Transforming Artillery Communications

C2 Fix and Unburdening the Fire Support Enterprise

By CPT Cindy Yam and CPT Justyn G. Curtis

Introduction

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

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

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

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

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

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

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

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

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

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

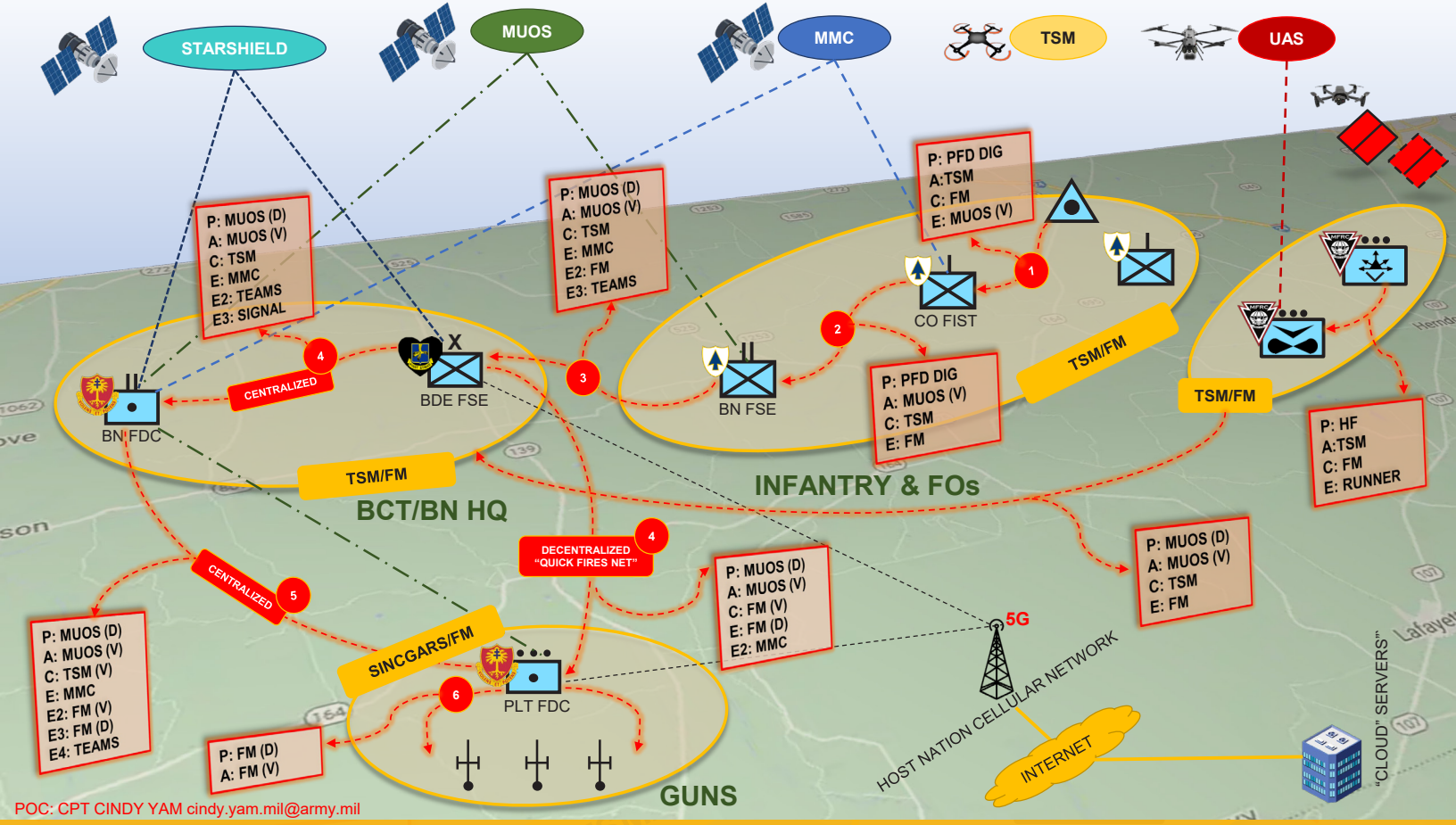

Figure 1: Fires Communications Architecture. *(Diagram created by the author, CPT Cindy Yam)*

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

TSM (Tactical Scalable Mobile Ad-hoc Network)

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

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

MMC/ATAK – LIVE COP

The Mounted Mission Command (MMC) system provides a live COP, enabling echelons to share PLI

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

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

SBU-E (Secure but Unclassified-Encrypted)

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

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

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

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

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

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

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

Conclusion

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

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

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