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The FA Journal is published quarterly by USFAA. Most of the content is orginially sourced from the US Army Field Artillery School and Marine Detachment, Fort Sill, OK. The views expressed are those of the authors, not the Department of Defense or its elements. FA Journal's content doesn't necessarily reflect the USFAA, USMC or US Army's positions and doesn't supercede information in other official Army or Marine publications. Use of news items consitutes neither affirmation of accuracy nor product endorsements.

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LTG David Halverson U.S. Army, Retired Chairman of the Board, USFAA Chairman/CEO, Cypress International

Looking to the New Year Ahead!

We've all seen the memes on social media about 2020. It was a trying year for all of us. The pandemic, politics, civil uprisings, wildfires, were among a list of crises too long much more. to print. All of our lives were impacted by one or more of these issues this past year. However difficult the year was, the Board and plaques and \$1500 to the first, sec-Staff at USFAA continued to push ond and third place winners. Any through to make your professional association work better for you. We sustained quarterly printing of the FA Journal, bringing you issues packed with thought-provoking articles from throughout the branch. We also made your membership dues stretch further and were able to award over \$17,000 in chapter grants to your unit chapters.

There were many new things US-FAA rolled out in 2020. The Staff Chapter, MO ARNG, increasing their initiated rebranding, website revitalization, digital member database, electronic awards, membership, and scholarship submission and support level, whether it be in portals. These upgrades position processing St. Barbara Awards or us at the ready for the next wave of in new programs we create for our progress in association operations. members. Be on the lookout for a We brought to life a new six-part, series of webinars hosted in conprofessionally produced, documen- junction with LTG (R) Richard Fortary on Field Artillery history. Each mica and the Capitol Cannoneers episode covers a different era of the branch. These are available on the website for any of our members to view and share. With the DOD's push for a fitter fighting force, we aligned fitness with our branch Mark McDonald, members of the pride and history in the first-annual King of Battle Virtual Fitness Challenge. For the first year, we started at the beginning of U.S. FA History, re-tracing Henry Knox's Noble Train of Artillery, 321 miles you. May St. Barbara continue to from Fort Ticonderoga to Boston. watch over you and keep you from Now we are ready to deliver the harm! program to our chapters as an additional way to help them raise funds. The FA store received a product offering overhaul as we continue to watch apparel and gifting trends.

Going into 2021, we are a onestop-shop for professional content, branch history, traditions, howto guides, FA merchandise, and so

Our friend, LtCol (R) Michael Grice donated the funds to start a Writing Award. In 2020 we awarded custom article published in the FA Journal during the year was eligible. A panel made up of branch leadership voted which pieces best fit the contest's theme of "what can artillerymen do better?"

Additionally, we held a membership contest amongst the chapters, giving everyone the ability to earn more money in their yearly grant. Our top performer was the Truman membership by 300%.

In 2021 we are looking forward to providing you with the same service Chapter. The first-ever live broadcast of the Musical Tattoo will happen on 26 March. This year's event will honor MG (R) Mark Graham.

I, along with President, MG (R) BOD and Staff will continue to revitalize the association for the betterment of the branch and our members. We are always open to suggestions and love to hear from



Colonel C. A. Tavuchis **Commanding Officer** US Marine Corps Artillery Detachment, Fort Sill, OK

COVID-19: Challenges and Opportunities For The Training Establishment

The year 2020 will go down as an unprecedented year for the Marine Corps formal schools training establishment. Not only were we challenged to aggressively modernize our curricula and transform the teaching and learning experience Corps' Moodle applications, adto our instructors and students, the Commandant of the Marine Corps published his seminal Commandant's Planning Guidance that served as a harbinger of tectonic changes to come to the artillery and fire support community in the coming years.

enough, we also witnessed the outbreak of the most significant global medical emergency in over one hundred years – the novel coronavirus or severe acute respiratory syndrome coronavirus 2, or SARS-CoV-2, Coronavirus 2019 or COVID-19.

The rapid imposition of the necessary risk mitigation measures designed to protect our instructors, staff, students and families leaves little doubt to the severity of the pandemic and its impact on our organization and bears mention as we lean into 2021. The fact is, we were ordered to continue the mission

and, due to the intellect, drive, flexibility and creativity of our instructors, we not only made mission we made the mission better.

The organizational response and mitigation effort levied new and additional requirements on the MarDet that were necessary to realize the mission. Some of these measures accelerated certain procedures while driving us to cease or modify other procedures on the enduring training continuum that bears highlighting. While the world breathes a collective sigh of relief with the news of a number of vaccines rapidly developed and being deployed, the after effects and implications of the pandemic have presented our community with both challenges and opportunities worthy of highlighting.

By the time the pandemic emerged mission. The more likely reality, during the spring of 2020, the Mar-Det was well on its way to working towards digitizing content through our Learning Modernization Council (LMC), migrating content and handouts to wireless tablets, online platforms such as the Marine justing our programs of instruction (POI) to accommodate increasing digital platform-centric training and instructing. The development of online content and guizzes, and a more decentralized teaching format realized efficiencies for our instructors and student alike. As As if these challenges were not we worked to isolate and preserve our instructor capacity during early COVID-19 outbreaks, we accelerated our modernization. The progress has been "burned in" and there is now no turning back as we are – on average – at almost 80 percent digitized across all POIs.

Another enduring and positive outcome from the COVID-19 pandemic is the emerging reality of telework – or working from home or an alternative location. While often maligned and criticized about relationships. due to our aggressive professional culture of physical presence as formal learning center such as the leadership, what we have realized - MarDet, it is incumbent upon leadalong with our civilian counterparts ers at all levels to remain engaged.

- is, that with the right tools, leadership, motivation and intent, telework can be as productive as being present for duty. Across the enterprise, our work sections and schools are embracing telework as a completely viable alternative - when necessary – to continue the mission, mitigate exposure of high risk personnel, and preserve the health of our staff, instructors, students and their families.

While several positive outcomes are highlighted as a result of our COVID-19 response and mitigation procedures, there remain a number of things we should not be doing anymore and challenges to be resolved. We remain hopeful that the vaccines and other measures will serve to prevent the dramatic spike in cases and the implications to our however, we will continue to wear face masks, remain 6 feet apart and avoid crowding. These measures will continue to keep us from gathering like we are accustomed to whether for physical training, large classes, or unit-level social gatherings such as our annual Saint Barbara's Day and Molly Pitcher rituals – not to mention the sacred Marine Corps Balls and the annual Devil Dog Run. The social and familial implications to our staff, students, and families are profound and will continue to affect morale and how we interact in the coming months. For example, there remains significant strain on our family support systems as personnel cannot obtain reliable babysitting services. To be sure, we must redouble our efforts and find ways to remain connected, especially when we suffer spikes in COVID-19 cases (as most units have). It remains a leadership challenge (and imperative) at all levels to ensure we are engaged with our Marines and continuing to foster our professional and personal

For students arriving at entry level

Until recently, our Marines did not enjoy the privilege of postboot camp leave to visit home and we continue to execute the "Minimal Exposure Movement Plan" or MEMP. The plan delivers our students from the two Schools of Infantry to the MarDet, Fort Sill in a sterilized mode of transportation. There is no doubt of its effectiveness, like many of the procedures imposed, it requires us to be more engaged with our Marines. This is a COVID-19 related adaptation that will likely run its course as we anticipate a return to the status quo, once conditions permit.

Regardless of the circumstances created by COVID-19, the silver lining remains that our staff and instructors continue to demonstrate the type of resilience and mastery of their craft that we demand as professionals. To a member or the unit, the community in general – and the MarDet, Fort Sill in particular. remains proud of its steadfast and demonstrated ability to generate the necessary personnel to keep the Fleet Marine Forces ready to answer the Nation's call at a moment's notice. Despite conditions that are - in many respects akin to a combat deployment, our Marines continue to make mission despite the daily challenges and adaptations that COVID-19 demand.



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•You receive a complementary membership with AUSA. As long as you remain a member of the USFAA, vou will retain membership with AUSA. You are entitled to all of their member benefits and the legislative support from their lobbying arm. •We also have a robust board of re-

tired senior leaders who are available to advise and support our chapters professionally.

The team at the USFAA is eager to support you! If you have ideas on how we can provide better support please feel free to contact us.





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And Annual Annard LtCol (R) Michael Grice

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*Be the grandchild of a member. applicant.

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*Be accepted for admission or or university with a minimum academic load of 12 semester mester hours (graduate).

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This Writing Award was established by LTC (R) Michael Grice and USFAA to promote involvement in the creation of content for FA Journal. It was meant to encourage creative thinking and sharing of ideas among both officers and enlisted, Soldiers, Marines, National Guardsmen and Reservists throughout the branch. Eligibility is open to any new article published in the four FA Journal issues of 2021. The topic of this year's contest, "Chal-lenge the status quo – What can we as artillerymen do better?". *See Submission Guide on Page 57.*

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IMPORTANT UPDATE TO THE APPLICATION PROCESS FOR ST BARBARA AND MOLLY PITCHER AWARDS

Honorable Order of Saint Barbara, Ancient Order of Saint Barbara and Artillery Order of Molly Pitcher Awards will only be accepted through electronic submission on the USFAA website www.fieldartillery.org. Use your member log-in to access the award submission page.

POC's can use the membership directory on the website or use the look-up field on the award submission page to check which nominees have current memberships. Chapter rosters can also be accessed through the membership directory by clicking on filters, then using the drop down menu to select chapter name.

Memberships can be obtained through the membership link on the website. Awards packets can be paid using a credit card or check electronically at the end of the submission. We no longer process memberships and awards together.

<u>FAQ:</u>

QUESTION: Is the Multi-Nomination/Single Nomination form still valid?

No, All award submissions must be submitted via the online process. No exceptions will be made.

QUESTION: Who is my approval authority for awards?

All AOSB are submitted to the FA Commandant for approval, HSB and Molly Pitcher's are approved by your units O-6 FA Commander (O-5 for National Guard Units). If you do not have an FA Commander, your award will be forwarded to the USAFAS to be approved.

QUESTION: Do I need to submit a write up and nomination memo?

No. We no longer need an approval memo submitted with your awards. Nomination write-ups are only needed with AOSB, or if you do not have the proper approval authority. There is an attachment area for these awards on the online submission form.

QUESTION: Do my nominee's need to be members?

Yes, All nominees must be members prior to submission for an award to obtain eligibility.

QUESTION: Can my unit pay for our nominees memberships?

Awards and Memberships can not be purchased together and we discourage units from paying for each nominee's membership. Nominees must be members prior to electronic submission for awards to be eligable.

QUESTION: How long does it take to process my awards?

All awards must be submitted 30 days prior to presentation. All submissions received after the 30 day window will incur a late fee.

QUESTION: How do I obtain a log in for the awards process?

Your log in is the same as your memebr log in. If you are not a member you must obtain a membership.

If you have further questions please email awards@fieldartillery.org

Now Is the Time For A Force Field Artillery Proficiency Test

By: MAJ Frederick J. Carr, COL Bryan L. Babich and MG (R) Richard Longo

It is the first day of a future Mission Command Training Program (MCTP) Warfighter Exercise. The Division Artillery (DIVARTY) Commander is receiving his first Battle Update Brief. During final comments the Commander asks the following questions....

CDR: S2, how are we feeding the G2, ACE, and FAIO our counter-fire analysis and predictive Battle Damage Assessment based on decay time and fire order? S2: Sir, Division will provide us with those estimates from what is identified from collection assets, and additionally, we have to wait for the 35T to get DCIGS talking to

CDR: Battle Captain, is the battlespace-owning BCT Commander providing an adequately-sized operation area to enable the survivability moves of our HIMARS battalion?

AFATDS.

Battle Captain: I'm not tracking which BCT's battlespace we're operating in and not sure whether the OPAREA is adequate because I am more of a "cannon-guy."

CDR: S4, is our ammo count listed as pods or rockets and what is the Controlled Supply Rate for our long-range munitions?

S4: Sir, I don't know, the division order did not say and I asked division to give me our Required Supply Rate.

CDR: S6, is our AFATDS talking to adjacent units, JAGIC, and Division Fires?

S6: Sir, we're up with Division and JAGIC. I'll work with the AFATDS FSR on which adjacent units we need to communicate with.

With the reintroduction of DI-VARTYs across the active Army, there has been continuous and evolutionary improvement in performance as lessons are learned and shared from one training event or unit to the next. However, the principle challenge that DIVARTYs face is a lack of experience of the NCOs and Officers in the Command Post. This is compounded by the fact that the majority of these leaders primarily come from a cannon artillery background and lack a basic understanding of how to fight MLRS and

HIMARs, which are the predominant weapon systems available to our DIVARTYS. In most cases, assignment at DIVARTY will be an individual's first time operating at the brigade level, let alone within a DI-VARTY or Force Field Artillery (FFA) headquarters. Sometimes there will be an Operations Sergeant Major or

a Fire Control Noncommissioned Officer with experience, but everyone else will be new to DIVARTY, and just as importantly, division operations.

The primary training opportunity for a DIVARTY and staff is in the preparation for, and execution of, a MCTP Warfighter exercise. The current model is for MCTP to provide a week of "academics" in a sterile classroom environment where they coach the seemingly always new members of the team on the fundamentals and doctrine of DIVARTY operations, as well as the best practices of previously observed units. This is followed by a series of division-led Command Post Exercises (CPX), culminating in the Warfighter exercise. Usually, there are three of these CPXs, generally progressing from crawl to walk to run.



competing time demands including the certification and qualification of all artillery batteries and first time operating at this levbattalions in the division. The very best DIVARTYs use these training and readiness oversight events as training opportunities for their own command posts. However, the training value is limited as there is not the external stimulus necessary to prepare them fully for the intensity of a WFX. The reality of the situation is that DIVARTYs are two headed organizations. One is focused down and in on certifications, and the other is focused up and out to operate as a Force Field Artillery Headquarters (FFAHQ). Most view DIVARTY as the former rather than the latter, and almost all Red Books serve as proof; as they are built around certifications, rather than fighting as a FFAHQ.

What is missing from this sequential progression of training readiness is an understanding of exactly what fundamental knowledge is necessary of every member of the command post in order to get the most benefit from the collective training event, and ultimately to be prepared to fight as the division's FFAHQ.

In our field artillery battalions, we begin to build training readiness with an Artillery Skills Proficiency Test (ASPT). We execute this evaluation prior to progressing through our artillery tables as we build collective readiness. This test serves as a verification that the individual has the foundational knowledge required prior to building further individual and collective skills.

Our recommendation is that we use a similar model for DIVARTYs to ensure the foundational knowledge exists at the individual level. Just as these proficiency tests are the first gate in our collective training strategy in artillery battalions, a similar, fundamentals-based proficiency test will enable building collective readiness at the DIVARTY level.

We should state at the beginning that what we are recommending here would apply just as well to Field Artillery Brigades serving in a FFAHQ role.

DIVARTYs have a multitude of Division Artillery Skills Proficiency Fires: Test (DASPT).

el for most involved. We recommend that every staff primary and alternate officer, and noncommissioned officer, to include the fire control and counter-fire sections, in the DIVARTY headquarters be required to demonstrate mastery of the necessary fundamentals in the form of a certification. This will be achieved by passing a two part test. The first part is MOS-immaterial and focused on MLRS and HIMARS knowledge, as well as doctrinal requirements and duty descriptions for a FFAHQ. Each leader, regardless of MOS, will be required to demonstrate an understanding of basic system capabilities, ammunition nomenclature, ranges, effects and firing reload times. The second part of the DASPT would focus on cross-educating the same audience on how to "artillerize" specific warfighting functions. The purpose of this part is to create a common language across the DIVARTY command post and an appreciation for how their work interconnects and enables the entire staff.

The following paragraphs provide recommended learning objectives that can serve as a basic framework for our proposed DASPT.

The test must demand under-As mentioned earlier, this is the standing of Fire Support Coordination Measures, the targeting process, and the capabilities and limitations of the fires systems assigned, or likely to be made available, to the division. In addition, a basic comprehension on how the so-called "Deep Fight" is delineated between Corps and Division using the Fire Support Coordination Line (FSCL) and Coordinated Firing Line (CFL) or other control measures. Other emphasis areas should include how a DIVARTY coordinates with the Division's Fire Support Element (FSE) and Joint Air-Ground Integration Cell (JAGIC), validates a No Strike List, airspace management planning factors, and tactical employment of all enablers provided from outside the division. **Command and Control:**

The staff should demonstrate understanding of Command and Support Relationships and how or with whom a DIVARTY coordinates to ensure synchronized movement and survivability throughout the Division's battlespace. The staff should also understand the various communication systems and how they provide access to the upper and lower tactical internets. In addition to Command and Control requirements, the members of a





A M777A3 from C BTRY, 3-320th (Red Knights) is carried into battle during Platoon Qualifications. Photo by CPT Rance Blake, US Army

DIVARTY staff require a basic understanding of the fires kill chain architecture with AFATDS, JADOCs, DCIGS and TAIS as just a few examples.

Sustainment:

The DASPT should focus on foundational artillerv sustainment knowledge to include definitions of a required supply rate (RSR) and controlled supply rate (CSR), the concept of area support, and the capabilities and limitations of the logistics assets available to the DI-VARTY. Other areas of sustainment emphasis include the management of PODS versus individual rockets or missiles, the requisition process, how the loss of a launcher effects ammunition, and how to enable the movement of supplies through Brigade Combat Team's battle space. Specific to personnel, it is crucial that this warfighting function, and those that feed it information, can

demonstrate the understanding of a understanding of how to synchrocritical Military Occupational Specialties within the artillery commu- Intelligence Warfighting functions. nity as they translate to operational The staff must understand both crews. Ultimately, this will enable friendly and enemy radar capabilreporting and requisition to ensure ities and zones, capabilities of oththat replacements, and their timely er friendly and enemy collection arrival to a firing unit, creates combat power synchronized with operational pacing items. The replacement of a launcher is useless if a understand the Battle Damage Asunit does not have the Soldiers with sessment (BDA) and the impacts of the right MOS to put it in action. **Protection**:

The test must demand understanding of DIVARTY critical assets and placement on the Prioritized how this Intelligence drives DI-Protection List (PPL), the self-secure capability of the command post Division's Targeting Process and and subordinate units, and active the greater Intelligence enterprise. and passive protection measures. Intelligence drives all warfighting The DIVARTY staff should under- functions within the DIVARTY HQs stand how to communicate with the and its emphasis within the DASPT Division's Protection Cell and en- should be commensurate. sure appropriate enablers such as

Avengers, Military Police escorts, and Engineers are synchronized with the movement of firing units. Maneuver:

Every member of the DIVARTY staff should demonstrate basic comprehension of maneuver graphics with a focus on ground and airspace control measures. The staff must understand how to coordinate with battle space owning maneuver units to ensure movement is synchronized in time and space, and informed by the enemy situation at the ground level. This would include understanding the capability and limitations of the division Combat Aviation Brigade (CAB) for supporting the suppression of enemy air defense, and de-conflicting Position Areas for Artillery (PAAs) and position area hazards (PAHs) with friendly air corridors to enable responsive fires. Also, for planning purposes, the staff must be proficient in the tactical considerations for movement of HIMARS, MLRS, and Radars throughout the battlespace to avoid threats and minefields to include what informs decisions for survivability move criteria and movement to alternate PAA's. Intelligence:

Most critical to the foundation of a proficient DIVARTY staff is the nize and integrate the Fires and and weapons systems, and be able to articulate the associated risks to the commander. The staff should target decay time, enemy displacement times, and effects achieved by each specific friendly munition. In addition, the staff must understand VARTY's Counterfire Analysis, the



Way Forward:

This article provides a recommendation for a DIVARTY Artillery Skills Proficiency Test and a Warfighting Function framework for its development. As with the established Field Artillery Skills Proficiency Test, a similar doctrinal addition that provides common core requirements for all DIVARTYs would be optimal for implementation and assurance this initiative would endure. Divisions and DIVARTYs would have the latitude to enhance, or add-to, based on their unique mission requirements.

The DIVARTY Artillery Skills Proficiency Test is a "First Step" in the Staff's training progression. DIVARTY's should consider incorporating this test into their reception plan for new Staff officers and NCO's with a study guide and appropriate amount of time to prepare for the exam. Within a typical DIVARTY Warfighter Exercise training glide path, the target audience should complete this requirement prior to attending the Mission Command Training Program's (MCTP) Academic Week. With a basic understanding of systems, processes, and functions of a DIVARTY Staff, the DASPT will provide a solid intellectual framework to get the most out of these collective training opportunities.

About the Authors:

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vision Fires in the Sa Observations from a Division Level Rotation at the NT

By: LTC Derek R. Baird, Wolf 07, NTC Senior Fires Trainer

(NTC) is centered on its Brigade with at the NTC. Deploying to the level training environment, traditionally known to maximize unit the DIV Fires Enterprise, to train lethality, deployability, and expertise. During September 2020, the establishing a main command post NTC hosted its first Division level rotation complete with a Division headquarters (HQ), a Division Artillery (DIVARTY) HQ physically supported by a MLRS Battalion, and several additional constructive Rocket and Field Artillery Battalions, to include a virtual Extended Range Cannon Artillery (ERCA) Battalion. A reinforced Cavalry Squadron (RCS) supported by a Field Artillery and Air Cavalry Brigade, and additional enablers physically operating throughout the NTC dirt, affectionately known as the sandbox, supported the Division. This complex rotational design included the physical realm at the NTC, and simultaneous, simulated virtual operations. Rotation 20-10's complexity enabled the Division's Fires Enterprise to execute targeting, and shape the Division's operational environment by synchronizing, and integrating joint and organic assets. The challenges the DIV Fires Enterprise faced are not uncommon, and very similar to challenges that

The National Training Center Brigade Combat Teams (BCTs) deal NTC enabled all headquarters across basic, fundamental tasks such as (MCP) and TAC, and exercising field craft. This white paper focuses on observations on communications architecture that enable a joint, permissive environment through air and ground integration, targeting processes, and rehearsals.

> The tyranny of distance stresses the communication architecture of every organization deploying to the National Training Center. Organizations develop, and exercise their primary, alternate, contingent, and emergency (PACE) communications architecture to maximize their ability to communicate at distance, and rapidly move up and down the PACE plan during electronically degraded environments. The Division's Fires PACE plan relied heavily on upper tactical infrastructure (Upper TI) to manage communications, and command and control over enormous distances at the NTC. The PACE plan included FM, HF, and HCLOS, but were underdeveloped, particularly the use of retransmission (retrans) teams to support the FM

U.S. Army photo by NTC Vulture Team. FDC command post establishing command and control systems.

network. This underdeveloped PACE plan, and over reliance on the Upper TI network stressed the Fires Enterprise command and control,

especially during periods of intense electromagnetic spectrum jamming. These degraded periods disrupted the Division's joint fires fight, greatly increasing fire mission processing times, command and control with joint and organic enablers, and the ability to manage ground and air clearance. During these disruptive periods, the Fires Enterprise was challenged to move across their PACE plan to re-establish, and provide command and control. We recommend the Division Fires Enterprise develop a solid, usable PACE plan, establish it during a Warfighter Exercise (WFX) or Command Post Exercise (CPX), and replicate disruptive effects. This allows users at all levels to better understand their PACE plan and all involved equipment (especially at distance), train through the friction of disruptive effects, and quickly re-establish command and control over the Fires Enterprise.

The Fires Enterprise's intent for their communications architecture was to operate multiple mission command systems, such as the

AFATDS, AMDWS, TAIS and CPOF to rapidly employ joint enablers by creating permissive airspace measures beyond the DIV coordinated fire line (CFL). The Joint Air Ground Integration Cell (JAGIC) and the DI-VARTY used these systems to synchronize air and ground; however, the systems were rarely properly integrated, internally to the DIV HQ, and externally to subordinate units, leading to long delays in airspace clearance, and fire mission processing. Figure 1 illustrates this powerful integration within an organization, and between echelons. Systems integration across the Division's Fires Enterprise, from Division to Battalions and below, maximizes permissive joint fires environments. It is imperative that Fires Enterprises at all echelons develop, and conduct systems integration during home station training. A Division level warfighter exercise (WFX), or command post exercise (CPX) are perfect opportunities to connect these systems, and train across a well-developed PACE plan to create this permissive environment. Digital sustainment training (DST), from the Division fire support element down to subordinate Brigades and below, is a great opportunity to develop and establish a solid network, and train users to deliberately and dynamically execute operations across this network. Secondary to this, is trusting the system. Organizations that train the integration of these systems inherently have more trust in this system, and do not add additional and time consuming checks, further maximizing a rapid, permissive joint fires environment.

The Division's targeting process was a mature, refined process codified within a well- defined SOP. synchronized at the planning level. However, it was not often properly transitioned to the CUOPS floor, resulting in a less than permissive, joint fires operations. When transitions did occur in a timely manner, the Division was able to conduct deliberate and dynamic targeting resulting in simultaneous lethal, and non-lethal effects on high payoff targets and priority

mental to success in any operation, and are often overlooked during staff internal processes. Inadequate staff process transitions effect understanding, tempo, and decision making within the staff, resulting in a more dynamic, and restrictive Division fires fight. The targeting team believed their targeting efforts were transitioned to the current operations floor through a series of transverse chat windows, which tended to be a fire and forget methodology. There needs to be a feedback mechanism to ensure planned targeting efforts are received and acknowledged by the CUOPS, and JAGIC teams to ensure understanding of the Division's shaping efforts, and a permissive air-ground integration. Although the Division had a mature targeting process, it could have been better supported by the DIVARTY's internal targeting process. The DIVARTY Commander and portions of his staff were regular participants in the Division Targeting Working Group (TWG), and Division Target Decision Board (TDB). However, the DIVARTY did not regularly host its own TWG or TDB. With only one echelon con-ducting a TWG, the DIVARTY did not synchronize its assigned targets with the appropriate collection, delivery, and assessment assets. This caused most missions to go without reported battle damage assessment (BDA), leaving the DIVARTY to use inferred BDA to inform their overall

formations. Transitions are funda-

enemy assessment. The DIVARTY used the Division's TWG and TDB as the inputs to their planning process and to produce a DIVARTY Field Artillery Support Plan (FASP) daily. The planning process was insular, and did not feed back into the Military Decision Making Process as outlined in ATP 3-60. The Staff primarily relied on the Rapid Decision-making and Synchronization Process to create orders. Subordinate organizations were often unable to plan effectively due to the lack of products and dynamism of the Division's execution. To better synchronize targeting at echelon, we recommend hosting a regular TWG and TDB at the DIVARTY level to synchronize delivery and collection assets, and ensure the MDMP continues in parallel to the targeting process. By doing this, the Division targeting process, supported by DIVARTY's internal targeting, provides a more synchronized, joint permissive environment. Furthermore, a DIVARTY targeting process synchronizes operations with its subordinate Battalions in stride, creating shared understanding of the battlefield environment at echelon. Targeting and planning efforts are then transitioned to effective operations through the rehearsal process. Fire support rehearsals are effective tools to transition targeting efforts to better prepare, and synchronize organizations across all domains and warfighting functions (FM 3-09).



Figure 1: Mission Command Joint Fires System Integration

Figure 2: DIVARTY Communications Architecture vs The Tyranny of Distance



scale combat operations, IAW FM are not currently task organized 3-0, are fundamental to under- with organic subordinate rockstanding specific roles, synchronize et units, and may not understand the fire support plan, and prac- the capabilities of these subordi-tice tasks prior to execution. The nate rocket Battalions. It is import-DIVARTY conducted several fire ant to understand rocket artillery support rehearsals, technical and specific roles during rehearsals to tactical, over the course of the ro- better synchronize the DIV Fires tation. Tactical rehearsals began Enterprise during the fire support with a map rehearsal, graduating to rehearsal. This includes undera sand table fire support rehearsal standing and rehearsing not only that enabled a more prepared, and the fires plan, but the communicasynchronized joint fires operation. tions architecture, and the different Of note, it is vital prior to rehears- types of communications packages als that DIVARTYs understand their each subordinate echelon operates. subordinate unit capabilities, how DIVARTY technical rehearsals are they operate, and what they bring

Fire support rehearsals in large to the fight. For example, DIVARTYs time consumers and planned

accordingly, must involve all resources within the kill chain, and conducted over the appropriate architecture. The communications architecture is extremely important when operating over great distances, and electromagnetic challenged environments. Figure 2 illustrates a DIVARTY communications architecture for a joint, deep attack that was overcome through a series of rehearsals, and dynamic actions to maintain a joint, permissive environment across the PACE plan, allowing the DIVARTY to successfully execute its deep attack.

Large scale combat operations (LSCO) are conducted under harsh, challenging environments that constantly induce friction across all echelons. The National Training Center provides a fantastic opportunity for Division level main command posts to stress systems and processes in a tough, realistic scenario played out in real time, in a harsh, physical environment. These stressors are not found during a warfighter, or command post exercise conducted in a comfortable, classroom-esque setting. DIVARTYs should invest valuable training time operating under canvas with organic mission command equipment to develop expertise at home station





in scenarios that replicate LSCO environments. A TTP for moving toward this endstate is to utilize the Division DST program to a field environment to build proficiency on equipment, validate command post layouts, and train mission essential tasks. A Division's Fires Enterprise can define success at the NTC by rapidly enabling a joint, permissive fires environment across a

well thought out and understood communications architecture, a solid targeting cycle capable of transitioning from future operations the National Training Center. planning to current operations, and well-rehearsed operations to better synchronize the Division's shaping efforts across all warfighting functions. Staff to staff coordination is critical between the DIVARTY and subordinate Battalion headquarters, since DIVARTY's are not currently task organized with subordinate rocket or cannon units. It is important to invest time into

understanding the requirements *About the Author:* prior to RSOI, which significantly reduces friction between the LTC Derek R. Baird is Wolf 07, the formations, and improve the DI-VARTYs ability to synchronize fire support in contact. The complex, simultaneous physical and virtual construct of Rotation 20-10 enabled ficer for the 1st German-Nethera Division Artillery HQ to provide lands Corps (a NATO Rapid Deployjoint fires in support of a Division's deep shaping efforts, and develop lessons learned for future home station training, and for additional future Division level operations at *Aligned Force deployment*.

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CLEARING THE AIR

Clearing airspace has become a critical and at times slow cumbersome event. This article will not focus on the "how to plan airspace", instead it will focus on the technical aspect of automating the airspace clearance process The intent is to identify how our automated systems work and to leverage them to save seconds and increase responsiveness of fires.

As fire supporters, we must execute the timely employment of all joint fires assets. This means that both surface-to-surface fires and air to ground fires operate and execute targets simultaneously without stopping one method of (BDE FSE) or JAGIC does not have Unfortunately, with an infire. crease in air space users this task has become complex and unwieldy at times. Trend reports from the Combat Training Centers (CTCs) and Mission Command Training Program (MCTP) continue to show that clearing airspace and deconflicting fires and aircraft is an issue year after year at all echelons. The Field Artillery Commandant has recognized this issue and included it in his Counterfire Imperatives. Imperative number three focuses on battlefield design, geometries, **Fire Support Coordination Measures** (FSCM) and automation to increase fires and shorten the "flash to bang."

Clearing airspace is ensuring that surface-to-surface fires do not violate Airspace Control Measures (ACM). This lowers the risk that an artillery round and aircraft meet. The intent for fires planners and airspace planners is to create a Unit Airspace Plan (UAP) that is permissive for both surface fires and airspace users.

Partially to blame for units struggling to clear airspace is the lack in doctrine on how to clear airspace. FM 3-09 states that clearance is a staff process.¹ The Joint Air Ground Integration Center (JAGIC) manual (ATP 3-91.1) states that the JAGIC needs firing unit location, target location and maximum ordinate (max

ord) to clear fires.² The methodology of ATP 3-91.1 does not identify which, if any, ACM violations occurs and does not account for aircraft's ability to fly below the trajectory. The ATP 3-91.1 method results in the "hot wall" that uses the entire airspace from along the gun-target line from surface to the max ord. The "hot wall" is discouraged due to unnecessarily restricting airspace. Yet, this is the method described and endorsed by doctrine. The "hot wall" method is what units and individuals use as the default method to clear airspace.

A Brigade Fire Support Element the information required by ATP 3–91.1 readily available. It means that every mission requires clearance, instead of only missions that violate an ACM. In order for a BDE FSE or Division JAGIC to get the firing unit location and max ord data, the mission routes to the appropriate firing battalion Fire Direction Center (FDC), battery/platoon FDC and then the appropriate information sent back through the chain to the BDE FSE Division JAGIC to await air space clearance (Fig 1).

By: MAJ Alpheus M. Davis

The information provided from a firing FDC to the JAGIC does not identify any ACM violation occurrences or if airspace is clear or not. It does not state where along the gun-target-line the max ord occurs nor does it show if an ACM along the gun-target-line is above or below the round at that particular point (Fig 2). The BDE FSE or JAGIC does not have enough information to either move aircraft, or allow the fire mission to proceed.



Despite the gaps in our formal education and FM 3-09 and ATP 3-91.1, there are doctrinal solutions available to automating and improving our airspace clearance process. The AFATDS Manual (TB 11-7025-354-10-7) lays out and



Current Process to Clear Air (Figure 1)

explains how AFATDS reviews and checks ACMs. In short, AFTADS in a Fire Support role only identifies if the target plots under an active ACM. If the target is not under an active ACM, the fire mission continues to be processed. If the target is under an active ACM (a violation of ACM), AFATDS generates a coordination request. The platoon FDC analyzes the trajectory for violation as the AFATDS computes technical firing data. Once again, if no violations occur at the Position Area Artillery (PAA) or along the flight path, the mission proceeds to the guns.³ If a violation occurs, the mission pauses and sends a coordination request (Fig 3).



ATP 3-52.1 (Airspace Clearance) lays out that airspace clearance with the AFATDS occurs when a technical FDC AFATDS determines that a mission violates an ACM.⁴ This manual identifies that airspace clearance can be done with automated systems. This manual is consistent with the AFATDS TM on stressing the automation and allowing our electronic systems to determine if fire missions requires clearance. This also ensures that only those missions that require air space clearance go through the clearance process. This prevents unnecessarily slowing down fire missions to clear airspace for missions that do not violate any ACM.

With a slight change to how airspace is used and viewed, this methodology applies to clearing airspace above the Coordinating Altitude. The Army and artillery do not control the air above the Coordinating Altitude but we are a user and need a defined airspace for rockets and missiles. The simplest and most efficient method is for the Army to

request a slice of airspace from ACMs updated or changed. Pilots, the Airspace Controlling Authority. briefed and understood that ar-This sounds hard but it is relative- eas inside ACMs is cleared and air ly easy. The way to request control outside ACMs is uncleared and had of this airspace is through the cre- a higher risk. Before each battle, ation of a Restricted Operating Zone all ACMs were active during the (ROZ). coordinated and runs from a firing fy if any mission would violate an unit location to areas of planned ACM. Our rehearsals showed that targets (i.e. Objectives, Call For Fire no missions violated an ACM. The Zones).

OC/T, one rotation had such bad operator sat between the BDE Air weather that half the rotation had Element (BAE) and the Tactical Air zero aircraft flying. A review of Control Party (TACP) to dynamically acquire to fire times for counter- activate and inactivate ACMs while fire during this rotation showed aircraft operated in the battlespace. that missions were on average 10 During the rotation, both force-onminutes faster during the periods force and live fire, we only received of red weather. Ten minutes is a coordination requests and cleared long time to clear air and poten- three missions. An incorrectly built tially slow fires. This shaped how ACM caused these three coordina-I, as a Brigade FSO, wanted to clear tion requests and clearance. air during my NTC rotation. I informed my Brigade Commander, today's modern battlefield. There BDE FSCOORD and supporting avi- are automated systems and proceation elements that I was not going dures that enable this action. Units to clear air for every mission, only should understand and leverage the those that violated an ACM. After automated systems and procedures explaining and teaching how AF- to reduce airspace clearance fre-TATDS views ACMs and how this quency and times. By building a method is safe and will speed fires; the BDE Commander and FSCOORD approved this methodology (Fig 4).



To leverage the AFATDS and procedural control to clear airspace it is essential and required to have three items; a thoughtful and complete UAP, consistent method to distribute FSCMs and ACMs, and discipline to conduct technical rehearsals. To execute this our Brigade made a comprehensive UAP that routed aircraft away from artillery positions and presented some limitations on fires assets to enable air assets maneuver space. The BDE AFATDS built ACMs and utilized a data distribution for geometries that automatically updated all AFATDS when

This ROZ is planned and fires technical rehearsal to identionly ACMs active contained aircraft During my experience as an NTC at that specific time. The AFATDS

Airspace clearance is necessary on thoughtful and complete UAP, electronically distributing ACMs, and trusting automated systems units can reduce the amount of missions that require airspace clearance and speed the time it takes to clear missions.

About the Author:

MAJ Davis is a graduate of the Command and Staff College. He has served as a Brigade FSO and a BN XO supporting a STRYKER Brigade Combat Team. He has served as an OC/T with NTC and currently with MCTP. He has deployed in support of Operation Iraqi Freedom and Operation Freedom's Sentinel.

1. FM 3-09 (Fires, APR 2020): Page B-22, para B-79.

2. ATP 3-91.1 (JAGIC, APR 2019): Page 2-3, para 2-7

3. TB 11-7025-354-10-7 (Fire Support Operations Battalion, Brigade, and Division for AFATDS Version 6.8.0.1, JAN 2014) ACA and 4. Air Corridor checks. Page 268, Chp 7 para 6.e

ATP 3-52.1 (Airspace Control, FEB 2019): Page 46, para 2.a.1.b

IRSPACE MANAGEMT AND JOINT FIRE in the Korean Theater of Operations

By: COL Shayne S. Mullins, 3rd BCD Commander-Korea



Application

Airspace management and Joint Fires within Joint and Combined Military Operations is becoming Demilitarized Zone (DMZ) is the more and more complicated as we move into the 21st Century. Airspace management, and successful airspace/fires deconfliction tactics, techniques, and procedures (TTPs) are increasingly more restrictive ing cut and cover bunkers exacerand must be re-evaluated, codified, and employed to meet the new through August 2020, the 3rd BCD demands within a multi-domain and 607th AOC, envisioned, pienvironment. The US military has loted, and validated new airspace historically attempted to integrate clearance procedures that have irthe TTPs of Fire Support and Airspace Control Measures (FSCMs/ ASCMs) as early as 1982 in Airland overall "kill chain" for exception-Battle Doctrine, again in Full-spectrum Dominance, and now, more fires - but it wasn't easy. The comcurrently within the framework of ponents faced three major hurdles. Multi-Domain Operations. Within The technical, procedural, and culthe last few years, new technology tural hurdles presented challenges and an ever-changing environment that would take almost a year to has forced component command- overcome. ers to re-evaluate the way they Procedural (JFA-K Process) deconflict Joint and Combined Op- The former technical clearing proerations. The combat forces in the cess used the well-known Fire Sup-Korean Theater of Operations may port Control Measure of the Joint have found a solution. Current- Fires Area in Korea or JFA-K. The ly, the Combined Forces Command JFA-K was designed to demon-(CFC) with direct support from the strate a permissive fires area, de-3rd Battlefield Coordination Detachment (BCD) and 607th Air Op- of space which allows for de-conerations Center (AOC) in South Korea have revolutionized the way we multiple component-level assets deconflict airspace to provide the without prior coordination as long most lethal, responsive and effective use of operational fires.

Challenge

The challenge associated with coordination, synchronization and deconfliction of Joint and Combined tions do not exceed the coordinaforces under US Forces Korea in the tion altitude of 30,000 feet. For Air Korean Theater of Operations is no

exception. Airspace management in Component (ACC) can attack targets any theater must be deconflicted to provide joint and combined operational effects on a specific target while mitigating potential fratricide while achieving the Joint Force Commander's objectives. However, South Korea has a unique threat most component commanders will not face. The threat of enemy longrange artillery placed along the single most conventional threat to the greater Seoul Metropolitan Area (GSMA). The fact that the enemy long-range artillery is also protected by re-enforced concrete usbates the issue. From August 2019 revocably changed immediate or dynamic targets by decreasing the ally lethal, and effective operational

picted as a three-dimensional block fliction and permissive fires using as the coordination altitude was not violated. As depicted in the example below, surface to surface fires can fire into the JFA-K Tier 3 (Blue) without coordination if the munito surface fires, the Air Command

simultaneously within the JFA-K Tier 3 (Blue) if the airborne platforms do not fly below the coordination altitude of 30,000 feet. Contrarily, If the Ground Component (GCC) request to shoot high altitude munitions, for instance, surface munitions fired from Artillery Tactical Missile Systems (ATACMs), the munitions would certainly exceed the coordinating altitude and an immediate JFA-K change request would be submitted. The immediate target request would follow the digital "kill Chain" through the BCD and its Tactical Airspace Integration System (TAIS) to the Air Component Command (ACC) and their Theater Battle Management Corps Systems (TBMCS) resulting in an Air Control Order (ACO) to synchronize surface to surface and air to surface fires. In 2020, CFC formally established six JFA-Ks with six distinctive tiers characterized by color and coordinating altitude to provide aircraft with more maneuverability while being less restrictive for artillery or surface fires. The decision process would be routed to CFC as the approving authority for all components. Typically, the J3 within CFC Operations would have delegated authority to expedite adjudication, but the process still proved to be very time consuming, 10 to 15 minutes and often approved after the target moved.

Technical (GARS- Key Pad Process): Joint Fires Areas worked exceptionally well with pre-planned areas to de-conflict. However, the battlefield is fluid and changes are often required to keep the operational advantage. The JFA-K tiers provided aircraft with maneuverability while being less restrictive for surface fires. However, several situations required single Air Support Control Measures (ACMs) such as Restricted Operational Zones (ROZs) for theater conventional missiles such

AIRSPACE VS. BOUNDRIES



as ATACMS. The ROZs are constructed one at a time using the "Keypad" method within the Global Area Reference System. In accordance with US Army ATP 3-09-34, The Global Area Reference System (GARS) was approved in 2007 by the US Department of Defense, The Chairman Joint Chief of Staff to provide worldwide geographical reference points or locations. The GARS is a common reference for all components used to divide the globe up into longitude and latitude blocks of airspace or Cells. The Cell consists of a 30-minute by 30-minute block of airspace further sub-divided into four (4) Quadrants. Quadrants consist of a 15-minute by 15-minute blocks of space further subdivided into nine (9) Keypads. Keypads consist of a 5-minute by 5-minute blocks of space. The three distinctive metrics delineate the size of the airspace for situation awareness and specific references for deconfliction. In Korea, the Ground Component Command (GCC) requests Integration (TAIS) and the Theater

designated consecutive GARS keypads to allow permissive surface to surface fires while deconflicting for rapid airspace maneuverability. Previously, the Ground Component Command (GCC) built blanket airspace coordination measures (ACMs) which included keypads of similar tiers as a single ACM. However, this process did not allow for dynamic changes to keypads because keypads within tiers were built as a single measure taking an unacceptable amount of time, as much as three (3) minutes per keypad to build each. As a result, single keypads requested to be changed by GCC or Air Component Command (ACC) required the Republic of Korea (ROK) 3rd BCD Airspace Officer to rebuild a JFAK tier from the Korean Joint Fires Operations Systems Korea (JFOS-K) to a Joint Automated Deep Operations Coordination System (JADOCS), to include the change, process the requested ACM through US BCD Tactical Airspace

Battle Management Corp Systems (TBMCS) to publish an executable Air Control Order (ACO). The entire JFA-K process using individual keypads for each change required on average 18-20 minutes.

Cultural (Decision Authority)

The previous Combined Forces Command Publication 3-1 explicitly instructed all coordination for JFA-K changes must be approved by the USFK J3 before the changes are implemented. In layman's terms, if the JFA-Ks were not deliberately planned during the Master Air Attack Plan, the Air Tasking Order, or anywhere in the Joint Air Tasking Cycle, the dynamic procedural approval process would require a decision-making authority from both components. Although all components support the CFC commander, each commander possess individual objectives and priorities to achieve the CFC Commander's overall objectives. The component objectives sometimes conflict when resources are constrained or limited during

GLOBAL AREA REFERENCE SYSTEM (GARS)



execution and an approval from higher headquarters (USFK) is required. The adjudication process can be lengthy and time consuming and is often requested during execution on the Combat Operations floor for immediate prosecution. Solution.

The entire airspace deconfliction process: technical, procedural, and cultural, could potentially take 45 minutes to prosecute through the component-level decision authorities. The C4I fire control systems to include the air space management digital "kill change" was completely compatible among the US and ROK, however, the process was not fast enough to strike within the enemy's vulnerability window. The solution addressed all three Lines of Efforts. The 607th AOC (7th AF) and 3rd BCD (8th Army) applied a complete quadrant change for responsive fires while still accounting for deconfliction among component assets. However, moving away from the "Keypad" method towards the "Quadrant" method saved approximately 18 minutes. Additionally,

JFA-K decision to the Combat Operations Division (COD) Chief (AF Colonel) and the 3rd BCD CDR (Army Colonel) the authority to make the dynamic changes as long as no conflicts existed within the components, which shaved potentially an additional 25 minutes to response time. The biggest challenge was convincing the Air and Ground Component Commanders that the 607th AOC and the 3rd BCD could use this method to deconflict airspace and surface fires within ten minutes without impeding one or the other's operational objectives. We completed several tests runs before the July 2019 and piloted it during the component-level exercise in August. The CFC Commander approved and we codified it in the new CFC publication 3-1 in November, 2019. We validated the entire airspace clearance procedure again with an entire new staff, US and Korean, during the component level exercise in August 2020. The suc cessful use of the Quadrant method has proven time after time to be

the CFC Commander delegated the JFA-K decision to the Combat Operations Division (COD) Chief (AF Colonel) and the 3rd BCD CDR (Army Colonel) the authority to make the dynamic changes as long as no conflicts existed within the components, which shaved potentially an additional 25 minutes to re-

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COL Mullins is a US Army Field Artillery Officer who has held multiple Command and Staff positions for more than 22 years in the US Army Officer Corps and 6 years as a 13B prior-enlisted Soldier. He a recent graduate of the US Army Senior Service College under the National Security Fellowship Program at the JFK School of Government, Harvard University. His research focused on a "Security Cooperation in Northeast Asia".

^{1.&}quot;25-2ch3.Pdf," accessed August 31, 2020, https://fas.org/irp/doddir/army/fm34-25-2/25-2ch3.pdf.

^{2.&}quot;JP 3-09, Joint Fire Support," n.d., 117. 3."TP525-3-1_30Nov2018.Pdf," accessed August 31, 2020, https://www. tradoc.army.mil/Portals/14/Documents/MDO/TP525-3-1_30Nov2018.pdf

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OTD-S leverages Industry to Virtualize Radar Maintenance Training

By: CW4 Fatima A. Nettles and CW3 Michael D. Gulsby

INTRODUCTION

The Army-wide shortage of AN/ TPQ-53 Radars, specifically, in the uct Manager developing a blueprint TRADOC environment motivated and acquiring funds. Phase one was the Ordinance Training Detach- executed in a series of sprint meetment-Sill (OTD-S) to establish a ings, where OTD-S and PEO C3T supplemental hands-on training developed the initial prototype and aid capability. OTD-S saw potential capability to easily adjust the softin a virtual system used by MOS 13R, ware as IMIs and technical manuals Fire-finder Radar operators and be- update. During phase two, PEO C3T gan to develop a solution where in- operationalize the data input while structors could insert maintenance OTD-S validated that the system training scenarios in the Training achieves the desired outcome from Aids, Devices, Simulators and Sim- a software perspective. The third ulation (TADSS) product to achieve and current phase of implementathe desired training results.

Defense Research and Engineering switches, cabling, and comput-Network (DREN III), AN/TPQ-53 er imaging for full operation. The Radar Virtual Software (RVS) capa- Field Artillery Center of Excellence bility to enable virtual radar main- (FCoE) provided information techtenance training for MOS 94M, Ra- nology support, Product Manager, dar Repairers and 948D, Electronic Multi-Mission Surveillance Sys-Systems Missiles Technicians. The DREN allows an state of the art servers and switchindependent network separate from the installation Net- skillset to splice category six (CATwork Enterprise Center (NEC) per- 6) cable to enable connectivity. The mitting ease of operation and uninterrupted access of the AN/TPQ-53 Assessment are in progress with RVS. The RVS provides maintainers a ground-breaking "Man-Machine" interface for extensive training and evaluation on Radar theory, indepth fault isolation, complex troubleshooting, and the removal and installation of Line Replacement Units prior to students conducting practical hands-on training. Subject matter experts from the Sill team along with the Program Executive Office Command, Control, Communications-Tactical (PEO C3T) and Product Manager, Multi-Mission Surveillance Systems (M2S2) used a phased approach to integrate the AN/TPQ-53 interactive multi-media instruction (IMI) and technical manuals to develop a cohesive capability to simulate realistic radar maintenance training.

IMPLEMENTATION PHASES

The first phase involved the Prodtion encompasses hardware instal-The Fort Sill team acquired the lation. The system requires servers, Maintenance tems (M2S2) funded and delivered capability es, and OTD-S used their electronic last two phases of Execution and plans to go live with the AN/TPQ-53 RVS in February 2021.

CONCLUSION

OTD-S continue to leverage industry in support of the Army's Modernization plan to deliver tactically and technically proficient Warrant Officers and Soldiers, equipped with the knowledge to fight and win in a multi-domain battle. The AN/TPQ-53 RVS enabled by the DREN, balanced with practical training on the actual equipment allows the Army to reach the optimal training outcome. Additionally, the use of the RVS and other virtual systems in Forces Command (FORSCOM) operational units could serve as great tools for low density and remedial training.

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In June of 1990 the United States Army's Combined Arms Training Activity Center for Army Lessons Learned (later CALL) published The Musicians of Mars: A Story of Synchronization for the Company/ Team Commander. The purpose of this publication was to describe how different combat arms needed to harmonize their actions on the battlefield to meet the commander's intent instead of allowing the different arms to act alone. The ba- sis of the short pamphlet came from the Army's success during Opera- tion Desert Shield and Desert Storm but also sprung forth from a quote from then Major General George S. Patton, Jr. when he commanded the 2nd Armored Division in July of 1941.

"There is still a tendency in each separate unit ... to be a one-handed puncher. By that I mean that the rifleman wants to shoot, the tanker to charge, the artilleryman to fire ... that is not the way to win battles. *If the band played a piece first with* the piccolo, then with the brass horn, then with the clarinet, and then with the trumpet, there would be a hell of a lot of noise but no music. To get harmony in music, each instrument must support the others. To get harmony in battle, each weapon much support the other. Team play wins. You musicians of *Mars ... must come into the concert* at the proper place at the proper time."1

Reading the Music of Mars: The Importance of Doctrinal Foundations in the

Organizational and Personal Domains

By: MAJ Mark A. Lichak

A decade and a half would pass before the Army would feel the need to follow up on its original Musicians of Mars (1990) pamphlet with three additional sequels in 2016 (Musicians of Mars II), 2019 (Musicians of Mars III: The Cobra Strikes) and the latest in May 2020 (Musicians of Mars IV: The Mustangs' War). While each of these installments varies in format, all of them address a fundamental need to understand warfighting involving the combined arms team, mainly at the small-unit level, and especially in terms of Large Scale Combat Operations (LSCO) in the later versions. While mentioned in these collections of vignettes and tactical examples, the importance of reading, understanding, and using doctrine is only implied. It is as if the practitioners and characters within these publications absorbed doctrine in between the volumes or between the pages. The fact that you cannot be a "Musician of Mars" if you do not read the music is left out – and doctrine is our music.

As the Army continues to shift its focus and efforts on returning to LSCO against near-peer com- petitors the Field Artillery is doing its part to follow suit here at Fort Sill. The institutional courses at the United States Army Field Artillery School (USAFAS) consistently and aggressively teach the use and importance of doctrine. But is it being taught and emphasized enough in the operating forces or have units come to rely too heavily on tactics, techniques, and procedures (TTPs), standard operating procedures (SOPs), and "this is the way we have always done it," mentality? In the age of Multi-Domain Operations, is it ever enough to study doctrine only in the institutional realm or do we need Soldiers and leaders to acquire a desire to read, understand,

and discuss doctrine with those they lead and serve. Doctrine serves as the foundation of tactical and technical knowledge in the Army and serves as a guide to how units structure their training and planning efforts should the nation go to war. A greater emphasis on its use and study in the operating and individual domains is necessary to maintain and advance the qualitative advantage that our Army still possesses over our near-peer competitors. Field Artillery leaders at all levels need to review their leader development plans to ensure that their efforts include sufficient time and energy spent on the teaching, studying, and employment of current and developing doctrine.

Within the Army, there are three learning domains. Institutional, organizational, and personal. The institutional domain includes basic combat training, basic courses for officers and warrant officers, basic, advanced, and senior leader courses for NCOs, and the Command and General Staff Officer's Course to name a few. Within the different schoolhouses doctrine serves as the professional foundation for occupational knowledge, skillsets, and behaviors.

The organizational domain includes units in major army commands such as FORSCOM and TRADOC as well as units assigned to the Army's Service Component Commands and Direct Reporting Units (DRUs), while the last domain, the personal domain, encompasses those actions and activities that a leader or Soldier does to prepare themselves for their duty positions and their overall self-development. Over the time of their professional development Soldiers and leaders should come to regard themselves as both subject matter experts within their specific field (MOS) and a generalist (i.e. all leaders need to have knowledge of the orders process, or how to write awards and evaluations).

While a Soldier or officer receives a foundation in doctrine early in their careers, that baseline only builds intermittently as they move into and out of the institutional domains along strict lines of progression based on rank, time in service, and other key developmental milestones. With this in mind, it is not uncommon for three to four years to pass between an officer's graduation from the Basic Officer Leader Course (BOLC) and their attendance to the Captains Career Course (CCC). The same goes for the time between CCC and an officer's attendance to the Command and General Staff Officer's Course (CGSOC). If units and individuals do not continuously study doctrine outside of the institutional domain than it is possible that officers, NCOs, and Soldiers could miss substantial doctrinal changes (i.e. the current shift from Unified Land Operations to Multi-Domain Operations). Thus the continued study of current and emerging doctrine is essential for commanders to emphasize.

Aside from the outright reading, understanding, and studying of field manuals and Army Tactical Publications, doctrine is doubly important as it serves as a guide for the planning and execution of Army operations. In a way, it provides the 'notes' that the "Musicians of Mars" are going to get their combined arms orchestra to play. While the commander provides purpose, direction, shared understanding as well as their intent, key tasks, and end state, it is largely the job of the operations officer and the Fire Support Coordinator (FSCOORD)/Fire Support Officer (FSO) to ensure the timely execution and synchronization of those assets which make up the orchestra itself. Just as the orchestra comprises different sections made up of various types of instruments, so too is the corps, division, and brigade combat team divided into smaller units, systems, and individuals which all have specific parts to play in making the harmony. Therefore doctrine deserves

continuous attention from all seri- in the specifics based on unit type, ous military professionals and why missions, and the current operating it should make up the 'crawl' step environment. There are times when of every training progression and doctrine becomes stale or the tactical basis of each operation and cam- situation facing the Army demands paign.

closely, perhaps we would not see forces? It is the leader's responsithe amount of repeated trends bility to identify newly published at the Combat Trainings Centers doctrine and make the organiza-(CTCs). Observer/Controllers re- tion aware of its implementation. corded trends including deficiencies Delivering this in a classroom-like in targeting, fire support, place – setting driven by a leader with aument of artillery on the battlefield, thority is one recommendation. It is and logistics, ever since the im- then the individual's responsibility plementation of the first Decisive to further read and understand the Action Training Exercise (DATE) new doctrine. This is admittedly in October 2012 at the Joint Multi- harder in the operating forces than national Training Center (JMTC) in in the schoolhouses. Grafenwoehr, Germany.² One of the reasons that the list of trends and units to achieve buy-in for the their content have not substantially study of doctrine is to let their Solchanged over the last eight years is diers and leaders know that they because of the lack of use and practice of doctrine by formations and and review of new doctrine. It is a Soldiers while in the organizational fact that doctrine needs to change domain.

be overwhelming if taken in its en- of the Army's doctrinal publicatirety. However, it does not apply tions list the proponent, preparing to every situation and every person agency, and a way to make recomall the time. The task of studying mendations on future changes to doctrine should be narrowed and that publication through a DA Form actively focused on through the use 2028. of leader professional development (LPD) and counseling sessions. This Soldiers in the operational domain allows an organizational leader to falls on the commander. It should be guide an individual's development included as part of the command's and focus attention on the specif- professional development series ic doctrine which matters to their and adequately planned, scheduled, precise role within the organization resourced, and reviewed prior to beand include both doctrine specific ginning any training progression or to their MOS or more general topics the development of a training plan. like training, writing, and leader- Furthermore, to consider someone a ship. Some will make the argument professional Soldier, they also need that doctrine is cumbersome, there to take individual responsibility and is too much of it, and it is always build time into their own schedules changing. There is only so much to read and study the doctrine that time for LPDs and why study doc- matters most to their Army-related trine if we already have TTPs, vo- specialty. luminous tactical SOPs (TACSOPs), and "playbooks."

playbooks is in the field and only if and regulations – its doctrine – be– those products had proper ground- fore he could know which rules he ing in doctrine and were taught, could bend, which rules he could discussed, and practiced prior to break (and still get away with) and execution. Where units encounter what to do if the play broke down. some topic not spelled out in doc- Jazz musicians are much the same, trine then TACSOPs and SOPs fill

an update. How can emerging doc-If we adhered to doctrine more trine make its way to the operating

One way for commanders and can be involved in the development over time to keep up with changes The shear amount of doctrine can in the operating environment. Each

The bonus for teaching doctrine to

Michael Jordan (arguably the greatest basketball player of all The time and place for TTPs and time) had to learn the game's rules learning to play their instrument(s) while also learning to read the music before they can improvise and create new music. At an LPD on new and emerging doctrine in February 2020, COL Jeffrey Buck, then commander of the 428th Field Artillery Brigade stated that, "the more one grounds themselves in doctrine and truly understands its purpose, the more one can knowingly deviate from it."

While doctrine is imperative to how the Army operates, it is also a known and often repeated cliché that Soldiers and leaders are to be "doctrinally sound, not doctrinally bound." This subverts and diminishes the actual importance of studying doctrine and its overall usefulness to the force as a whole. Currently lacking a quantitative advantage over our near-peer adversaries we can strive to maintain the one advantage that the United States Army has long had over our enemies - quality. Knowing, studying, and contributing to the refinement and development of doctrine is the underlying foundation to maintaining the quality of our Soldiers and those who lead them.

About the Author:

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The Roles of Battalion Logistical Mission Command

Reversing trends at JMRC and Combat Training Centers

By: CPT Nicholas Bowers and SFC Brandon Williams

The brigade combat teams main effort is in attack positions ready to secure the near side objectives of a gap crossing. The bridging units are ready to deploy, but there is a prob*lem. The smoke targets planned for* the far side of the gap to obscure enemy scouts and forward observers failed to fire. There is chaos in the artillery battalion operations center, what happened?

The failure is often not in the execution of field artillery technical rehearsals or a battery out of position, but in the often ill-trained and out of practice logistical support system. The effectiveness of the field artillery battalion correlates directly to the proper functioning and leadership of personnel assigned to the combat trains command post and the field trains command post. These critical nodes make up the foundation of the battalion's logistical system and it is essential they are proficiently trained to ensure maximum effectiveness. The field trains command post and combat trains command post are separate and distinct in composition and role as well as the space on the battlefield. Understanding the specific mission and composition of these two posts helps leaders conceptualize how to man and equip these critical mission command nodes within their formation.

The field trains command post is doctrinally located within the brigade support area. It receives updated mission requirements, prepares planned resupply operations, and maintains readiness to support emergency or unplanned resupply requests by coordinating regularly with the combat trains command post and the brigade support area. The field trains command post acts as the field artillery battalion's link

to the brigade support area and in- gade combat team, and brigade directly to the combat sustainment support battalion planners and exsupport battalion and theater sup- ecutors. The brigade combat team ply assets. The field trains com- utilizes a combination of upper mand post must be able to rapidly tactical internet, frequency modand seamlessly interface with the ulation, and Joint Battle Combrigade support battalion and brigade combat team logistics planners nicate logistical information, but and senior leaders. For this reason, according to FM 3-96, 9-107, the field trains command post is often tions (TACSAT). Whatever primary, located in the brigade support area. Locating it here helps increase the survivability of the mission command node and facilitates incorporating it into the larger brigade field trains command post must support area protection plan. The field trains command post's functions include "coordinate logistics requirements with the brigade support battalions support operations, configure logistical packages tailored to support requirements, and forecast and coordinate future sustainment requirements" (FM 3-96, 9–108) among others. In order to ly, if ever, located there. One way to achieve its mission, the field trains command post must have the proper equipment to communicate and coordinate with the battalion, bri-

mand-Platform (JBC-P) to commumay also require high frequency or tactical satellite radio communicaalternate, contingency and emergency (PACE) medium they choose must be established, practiced, rehearsed, and not deviated from. The also be equipped with like systems. In a field artillery battalion's mission table of organization and equipment (MTOE) only one upper tier one server is available. As the battalion senior leaders are physically separated from the field trains command post, the battalion's tactical communications node is rareensure communications is to co-locate the field trains command post with the brigade support area and conduct frequency modulation and face to face communications.





The field trains command posts communications with the combat trains command post are equally important. The distance between the combat trains command post and field trains command post fluctuates throughout the course of the fight and standard frequency modulation radio communication is not consistent. JBC-P is the most reliable and allows forwarding or saving of the text transmission for later reference. Radio voice transmissions through high frequency and frequency modulation radios are solid alternate and contingency plans for communications forward to the combat trains command post.

he field trains command post is a mission command node and must operate as such; utilizing 24-hour operations and staffed with shifts of personnel to receive and transmit data. To ensure mission success of the field trains command post the manning must appropriately fulfill all mission requirements. This includes a mixed group of personnel from the headquarters and headquarters battery and the forward support company. An additional task of the field trains command post is "to coordinate with the brigade combat team for personnel services and replacement operations" (FM 3-96, 9-108). This task mandates the assignment of S-1 personnel at the field trains command post to track casualty move

ment to the Role II and beyond.

Additionally to facilitate recepassignment, and forward tion, movement of replacement personnel. The field trains command post in the battalion's logistical statismust have the infrastructure to tics. The forward support company support these operations and run all executive officer stays at the field the required systems. The forward trains command post facilitating support company has the capability its mission in the commander's abinternal to the company to support sence. The field trains command these operations either through the post is the field artillery battalemployment of the company command post 1068 in an armored formation or the use of the expandable area and serves to properly prepare van or one of the command team configured loads before sending vivehicles in a towed formation. A tal sustainment to the next link in light formation has the capability the logistics chain. to operate this command post with the use of internal assets from the is the logistical middle point of maintenance control section or the the fight coordinating between the distribution platoon headquarters main command post and the field and company command team combined to include power generation.

at the field trains command post is tion and planning resupply triggers. the correct configuration of ammunition. Class-V packages must be assets to complete the mission and configured at the field trains command post prior to movement to the ing the smallest signature possicombat trains command post or to ble. The combat trains command a logistics release point according post cannot become the battalion's to the unit TACSOP and standard operating procedures for distribution of ammunition. This requires security is dependent on survivabilsomeone knowledgeable in artillery ity and mobility. It must be mobile ammunition to inspect loads prior enough to support frequent moves to disembarking the brigade sup- under several conditions, the most port area. A best practice is to uti- important being compromised selize the battalion master gunner as curity (FM 3–96, 9–105).

they are not encumbered with fighting a platoon and are likely the most knowledgeable cannon crewmember (13B) in the battalion. The master gunner would ensure complete rounds are in the combat configured loads and the correct projectiles go to the appropriate battery. The OIC of the field trains command post is the forward support company executive officer while the company commander has mission command oversight and their company command post here. This allows the commander to conduct battlefield circulation and liaise with the combat trains command post as required but facilitates them being the battalion's representative to the brigade synchronization meetings in the battalion executive officer's absence. They will have the knowledge and experience to effectively communicate the battalion's logistical needs and are well-versed ion's link to the logistical support and planners in the brigade support

The combat trains command post trains command post to facilitate the correct resources forward when Critical to field artillery operations needed by anticipating consump-It is a fine balance between enough increasing survivability by projectparking lot- only mission-essential vehicles must remain with it as its

comprises multiple elements and may co-locate with the battalion Operations Center) assumes tactisupports multiple missions. It is main command post enabling fastresponsible for "controlling sustainment support to the current the Role II. As another example, the command post must ensure proper operation, providing sustainment UMCP emplaces as a separate node representation to the main command post for planning and integration, monitoring supply routes trains command post. and controlling the sustainment coordinating the evacuation of casualties, equipment, and detainees" (FM 3-96, 9-106).

The accomplishment of most of these missions rests with the battalion S-1 and S-4 overseen by the battalion executive officer, which in older doctrine is referred to as the Administrative and Logistical Operations Center (ALOC). This cell systems remains vital to the function of the battalion. Additionally at the combat trains command post, is the S-4. The S-4 coordinates with the doctrine calls for the battalion the rest of the battalion staff, field aid station and the unit maintenance control point. These nodes can operate out of the combat trains command post or separately based on METT-TC. Field artillery battalions do not possess enough assets to self-secure multiple nodes effectively. Safety lies in dispersion and concealment. Often this calls for multiple smaller nodes.

A small combat trains command post consisting of the ALOC, distribution platoon assets, and a small S-6 detachment with the battalions' tactical communications network allows for a small combat trains command post that easily conceal and disperse. An alternate option for upper tactical internet is the placement of the tactical communications network with the main command post and the utilization of the Soldier network extension asset (organic to the battalion S–6) or very small aperture terminal (organic to the forward support company maintenance control section) at the combat trains command post. These alternatives allow the operations staff at the main command post access to the tactical internet mand post is not mission capable, while enabling the combat trains command post to maintain connectivity as well. The other elements,

The combat trains command post battalion aid station for example, ance while one of them (Battery er transfer from point of injury to For this reason the combat trains from a separate battalion providing rest of staff (at the main command it the same benefits as the combat post) is taking place at all times.

flow of materiel and personnel, and is the senior leader at the combat the effectiveness of which can vary trains command post that is responsible overall for the sustainment and logistics for the battalion. tinational Readiness Center and The XO moves between the combat other Combined Training Centers trains command post, field trains command post, and the logistic roles and responsibilities, defensive release points that the battalion postures, personnel management, conducts ensuring the battalion's and the prolonged functioning of logistics needs are met. The headquarters and headquarters batwith required mission command tery commander usually exercises understanding historical trends, mission command for the combat future units can trains command post while the OIC trains command post, and forward support company leadership ensuring the current fight is fully sustained while assisting with planning for future operations. They chain of command that encomcoordinate with the staff utilizing passes all command nodes within the battalion signal PACE plan. Typically JBC-P is the best medium footprint is paramount to setting for planning as it is readily available at the main command post, field trains command post, as well manders of jointly shared command as the firing batteries who also have access to it for submitting reports and requests resupply. Maintaining upper tier-one at the combat trains command post additionally allows the S-4 and S-1 to coordinate directly with the brigade sustainment leaders to order future logistics packages as well as replacements.

The final task of the combat trains command post is to act as an alternate command post for the battalion. The combat trains command post does not have fire direction capabilities, but does retain communications with the brigade combat team – a capability the firing battery's do not possess with their MTOE. In the event the main comthe combat trains command post assumes control of the battalion for forward support company executive movement and positioning guid-

cal fire direction for the battalion. battle tracking continuity, with the The combat trains command post The battalion executive officer is a critical mission command node, from unit to unit.

Rotational Units at the Joint Mulhave struggled with delegation of the combat trains command post and field trains command post. By

prepare for the challenges experienced by their predecessors. Defensive postures within logistical command nodes suffer due to a very simple issue: lack of cross-talk between leaders.

Establishing a clear and defined the combat trains command post the conditions for a shared defensive plan. First Sergeants and comnodes struggled to develop a defensive plan as a result of not having the chain of command understood by all parts of the combined formation. If the chain of command is in question, the command node is sure to fail. It is the command TM's responsibility to ensure security and survivability and in command nodes incorporating more than one element, someone must be in charge.

Often the combat trains command post is under the command of the headquarters and headquarters battery commander with the S-4 acting as officer in charge (FM 3-96, 9-107). However, the field trains command post is under the Command of the forward support company commander with the headquarters battery executive officer or officer as the officer in charge.

These command teams assume responsibility for and inspect defensive plans and positions as often as possible. The involvement of the battalion executive officer is critical in this area as his directed guidance to the staff will likely drive the development of the combat trains command post's chain of command and mission command functions.

The placement of key staff officers and NCOs has significant impacts on the performance of the field trains command post. The medical platoon leader is often located with the aid station at the combat trains command post and removed from being part of the military decision making process as the unit progresses through the phases of the battle. Alternatively, the S-4 often remains in the main command prevents the battalion from exerpost, therefore, breaking a critical cising all of its systems in a simulink in the communication from lated combat training scenario. Incombat trains command post to field trains command post. Both of these employments of staff officers proved ineffective and hindered the battalion's ability to perform critical functions at both the main command post and the combat trains platoons too, must practice their command post.

The prolonged functioning of the combat trains command post relies on the available mission command nodes at the unit's disposal. The communications platforms on the ground combined with the level of digital connectivity determines the efficiency of reports, and the ability to stay abreast of real-time changes on the battlefield. When units fail to conduct a critical analysis of mission command system placement and employment throughout the formation, logistical reporting and sustainment readiness can become a challenging obstacle to overcome.

Leaders must seek out creative ways to exercise their logistical mission command nodes including the deployment of the combat trains command post and field trains command post for every exercise, utilization of constructive/replicated ammunition, and reduction of on-hand classes of supply. Multiple post rotational after actions reviews reveal a common trend of rotational preparation in the field trains comtraining units – their participation mand post, planning in the combat *since 2017.*

at JMRC is their first time operat- trains command post, understanding a combat trains command post. Lacking quality repetitions during of training for the logistical nodes. home-station training, units move straight into the execution phase without training the critical experience needed to avoid any of the common pitfalls experienced at combat training centers or in combat.

Throughout home station training cycles, units face challenges with munition expenditures in the next refining collective training tasks while balancing enduring tasks. Field artillery battalions often default to leaving support elements and staff members in the cantonment area rather than move forward with the firing batteries when often these critical aspects of the deploying to a field collective training environment. In doing so, this corporating staff involvement into training events is essential to test reporting procedures and validate practices that incorporate into the unit's TACSOP.

The maintenance and distribution craft in a field environment. Replacing an engine in a maintenance *About the Authors:* bay is significantly different from replacing one in a contested field CPT Nick Bowers is currently the environment at the UMCP and Soldiers need the repetitions to build confidence. Deploying the entirety of the forward support company enables the company command has served on DIV Staff, FA BDEs, team to understand the logistical DIVARTYs, and Armor Brigade challenges inherent to having personnel spread across the battlefield. In doing so, this provides the opportunity of gaining repetitions of his Battery Command in 2/3 ID as personnel management in a simulated combat environment. Accounting for work/rest cycles, manning shortages, and distribution of *ly the Headquarters and Headquar*equipment and weapons systems, will enable leaders to get a better understanding of how to provide the battalion the support they need to continue the fight, and maintain FA BNs, DIVARTYs, Infantry, and their defensive postures.

Overall, in order to ensure the effectiveness of the field artillery battalion, leaders must focus on *master gunner time in the 3rd In-*

ing trends, and increase the amount These nodes have to receive equal attention in regards to manning, equipping, and training equivalent to that of the main command post. The combat trains command post and field trains command post are vital for field artillery battalion operations from forecasting amphase to the replacement of combat casualties. Every logistical move is planned or executed at one of these nodes. When we need a mission to be successful, we inherently know it must be rehearsed. However, too mission fall by the wayside as leaders mainly focus on certified and qualified crews. It is the vital responsibility of the command team, battalion executive officers, and staff officers and NCOs to ensure Soldiers and systems within their sustainment chains are exercised. Leaders and Soldiers must understand their part in the mission and fulfill it effectively and efficiently.

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M777A2 Case Analysis: Ergonomic Assessment of the Number Four Man's Position

By: Capt Austin G. Quintero

Though combat deployments, at present, have perceptively decreased for Marine Artillery, there is a continued requirement that all fleet marine force units be ready to deploy at a moment's notice. The effort to sustain combat effectiveness therefore becomes a repetition of training exercises in which high-stress and dynamic situations are presented. These exercises vary in size (i.e. regimental, battalion, and battery level) and usually occur at designated intervals throughout the year. While there is indeed significant consideration given to the safety aspects of these exercises in their planning, the topic of ergonomics is often overlooked. Hence,

the purpose of this case analysis cannon is to evaluate the ergonomic aspects associated with operating the M777A2 howitzer so that improvements may be made to minimize both immediate and long-term injuries. Furthermore, it will reinforce the safety associated with ergonomics, a topic often overlooked by artillery operations. This will become increasingly important as cannons receive less attention with the development of new artillery weapon systems. Conternational content of the second print and without fectivene its funct tem Eng model d categorie chine, m Mission The m gram is functional cannons receive less attention with the development of new artillery

<u>System</u>

The system that is to be analyzed is the M777A2 howitzer. Developed and assembled by BAE systems, the M777A2 is currently the primary

cannon employed by Marine Corps Artillery. Its lightweight design allows for a minimal logistical footprint and promotes maneuverability without degrading munition effectiveness. To aid in describing its function, the 5M model of System Engineering will be used. This model divides the system into five categories: the mission, man, machine, media, and management. <u>Mission</u>

The mission of the M777A2 program is to, "develop, produce, field, and sustain a towed 155mm howitzer that provides increased mobility, survivability, deploy ability, and sustainability in expeditionary operations throughout the world,".

Man

The M777A2 is operated by a full crew of ten Marines, minimum crew of seven. The individual positions are the section chief, gunner, assistant gunner, recorder, driver, and number one, two, three, four, and five man, respectively. Combined, these operators are referred to as the gun line or gun crew. Machine

The weapon system itself (hardware) is a 155mm cannon that uses a suspension system and hydraulic recoil mechanism (U.S. Marine Corps [USMC], 2016; USMC, 1996). The cannon tube is comprised of a rifled section, a powder chamber, and a breech block. The ammunition fired by the system is separated into four categories - the projectile, propellant, fuze, and primer. When ble for different tasks and actions, fully operational, the M777A2 uses the Digital Fire Control System (DFCS), a computerized software which displays navigational information and the firing data to be set nomically speaking) is the number on the weapon.

Media (Environment)

In regards to operational environment, the M777A2 is exclusively utilized outdoors for artillery operations. These operations include providing suppressive fires in support of maneuver and air elements, or operating autonomously as the main effort. For the ambient environment, the M777A2 is often described as an "all-weather system." Management

The M777A2 can be thought of as a giant rifle. The following sequence is generally used when firing rifle - a bullet is loaded into the rifle, the weapon is aimed, the operator pulls the trigger, a firing pin strikes the cartridge, gasses expand, and the bullet is propelled through the front. The same process, or relatively same, is taken on the M777A2 at a grander scale.

A fire direction center relays firing data to the gun line which tells the section chief what, and how much ammunition to fire, and the numerical data (deflection and quadrant) on which the gun must be set. This is stored. Furthermore, the projecdata is used to "aim" the cannon. At this point, the gunner and assistant gunner will begin laying the

howitzer on the correct data while bear down on the operator's domithe driver, three, and four man begin prepping the ammunition.

After the howitzer is laid, the four man and driver place the round on a feed tray (a ramp into the cannon) and then ram the round in the tube using a two-man ramming rod. Next, the two man places the propellant in the tube and the breech is closed. The section chief performs a final verification of the deflection and quadrant and then gives the command to fire. A firing mechanism is pulled which ignites the propellant in the powder chamber, causing the rapid expansion of gasses and the projectile to be propelled out of the tube.

Human Posture/Considerations

As each operator is responsithe ergonomic risks are subject to the individual's position. In terms of human posture, however, the most at-risk individual (ergofour man. After fuzing the projectile, the number four man must lift the round, carry it to the gun, and load it onto the feed tray. The feed tray is approximately three and a half feet tall and 10 to 15 ft away from where the projectile is stored (USMC, 2016). When carrying the projectile, they must pause in stride for the section chief to inspect the ammunition. Loading the projectile also requires the number four man slightly lean and reach forward to ensure it is fully seated on the tray.

While there are different projectiles (high explosive, white phosphorus, rocket assisted, etc.) that vary in weight and size, they all share the same characteristics of being heavy and awkward to carry. The standard weight for the standard M795 projectile is 103.5 lbs and measures 6.1 in. in diameter by 33.2 in. in length. The projectile is aerodynamically shaped so that the top is tapered to a conical point (where the fuze sits). This end also weighs significantly less than the bottom, which is where the explosive filler tile must be carried at a 45 degree angle with the fuzed end up. There noneer students, between the ages fore, the majority of its weight will of 18 and 21.

nant hand when carried rather than be distributed evenly.



Method

Participants and Variables

As there were no individuals used in this assessment, the primary source for gathering posture data was training media provided by the Marine Detachment's Cannon Crewman Course, Fort Sill, OK. This media included training videos, pictures, publications, and class materials for operating the M777A2 howitzer. All individuals operating as the number four man in this media were male, Marine Corps Can-

Human measurements were determined by applying the average male anthropometry outlined in the 2010 Anthropometric Survey of Marine Corps Personnel. Measurements of the M795 projectile were identified using the ammunition specifications provided by General Dynamics. Task-specific measurements were determined by cross referencing posture positions to the anthropometry tables.

Ergonomic Assessment Tools

When operating the M777A2, the number four man's chief responsibility is to load the ammunition. To analyze this task, however, it must be broken down into its sequential subtasks. These are the lifting, carrying, and lowering of the M795 projectile. To provide a comprehensive assessment of these tasks. three tools will be used - the Liberty Mutual Manual Material Handling (Snook) Tables, the National Institute for Occupational Safety and Health (NIOSH) Lifting Equation, and the Rapid Entire Body Assessment (REBA). A minimum of two tools will be applied to each of the three subtasks to both reinforce results and compensate the others' scope (or lack thereof). For example, though NIOSH and REBA can both assess a lift, one addresses posture while the other addresses measurements.

Snook Tables

The Snook Tables were applied to all three of the subtasks in this in this assessment to identify risks associated with the M795's weight. The purpose of this tool is to determine whether the weight/force of an object is too heavy for a given task (Middlesworth, n.d.). Task-specific variables are recorded and used to produce a design goal (goal weight) for the object being handled. For lifting and lowering, these variables include: lift/lower point, the vertical location of the hands during the task; frequency, the number of lifts/lowers conducted per minute; horizontal distance, the distance between the body's front and the hands; distance of lift, the distance the hands move during the lift/lower; actual weight, the weight risk level is detailed by the followof the object. For carrying, the vari- ing groupings – negligible (REBA

ables are: carry point, how high the score, 1), low (2-3), medium (4-7), hands are during the carry; frequency, the number of carries per minute; carry distance, how far the object is carried; actual weight, the were used was ErgoPlus Industriweight of the object.

NIOSH Lifting Equation

The NIOSH Lifting Equation was applied only to the lifting and lowering of the M795. Like the Snook Tables, this equation is used to determine whether an object is too heavy for a task (Waters et al., 1994; Marras, 2006). The variables measured in this tool are the horizontal location (H) of the hand, vertical location (V) of the hands, vertical travel distance (D) of the object, asymmetric angle (A) of the individual's trunk, and the coupling (C) of the object (i.e. how well suited the object is for holding [e.g. handles]). Additional variables are the frequency, average and maximum loads, and duration of the task.

Lifting Equation is a recommended weight limit (RWL) for the task. This is determined to be the load weight which all healthy works can perform over a standard shift or Lifting workday (Waters et al., 1994). The lifting index (LI) is another output, which estimates the physical stress accompanying the task. The greater nition pallet. As the pallet is only the LI, the fewer percentage of operators can safely perform the task must bend down to correctly grasp (Marras, 2006). The LI is determined by dividing the load weight an angular displacement in the op-(L) by the RWL (LI = L/RWL). REBA

In this analysis, REBA was used to assess the risks of lifting, carrying, and lowering the M795. Designed to address the risks associated with bodily posture, this tool evaluates task positions in two different groups (Hignett & McAtamney, 2000). Group A analyzes the ergonomics of the neck, trunk, and legs during the task; Group B analyzes the arms and wrist. Each group is scored and used together to provide an overall REBA score. The REBA score reflects the risk level associated with the task and offers a recommendation for when action should be taken to correct it. This

High (8–10), and very high (11–15). **Data Collection and Platform**

The platform through these tools al, an online company which offers the use of ergonomic software. This software contains calculators for the NIOSH Lifting Equation, the Snook Tables, REBA, the Rapid Upper Limb Assessment (RULA), and WISHA Lifting Calculator. The software works by first creating a job, then creating the tasks associated with its performance. Under each task, the user selects which tools they will use and inputs the appropriate task-variables. Once calculated, the software provides the original tool's score/output (e.g. a REBA score) and an ErgoPlus score referred to as the Risk Index. For this assessment, only the original tool's scores/outputs were used. After using the calculators to analyze The primary output of the NIOSH the tasks, all data was collected and stored on the ErgoPlus user profile.

Results

To summarize, this task consists of the number four man lifting the M795 projectile from the ammu-3 in. off the ground, the operator the projectile. This bending causes erator's trunk (i.e. they must lean forward) and requires that they assume a squatting position. The NIOSH Lifting Equation, REBA, and Snook Tables (Lift) were used to assess this task.

NIOSH Lifting Equation

Because the object's distance from the midline of the body was relatively the same from the start of the lift to the end, the horizonal locations of the origin and destination were both 10 in. The vertical location, however, was 3 in. at the origin and 25 in. at the destination. The angle of asymmetry at the origin measured approximately 30 degrees at the origin and 0 degrees at the destination.

Coupling was deemed fair as the base of the M795 has a one-inch

indentation, but no handle. The sustained rate of fire for the M777 is one round every two minutes, therefore, the frequency of the lowering was determined to be 0.5 (one lift per 2 min). The average and maximum loads were 103.5 lbs, the standard weight of the M795. Because fire missions occur intermittently throughout the day for periods of 5 min. or less (normally), the duration was categorized as moderate, or 1 to 2 hours.

Again, the two primary outputs of the NIOSH lifting equation are the recommended weight limit (RWL) and the lifting index. The RWL determined was 28.98 lbs at the origin and 38.69 lbs at the destination. The lifting index (risk index) was 3.57 at the origin and 2.68 at the destination (see Table 1). REBA

Operators are taught to maintain a straight back and neck during the lift, so the neck position selected for REBA was 0 to 20 degrees. Again, the trunk is leaned forward as the operator bends down, so 20 to 60 degrees was selected for the trunk position. Bilateral weight bearing was chosen for the leg position due to the static posture, however, the leg adjustments were determined to be 60 degrees or more.

The force/load was greater than 22 lbs, the upper arm position was 20 to 45 degrees, and the lower arm position was 0 to 60 degrees. The wrist position and adjustment selected were 15 degrees and twisted. Like the NIOSH lifting equation, coupling was deemed to be fair. This task achieved a REBA score of 9 (see Table 2).

Snook Tables

Because the number four man must bend down to pick up the projectile, floor to knuckle (below 29 in.) was selected for the lift lower point. The frequency was one action per 2 min. and the horizontal distance was 10 in. The distance of the lift and actual weight were 30 in. and 103.5 lbs, respectively. The design goal determined was 22 lbs (see Table 3).

Carrying

As a task, carrying is the number four man transporting the projectile

		Table 1.		
NIC	OSH Lifting	Equation - Lif	fting Task	
Variables Horizontal Location		Results Origin		
Vertical Location				
3	25	10000000000	. State of the second	
Angle of Asymmetry		3.57	28.98 lbs	
30	0			
Coupling		1		
Fair		Destination		
Frequency		Risk Index	RWL	
0.5		2.68	38.69 lbs	
Average Load				
103.5				
Maximum Load				
103.5		1		

Table. 2

Var	iables			
Neck Position Upper Arm Positio				
0-20 degrees	20-45 degrees			
Neck Adjustmets	Upper Arm Adjustments			
NA	NA			
Trunk Position	Lower Arm Position			
20-60 degrees	0-60 degrees			
Trunk Adjustments	Lower Arm Adjustments			
Fair	NA			
Leg Position	Wrist Position			
Bilateral Weight	15 degrees			
Leg Adjustments	Wrist Adjustmets			
60 degrees or more	Twisted			
Force/Load	Coupling			
	103.5			
> 22 lbs	Activity score			
	NA			
REBA	Score			
	9			

Table 3.



from the ammunition pallet to the feed tray. This distance is typically between 10 and 15 ft and located immediately to the rear of the howitzer. While there are other operators moving in this area during fire missions, it is clear and free of hazards by the time the number four man is ready to transport. REBA and the Snook Tables (Carry) were used to assess this task. REBA

Both the neck position and trunk position for this task were 0 to 20 degrees. The leg position selected was one leg raised because the operator is running the ammunition to the next location. The force load, upper arm position, lower arm position, coupling, and wrist position/ adjustments did not change from the lifting task. This task received a REBA score of 8 (see Table 4). **Snook Tables**

Although neither hand is the same height during the carry, the carry point used in this assessment was waist height. The selection for carry distance was 14 ft, as this is a typical distance that may be experienced during operations. The frequency and actual weight did not change from the lifting assessment. The design goal for this task was 33 lbs (see Table 5).

Lowering

For this task, the number four man stands next to the howitzer and places the projectile onto the feed tray. Because the feed tray is approximately 3 ft high, the lowering distance is significantly less than the original lift distance. However, the operator must lean forward to place the projectile on the tray, creating a slight angular displacement in their trunk. This task was evaluated using the NIOSH Lifting Equation, REBA, and Snook Tables. **NIOSH Lifting Equation**

During this task, the horizontal location was 10 in. at the origin and 15 in. at the destination; the vertical location was 25 in. at the origin and 20 in. at the destination; and the angle of asymmetry was 0 degrees at the origin and 10 degrees at the destination. There was no change from the lifting assessment in the coupling, frequency, average

Table 4

REBA - Carryin	g Task
Variable	S
Neck Position	Upper Arm Position
0-20 degrees	20-45 degrees
Neck Adjustmets	Upper Arm Adjustments
NA	NA
Trunk Position	Lower Arm Position
0-20 degrees	0-60 degrees
Trunk Adjustments	Lower Arm Adjustments
Fair	NA
Leg Position	Wrist Position
One Leg Raised	15 degrees
Leg Adjustments	Wrist Adjustmets
60 degrees or more	Twisted
Force/Load	Coupling
	103.5
> 22 lbs	Activity score
	NA
REBA Scor	e
9	

Table 5.		
Snook Tables - Carrying Ta	ask	
Variables	Results	
Lift Lower Point	Design Goal	
Knuckle to Shoulder (between 29 and 54 in.)	1010 F	
Frequency		
1 action/2 minutes	100 C 10 C 10 C 10 C 10 C	
Carry Distance	33.00 lbs	
14 ft		
Acutal Weight		
103.5		



NIC	SH Lifting E	quation - Lov	vering Task	
Variables Horizontal Location		Results Origin		
Vertical Location				
25	20	1		
Angle of Asymmetry		2.41	42.9 lbs	
0	10			
Coupling		1		
Fair		Destination		
Frequency		Risk Index	RWL	
0.5		3.89	26.61 lbs	
Average Load				
103.5				
Maximum Load				
103.5				

this task. The determined RWL was 42.9 lbs at the origin and 26.61 lbs a design goal of 22 lbs; lowering at the destination. The lifting index scored an 8 on REBA, a peak liftwas determined to be 2.41 at the origin and 3.89 at the destination (see a design goal 29 lbs.; and carrying Table 6).

REBA

was 0 to 20 degrees. Because the REBA assessment, and lifting inoperator must turn his neck to look dexes of both the lifting and lowerat the feed tray, neck twisted was ing tasks fell into the "needs redeselected for the neck adjustment. Zero to 20 degrees was selected for the trunk position and bilateral lbs less than the standard weight of weight bearing was chosen for the the M795. These results indicate a leg position. Again, the force load, need to reevaluate or redesign the upper arm position, lower arm position, coupling, and wrist position/ lifted, carried, and lowered onto the adjustments did not change from

the previous tasks' assessments (lifting and carrying). This assessment resulted in a REBA score of 8 (see Table 7).

Snook Tables

The lift lower point for this task was between the knuckle and the shoulder (between 29 and 54 in.). The frequency was one action per 2 min and the horizontal distance was 15 in. The distance of lift (lower) was 10 in., and the actual weight was 103.5 lbs. The resulting design goal was 29 lbs (see Table 8).

Discussion

When comparing the outputs of each tasks' assessments, consideration should be given based on the highest and lowest scores by category, as they indicate the level of risk posed to the operator. The highest REBA score reflects the task which poses the highest threat based on postural positions. Under the NIOSH Lifting Equation, any lifting index greater than 1.00 incurs risk; the greater the value is beyond 1.00, the greater the risk. The RWL and design goal from the NIOSH Lifting Equation and Snook Tables, respectively, represent the max weight which should be handled per task. Therefore, for these outputs, greater risk is reflected by lighter weights.

As anticipated, each task was found to pose significant risk to the operators. Lifting scored a 9 on the and maximum load, and duration of REBA assessment, a peak lifting index of 3.57, a RWL of 28.98 lbs, and ing index of 3.89, a RWL of 29, and scored an 8 on REBA and a design goal of 33 lbs. Each of the tasks were The neck position for this task classified as high risk based on the sign" category. Furthermore, each design goal and RWL was at least 70 manner in which ammunition is howitzer.

Table 7.

REBA - Lowering Task			
Variables			
Neck Position Upper Arm Position			
0-20 degrees	20-45 degrees		
Neck Adjustmets	Upper Arm Adjustments		
Neck Twisted	NA		
Trunk Position Lower Arm Positio			
0-20 degrees 0-60 degrees			
Trunk Adjustments	Lower Arm Adjustments		
Fair	NA		
Leg Position	Wrist Position		
Bilateral Weight Bearing	15 degrees		
Leg Adjustments	Wrist Adjustmets		
60 degrees or more	Twisted		
Force/Load	Coupling		
	103.5		
> 22 lbs	Activity score		
	NA		
REBA Score			
8			

Table 8.

Shook Tables - Lowering Ta	ISK	
Variables	Results	
Lift Lower Point	Design Goal	
Knuckle to Shoulder (between 29 and 54 in.)		
Frequency		
1 action/2 minutes		
Horizontal Distance		
15 inches	22.00 lbs	
Distance of Lower		
10 inches		
Acutal Weight		
103.5		

Limitations

Additional weight that was not accounted for in these assessments is the personal protective equipment (PPE) worn by Marines. According to U.S. Government Accountability Office, this PPE consists of eye protection, ear protection, gloves, a flak jacket and kevlar helmet. Their combined weight totals to approximately 27 lbs. Although the equipment is worn and not handled, it can be assumed the additional load on the body likely increases the ergonomic risks of these tasks.

Recommendations

Both the NIOSH Lifting Equation and Snook Tables result in the recommendation of a maximum weight to be handled during a task. All tasks' results in this case analysis were approximately 70 lbs less than the actual weight of the M795, suggesting the projectile be re-designed to weigh less. However, its current design promotes aerodynamic efficiency and combat le- to target operator-specific tasks. the threat of musculoskeletal inthality, not proper ergonomics. Changing its design or reducing its weight would likewise reduce its effectiveness. Therefore, ergonomic improvements must focus on characteristics other than projectile design.

Crew Rotation

Of the cannon's crew, only the section chief requires specialized training beyond what is acquired by the entry-level cannoneer, meaning each of the other crew members can perform the number four man's duties, and the number four man can perform theirs. Still, most crews dedicate one person to each position and only change positions as they progress in seniority. This progression typically results in moving to less physically demanding jobs. Hence, the number four man usually remains at his position until more junior member joins.

There is no doctrinal purpose to the promotion of these duties; it is just a common way to show seniority within the crew. However, changing the doctrine may force the members to rotate in a way that promotes ergonomics. One example would be to change positions after each mission. In this case, the number four man would only handle the ammunition a fraction of what he would under normal conditions. Even rotating by time, i.e., changing positions every hour, would distribute the hazards equally amongst the team members. It should be noted, however, operational efficiency may decrease with the crew members becoming a "jack of all trades" instead of a "master of one."

Physical Training

As two critical factors of the number four man's duties are task repetition and heavy weight, performance in part depends on the operator's fitness. Exercises that concentrate on strengthening the muscles used most during these tasks will improve performance and reduce the potential for musculoskeletal injuries (Schellenberg et al., 2013). However, despite an emphasis on physical conditioning in the Marine Corps, it is rare for unit's PT

According to Dunaway, unit PT often aims at improving scores on the physical fitness test (PFT) and combat fitness test (CFT) rather than improving specific functional muscle groups.

While there was an effort to assess job-specific tasks through the MOS-Specific Physical Standards (MSPS), little changed in the PT programs' focus . Most are still disproportionally focused on cardiovascular endurance rather than muscular endurance. However, making the change is logistically easy and only requires small-unit leadership to reevaluate their PT plans. During the number four man's task, the muscles most at risk are in the lower back and legs. The back squat and deadlift are two well-known exercises that strengthen these areas. While these exercises are common, teaching proper form is imperative as poor body form during their execution can also result in musculoskeletal injuries.

Conclusion

Of the M777A2's crew, the number four man is at the most ergonomically at-risk during operations. The weight of the M795, coupled with the repetitiveness and body postures taken during the tasks, increases his risk of acquiring musculoskeletal injuries to the lower back and knees. Results of the NIOSH Lifting Equation, Snook Tables, and REBA all indicate the projectile is too heavy to be lifted, carried, and lowered as a job-related task (i.e., performed repetitively throughout the day). While re-design of the projectile is likely out of the question, changes to doctrine and unit PT programs can help reduce its overall threat.

Doctrinally instituting a standard for rotating positions in between fire missions would reduce individual risk by reducing the number of times a task is performed. The use of doctrine would also dissuade sections from assigning positions based on seniority. Strengthening the muscles most at-risk and used during operations may also reduce

juries. This can be accomplished by constructing PT programs that teach and reinforce exercises like the deadlift and back sqat.

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WHAT WAS OLD IS NEW: The Paris Guns and The Future of Strategic Long-Range Cannon Artillery

By: MAJ Ian Patrick Grundhauser

It [The Paris Gun] was an astonishing achievement in technical terms, but the means and tactic of the day proved inadequate for the revolutionary strategic objective.



On the afternoon of March 29, 1918, in Paris, France, faithful Cath- its own strategic artillery weapon olics were celebrating Good Friday systems. One of these systems, unmass in the Church of St. Gervais. der development by the U.S. Army's Suddenly, an explosion rocked the Long-Range Precision Fires (LRPF) church, and "the massive stonework supported by one of the huge the Strategic Long-Range Cannon pillars was hurled with a frightful crash down on the mass of kneeling the U.S. Army seeks to achieve depeople in the nave."¹ This explosion sired effects beyond 1,000 nautical killed 88 men, women, and children, and wounded 68 more. A gas leak, or some poorly attended paint system for the U.S. Army that can cans did not cause this explosion. Instead, it was the work of an ar- (A2/AD) capabilities, suppress adtillery projectile hurled from more versary Long Range Fires and enthan 70 miles (mi) distant. This ex- gage other high payoff/time sensiplosion occurred on the seventh day tive targets."⁴ The U.S. Army LRPF of the bombardment of Paris by the CFT can achieve these strategic ef-"Paris Guns," the world's first truly fects by avoiding the strategic tarstrategic artillery.²

Today, the U.S. Army is pursuing Cross-Functional Team (CFT), is (SLRC)³ With this weapon system, miles (nmi) or 1,151 mi. Achieving these ranges provides a weapon "defeat Anti Access/Area Denial geting failures of the Paris Guns, as

- Major General (Ret.) Jonathan B. A. Bailey, **Field Artillery and Firepower**

> well as by relying on the principles of mass, accuracy, precision, and mobility.

The Paris Guns

The Paris Guns were a series of long-range artillery pieces developed by the Friedrich Krupp AG Corporation for use by the German Military during World War I (WWI). These guns were a modified version of the L45 "Long Max," a heavy naval and coastal defense gun capable of firing a 15-inch (in) projectile weighing 1638 pounds (lbs) as far as 17.4 mi.⁴ The Germans adapted the Long Max for use against the Allied trench systems on the Western Front. These guns underwent further adaptation in the development of the Paris Guns. The Paris Guns utilized the carriage and barrels of the Long Max. They were transported by rail, assembled, and then emplaced semi-permanently at specially designed positions on the Western Front behind the German lines. The 35 and 38-centimeter (diameter) barrels of the Long Max received rifled barrel inserts of 68.9 feet (ft) in length. A smooth bore attachment to the end of the rifled barrel of either 19.7, 29.5, or 39.4 feet (ft) (selected based on desired range and tube wear) completed the barrel configuration. In this configuration, the weapon could fire a 233.6 pounds projectile at least 75 mi carrying 15.4 pounds (lbs) of explosive TNT fill.⁶ In total, 352 projectiles fired by the Paris Guns impacted within Paris, France, and surrounding areas. These projectiles traveled between 50 and 75 mi 40

23 and August 9, 1918. Ultimatewounded 620 people throughout miles. Thus, the High Command the bombardment.⁷

Strategic Targeting

through the long-range bombardment of Paris by the Paris Guns. This belief resided in their valuation of intended negative psychological effects produced by the random and prolonged bombardment of a civilian population, and the resulting loss of morale or support for the Allied war effort. The Germans believed this psychological effect would result from the surprise at the German technological achievement, coupled with the random and prolonged terrorizing effect of the bombardment. Despite the intended effects, initial fear following the start of the bombardment on March 23, 1918, quickly abated. A sense of indifference or novelty quickly replaced this fear and continued until the bombardment's final day, August 9, 1918.⁸ Beyond indifference, the bombardment of Paris resulted in public and political outcry, especially after the most lethal day of the bombardment, the destruction at the Church of St. Gervais, on March 29, 1918. This outcry came, not only from German adversaries, but also from apolitical or neutral actors such as the government of Switzerland⁹ and the Roman Catholic Church.¹⁰ The inability to achieve intended psychological effects with the Paris Guns, coupled with unintended political effects resulted in a net negative strategic effect for the Germans, and an overall misstep in the employment of the Paris Guns.¹¹

Part of the flaw in the German pursuit of the Paris Guns, lay in a misalignment between strategic objectives and an operational approach to achieve those objectives. Further, a blind pursuit of technol– ogy for technology's sake, without an achievable objective for that technology, amplified this problem. At the strategic level, the Germans sought an end to WWI. In 1917, the Friedrich Krupp AG Corporation in-

on 43 separate days between March formed the German High Command intended and unvalidated capabilithat they had developed a weapon ty as a psychological weapon were ly, these weapons killed 256 and capable of achieving ranges of 62 had a weapon that could potentially aid in achieving their strategic Paris Guns, the intended objec-In the Spring of 1918, the German objectives. Unfortunately, in 1917, Military believed they could achieve Paris was more than 70 miles away strategic effects on the French from the German lines. The solution was simple: increase the range of the gun. The Friedrich Krupp AG tended strategic effect. The U.S. Corporation complied, and by ear- Army will use SLRC artillery to dely 1918 had created the Paris Guns, ter in competition while penetratcapable of shooting over 75 miles. ing and dis-integrating in armed Once the gun could shoot 75 mi, German leadership determined that the gun could, indeed, achieve a psychological effect if it bombarded Paris.

> Michael J. Neufeld's book, The Rocket and the Reich, best captures this thinking's illogical nature. He states, "The gun [The Paris Gun] was a triumph of narrow technological thinking: the technical intended strategic results. SLRC arfascination of being able to break tillery should maintain its current through traditional limits and fire concept, and let that concept drive over such unprecedented distances had overwhelmed any rigorous analysis of its likely impact on enemy morale."¹² This narrow technological approach and view of potential targets, resulted in a weapon capability, tactical action, and incapable of exponentially greater tended strategic effects desired by ranges than artillery pieces of its the U.S. Army.¹⁵ day. Despite this feat, its narrowly

substantively hollow.¹³

Fortunate for the LRPF CFT's pursuit of SLRC, and in contrast to the tives and purpose for SLRC preceded their development. Already, the U.S. Army is developing a weapon to meet a requirement and an inconflict.¹⁴ The tying of tactical action to a desired strategic effect (introduction of the Joint Force, and ultimate end of armed conflict) stands in stark contrast to the development and employment of the Paris Guns. The Paris Gun stands as a monument to function following form, and misalignment of technical capability, tactical action, and its development, and future use. Should the SLRC be subject to the narrow whims of an ever-changing and ever-elusive specific target set, it could fail to provide the technical



Mass

Paris Gun project, Dr. Fritz Rausenberger, identified one of the most significant flaws and misalignments between technical capability and desired effects. Dr. Rausenberger, stated, "Even the bombardment of Paris with such a relatively small shell containing only 8 kg of explosives . . . could only have a psychological effect on the enemy. Even to achieve this effect, it would be necessary to maintain a continuous bombardment, varying in intensity, for weeks or months."¹⁶ Dr. Rausenberger knew what apparently the German High Command did not, that without the ability to mass the effects of the bombardment, and sustain a relatively high tempo, these weapons would not achieve their intended psychological effect. One of the principles of 100 years.²¹ joint operations is mass, meaning, to "concentrate the effects of combat power at the most advantageous place and time to produce decisive results."¹⁷ SLRC weapon systems must be able to independently mass their fire on selected targets, or synchronize the massing of theirs' and other weapon systems' effects to achieve strategic results.¹⁸

SLRC weapon systems will inherently be large weapons, and will, therefore, require increased reloading times. Additionally, they will likely have reduced tube lives due to the same problems faced by the Paris Guns, that of large quantities of required charges and resulting high muzzle velocity creating increased tube wear. For these reasons, it is incumbent upon the U.S. Army to create such a number of these weapons to provide a near-continuous ability to mass effects for an extended period during armed conflict. If the U.S. Army does not meet this requirement, the SLRC weapon system will likely face the same challenges as the Paris Guns. These include an inability to mass fire at decisive points for an extended duration, while avoiding adversary counterbattery fire.¹⁹

If SLRC weapon systems are unto the inadequacies of the Paris timely massing of fires on a given Allied sound-ranging systems).²⁵

Guns. At any one time, the Par- target and the survivability of the The German lead scientist for the is Guns had, at most, only three attacking weapon system and its weapons in position ready to fire. These weapons had an average reloading time of 30 minutes, and fired intermittently to achieve impacts every 5 to 15 minutes.²⁰ On top of lag between shots, these weapons were fired at an area target (Paris), resulting in projectiles sometimes impacting miles apart. Coupled with short tube life (50 to 60 rounds per tube), and a low number of available weapons, the Paris bombardment resulted in only 352 projectiles impacting in and around Paris over 139 day period (an average of less than 2.5 rounds per day). If the U.S. Army hopes to avoid the Paris Guns failings, it must achieve massed fire, especially given the potentially great ranges (>1000 exponential increase in target mobility and survivability over the last of effects.

Accuracy, Precision, and Mobility

Regarding accuracy, the U.S. Army's Field Manual 3-09, Fire Support and Field Artillery Operations states:

The goal of any indirect firing unit is to achieve accurate firstround fire for effect (FFE) on a target . . . If the requirements for accurate fire cannot be met completely, the firing unit may be required to use adjust-fire missions to engage targets. Adjust-fire missions can result in reduced effect on the target, loss of surprise, increased ammunition expenditure, and greater possibility that the firing unit will be detected by hostile TA [target acquisition] assets.²²

These principles are as true today as they were during WWI. Accuracy depends not only on the ability to determine a target's location but artillery platforms employed by also on the U.S. Army's five defined the U.S. Army, they must remain requirements for accurate predicted fires. These requirements include: accurate target location and size, firing unit location, weapon and is Guns provide an example of the ammunition information, meteoro- cost of an inability to move. While logical information, and computa- bombarding Paris, the Germans attional procedures.²³ All of these re- tempted to mask their fire using able to mass fire, they will fall prey quirements must be met to ensure heavy artillery batteries (to defeat

crew.23

The problem of accuracy has increased exponentially since WWI. The Paris Guns enjoyed a static area target some 12 mi in diameter, the City of Paris, France. On the modern battlefield, targets are extremely mobile and employ a host of countermeasures and integrated systems to prevent detection. The increased need for accuracy coupled with the exponential increase in the difficulty of achieving it, necessitate advanced targeting systems and structures to inform SLRC targets. These targeting processes and systems must provide accurate real-time targeting data at SLRC's nmi), to enable the timely massing

In addition to meeting the requirements to achieve accuracy, the modern battlefield also requires SLRC munitions to enjoy the precision present in contemporary weapon systems. Again, FM 3-09 states, "A precision munition is a munition that corrects for ballistic conditions using guidance and control up to the aimpoint or submunitions dispense with terminal accuracy less than the lethal radius of effects."²⁴ The Paris Guns did not enjoy a precision guidance capability, and therefore achieved limited massed effects on point targets. A precision capability works hand-in-hand with accuracy to achieve desired strategic effects, especially given the likely high-end nature and strategic value of SLRC's intended target sets.

Finally, the SLRC weapon systems must be relatively mobile. Acknowledging that these weapon systems will likely be larger and therefore less mobile than current semi-mobile to avoid counterbattery fire after prosecuting their fire missions. In this regard, the ParDespite these German efforts, the visioned for the future. Once em-French artillery located the Paris ployed, these weapons require strafirst day's bombardment. After lo- the principles of mass, accuracy, cating the firing unit locations, they precision, and mobility to ensure fire within 24 hours. This counter- the battlefields of tomorrow. battery fire resulted in the wounding of several Paris Gun crewmembers. Further, it limited the ability of *About the Author:* the guns to continue firing on that day.²⁶ Because, the Paris Guns were *MAJ Ian Patrick Grundhauser was* lay exposed to counterbattery fire at from Marguette University, Milthe whims of the French artillery.²⁷

prepared fixed positions after first *commissioned through the Reserve* being moved by rail and assem- Officer Training Corps into the U.S. bled.²⁸ Mobility required the cre- Army Field Artillery in May 2009. ation of new prepared concrete and Major Grundhauser has served in steel positions, disassembly, move- the 1st Stryker BCT, 25th Infantry ment by rail, and reassembly. De- Division at Fort Wainwright, Alaska, spite rudimentary sound-ranging 4th Infantry BCT (Airborne), 25th technology, the French were able Infantry Division at Joint Base Elto locate, reposition railway artil- mendorf-Richardson, Alaska, 377th lery, and provide accurate counter- *Parachute Field Artillery Regiment*, battery fire all within 24 hours of the Squadron Fire Support Officer in the initial bombardment. Through 1st Squadron (Airborne), 40th Cavthe rapid and expansive growth of alry Regiment, 82nd Airborne Divitechnological capability, adversary *sion at Fort Bragg, North Carolina* counterbattery capabilities will re- and the 1st Battalion, 75th Ranger quire only minutes, and possible Regiment. seconds, to respond to the firing He deployed to Kandahar, Afghaniof a SLRC weapon system. For this stan in support of Operation Endurreason, it is critical to the survival *ing Freedom, Mitrovica, Kosovo in* of these weapons, that they be mo- support of Operation Joint Guardbile enough, or have some means of ian, and once in support of Operadefensive capability to provide in- *tion Freedom's Sentinel.* creased survivability on the modern Major Grundhauser is currently enmet, after its initial volleys, SLRC Scholars program within the U.S will be unable to continue firing in Army Command and General Staff support of strategic objectives. Conclusion

A critical lesson of the Paris Guns on a Master of Military Art and Sciis that pursuing technology for technology's sake, and misaligning strategic objectives with an operadesired end state. The Paris Guns Artillery currently under developserve as a historical warning of how these misalignments can translate lery. The title of Major Grundhausto failure in armed conflict. In pursuing SLRC artillery, the U.S. Army Gun Trap: The Future of America's LRPF CFT must maintain a view of *Strategic Artillery*". the intended purpose, effects, and objectives. This view will inform their development, ensuring they New York Times, March 31, 1918, accessed Janupossess the capabilities required to meet the strategic objectives en-

Guns' firing positions after only the tegically aligned targeting based on returned effective counterbattery the lasting effectiveness of SLRC on

unable to dislocate after firing, they *born in Minneapolis. He graduated* waukee, WI, with a Bachelor of Sci-The Paris Guns were fired from *ence in Mechanical Engineering. He*

battlefield. If these criteria are not *rolled as a member of the Art of War* College, Fort Leavenworth, Kansas. Most recently, he completed work ence thesis. This thesis, researched the history of the Paris Guns during World War I to inform the use of futional approach seldom achieves the *ture Strategic Long–Range Cannon* ment by the U.S. Army Field Artiler's thesis was: "Avoiding the Paris

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Use of Bonus verses DPICM **A CTC Perspective**

By: CPT Eric B. Johnson and CPT Ian D. Sheffield

fies an enemy mechanized infantry judication tables, a 155mm artillery company of BMP-2s and T-72s in battalion must accurately fire 54 an assembly area. He quickly sends rounds of DPICM, producing 3,888 a call for fire through his squad- bomblets to destroy a T80 tank, reron to the brigade TOC. The mis- sulting in 85 duds. This creates a sion reaches the artillery battalion, hazard for civilians, but also for any where the fire direction officer cal- friendly forces who subsequently culates a fire order. Since the activa- clear the terrain. BONUS is an artion of NATO Article V, he is autho- tillery-launched, fire-and-forget rized to fire Dual Purpose Improved munition capable of successful-Conventional Munitions (DPICM). ly combating any armored vehicle. To destroy the armored vehicles in Compatible with the majority of this company-sized formation, he existing artillery guns, BONUS is will need to mass the FA battalion handled much like a conventionand fire 180 rounds, 10 from ev- al shell. When launched from any ery gun in the battalion. While the 155mm artillery system, the BONUS mission is successful, the battalion carrier shell separates to deploy two must subsequently conduct surviv- sensor-fuzed munitions that then ability moves and resupply for each search for targets within a given battery. This is a plausible story footprint, up to 32,000 square mefor many units as they look down ters, with a dud rate that is complitheir optics at the OPFOR hoping ant with current cluster munitions for a quick solution for an armored treaties.¹ target. A solution that presents itself within the European Theater our thoughts within large-scale is the BONUS round. At JMRC, The combat operations (LSCO) mov-Fire Support Training Team (Vam- ing forward, Battalion Commandpires) bases the use of DPICM on ers within the AAR from 3ID after an assumption that Germany and OIF1 requested lowering DPICM and the COCOM CDR would delegate BB-DPICM due to the concerns with employment down to the Brigade DPICM. Additionally, given the suc-Combat Team (BCT) CDRs with the cess of SADARM unit tactics, techactivation of Article V. While DPICM niques, and procedures (TTPs) were can achieve effects, the BONUS four rounds in effect against a point round provides commanders with target. The BONUS Mk 2 is a critithe capability to engage armored cal enabler for the field artillery to targets in compliance with current provide lethal effects against spetreaties, with a lower round count, cific targets against a near peer or decreased impact on logistics, and peer adversary. The rationale beincreased survivability for friendly hind using the BONUS munition as units.

The majority of NATO allies are signatories to the "Convention on Cluster Munitions", which restricts cluster munitions with a dud rate cient and appropriate for attacking of over 1%. DPICM falls outside this limit, with a dud rate of 2-3%. While it may not seem significant, the effects of destroying a MIC (mechanized infantry company) worth of combat power litters the battlefield with unexploded bomblets. Refer-

A troop forward observer identi- encing the commonly used CTC ad-

As we look to the past to support stated in the doctrinal special text TTPs, "Conventional projectiles, though effective, have deficiencies that preclude them from being effiarmored targets. With conventional munitions, large volumes of fire are needed in order to defeat a single vehicle."1

With BONUS, units gain the capability to fire two rounds at an armored target and destroy it, for a

96% reduction in ammunition expenditure per fire mission. Now before we swap all of our ready racks with BONUS there are some limitations. The BONUS round can only be employed with 155mm howitzers, the M109A7 Paladin Self-propelled howitzer and the M777A2 towed howitzer. The round is ballistically similar to the SADARM (Sense and Destroy Armor) munition and base bleed M864 DPICM. In FY2000 DoD terminated procurement of the SADARM round with an average unit cost of \$50-60K. In retrospect, the cost of HE is between \$754 for a M795 or \$2716 for HE rocket assisted projectile (RAP). While DPICM is between \$655 and \$60,362 per round for M483 and M864 respectively. The problem arises with space available in each of our artillerv formation vehicles and turrets to house each one of these rounds. Additionally, with more rounds dedicated to missions, this greatly increases the unit's firing signature to enemy acquisition assets such as counterbattery radar and acoustic ranging radars. [Additionally, the BONUS round is currently only available within the European theater and the Army recently procured 3,500 rounds for use in the European theater.] As a base bleed round, it has a higher minimum engagement range than other munitions and while the submunitions are "smart" there is still a recommended five kilometer standoff from friendly armored vehicles to mitigate fratricide.

Battlefield calculus allows commanders and staffs to analyze relative combat power, estimate and verify capabilities and translate into missions, conduct predictive analysis and allocate resources at the time and place necessary to defeat the enemy. Using this technique, during war gaming units plan the number of rounds necessary to destroy an armored vehicle,

ΔΔ

current adjudication tables in resupply. For a M109A7 battery use at all combat training cen- with a haul capacity of 822 rounds, ters (CTC) specify the requirement expending 36–54 DPICM rounds for for 54 DPICM projectiles per main every fire mission rapidly depletes battle tank (MBT) (T-72 or T-80) this quantity. No matter which reto achieve a destruction mission. supply TTP is used (R3SP or LRP), This translates to a BN 3 or a BTRY conducting resupply places friendly 9, respectively. Using the BONUS forces in motion on the battlefield, round, the same firing battery only increasing the likelihood of enerequires two projectiles to achieve my contact and subsequent comthe desired effect. This has signifi- bat losses. Additionally, frequent cant impacts on the firing unit from class V resupply of the FA battalion both a survivability and logistics reduces the haul capacity for othperspective.

DPICM, the battery immediately high quantity of rounds will also encounters survivability concerns. absorb valuable space from theater Given the high quantity of muni- level depots to the ASP established tions needed to destroy a single ve- by the FA battalion FSC. hicle, engaging a battery of 2S19s or a platoon of tanks requires even nificantly mitigates both of these more ammunition. This greatly in – problems. Firing signature is re– creases the unit's firing signature to duced dramatically, both in the enemy acquisition assets to include number of acquirable rounds fired counterbattery radar and acoustic and in the number of howitzers ranging systems. It also increases required to fire. During rotations, the duration of each mission, al- OPFOR (opposing force) often will lowing the enemy a greater window not shoot back at low round count of opportunity to deliver effective acquisitions (higher shoot back cricounterbattery fire on U.S. artil- teria) considering them as either lery units. The battalion chooses to as baiting fires to expose their own mass to decrease its signature and batteries, or low-threat missions. the amount of firing time, it poten – With the sharp reduction in the tially exposes all of its firing batter- number of rounds employed, baties to enemy acquisition.

of ammunition, the battery also requires more frequent class V

er units and classes of supply from tages in survivability and logistics, Firing high-count volleys of the CSSB and echelons below it. The

Conversely, the BONUS round sigteries can conduct rapid survivabil-With the increased expenditure ity moves or PAA jumps, reducing the enemy's time window to deliver successful counterbattery fire.

Logistically, the unit conducts less frequent resupply, reducing the burden on supporting distribution assets, increasing the amount of time the battery is in position ready to fire, and increasing throughput capacity across the Brigade Combat Team (BCT). With the reduction of DPICM carried on board, the battery can dedicate more turret space to other munition types, increasing the versatility of onboard loads.

While the round provides advanit is also cost effective. Internal emails from March 2002 provided to the Secretary of Defense show the need for a "Smart Artillery Round." To the tune of an estimated \$25-35K per projectile, the BONUS round is the most cost effective option. The SMArt 155 round manufactured by the GIWS of Nuremburg, Germany, is approximately \$50-60K per round and is the most similar munition adopted by a NATO member.

The Vampire Team utilized rotations within the last two years to collect data and determine best practices and TTPs utilized by rotational training units (RTU) in employing BONUS and understanding its effects on the battlefield. To achieve the needed effects, the Vampire team coaches units that BONUS rounds are a finite resource n theater. This is based on the theory of operational stock of this mu-



priority of support for the RTU in get a smarter artillery round?" we the broader conflict scenario.

BONUS after observing the capability the round provides against round or a similar munition should armored threats around training be made available within each area day four. Initial challenges units or responsibility (AOR) which posexperienced were shooting BONUS sess a peer threat that includes a at point targets, and excessively significant armored threat. The high fire orders for the target ar- DOD policy on cluster munitions ray. Successful TTPs included us- states, "cluster munitions provide ing area targets (300m x 300m or a the joint force with and effective 300m radius) to cover the entirety and necessary capability to enof an enemy tactical formation, as gage area targets."² On the Korean well as sufficient battery standoff peninsula specifically, we see the from potential targets to avoid the Republic of Korea (ROK) purchasminimum range issues of the base ing 361 CBU-105 half-ton bombs, bleed projectile. Additionally, units for delivery in 2016. The CBU-105 expended 20% fewer rounds while is actually a container carrying 40 firing BONUS rounds compared to BLU -108/B SFW (Sensor fuzed mutheir DPICM and BB-DPICM usage. nitions) bomblets, a SADARM-like Despite the fact fewer rounds fired, munition. This purchase was osunits destroyed 34% more armored tensibly to addresses the target set targets with BONUS while reducing of North Korean Tanks. the firing signature and typically without triggering a counterfire response from the OPFOR.

If we are to enter into armed conflict with a near-peer / peer adversary, we must be able to achieve sure, would please the former Chief mass and survivability simultaneously. Bonus provides us both with Baxter, as he coined this term in the it's capabilities and characteristics. JAN-FEB 1998 edition of the Fires Bonus provides us both with its ca- Bulletin while discussing SADARM.³ pabilities and further provides the Now we only need to promulgate capability needed in LSCOs to de- this knowledge to the force and stroy armored targets and deter ag- provide an opportunity for units to gression against the alliance. As a train on this munition before they response to Donald Rumsfeld's

nition currently available and the question from 2002, "How do we build a munition for theaters where would respond by saying here in the Units are most successful with European theater in 2020 we have one. Beyond Europe, the BONUS

As the Field Artillery moves forward, we need to work toward the goal of "one-round-one-kill," to first achieve dominance of fires in support of maneuver. Which, I am of the Field Artillery, MG Leo J. arrive in the European theater and

there is an armored threat.

In conclusion, units were successful with BONUS after seeing the capability the round provided against armored threats after training day four. Initially skeptical units began to understand the need for utilizing this round against armored targets and in support of certain EFSTs (essential fire support tasks). The SADARM unit basic load (UBL) for 3ID from OIF 1 consisted of enough rounds that, if swapped out for BO-NUS rounds today would provide enough rounds on the guns to destroy 63 armored targets, roughly two tank battalions worth of combat power. Furthermore, the US Field Artillery has a multi-functional team focusing on extended range fires, which will encompass the requirement to destroy armored targets as they present themselves on the battlefield. The BONUS round provides this capability in Europe, and potentially wordwide.

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PLT BTRY BN

GETTYSBURG ARTILLERY TOUR

and enlisted men of Battery B, 1st These two original guns were the Battalion, 108th Field Artillery Regiment, PAARNG, left their armory in Chambersburg, Pennsylvania, to tour the nearby battlefield of Gettysburg. The tour was led by the writer, a retired Lieutenant Colonel, NYARNG, and professional historian. The short drive east on the modern Lincoln Highway brought the group to McPherson's Ridge, the scene of the meeting engagement fight on the morning of 1 July 1863. Although most of the local National Guardsmen had previously visited the battlefield as tourists, the tour was designed to introduce the battery personnel to the organization and tactical employment of Civil War field artillery in this momentous three-day battle. Other study topics included the Principles of War, logistics, terrain analysis and leadership.

Morning stops on the field allowed the group to follow the course of the first day's battle with a study of the three main artillery weapons used by both sides at the battle. Near the equestrian statue of Maj. Gen. John F. Fulton, the group studied the rifled, wrought-iron 3-inch Ordnance Rifle, employed by Battery A, 2nd U.S. Artillery, a horse artillery battery attached to the 1st Cavalry Division of the Army of the Potomac's (AOP) Cavalry Corps. At the statue and monument to Brig. Gen. John Buford, the group examined the original tube which fired the first artillery round during the battle. A later stop at the Eternal Peace Light Monument on Oak Hil allowed a discussion of the British Whitworth gun, two of which came through the Blockade to equip the Confederate Army of Northern Virginia. This state-of-the-art artillery piece had a maximum range of

On 7 August 2020, the officers 2,800 yards at 5° of elevation. only breechloaders on the field; and they demonstrated the technological advances of mid-19th Century ordnance equipment. A stop at Blocher's Knoll on the northern end of the field, examined the bronze Model 1857 12-pdr "Napoleon" howitzer, the ultimate anti-personnel weapon, utilized by Battery G, 4th U.S. Artillery. This discussion also concentrated on the four main types of ammunition used by these guns. Pvt. Benjamin Thomas, a battery cannoneer, commented, "As an artilleryman, I appreciated the opportunity to learn about the different types of ordnance on the battlefield. The ability of the artillery to fire multiple rounds of cannister from artillery pieces was remarkably interesting, as was the extreme length of counterbattery duels."

By: LTC Gustav Person, NYARNG-Ret.

At a stop on East Cemetery Hill, the group discussed the retreat of the Union forces through the town of Gettysburg and their fallback position late on the afternoon of 1 July. At the nearby Steven's Knoll, the group was briefed on the "French Ordnance Glass," a recent technological advance utilized by Capt. Greenlief Stevens, who commanded the 5th Maine Battery of the 1st Army Corps Artillery Brigade. Using this early optical range finder, his six 12-pdr Napoleon howitzers were instrumental in defeating a major Confederate assault on the second evening of the battle.

During a visit to the nearby National Cemetery, ROTC Cadet Jarred Birrel of Battery B presented a dramatic reading of the Gettysburg Address at the site where President Abraham Lincoln delivered it during the dedication of the cemetery on 19 November 1863. The group then traveled to the nearby National Park



The author briefing the Battery on East Cemetery Hill (Photo by CPT Patrick Quinn)

Service's impressive Visitors Center to view the excellent documentary film narrated by Morgan Freeman; and the historic Gettysburg Cyclorama which depicts the climactic aspects of Pickett's Charge on the afternoon of 3 July, the third day of the battle. The group was also able to spend some time viewing the exhibits in the museum. The Visitors' Center, opened in 2008, is well worth a visit before touring the battlefield.

The afternoon's activities included a stop at Little Round Top to discuss some of the second day's fighting; and an in-depth examination of the fire support operations of both armies during Pickett's Charge on the third day.

At Little Round Top, the discussion centered around the role of key terrain in operations. The group was also briefed on the role of Battery D (Hamilton's Battery), 5th U.S. Artillery, currently the oldest artillery battery in the Army; and the cannoneers' herculean efforts to manhandle their six guns, equipment and ammunition up the rocky slopes to the summit of the hill. Slightly down the reverse slope, the group also stopped at the 20th Maine Volunteer Infantry monument to discuss the pivotal role of Lt. Col. Joshua Lawrence Chamberlain, certainly a prime example of the leadership of a citizen-soldier. After the war, Chamberlain received the Medal of Honor for his exploits and also served as the Governor of Maine from 1866-1870.

The rest of the tour was devoted to the third day's fighting. Near the North Carolina monument on Seminary Ridge, the group had been introduced to the third of three main artillery weapons used by both sides on the battlefield. The Parrott 10pdr rifled gun was invented in the 1850s by Capt. Robert Parrott, an Army ordnance officer. This gun can always be readily identified by the band of steel welded around the breech to prevent bursting of the barrel. Additional models of this type included the 20- and 30pdr guns. The latter weapon was a siege gun and was not used during the battle. Capt. Patrick Quinn, the

The author briefing the Battery on key terrain on Little Round Top (Photo by SSG Andrew Person)



battery commander, took the op- yards in front of the Union forward portunity to compare Civil War ar- edge of the battlefield. Additionwithin modern army units.

Ridge, the group discussed the ammunition re-supply point, plus a Confederate plan of fire support for repair and battery replacement site. Pickett's Charge, and also concentrated on the incomplete planning, faulty fuses, and ammunition; and use of the Artillery Reserve in the the failure to adequately breach the Army of the Potomac; and that the Union line prior to the infantry assault.

On Cemetery Ridge, the group first stopped at the Pennsylvania Monument to obtain a panoramic view of the battlefield, and to discuss the Union plan of fire support devised by Brig. Gen. Henry Hunt, the AOP chief of artillery, and certainly one of the world's preeminent artillerists in the 1860s. He deployed at least 123 Union guns from three different army corps and the AOP Artillery Reserve. Hunt planned to conserve ammunition during the two-hour counterbattery duel, and to use slow and deliberate fire to knock out the Confederate guns by stages. During the following Confederate infantry assault, his concentrated fire was so decisive that Pickett's Charge was effectively defeated before the first Confederate soldier set foot in the Emmitsburg Road, about one-to-two hundred

tillery organization and its short- al time was devoted to examining comings to today's debate over Hunt's plan to utilize his Artillery the re-introduction of the DivArty Reserve; and to assemble a nearby artillery park behind Cemetery At the two stops on Seminary Ridge to provide a readily accessible Staff Sgt. Jesse Morris later noted, "I was particularly interested in the army's ability to deploy and support any portion of the battlefield at will





A portion of Paul Philippoteaux's famous 1883 Gettysburg Cyclorama shows the Confederates breaching the Angle around 1600 hrs. on 3 July. 1LT Alonzo Cushing's cannoneers can be seen removing their disabled guns as Federal reinforcements arrive on the scene, while a fatally wounded Cushing has fallen into the arms of First Sergeant Frederick Fuger below the Copse of Trees (Gettysburg National Military Park).

as a major component of the Union victory."

At the Angle where the assault climaxed, the group spent some time examining the significant role of 1st Sgt. Frederick Fuger, a German immigrant and exemplary non-commissioned officer. Fuger took command of Battery A, 4th U.S. Artillery when the acting commander, 1st Lt. Alonzo Cushing, who had been already severely wounded and being held up by Fuger, was shot through the mouth, thus mortally wounded during the hand-to-hand fighting around the battery. The battery cannoneers actually fought the Confederate infantry with handspikes and rammers. For his braverv and meritorious service, Fuger received the Medal of Honor and a battlefield commission. He remained in command of the battery for the rest of the war, and finally retired as a lieutenant colonel at the turn of the century. Cushing also received the MOH 151 years later for his his service at Gettysburg.

The Gettysburg battlefield provides a significant outdoor classroom to study operations, and to gain an appreciation for lessons learned. Examples of outstanding leadership by officers and enlisted men of both armies are legion and are indicative of selfless service and devotion to duty. Cpt. Quinn summed up the day's events, "Commanders during the Civil War often had difficulty in analyzing the Battle Space. Field Artillery has changed considerably, but much has remained the same. It is fascinating to realize that there are still batteries, smoke, officers, and NCOs who fill the same roles and are integral to winning the battle and supporting the infantry. Finally, as demonstrated today, the modern military constantly reaches back in its history to foster its traditions and heritage."

About the Author:

Gustav Person has a Master of Arts degree in History from Queens College, City University of New York. He retired in 1999 as a lieutenant colonel, New York Army National Guard. After a career in the New York State Division of Parole, he worked for fifteen years as the Installation Historian at Fort Belvoir, VA. During that time, he conducted numerous Staff Rides and tours at various Civil War battlefields in the Mid-Atlantic states. Currently, he also conducts Gettysburg Artillery Tours for Field Artillery Senior Leadership Course (SLC) Non-commissioned Officer students in training at Fort Indiantown Gap, Pennsylvania.



B BRTY poses for a group photo at the 3-m. Ordnance Rifles of Battery A, 4th U.S. Artillery a the Bloody Angle



What Boche PWs Think About You

published by the U. S. Army's Orientation Branch for its forces in the European Theatre of Operations. The newsletter carried a variety of information of interest to soldiers including tips for surviving combat, morale boosting articles and infor*mation on Allied enemy forces. The* weekly publication covered October 1943 through May 1945. The excepts dicsussing artillery are from an article, "What Boche PWs Think About You" appeared in the Vol 2, Issue 35, 30 Aug, 1944.



What Boche PWs Think About You



The big American push across Brittany trapped thousands of German soldiers. They fell into the hands of our infantry and tanks and were rapidly carried back to the PW cages. There, fresh from combat-but a few hours away from their last clash with the Yanks-they were interviewed by an ARMY TALKS reporter.

"What do you think of the American soldier?" he asked. "What do

Army Talks was the newsletter you think of his equipment? How Statements By well does he use it? You were in a German Prisoners good position to judge his ability. Tell us what you think about him."

Here are some of the answers. They are completely unedited. They are presented exactly the way the interrogator translated the German prisoners' remarks. They should be evaluated with caution. Some of man acting as infantry squad leadthese Germans were arrogant Nazis. Their statements may not be trustworthy. They may be colored by their Nazi indoctrination. Others -conscripts from conquered nations-may have been trying to curry our favor. Their flattering remarks should not be taken too seriously.

Every company officer, however, can conduct an interesting Army Talk by quoting these statements of German prisoners. Somewhere in the bulk of these statements by German prisoners is a residue of front more than once). truth. From this truth every American soldier can profit. Mistakes can be avoided, strengths can be exploited. The German enemy can be better understood, and above all, pride in the great military machine our "feeble democracy' has so quickly built will be strengthened.

For whatever the criticisms, the defects and the errors the experienced German soldier points to in us, the fact remains that these Germans are our prisoners. The German Army is in retreat. And the German ambition is being foiled by "weak, green, decadent Americans."



About our Infantry:

(Note: If this gets the infantry mad, remember, it is the German PWsnot ARMY TALKS- whose opinions are expressed here.)

Acting Sgt. (an SS artilleryer, with service at Narvik, and two years on the Russian front) "In this last action I was lying in my LMG pit, with the rest of my squad disposed around me. I didn't dare stir out of my hole for over two hours because of the terrific artillery and mortar fire we were getting. Right after the fire let up, I noticed American Infantry next to my hole, they must have suffered casualties from their own fire being that close (a thing I have seen happen on this

"They were making their way past our position and across the field we were supposed to be covering without even noticing our presence there. The funny thing is that I was in a shallow little pit I had scraped out with my bare hands-no camouflage but a few potato plants stuck around. I could have mowed down the first wave at my leisure if I had, been a fanatic. If I hadn't been sick of the whole business I think I could have got away without any trouble; there was a long interval beween the first and second wave. Finally, however, after a lot of troops had passed, I saw some medics wandering around, and decided to give myself up."

Pvt. (lnfantry) "Your infantry doesn't take advantage of their supporting weapons. The artillery has us down and out, but by the time the infantry get there we are freshed up and ready for them. The same thing happens when we are battered by your bombers."

"Your infantry doesn't stay close enough behind the artillery fire and when they attack they haven't any push."

Sgt. (Infantry, three years in Russia) " The American infantry is too cautious. They are always thinking of how to save their own lives. The Russian soldier goes through just as though we weren't shooting at him." (The interpreter suggested to this man that we were interested in saving as many lives as possible because we could afford to with our equipment even though it would take a little longer. His response was a smile which was a combination of disbelie and scorn.)

"Your riflemen shoot well but they are not aggressive enough. When the infantry starts coming up all we have to do is to throw a few shots at them and they stop. They are altogether too cautious.'

"Your machine gun fire is badly aimed and doesn't hit anything. Instead of waiting utilI we get close they just start firing without seeing anything."

"The men are very frightened by mortar fire. In some ways it's worse than artillery. You can hear the artillery shell but the mortar shell just goes 'boom' and it's right there on you. Your mortarmen are very good."

Cpl. (Infantry) "Your attacks are not always followed up quickly. We have time to reorganize and entrench ourselves before your thrusts are resumed. A long time elapses between your artillery concentrations and the appearance of your foot troops."

Sgt (Infantry)"After being subjected to two days of your continuous artillery fire we would have crumbled quickly; in the face of a strong infantry attack we would have surrendered immediately, but your infantry took too long a time in arriving. We were better prepared and were able to kill many of your men before we finally gave up.'

Cpl. "Your infantry is too cautious. They rely too much on the artillery to pave the way for them. If our infantry had the same kind of support vou would be thrown back into the ocean by now."

but contempt for your infantryman so far as his military qualities are concerned. He doesn't understand cover or concealment. He doesn't follow his artillery barrage. You give us plenty of chance to reorganize. If we had your artillery support not combat) " The toughest thing we one of you would leave France alive. Compared to our German soldiers you are not proficient in armored vehicle combat. If armor gets too close you lose your head. Our men in the army, three or them on the stand their ground and throw grenades. The best I can say for your men is when we capture you, you don't talk. You are good soldiers in that way."

Sgt. {Panzer Grenadiers) " I cannot figure your infantryman out. He is either too cautious or, if he is audacious, he is careless. The Russian soldier is a harder man to deal with. He is sly and sneaky and he prowls like an animal, but the American walks out straight and we bowl him over with a few bullets. You attack fiercely with your artillery and your air force. We burrow in our holes and are shocked into impotence. Then maybe three hours later your infantry comes along-too late, we are ready again."

Pvt. "To our green troops your mortar is worst. After we learn to take cover and protect ourselves from it we think your machine gun is worse. Many of our men believe your rifle ammunition explodes on impact.

Your artillery fire is mentallyterrible. It leaves us demoralized, but its actual effect isn't always great because we keep spread out and we dig in. But it makes our green troops dizzy."

Sgt. {Infantry) "Your artillery and air force are trained to the last ditto point in accuracy, but your infantry is bad. Its main fault is that it is not aggressive. It expects the air force and artillery to knock out all our automatic weapons before it attacks. If it were a little less cautious many of your lives would be saved. You give us a chance to reform and lay mine fields. We are proud of our mine-laying system. Our mines play havoc with you and we enjoy making up new devices; we keep

Lt. (SS division) "We have nothing changing them all the time. When you learn one trick we have a new one ready."



Sgt. (Infantry, with two years of have had to face was your artillery. Its accuracy, concentration and fragmentation are terrific."

Pvt. (Infantry, with five years Russian front, after criticizing several other parts or our Army) "Your artillery is OK."- His expression and eyes indicated his admiration as he said it.

Lt. (SS division) " Everybody hits the dirt and doesn't dare to move until your artillery fire stops. And the accuracy of your artillery fire is uncanny, especially that of the big naval guns. They seem to adjust by millimeters, and make living in a house very inadvisable. As a result, those artillery observation planes of yours are the most hated thing on the battlefield. No one: dares move an inch when they are up: we all just dive for cover and hope to God we we weren't seen, as you seem to think nothing of bringing down a battalion concentration on one single man. And your air force is pretty annoying too, particularly those fighter bombers you have. So far as your individual soldiers are concerned, we have a pretty good opinion of you; you are an athletic people, and in good shape physically. But a soldier is no better than his leadership; and yours still has the usual faults of inexperience."

Sgt. (Ordnance company, Infantry division) "We were in the thick of the fighting on the Russian front, but we have never seen anything like your artillery and mortar fire. Your fire is very exact.



The nerves of the few soldiers you didn't hit were so badly shattered that we could not fight. We actually become careless because we consider it a miracle if we survive such an ordeal."

Sgt. (Austrian Infantry regiment) "We used to think the Russians were masters of mortars, but we have changed our opinion since fighting against you Americans. Even the SS troops are surprised that people not belonging to the master race can produce such equipment and artillery pieces as you have. Also, we must admit you know how to use them."

Sgt. "Your artillery is more terrifying than anything I have ever Lived through in Russia. They are accurate and don't waste ammunition."

Lt. (Artillery battalion) "Our artillery is afraid to fire counter battery missions. After the first few rounds our men know they can expect to be paid back ten for one." Sgt. (Infantry) "We think this is worse than Russia. Your artillery and air force is worse to face than the Russians. We are nervous and shocked by it, it is so accurate-so much-the fragmentation is terrible. We are most afraid of your fighter bombers. Your mortar fire also, when it is well placed."

This issue was prepared by a staff member of ARMY TALKS, who interviewed more than one hundred German war prisoners in France just after their capture and while their battle experience was still strong in their minds.

This article can be found in its entirety at fieldartillery.org/blog.

Original scanning and OCR performed by Government Documents student employees at the University of Richmond.



The most commonly used field artillery piece used by the U.S. Army in World War II was the M2A1 105mm howitzer. In this 25 March 1945 photograph, gunners from Battery C, 337th Field Artillery Battalion, prepare to fire the battery's 300,000th round since entering combat in June 1944. (National Archives)



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Take the journey with a young adolescent as he embarks on his new life as an Artilleryman in the U.S. Army taking him around the world. From the Korean DMZ to Germany's Fulda Gap during the Cold War, each day was a new experience and adventure. Some funny and some sad stories are shared. Many veterans have shared similar experiences, yet few books are written about the peacetime antics and missions have been written. You can read about them here.

What made him and many others grow into men? How did the rigors of military life affect and transform him into early adulthood? This easy to read memoir shares these stories good and bad.

Order the book "Memoir of a Peacetime Soldier" on Amazon and visit www.PeacetimeSoldier.com

Jack of All Trades or Master of None: DA PAM 600-3 vs. AIM 2.0

By: CPT Jennifer Melfi and CPT Marc Melfi

Introduction

With the advent of the AIM 2.0 marketplace, Army Human Resources Command (HRC) and DA PAM 600-3 now offer differing guidance on the career progression plan of Field Artillery (FA) officers. Traditionally, HRC expected FA officers to move to a differently composed Brigade Combat Team (BCT), particularly after completion of the next level of professional military education. With the release of the Army Talent Alignment Process (ATAP), FA officers have the challenge of choosing to diversify their knowledge and skills across multiple artillery weapon systems or remaining in a specific weapon system that they already have experience in to truly become a subject matter expert.

Background

In April of 2019, the FA proponent of HRC updated DA PAM 600-3 with the guidance that "HRC will attempt to assign Captains who served in BCTs as Lieutenants to Field Artillery Brigades or to Maneuver Brigades with a different weapon system than what the officer previously experienced...this diversity of experience is designed as purposeful expansion of every officers Field Artillery knowledge and skills. Field Artillery company grade officers must grow experience and develop skills across the breadth of formations and weapon systems in the Field Artillery and the Army." This follows the traditional model of FA officer career progression and attempts to serve as a forcing function for officers to become more broadly experienced. However, the AIM 2.0 marketplace gives officers a choice of what they want to do. If an officer desires to stay in the same weapon system or diversify, all they have to do is match with a unit that will allow them to do so.

This makes DA PAM 600-3 more of a suggestion than a doctrinal answer on what an FA officer's career should look like. Therefore, it is important for all FA officers to understand the advantages and disadvantages of both diversifying and pigeonholing to make the best decision for their career.

Advantages of Diversification

In an interview with Brigadier General Stephen Smith, Commandant of the US Army Field Artillery School and the Chief of the Field Artillery, he expressed his opinions on diversification. He stated that "if you did the 82nd as your first assignment, then you go to the 1st Infantry Division and learn (how) a mechanized infantry division fights. You get a whole different view on life on the lethality, maintenance and an extremely high operational tempo and the pace of battle and how you provide fire support in that type of warfare."

One of the primary advantages of an officer diversifying is the ability to gain a broad knowledge base of multiple forms of FA. Understanding different weapon systems and their respective capabilities allows for officers to best meet the maneuver commander's intent. Having a wide experience in FA assets also provides a better understanding of multi-domain operations and helps to integrate FA into the overall mission. Diversification builds officer resiliency through challenging environments where personal and professional growth is imperative. In the move to large scale ground combat operations, it is imperative to understand how to properly utilize multiple types of BCTs to enable integration on the battlefield. An example of this would be the 25th Infantry Division, which is comprised of two Infantry BCTs, one Stryker BCT and one Airborne BCT.

Disadvantages of Diversification

Disadvantages of diversifying include having a broad knowledge base that is not necessarily deep enough for an officer to be a subject matter expert in a particular weapon system, as well as the fact that during the initial period of an officer being in a position there will have to be a large amount of on the job learning. This period of learning the new weapon system takes time and creates opportunities for costly mistakes. Diversifying may not utilize the skills and talents that the Army has developed in certain officers for more than one assignment and therefore wastes time and money. One example would be the Bradley Fighting Vehicle (BFV) equipment training, which takes 304 hours to complete. If an FA officer only utilizes this training during their time as a company or battalion level fire support officer and then switches to a BCT that does not utilize BFVs, the officer is no longer able to use the skills that the Army has spent time and money to develop. Finally, diversifying may not allow the officer to align their personal and professional goals with the needs of the Army.

Advantages of Pigeonholing

Pigeonholing into a specific weapon system can have advantages. FA officers have the opportunity to become subject matter experts in a particular weapon system, making their use more effective, efficient and lethal. Malcolm Gladwell argues this theory in his book Outliers, where he states that to become an expert in something you must spend 10,000 hours of time or 10 years practicing at it. This is only possible if an officer remains in the same weapon system throughout their careers building on both tactical and technical knowledge. Becoming a subject matter expert on a weapon system can make the dif- FA CCC 1-20 By the Numbers ference not only in the garrison environment but also on the battlefield where the artillery serves as the most casualty producing weapon.

Disadvantages of Pigeonholing

One of the largest disadvantages of an officer pigeonholing themselves into a specific weapon system is that the initial assignment that an officer receives at the Lieutenant level can limit future broadening opportunities if the officer does not diversify in follow on assignments. Many career strengthening opportunities may lie in transitioning to a different weapon system. versify, even though there was no FA officers should continually seek diversification forcing function personal and professional growth, within AIM 2.0. which may require the officer to **Conclusion** step out of their comfort zone and If HRC or DA PAM 600-3 does not switch to a different type of BCT. give clear guidance, FA officers will When it is time for an FA officer to divide between the two models, retake command at the battalion or higher level, the only opportunity to command could potentially be in by officers who choosing to pigeona weapon system that the officer is hole. Officers who want to pigeonnot familiar with. This places the hole can also struggle as they must officer at a marked disadvantage compared to their peers.



FA Captain's Career Course (CCC) class 1-20 was the first FA CCC class to go through the new AIM 2.0 marketplace. Of the 54 officers in the class, 40 were active duty officers who would PCS to a new duty station upon graduation. Of the 40 officers, 22 officers received assignments where they would be transitioning to a different weapon system. Eight returned to their About the Authors: original weapon system, four chose SFAB assignments and six chose branch immaterial assignments. 55% of the officers in the class have assignments where they would di-

sulting in officers who cannot diversify due to limited billets filled vacate their desired positions in order to make room for diversifying

ACT Career Map - 13A

officers. Diversification or pigeonholing only work as career progression models if the FA community widely accepts one of them. The ATAP and DA PAM 600-3 must communicate and present a clear picture to all FA officers on how to best manage their career progression and what will provide them the best chance of success.

CPT Jennifer Melfi is currently the Fire Control Officer for the 4th Infantry Division Artillery at Fort Carson, Colorado. She previously served as a brigade assistant fire support officer for 1st ABCT, 3rd ID, company fire support officer for 1-64 AR and platoon fire direction officer for 1-41st FA, 1st ABCT, 3rd ID Fort Stewart from Dec 2016 to Oct 2019.

CPT Marc Melfi is currently the squadron fire support officer for 3-61st CAV, 2nd SBCT 4th ID at Fort Carson, CO. His previous assignments include division assistant fire support officer for the 4th Infantry Division, platoon leader and battery fire direction officer for 1-9th FA and company fire support officer for 3-15th IN, 2nd ABCT, 3rd ID at Fort Stewart, GA.

CareerTracker

			Generated by Army C	Career Tracker Reporting		D
	Page 1 Report generated on: Nov 1					Report generated on: Nov 16, 2020
		LT	СРТ	MAJ	LTC	COL
OPERATIONAL DOMAIN	KEY DEVELOPMENTAL ASSIGNMENTS	Fire Support Officer Fire Direction Officer Platoon Leader	Battery Command	Brigade FSO CCT/Fires Brigade S3 BCT/Fires Brigade XO Battalion S3 Battalion XO	Battalion Command	Brigade Commander BCD Commander
	DEVELOPMENT / BROADENING ASSIGNMENTS	 Ammunition Officer Battalion Staff Officer Battery XO 	Battalion Fire Support Officer Battalion ArS3 Battalion Fire Direction Officer Battalion Fire Direction Officer Small Group Instructor (SGI) CTC O/C/T Mission Command Training Program (MCTP Operations Officer) Ground Liaison Officer (GLO) Special Operations Forces Fire Support Officer (Ranger/SF) Maneuver of Fires Brigade Staff Officer Instructor Positions (USMA Faculty, ROTC, other branch and service schools) Active Component/Reserve Component Trainers, other Reserve Component Trainers, ot	Small Group Instructor (SGI) Ordino ² Cops/EAC Assistant Fire Support Ordino ² Cops/EAC Assistant S3 ECT/Fires Brigade Assistant S3 A CARC S3X0 Instructor (USMA faculty and staff, ROTC APMS, Service School Instructor) Multi-National Coalition Trainer and Staff Officer Joint/Army Staff Positions B CD Operations Officer CTC O/CT Ranger/Special Forces Fire Support Officer Matter Developer	 Jond'Army Staff Positions NATO Siteff Comband Command Staff Snaior Fire Support CTC OC (MCTP, JMRC, UTC, TC) Orge/Division Staff Officer Special Operations Fire Support Officer ECD Plans Officer ECD Plans Officer TRADOC Fries/Army Air and Missile Obefonse/Air Defense Artillery Brigade Assignments AC/RC Training Support Team Chief/Commander Service Branch School Staff/Instructor ROTC Professor of Military Science 	Division/CorpsEAC Chief of Fires Division/CorpsEited Artillery Assistant Chief distafi (DCS, G-3/57) CTC Operations Group Commander/Chief of Staff MCTP CDR/Chief of Operations Groups TRADC Capabilities Manager XO to a General Officer Department Director, US Army Fires Center of Excellence HQDA or Joint Staff
INSTITUTIONAL DOMAIN	PME	• BOLC	· ccc	·ILE	• PCC • SSC	• SSC • PCC
	FUNCTIONAL TRAINING	- JFO - Air Assault - Airborne - Ranger	JFO JFC Arty Operational Electronic Warfare Course Fire Support Coordinator Course (FSCOORD) Air Assault Airtorne Ranger	SAMS SAMS Fire Support Coordinator Course (FocOORD) Usint Operational Fires and Effects Course JumeC JumeC JumeC JumeC Air Assault Airborne Ranger	- JIMPC - J4 II - Albasault - Alborne - Ranger	Senior Officer Legal Orientation Course (SOLD) Combat Developers Course Onthat Developers Course Junt Operational Fires and Effects Course (JOFEC) Air Assuit Airborne Ranger

Army Celebrates Production of 50,000th **GMLRS Rocket and Its Continued Evolution**

By: Kinsey Lindstrom, Program Executive Office Missiles and Space

Launch Rocket System rocket rolled off the industry partner's production line in Camden, Arkansas in mid-November 2020, marking a historic occasion for the U.S. Army and the field artillery community.

GMLRS postures as a battle-tested, long-range munition and is available to Army division and corps commanders, swiftly delivering a precision strike capability against critical, time-sensitive threats. With increased range and additional munition components, GMLRS is ever-evolving to address the Army's modernization strategy and serve in joint all-domain operations. Variants of the guided system have been deeply embedded within the Army, U.S. Marine Corps, and among allied partner nations and foreign military units worldwide for almost 20 years.

"I commend our STORM Project Office, government teammates and industry partners alike for achieving this phenomenal GMLRS program milestone," said Col. Guy Yelverton III, Program Executive Office Missiles and Space, Strategic and Operational Rockets and Missiles Project Office project manager. "Often referred to as the 70-kilometer sniper rifle for its incredible accuracy, the Army and Marine Corps heavily rely on this combat-proven munition, which delivers a distinct battlefield advantage."

GMLRS celebrates a long history of success. The early stages of the system date back to 1980, originally known as Multiple Launch Rocket System, Dual-Purpose Improved Conventional Munition, M26 basic rocket and its M26A2 extended range version. The M26 flew up to 32 km with the M26A2 honing its 45-km range. By June 1984, the MLRS weapon system, to include the M270 rocket launcher and rock-

The 50,000th Guided Multiple ets, was fielded to the 2nd Infantry-Division in Korea, representing the largest single increase in raw firepower for the Eighth U.S. Army in almost five years. Right on its heels, the C Battery of the 1st Battalion, 27th Field Artillery Regiment, then stationed at Fort Carson, Colorado, with the 4th Infantry Division, received its MLRS equipment in April 1985 – the first formal continental United States fielding of an MLRS battery.

> Decades later in the early 2000s, the M30 DPICM rocket emerged with increased accuracy and range as well as a GPS-aided navigation donning its new and current name, Guided Multiple Launch Rocket System. Two new variants were welcomed to the MLRS family of munitions, the GMLRS Unitary M31/ M₃₁A₁ and the GMLRS Alternative Warhead M30A1; AW later replaced DPICM altogether. The initial Unitary M31A1 and AW M30A1 rockets

were recently superseded by improved models with the Insensitive Munitions Propulsion System, the M31A2 Unitary and M30A2 AW IMPS.

The AW rocket began its development in 2008 addressing the Department of Defense plans to phase out submunitions in compliance with provisions of the Convention on Cluster Munitions international treaty. GMLRS AW proved its ability to eliminate the lingering danger of unexploded ordnance on the battlefield while also maintaining the same area effect.

Both GMLRS Unitary and AW boast a single 200-pound-class high explosive charge with ranges now exceeding 70 km. Unitary rockets impact point targets with low collateral damage while AW services area targets along with lethality-enhancing preformed fragments. With increased capabilities, Unitary and AW have established a



A precision-guided missile was fired during its first test-fire outside of the U.S., in 2005 near Tikrit, Iraq. The unitary-guided, multiple-launch rocket system was the latest addition to the U.S. Army's artillery arsenal and is designed to minimize collateral damage so not to cause unnecessary damage and destruction to innocent civilians U.S. Army photo by Spc. Alisan Gul (released) – Courtesy Photo



reputation for affordability and reliability. Demand for GMLRS remains unvielding as the Army has contracted with industry partners to procure more than 9,000 GM-LRS Unitary and AW rockets during 2021.

GMLRS continues to build on its legacy architecture. Extended Range GMLRS is a modernized variant designed to fly up to 150 kilometers. Retaining the current warheads, ERG will incorporate a new rocket motor and a side-mounted proximity sensor to improve performance against area targets. ERG is currently undergoing a series of rigorous tests, and the Army is on track to begin procurement in 2022. Accompanying ERG development is the unique Launch Pod Container. The LPC will be built to support the larger diameter of the ERG's rocket motor, which provides its greater range.

Deployed stateside and internationally, the MLRS weapon system was initiated in 1979 as a Memorandum of Understanding (Inter

between the U.S., United Kingdom, pillar in the field artillery commu-France and Germany. After 41 years, nity, generations of these rockets the agreement is still in place to- continue to combat and deter curday. The partnership served to de- rent and emerging threats for the velop the M270 rocket launcher and U.S., its partner allies and internathe M26 and M30 rockets. GMLRS tional customers. global presence has expanded to include foreign military sales to U.S. allies and partner nations. Abroad, *About the Author:* the system has demonstrated its critical significance during Operation Iraqi Freedom and Operation Enduring Freedom, and continues to prove its relevance and accuracy in support of current overseas contingency operations.

a testament to not only its proven strength in theater but also the combined team's unfathomable commitment to deliver the best, most reliable and modernized weapon system to the warfighter," Yelverton said.

Engineers, software experts, logisticians, cost analysts and test technicians are just a few of the integrated roles required to launch

national Cooperative Partnership) these rockets. As GMLRS remains a

Kinsey Lindstrom provides strategic communications for the U.S. Army Program Executive Office Missiles and Space, Strategic and Operational Rockets and Missiles (STORM) *Project Office, at Redstone Arsenal,* "The 50,000th GMLRS rocket is Alabama. With more than 10 years of writing experience, her career spans the defense, finance, journalism, nonprofit and outdoor industries. She has supported the Soldier through her community service with the Association of the United States Army-Redstone Huntsville Chapter.

FA Journal Submission Guide

The Field Artillery Journal serves as the professional forum of the branch across all ranks, Marine, Army, and Civilian. We exist to inform on new developments in the Branch and winning ideas from the field. The FAJ is seeking articles and short features on past, present or future programs, equipment, tactics, techniques, procedues or other issues affecting our Branch. Approximately 40 percent of our readers are company-grade Field Artillery Soliders and Marines. The other 60 percent is comprised of more senior-ranking Redlegs, servicemen from other branches and services, our Allies, corporate executives and politicians. We are a total-branch publication.

What to Subit:

Article submissions do not have to agree with current doctrine, official policy or approved techniques or procedures. Ask yourself how the topic is going to help the artillery community. Only unclassified information can be published in the FAJ. Articles must promote safe techniques and procedures. Be accurate, logical and complete in your writing. Submissions must be clearly written with an evident thesis, no more than 2500 words. Strive to educate, not impress. A message is most clear when written in simple language, An abundance of adjectives, adverbs and words that the reader will have to look-up detracts from the message. If possible please include graphics, charts or photographs to supplement your article.

Preferred Topics:

- Counter-fire at the DIV/Corps Level
- Targeting
- Training at homestation for LSCO
- Fires Support Issues within the EUCOM/PACOM AOR

All submissions must be emailed to director@fieldartillery.org with the subject line FAJ Article Submission. Please email submissions in an attached word doc format. DO NOT place images or graphics into the word document. Send them as attachments in jpeg, png, pdf, or eps files. Incude footnotes where appropriate, though we may not publish them with the article. Also include a short biography, highlighting the experience that makes you credible as a author on that subject. Include your name, email address and phone number so that we may contact you with follow-up questions.

The USFAA Staff reserves the right to edit an article and put it in the magazine's style and format. If you have questions on themes, subject matter or publication deadlines, please call 580.355.4677.

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