2/502nd IR C2 Fix Best Practices, Recommendations

JRTC 24-10

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In August 2024, 2nd Battalion, 502nd Infantry Regiment (2/502nd IR) "Falcon" participated in Joint Read-iness Training Center (JRTC) Rotation 2410, a compre-hensive exercise that included a large-scale long-range Air Assault (L2A2), brigade-level force-on-force (FoF) operations, and a brigade live-fire exercise (LFX).

Throughout the rotation, Falcon continued to integrate our Capability Set 23 (CS23) Integrated Tactical Network (ITN) equipment into our operational strategy, rigorously testing its effectiveness in varied and dynamic combat scenarios. Our efforts focused on enhancing the reliability, interoperability, and functionality of our communications to ensure robust and seamless command and control (C2).

Below are Falcon's formal observations and lessons learned regarding integration of the Krause-1000 (K1000) drones into our communication architecture, evaluation of the Instant Connect Enterprise (ICE) Tactical Assault Kit (TAK) application, and continued efforts to improve our Mobile User Objective System (MUOS) on-the-move (OTM) capabilities.

Krauss-1000 Integration

During JRTC 24-10, 2/502nd IR tested the K1000's effectiveness in extending the range of our Tactical Scalable Mobile Ad Hoc Networking (TSM), a newer mesh radio networking waveform. The K-1000 is a high-altitude, long-endurance drone designed for intelligence, surveillance, and reconnaissance missions. The drone's ability to operate for extended periods, coupled with its pseudo-satellite functionality, provided us with a reliable airborne relay with recorded air-to-ground links up to 40 kilometers. This minimized communication disruptions and ensured that all units remained connected to the TSM mesh network, regardless of their location on the battlefield.

Due to a shortage of drone operators, 2nd Mobile Brigade Combat Team, Strike, could only pilot one K-1000 at a time. This limited our capabilities because each drone can only retransmit two TSM nets simulta-neously. To overcome this obstacle, Strike dedicated one net to the brigade and prioritized the other net to whichever battalion was the main effort in the fight.

At the battalion level, we also directed each platoon leader to monitor the brigade TSM net to ensure the commander had a direct link to each element, regard-less of which battalion is the priority. Additionally, the K-1000's availability relied heavily on the weather.

Moving forward, we recommend having enough trained drone pilots to operate at least two drones simultaneously during operations to ensure that the brigade net and all three infantry battalion nets are relayed across the battlefield.

C2 Fix Updates

Efforts to extend communication range and ensure connectivity set the stage for the next phase of our initiative, advancing the mobility and effectiveness of command posts through new C2 Fix technologies. The C2 Fix initiative seeks to improve the mobility, scalability, and survivability of command posts while simultaneously simplifying the network infrastructure commanders use to maintain C2. A key component of this simplification process is the use of Android Tactical Assault Kits (ATAKs).

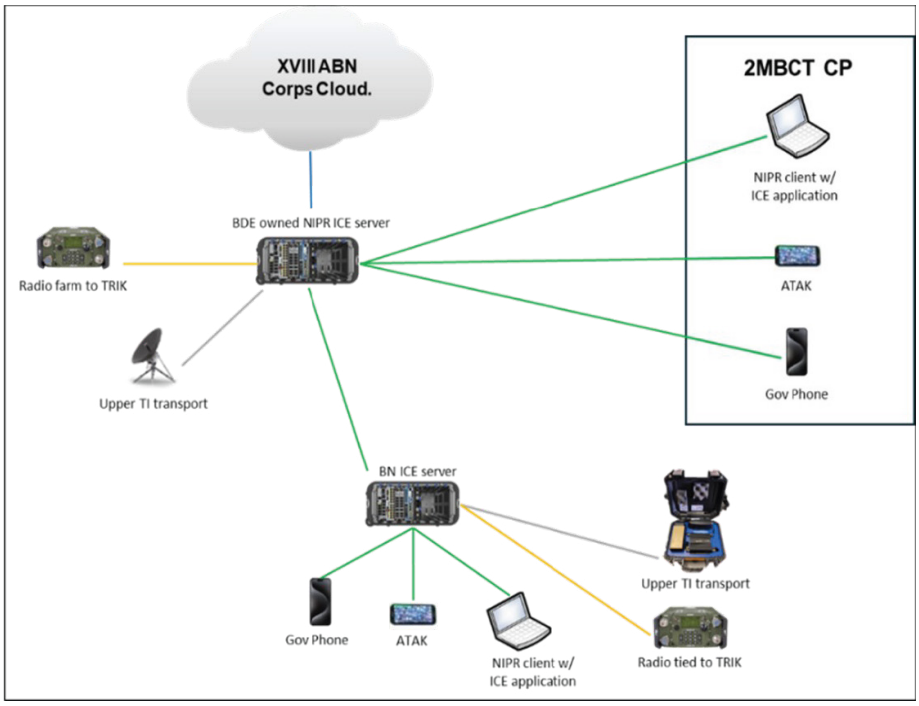
ATAKs are designed to provide Soldiers with a mobile situational awareness tool that enables real-time mapping, secure communication, coordination on the battlefield, enhanced decision-making, and operational effectiveness. Furthermore, the ATAK's integration with other systems and sensors helps provide a comprehensive operational picture to com-manders at all levels. During this rotation, 2/502nd IR was tasked to test and validate a new suite of TAK applications. ICE is a new TAK application that we frequently used throughout the rotation.

Instant Connect Enterprise

ICE is a push-to-talk (PTT) communication plat-form that enables real-time voice communications across various devices and networks. During JRTC Rotation 24-10, we used the server on our Tactical Radio Integration Kit (TRIK) to establish, maintain, and secure reliable communication between our radios, ATAKs, and government cellphones. The server acted as the central hub, processing and managing the data transmitted between the ICE application and our battalion command net. This integration enabled secure, instantaneous voice communications across the battalion and facilitated rapid sharing of critical information amongst key leaders. It also enhanced our ability to make timely decisions and synchronize efforts across the battlefield.

We positioned the TRIK Voyager 8 in the rear to safeguard it from electronic warfare and enable the brigade to sustain beyond-line-of-sight (BLOS) commu-nications during site jumps. This ensured our brigade maintained over-the-horizon capabilities and enhanced the reliability and range of our communications sys-tems in a hostile environment. However, the effectiveness of our communications was significantly

impacted by a key limitation of ICE: its reliance on Wi-Fi connectivity. Wi-Fi networks are often unreli-able, susceptible to jamming, and difficult to secure, especially in dynamic combat situations. This dependency not only forces units to operate within the limited range of network access points, reducing mobility, but also creates an electronic signature that can be detected and exploited by the enemy.



2/502nd IR ICE Data Flow

Furthermore, we found that the audio volume and options for ICE on ATAK were insufficient, making it difficult to hear communication traffic during operations. One improvement we recommend is increasing the volume levels and adding customizable audio settings to better accommodate the noisy and dynamic environments typical of battlefield conditions.

Additionally, creating an additional USB-C port on the ATAK would enable us to use headphones with-out having to disconnect from the docking station on the chest rig. Implementing these enhancements will ensure clearer communication and more effective coordination amongst units.

MUOS On-the-Move

Our final initiative focused on improving our MUOS on-the-move (OTM) capabilities. As MUOS is our primary means of communication with higher headquarters and company command teams, enhancing its effectiveness is crucial. From a vehicle perspective, we installed two Ultra High Frequency (UHF) X-wing antennas on our C2 box truck. This new an-tenna configuration provided more reliable and robust communication links while on the move and expedited main command post site setup.

Given these positive results, this solution could be implemented across all command vehicles, especially since the fielded ITN MUOS antennas have proven less effective. Unfortunately, the MUOS antenna fielded with the man-pack radio continues to prove ineffective during combat operations. This is primarily due to its inability to maintain a stable signal in challenging environments such as wooded areas and lower ground. The antenna struggles to perform effectively because dense vegetation and terrain obstacles can obstruct the signal path, leading to service loss and unreliable communication. As a result, this limitation impacts our ability to maintain consistent and dependable communication with higher headquarters and other units in these critical conditions.

One potential solution to improve signal reception is upgrading the fielded antennas with high gain or multi band models that are designed for challenging environments. Additionally, signal boosters or repeaters would also allow us to extend and amplify the MUOS signal in weak areas.

Conclusion

During JRTC Rotation 2410, 2/502nd IR advanced its communication capabilities through rigorous testing and integration of new technologies. We effectively used Krauss-1000 drones to extend our communication range, though limitations in drone availability and oper-ational conditions highlighted the need for increased deployment and training.

Our use of ICE demonstrated improvements in secure, real-time communication, but exposed issues with its reliance on Wi-Fi and poor audio settings. We also encountered performance issues with the MUOS man-pack antenna, particularly in obstructed environments.

Moving forward, we will address these challenges by seeking to deploy additional drones for expanded coverage, enhancing ICE's audio and connectivity features, and looking into the feasibility of upgrading our fielded antenna systems. By implementing these recommendations, we will further strengthen our opera-tional effectiveness in communications and ensure that we find a way to win in the fiercest conditions.