile-killer-26216.*
30 *Phillip Karber and Joshua Thibeault, "RUSSIA'S NEW-GENERATION WARFARE," Association of the United States Army.*
31 *James F. Dunnigan, How to Make War. ed. Fourth, 101.*
32 *Phillip Karber and Joshua Thibeault, "RUSSIA'S NEW-GENERATION WARFARE," Association of the United States Army.*
33 *Major Amos C. Fox, "The Battle of Debal'tseve: the Conventional Line of Effort in Russia's Hybrid War in Ukraine," Armor, Winter 2017 edition, accessed May 23, 2019, https://www.benning.army.mil/armor/eARMOR/content/issues/2017/Winter/1Fox17.pdf.*
34 *Ibid.*
35 *Capt. Joseph Schmid, 2nd Lt. Hector Lopez, 2nd Lt. Zach Tousignant, and 2nd Lt. Paul Mirabile, "An integrated brigade deep fight Brigade Deep Battle 2.0," Fires, November - December 2018: 20, http://sill-www.army.mil/firesbulletin/archives/2018/nov-dec/articles/18-6_Nov-Dec_web_Schmid.pdf.*

A WS-22 weapon system sits on display during a trade show. (Shadman Samee/Wikimedia)

ing Western ground forces using massed area Fires. One serious concern is that China may already possess an untested ability to use artillery in a devastating way against U.S. and allied troop formations.

First, China is adopting 52 and 54 caliber artillery with a range of up to 53 km when using Extended-Range, Full-Bore, Base-Bleed, Rocket-Assisted (ERFB-BB-RA) projectiles.[36] This is a greater range than that of the new U.S. M109A7 Paladin with its 40 km maximum range using Excalibur precision-guided projectiles. China has so far developed the PLZ-52 self-propelled howitzer,[37] the PLZ-05 self-propelled howitzer,[38] and the lighter weight SH-1 self-propelled howitzer with a 52 or 54 caliber.[39] China already possesses the Laser-guided Krasnopol projectiles that are also available for export from Russia.[40] Two versions called the GP-1 and GP-6 are produced by China.[41]

Second, China possesses several guided-rockets including the AR3,[42] WS-2,[43] WS-3,[44] WS-3A,[45] WS-32,[46] and the A300,[47] which are all Inertial Navigation System (INS) and satellite-guided. All these referenced guided-rockets have a longer range than U.S.

36 *"PLZ52 155mm 52 Calibre Self-propelled armoured tracked howitzer," Army Recognition, January 6, 2019, https://www.armyrecognition.com/china_artillery_vehicles_and_weapon_systems_uk/plz52_155mm_52_caliber_self-propelled_howitzer_technical_data_sheet_specifications_pictures_video.html.*
37 *Ibid.*
38 *Ibid.*
39 *"SH1 Wheeled self-propelled howitzer 155mm," Army Recognition, November 29, 2018, https://www.armyrecognition.com/china_artillery_vehicles_and_weapon_systems_uk/sh1_wheeled_self-propelled_howitzer_155mm_technical_data_sheet_specifications_description_pictures.html.*
40 *"Smart ammo: precision-guided munitions for field artillery," Jane's Defense Weekly, published 2015, accessed October 14, 2018, https://www.janes.com/images/assets/423/54423/precision-guided_munitions_for_field_artillery.pdf.*
41 *Ibid.*
42 *"AR3 370mm MRLS multiple rocket launcher system data sheet specifications information description UK," Army Recognition, March 4, 2011, https://www.armyrecognition.com/china_artillery_vehicles_and_weapon_systems_uk/ar3_370mm_mrls_multiple_rocket_launcher_system_data_sheet_specifications_information_description_uk.html.*
43 *"WS-2 Guided Multiple Launch Rocket System," China Aerospace Long-March International, accessed October 14, 2018, http://cloud.alitchina.com/en/?c=show&m=view&id=23.*
44 *"WS-3 Precision Guided Multiple Launch Rocket System," China Aerospace Long-March International, accessed October 14, 2018, http://cloud.alitchina.com/en/?c=show&m=view&id=20.*
45 *"WS-3A Precision Guided Multiple Launch Rocket System," China Aerospace Long-March International, accessed October 14, 2018, http://cloud.alitchina.com/en/?c=show&m=view&id=19.*
46 *"WS-32 Precision Guided Multiple Launch Rocket System," China Aerospace Long-March International, accessed October 14, 2018, http://cloud.alitchina.com/en/?c=show&m=view&id=21.*
47 *"A300 Precision Guided Multiple Launch Rocket System," China Aerospace Long-March International, accessed October 14, 2018, http://cloud.alitchina.com/en/?c=show&m=view&id=16.*

GMLRS guided-rockets, with a range of 70 km, and all but the WS-32 guided-rockets have a range of 200 or more km. However, INS and satellite guidance likely mean they need to use submunitions against moving targets. China possesses the WS-33 guided rocket which can hit moving targets with its infrared imaging terminal homing guidance and has a range of 60 km.[48] China also possesses the WS-43 Loitering Attack Weapon System which can hit moving targets and has a range of 60 km.[49] China has the SR5 Guided Multiple Launch Rocket System that can fire various guided-rockets with maximum ranges of 40 km to 70 km.[50] This range is equivalent to current U.S. GMLRS guided-rockets. China's Type 90B MLRS can fire salvos of 122 mm rockets with various warheads at a range of 20-40 km.[51] Lastly, China possesses the CM-501G and CM-501GA precision attack weapons, precision-guided missiles that can engage point targets with a range of 70 km and 40 km, respectively. The missiles can also perform reconnaissance and damage assessment, and they can be fired from planes, ships, or ground vehicles.[52] [53]

Third, China possesses numerous tactical, short-range, medium-range, and intermediate-range ballistic missiles, which can threaten not only the U.S. rear but also threaten U.S. bases throughout the Western Pacific.[54]

Thus, China is acquiring field artillery assets that could mass Fires against U.S. or allied forces with weapons technologies that far outrange similar U.S. artillery.

Additionally, Ukraine shows that the Russian military, and likely the better funded Chinese military, can afford the necessary C4ISR assets, vehicles, ordnance, and training to fight land wars with a heavy emphasis on massed area Fires, and potentially massed precision-guided Fires. This makes sense since the unit cost of Western armor is in the range of millions of dollars,[55] [56] which allows for very expensive munitions to be cost effective in the attrition of Western armored forces.

It must be stated that these advantages to near-peer militaries came about due to a lack of investment in U.S. artillery, and it reinforces the strategic need to prioritize artillery modernization above all other acquisition projects for U.S. ground forces, a position already embraced by the U.S. Army.[57]

Conclusion

This article assessed the threat presented by near-peer competitors against U.S. and multinational forces. An area of great concern is the longer range enjoyed by Russian and Chinese Fires units. Thus, the acquisition of the Tail Controlled Guided Multiple Launch Rocket System guided-rockets, the Extended-Range Cannon Artillery howitzers, and the Precision Strike Missile are programs of the highest priority to match or exceed near-peer capabilities. Fortunately, such is already the case with the U.S. Army.

In the next article in this series, the future of war will be assessed considering near-peer Fires capabilities.

Steven Yeadon is an independent scholar holding a Bachelor of Arts in political science from the University of Central Florida. He is a published author in the field of military operations. He is currently preparing for work as a military analyst.

48 *"WS-33 Precision Guided Multiple Launch Rocket System," China Aerospace Long-March International, accessed October 14, 2018, http://cloud.alitchina.com/en/?c=show&m=view&id=22.*
49 *"WS-43 Loitering Attack Weapon System," China Aerospace Long-March International, http://cloud.alitchina.com/en/?c=show&m=view&id=49.*
50 *"SR5 122mm/220mm GMLRS Guided Multiple Launch Rocket System," Army Recognition, December 19, 2018, https://www.armyrecognition.com/china_artillery_vehicles_and_weapon_systems_uk/sr5_sr-5_guided_multiple_launch_rocket_system_gmlrs_mlrs_122mm_220_mm_technical_data_sheet_specifications_pictures_video_11601162.html.*
51 *"Type 90B 122mm MLRS Multiple Launch Rocket System," Army Recognition, published May 16, 2019, https://www.armyrecognition.com/china_artillery_vehicles_and_weapon_systems_uk/type_90b_122mm_mlrs_multiple_launch_rocket_system_technical_data_sheet_specifications_pictures.html.*
52 *"CM-501G Precision Attack Weaponry," Xinhuanet, published May 27, 2015. http://www.xinhuanet.com//mil/2015-05/27/c_127846853.htm.*
53 *Ibid.*
54 *Missile Defense Project, "Missiles of China," Missile Threat, Center for Strategic and International Studies, June 14, 2018, last modified June 15, 2018, https://missilethreat.csis.org/country/china/.*
55 *"ABRAMS TANK M1A2," The Office of the Director, Operational Test and Evaluation, accessed January 28, 2019, http://www.dote.osd.mil/pub/reports/fy1999/pdf/army/99m1a2.pdf.*
56 *"BRADLEY FIGHTING VEHICLE SYSTEM-A3 (BFVS-A3)," The Office of the Director, Operational Test and Evaluation, accessed January 28, 2019, http://www.dote.osd.mil/pub/reports/fy1999/pdf/army/99bradley.pdf.*
57 *Todd South, "Return of Fires: How the Army is getting back to its big guns as it prepares for the near-peer fight," Your Army, Army Times, August 27, 2018, https://www.armytimes.com/news/your-army/2018/08/27/return-of-fires-how-the-army-is-getting-back-to-its-big-guns-as-it-prepares-for-the-near-peer-fight/.*

Joint terminal attack controllers stand by ready to integrate air-to-ground Fires and talk with the aircraft pilot to coordinate close-air support during BOLC Class 004-19's Redleg Culminating Training Event Aug. 8 at Fort Sill. (Monica Wood/Fires Bulletin)

FA hosts ADA at Redleg CTE for first time

By Mitch Meador

In a first for the Fires Center of Excellence, 23 Air Defense Artillery Basic Officer Leader Course lieutenants in Class 002-19 joined Field Artillery BOLC lieutenants in Class 004-19 for the last day of their Redleg Culminating Training Event Aug. 8.

"Our role out here today is to see how the aircraft actually come in and do their offensive attacks. So we, as air defenders, we actually support maneuver units. We support their defended assets. So they had two defended assets out there (in the training event)," explained Staff Sgt. Gregory Brookes, a 42 Papa BOLC instructor for ADA lieutenants going for the short-range (SHORAD) track phase.

The ADA BOLC lieutenants got to see how they would have been employed on the hilltop observa-

tion post. They also saw the avenues of approach for the aircraft and learned how they would defend ground forces from enemy aircraft, along a tree line using terrain, Stinger missiles and defensive tactics.

Instructors have long wanted to introduce ADA lieutenants to what goes on at Redleg CTE, but ADA BOLC is 19 weeks long, which doesn't mesh with anybody else's training schedule, Brookes noted. It just so happened that this time the planets aligned, and they were able to come out to the observation post to see how they could defend an asset.

"So (the FA lieutenants are) using it as offense, but we're actually using it totally opposite," Brookes said. "We're taking the aircraft that's coming in as enemy, and we're seeing how we can actually employ our Avengers and defend the asset."

What would the ADA instructor like to see his lieutenants get out of the lesson?

"I want them to understand the defensive tactics that they can use. We go by BOWMEDs, which is balance of Fires, overlapping Fires, weighted coverage, mutual support, early engagement and defense and death. If they understand those key principles, then they can deploy anywhere in the world, without an issue," Brookes said.

Having boots on the ground at Redleg CTE gives air defenders and Avenger crewmembers key insights on where to engage their targets, whether it's inbound or outbound.

"Now they get to see the better picture and actually get a live picture to see how they actually come in and scoot out," Brookes said.

This class of ADA lieutenants still had a month and a half to go before graduation. The FA lieutenants, on the other hand, graduated Aug. 13, having wrapped up Redleg CTE Aug. 8.

"It was really fun to get out there and utilize all the skills that we had and see all the training we had come together," said 2nd Lt. Hugh Fitzmaurice, whose first duty assignment after graduation will be at Fort Polk, La.

Asked if he felt like he got into the right branch, Fitzmaurice said, "Definitely. I always wanted to go FA. It's exciting to finally be going out into the force."

Besides the seven FA lieutenants standing on Andrews Hill, about 70 more were in the field. Half were on the gun line and half on Apache Hill.

They were in two-member teams paired up with a contractor and a civilian Joint Fires Observer Course instructor, according to Sgt. 1st Class Michael Huddleston,

Lieutenants in Field Artillery Basic Officer Leader Course Class 004-19 share binoculars to scope out the incoming fighter aircraft during the Redleg Culminating Training Event Aug. 8. (Monica Wood/Fires Bulletin)

One of two F/A 18 Hornets performs a "show of force" flyover in memory of Air Force Maj. David Gray on Fort Sill Aug. 8, seven years to the day after he was killed by insurgents while supporting Operation Enduring Freedom in Afghanistan. (Monica Wood/Fires Bulletin)

noncommissioned officer in charge of the Army Multi-Domain Targeting Center.

The FA lieutenants learned how to plan, prepare and execute the integration of surface-to-surface and air-to-surface Fires, according to Lt. Col. Nick Sargent, a British exchange officer nearing the end of his time as leader of joint integration within the Army Multi-Domain Targeting Center.

"When you look at the requirements that we'll have levied upon us in large-scale combat operations, we can't afford to stop artillery shooting to allow close air support to occur. So we're teaching them the techniques that allow them to develop attack geometry that allows a simultaneous massing of joint Fires, both from the air and from the ground," Sargent said.

Also part of the mix Aug. 8 were Air National Guard students from the Initial Combat Skills Training class that the 137th Combat Training Flight teaches at Will Rogers Air National Guard Base in Oklahoma City. Once they graduate they'll return to their Guard units and most likely take the Joint Terminal Attack Controller (JTAC) Qualification Course in the next six months to a year.

"We are here with some of our students observing training. The training is between the Field Artillery BOLC class with their culmination training exercise and then also some JTACs. They are from the 6th Combat Training Squadron. They are here at Fort Sill, and they assist with the JFO (Joint Fires Observer) Course," explained Air Force Maj. Jeffrey Hansen, director of operations with the 137th Combat Training Flight based at Will Rogers World Airport.

"What you are seeing is the combination of JFO training with JTAC training. The JFOs are the experts in field artillery integration with the JTACs as the air power experts. The JFOs are actually deriving targeting data, passing that targeting data to the JTAC to help the JTAC build the (close air support) brief, and having your Army and Air Force partners work together to essentially seamlessly integrate surface Fires and air-delivered Fires," Hansen said.

He cited two things going on: First, a ground-based threat being suppressed and flicked with artillery, after which air power is used to destroy it, thus demonstrating altitude deconfliction. Second, using artillery to suppress a threat while using aircraft to destroy a nearby target that would be higher up on the ground commander's intent, thus demonstrating lateral deconfliction.

"This is a practical example for deconfliction techniques for joint Fires we're actually able to demonstrate to them today," Hansen said

Mitch Meador graduated from Oklahoma State University in the bicentennial year of 1976 and has been in the newspaper business for more than 40 years. His father, Master Sgt. Chester ("Chet") Earl Meador, deployed to Europe with Company B, 1st Battalion, 354th Infantry, 89th Infantry Division, three weeks after D-Day and fought in the Battle of the Bulge.

AMCOM's display Patriot relocates to home of Air Defense Artillery

By Gina Baltrusch

The decommissioned Patriot missile launcher on display in front of the U. S. Army Aviation and Missile Command's headquarters departed Redstone Arsenal, Aug. 28, headed for a new home at the front gates of Fort Sill, Okla., to represent air defense artillery units and Soldiers stationed there.

It's been more than 10 years since the U.S. Army Air Defense Artillery School and many ADA units were relocated to Fort Sill as part of a Base Realignment and Closure. The 30th Air Defense Artillery Brigade is a subordinate unit of the Fires Center of Excellence, which is part of Training and Doctrine Command. The 31st Air Defense Artillery Brigade and its three battle-ready air defense battalions are organized under the 32nd Air and Missile Defense Command, at Fort Bliss, Texas, part of the Army's Forces Command.

"For decades, Fort Sill has been commonly known as the 'Home of the Field Artillery' – there are numerous static displays of howitzers and cannons all around the installation. In contrast, when it comes to having a visible presence on the installation, it's not easy to tell that Fort Sill is now also the 'Home of the Air Defense Artillery,'" said AMCOM's Missile Maintenance Officer Chief Warrant Officer 4 Araceli Rial. "So, when we received a request from the 30th ADA for our display launcher, we didn't hesitate to agree. It just seemed right that the ADA school and front-line ADA Soldiers should have our Patriot to represent them at their new home station."

A cooperative team of Patriot system and transportation experts from both installations pooled their knowledge and experience to figure out how to partially dismantle and load the launcher, which has greeted travelers on Martin Road passing the Sparkman Center, during rain or shine, for almost 30 years.

In order to transport the launcher on public highways, the top two of the Patriot's four missile canisters had to be removed and transported separately from the launcher so it would safely fit under bridges along the way.

The team had a little trouble when they encountered rust on one of the launcher's actuators, piston-like components which raise and lower the missile canisters on the launcher.

"Naturally, it has some rust after all those years outside," said Joe Woods, transportation lead from Redstone's Logistics Readiness Center, as LRC mechanics assessed the situation. "But, that's not anything we can't deal with – we just need to get the parts to start moving a little bit."

Some hammering, lubrication and a cutting torch did the trick, eventually allowing the missile canisters to be lowered using a hand crank to a level position for disassembly. The two canisters, then the launcher were lifted by crane onto flatbed trailers to begin their 760-mile journey.

"It definitely took the whole team to get the launcher ready for the trip," said Electronic Missile Systems Technician, Chief Warrant Officer 2 Jeremy Hedlind, who traveled to Redstone Arsenal from Fort Sill's 30th Air Defense Artillery Brigade to shepherd the launcher to its new home.

"We're really excited to have this Patriot coming home with us," Hedlind said, smiling broadly as a missile canister was crane-lifted for loading. "We had already searched many other units and maintenance depots for one soon to be decommissioned that we might be able to have, but had no luck. So when AMCOM said we could come get this one, we came."

The Patriot missile launcher arrived the afternoon of Aug. 29 at Fort Sill, where it will get a facelift of sanding and fresh paint, said Hedlind. It is destined for prominent placement at Fort Sill's Bentley Gate on Sheridan Road to represent the "Home of Air Defense Artillery" alongside "Home of the Field Artillery" displays.

The space left by its absence in front of the Sparkman Building will eventually be filled.

"We're already on the lookout for another missile or rocket system ready for retirement," said Rial.

Gina Baltrusch, serves as a public affairs specialist with the U.S. Army Aviation and Missile Command, at Redstone Arsenal, Alabama. With almost 25 years in Army public affairs, including seven as an active-duty Soldier (June 1991-November 1998), her experience includes media relations, public involvement, project-management support, writing, photojournalism, broadcasting and emergency management communications.

In the next issue of Fires

November-December 2019, Fires in cyber, electronic warfare and space. The proliferation of new and sophisticated conventional capabilities are emerging that are designed to exploit U.S. Army weaknesses. From unmanned aerial systems, to being tracked across the electromagnetic spectrum, what is Fires role as the future of war becomes more and more reliant on networks of computers? The Nov.-Dec. issue will discuss fighting in degraded and destroyed operations; operational security liabilities; and training to emphasize cover, concealment, dispersion, and operating without emitting a signal.

The deadline for submissions is Oct. 1, 2019. Send your submissions to usarmy.sill.fcoe.mbx.fires-bulletin-mailbox@mail.mil or call (580) 442-1090 for more information.

Members of 2nd Battalion, 263rd Air Defense Artillery, South Carolina National Guard, participated in an International Joint Force assessment of the first generation Chemical Agent Detector Colorimetric Reader (CADCoR) prototype, Clemson, South Carolina, July 13, 2019. Feedback from the Soldiers will be used to evaluate, improve and assess the CADCoR in determining calorimetric responses. (Photos by Capt. Ed Duvall/678th ADA BDE)