An Assessment of the ITN's Viability for C2 in LSCO

Up to code

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The way that Army doctrine characterizes modern conflict is stark in terms of both scale and speed. Brigade combat teams (BCTs), the cornerstone of Army forces, must grapple with areas of operation (AOs) that are 5-25 kilometers in depth (Department of the Army, 2022). Meanwhile, the Army's premier tactical echelon, divisions, face AOs spanning 20-40 kilometers, which incorporate multiple BCTs (Department of the Army, 2022).

Doctrine tells us that brigades must be able to plan operations 12-24 hours into the future, while their division headquarters deal with time horizons spanning 24-48 hours (Department of the Army, 2022). These vast distances and short time windows impose a requirement for BCTs and their division headquarters to share a robust command and control (C2) architecture.

The Integrated Tactical Network (ITN) is the Army's answer to this requirement. ITN represents a significant investment by the Army to not only ensure that its tactical units can talk to each other, but that they can also perform the data ingestion and information transmission tasks that are essential to both survive on and dominate the modern battlefield.

At its best, ITN theoretically goes beyond enabling *communication* to materially altering the way that units *operate*. It does this by facilitating an increase in the pace and volume of information exchange between echelons operating across the distances and under the time constraints described above. This makes the integration of ITN into BCT operations a task that must be shared by both signal professionals and their maneuverist peers. It is neither "just another piece of kit" nor something for the S6 to "figure out" in isolation, but instead an essential tool for modern warfighting.

Both of us recently served in an ITN-fielded BCT and had the opportunity to assess the technology's capabilities across two rotations at the Joint Readiness Training Center (JRTC). We will argue that the most current iteration of ITN enables organic BCTs to significantly speed up their planning and operational timelines in simulated large-scale combat operation (LSCO) environments - but only if these units achieve a high level of technical skill, staff training, and maintenance at multiple levels across the formation. Similarly, we will argue that ITN falls short of reaching its full potential because of technological inefficiencies and shortcomings that are built into the network.

An Unqualified Win for ITN: Faster Planning

Our brigade's greatest successes with ITN came from leveraging its data transport capabilities. This c apacity allowed us to dramatically shorten the amount of time it took our staff to run a cycle of the Military Decision-Making Process (MDMP) and enabled us to increase our overall operational tempo. Specifically, ITN's data transport facilitated our staff's preference for analog planning in a deployed environment.

The benefit of analog planning is speed and intrinsic synchronization. It is faster for brigade planners to collaboratively draw a concept sketch or synchronization matrix on the back of a laminated map than it is for them to huddle around a computer and try to get the zoom settings and formatting correct. The downside to analog planning is dissemination of orders and fighting products, which if not generated on a computer, have to be manually duplicated and then delivered. This drawback tends to negate any efficiencies the staff might have gained from analog planning in the first place.

We nullified the dissemination problem once we established our brigade's ITN network at full capacity. We extended the reach of the TrellisWare Scalable Mobile Ad Hoc Network with our Variable-Height Antennas (VHAs), and enhanced the data throughput capacity of the network with Tampa Scout-provided Upper Tactical Internet. Doing this now allowed our analog planners to take photos of their hard copy draft orders and fighting products on an Android Team Awareness Kit (ATAK) and push those photos in real time across the brigade's network.

Meanwhile, one designated planner was tasked with typing up analog products on a Windows TAK (WinTAK) so that, as a rule, the brigade published warning orders in analog format as photos and finalized orders and fighting products in digital format. This approach allowed us to push our planning windows from the 12-24 hours described by doctrine to 48-72 hours. The windfall from this shift was better parallel planning, more time for rehearsals, and an overall faster tempo. The brigade had to train methodically to get to this level of proficiency.

It takes time to configure the right number of WinTAK computers with the suite of applications and licenses necessary to enable this kind of distributed planning, and staff officers need to understand how to batch data files to prevent them from clogging up bandwidth. We spent seven months executing a series of staff exercises, command post exercises, leader training period, and field training exercises to ensure that our staff had the requisite level of technical proficiency to maximize its use of ITN-enabled planning. ITN's sophistication requires an unfortunately high degree of such technical proficiency, as illustrated by our brigade's experiences in controlling geographically-distributed forces.

Controlling Forces: A Draw

Our brigade entered the training area (The Box) via Joint Forcible Entry-Airborne (JFE-A), more commonly known as an airborne assault. We focused most of our combat power on Geronimo Drop Zone (DZ) in the northern portion of The Box, while allocating a battalion task force to Barry DZ in the south. ITN's TSM – its line of sight (LoS) functionality – facilitated excellent information flow on each DZ. Nowhere was this more pronounced than on Geronimo DZ, where TSM allowed crosstalk between leaders at all echelons in different battalions and had an inherently acceleratory effect on the overall brigade ability to achieve and sustain momentum. But the brigade struggled to achieve communications *between* the DZs. Barry's 10-kilometer separation from Geronimo forced the lone battalion task force on that DZ to rely on the Mobile User Objective System (MUOS), a satellite-based waveform that is ITN's answer to the outmoded TACSAT system, to send reports to the brigade from the outset of the JFE-A. This was a risk, but one we deemed acceptable. We believed that we could airland a sufficient number of VHAs to extend the TSM network from Geronimo DZ to our southern battalion by the time they had occupied their initial march objectives. That expansion did happen, but 48 hours later than planned.

Talented and well-intentioned as they were, the southern battalion's communications personnel lacked the proficiency to put their VHAs in operation to sufficiently expand the TSM bubble. Maintenance issues on the battalion's VHAs further decreased their reliability, necessitating the dispatching of a brigade-level VHA team to plug the gap in the mesh network.

In the interim, the southern battalion had relied almost entirely on MUOS and its liaison officer to maintain communications with the brigade headquarters, and because of the MUOS radio's high battery consumption rate, the battalion resorted to infrequent comms windows to send reports and receive information from the brigade. This combination of events threatened the brigade's ability to command its forces as it prepared to execute a defense. Events that were happening in real time in the southern battalion's AO were not being reported to the brigade headquarters with the frequency or level of detail that events that were happening to the brigade's other well-connected battalions.

The brigade staff and commander consequently made decisions about the allocation of scarce resources and capabilities – Class IV allocations, dig assets and blade hours, resupply of anti-armor munitions, allocation of priority targets, and fires – that were informed by only partially complete information.

Slow Links and Popped Bubbles

The previous episodes underscored that ITN can be a highly effective tool for increasing the tempo and scope of BCT operations – assuming a very high level of collective training on the maintenance, employment, and troubleshooting of ITN's component systems. However, even when BCTs manage to get all of these considerations right, technical shortcomings that are baked into ITN's hardware will still limit its utility to units that field it.

Our brigade had a combined arms company consisting of two platoons of Abrams tanks and one platoon of Bradley Fighting Vehicles attached to it for the duration of our most recent rotation. This company came from a division that had not been fielded with ITN capabilities. While ITN is compatible with legacy waveforms, such as the FM radios and Joint Battle Command-Platform (JBC-P) employed by this specific combined arms company, tank commanders could not look at an ATAK device and know that the units to their front were friendly or that the enemy slowed down the speed at which they could employ their formations. This in turn slowed down the speed at which the combined arms company could mass its armored assets, thereby reducing its ability to capitalize on its hallmark strengths of shock and firepower. The net result was that the brigade's tempo was significantly decreased. The battalion and brigade anticipated this problem. We did everything we could to mitigate it, to include providing key leaders in the combined arms company with ATAK devices, but these measures did not materially alter the fact that our brigade's speed in controlling operations was slower with its non-ITN-equipped enablers than with its organic forces.

All of our skill in utilizing TSM to control even our organic formation counted for little once the brigade transitioned to executing live fires at the Peason Ridge range complex. Here, civilian cell phone towers operating in the same ultra high frequency (UHF) range as our TSM waveform completely broke the mesh network, in spite of the fact that the distances we were operating and retransmitting across were shorter than they had been during our force-on-force module in The Box. This is a math problem that cannot be solved through training or technical ingenuity. A waveform in the same frequency range as TSM with more power amplification – e.g., a cell phone tower – will always pollute, degrade, or deny TSM transmissions.

Recommendations and Way Forward

ITN can significantly increase a brigade's operational tempo, specifically by increasing the rapid exchange of large amounts of information between echelons. However, this will only happen if there is a very high level of technical skills, staff training, and maintenance across the formation. Even then, ITN will slow BCTs down when they work with units that are not ITN-equipped, and ITN will outright fail in some environments that units are likely to face in LSCO. These conclusions imply that ITN-equipped units have a responsibility to set conditions for themselves to ensure they maximize use of their equipment.

The first of these is training, both of staff as well as signal professionals. Our brigade's success in using ITN to rapidly plan, prepare, and rehearse operations did not happen by accident; it was the end result of a seven-month training progression focused on refining our standard operating procedures and rehearsing our methodology for disseminating orders and fighting products. Similarly, ITN's failure at Peason Ridge suggests another training objective for ITN-equipped BCT staffs: how they think about and construct their Primary, Alternate, Contingency, and Emergency (PACE) plans.

The root cause of the Peason failure was electromagnetic interference (EMI) from a local cell phone tower. This problem is not going away. There are few, if any places, on the planet where cell towers or similar technologies will not cause EMI problems for units entrusted with 5-25 kilometer frontages. Similarly, our likely adversaries have the capability, capacity, and skill to use electronic attacks to deny, degrade, and disrupt friendly communications (The Economist, 2024). Tactical units must start falling back on PACE plans that will stand up to EMI; not just against specific platforms but specific bands. BCTs should develop a PACE for LoS, beyond line of sight (BLoS), and UTI respectively. This would have looked like our brigade shifting from TSM's UHF-reliant waveforms to FM communications before resorting to MUOS's slower BLoS capabilities at Peason. There would've been costs associated with doing this; that is what Course of Action analysis exists to evaluate. The main point is that staffs must be trained to think about robust PACE plans in terms of bands, not just platforms.

ITN-enabled BCTs must take ownership of training their signal professionals, the radio-telephone operators (RTOs) and S6 personnel who design, run, and repair the communications architecture. Our combined experience over three years and two JRTC rotations suggests that this requires a minimum six months' investment of time to get these junior leaders to the level of proficiency that enabled our brigade's operations. Even with that investment – multiple RTO academies, communications exercises, and field exercises designed to strain the mesh network – we still encountered training and maintenance shortfalls with our southern battalion during our most recent iteration in The Box. This is not a reflection on that battalion; they were just the most geographically isolated unit in our formation. Instead, it speaks to an institutional issue that the Army should fix.

Communications Soldiers do not learn how to employ ITN and its associated end items during their Initial Entry Training or Advanced Individual Training. These Soldiers arrive to units like ours able to operate and maintain legacy equipment, and unable to design a battalion talk group, maintain a TSM network, or advise staff where it should put a VHA to achieve optimal battlefield coverage. Army signals training can address this gap by incorporating ITN into its program of instruction and embracing a more strenuous focus on theory for entry-level Soldiers. The current Army model, with its heavy emphasis on hands-on training, does not generate professionals who can construct a C2 system appropriate to the breadth, depth, and EMI of their units' AOs. This training deficit ultimately produces situations such as the one our southern battalion found itself in: dependent on a brigade asset with more expertise and knowledge to reestablish reliable communications with higher headquarters.

The Army must also assess ITN's materiel composition. ITN's end items contain a plethora of functionally useless basic issue items (BII) and shortage of essential BII. For example, the ATAK is fielded with 15 total components, of which only about six are useful to the individual paratrooper. Our brigade experienced a marked decrease in physical communications capabilities over the course of our rotation because those six components, or their analogs in other ITN hardware, broke too often and easily to be reliable in LSCO. We were aware of this problem before deploying to the JRTC, but to date, our formation has had middling success in addressing it. The supply system has not caught up with the demand for those elements of ITN supporting hardware that are the most used and therefore are frequently the first to wear out and break.

All of this makes training personnel on the use and maintenance of ITN components much more difficult than it needs to be. We have described how many months it takes to train personnel to a basic level of proficiency on ITN. The combined arms company commander who is handed an ATAK a few days before the brigade assaults into the JRTC training area with a box of 15 cables he or she has never seen before is unlikely to make even minimal use of the system over the course of the rotation. The Army must reassess the user-friendliness of ITN's components and eliminate superfluous BII that does not materially make the BCT and its subordinate headquarters better off in the fight for information.

Up to Code But Some Upgrades Required

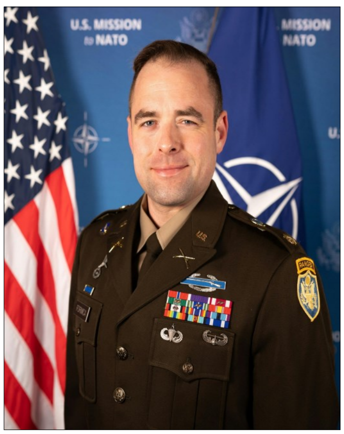
We believe that ITN is a sound step forward in the Army's effort to build communications systems that are up to the requirements of the modern battlefield.

Our brigade's proficiency in employing ITN allowed us to exercise C2 of our forces within both a brigade and replicated division battlespace as large as those presaged by contemporary Army doctrine. ITN's signal contribution to our BCT's effectiveness was its ability to allow our planners to outrun the time horizons anticipated in FM 3-0. We were consistently 24-48 hours ahead of where doctrine thinks brigades will be able to be because of the ability ITN gave us to ingest, analyze, and distribute information.

Cybersecurity professionals often joke that there's no such thing as a perfect system, and we share this perspective in evaluating technologies the Army develops to provide C2 on the battlefield (Schneier, 2018). ITN is not perfect, and it is never going to be. Adversary capabilities will evolve, technological innovations will render entire categories of communications platforms irrelevant, and force structure modifications will carry second-and-third-order effects for the ways future BCTs conceptualize their C2 requirements. However, the need for information to inform decisions will remain permanent.

The recommendations we have made here should be taken as achievable milestones the Army can set to improve its current system. We think ITN is still in its nascency. It provides the minimum requirements imposed by what the Army thinks future combat looks like. We believe that incremental adjustments such as those we have proposed will bring it to maturity.

We are excited to see the results that BCTs can achieve as ITN becomes more widely proliferated, as our communications professionals become more proficient in its application, and as Army commanders and their staff become more aware of just how much capacity ITN gives them to quickly find and destroy their enemies in combat.



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