

Bits, Bandwidth, and Backscattering

The new beans, bullets, and band-aids

by LtCol Matt Beck & Col Tim Hough

Carl von Clausewitz famously stated in the first chapter of his tome, *On War*, that though the nature of war is enduring, the character of war is ever-changing.¹ Today, we are on the precipice of another movement in the changing character of war as it relates to our close combat forces' ability to understand the battlefield and share that understanding. As the Marine Corps focuses on a new future framed by the Commandant's vision for force design and the expanding uses and increasing evolution of technology, the Marine Corps infantry squad will experience a seismic shift in the way they employ their weapons, optics, and equipment, providing a changing character in the way warfare will be prosecuted.

The Commandant states in his *Planning Guidance*,

Traditionally, the infantry company has been the lowest echelon capable of coordinating the full-range of combined arms, but miniaturization of electronics and increased processing power enable adversaries to empower individuals and small units with combined arms capability. We must be equal or better than this threat by pushing combined arms to the squad.²

The Marine Corps has done an excellent job prioritizing the procurement of the best night vision and weapons optics available to field to Marines today, such as the Squad Binocular Night Vision Goggle, or PVS-31s, and the Squad Common Optic, but future optical systems will leap ahead in capability with an increasing demand to consume, produce, and share data. Large Army programs such as the Integrated Visual Augmentation System (IVAS),

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Next Generation Squad Weapon Fire Control, and Enhanced Night-Vision Goggle Binocular introduce augmented reality capability, as well as the ability to wirelessly share information with other individuals to facilitate better C2 at the small unit level. While the Marine Corps is still monitoring these programs for possible future adoption, the capabilities resident in these programs have provided examples of what is in the realm of the possible for the future.

As a result, future small unit leaders will have to consider not only status quo constraints of maneuver and resupply during mission planning but also network availability, data refresh rates, and signature management. To effectively support the infantry of the future, the Marine Corps needs to emphasize critical requirements during the development and procurement of network integrated optical systems. Policy decisions, requirements, and procurements for small unit night vision and weapons devices should focus on three key areas: expected network connectivity, data strategy, and signa-

ture management. The Marine Corps must begin developing and deciding the policies and requirements today for tomorrow's optics technology in order to be postured for the world of 2030.

Our close combat forces have the best of breed as it relates to the capability to see at night and engage targets to the max effective range of their weapons with variable power optics. However, most of the existing systems at the small unit level do not provide data that enable unit leaders and Marines across the squad to have a full understanding of, or share, the common operational picture for both friendly and enemy forces. This has been the state of individual night vision technology and weapons optics since the first fielding of "the starlight scope in the 1960s."³

Because of the rapid pace of commercial augmented reality and networking technological development over the past thirty years, Marines now are on the precipice of being able to both see at night and gain an understanding of their environment through the use of augmented reality and a common op-



The Integrated Visual Augmentation System. (Photo by 94th Airlift Wing, Army Futures Command.)

erational picture display in their optics. Access to this information at close to realtime will aide in developing the individual understanding of each Marine's environment, thereby facilitating decision making and unlocking the pace of closing the kill chain at the small unit level.

In order to build understanding throughout the squad and to higher echelons of command, systems must be able to rapidly share data with each other wirelessly, laterally and upward. The Army IVAS and Enhanced Night-Vision Goggle Binocular programs have capitalized on the use of an Army-developed wireless signal using NSA-approved encryption to share secure, unclassified data across platforms used by squad members and to a tactical cloud. Using Microsoft's Hololens gaming technology, the IVAS program integrates augmented reality in conjunction with realtime data feeds to develop a common operational picture displayed in the lenses of the goggles worn by the soldiers. Data that can be accessed by each soldier includes graphic control measures, health metrics and remaining ammunition across the squad, as well as friendly and enemy information.

Additionally, these systems can limit personal exposure to enemy fire by projecting what is seen in the weapon's optic into the goggles worn by the sol-

dier. As mentioned, these systems rely on a wireless sharing capability to fully maximize the optics and tie sensors on the individual's weapon and optics to other members within the squad. During mission planning, members of small units can tailor the data feed they will receive in order to maximize efficiencies toward understanding while conducting operations. Concerns of cognitive overload are real but can be mitigated through the ability to rapidly turn off the augmented reality display in the goggle or through tailoring of what information is received in the goggle at any given time.

While this article is not suggesting the Marine Corps procure the IVAS system, it does seek to highlight the necessity of creating a requirement to share data wirelessly amongst the squad and display that data within the night vision device. Protection of this information when being shared is a critical requirement that must be addressed, but the decision itself to adopt the requirement cannot be binary. Signature management and risk reduction measures to protect the transmission of this data must be considered to maintain the tactical advantage. Moreover, commanders will need intuitive tools and graphical user interfaces in order to easily understand how their electromagnetic signature is being presented to the enemy.

Marines will require reps and sets with these signature management tools in order to build their tactics, techniques, and procedures while building proficiency for fighting within the electromagnetic spectrum. Not adopting this ability to transmit data wirelessly will create an environment in which the Marine Corps not only loses parity with its DOD counterparts but also, and more importantly, loses parity against our pacing threats who are grounded on innovation and adoption of similar capabilities.

For instance, a recent news article revealed,

Beijing-based augmented reality (AR) company Xloong created such a set of smart glasses for Chinese police in 2017, according to a company brochure. When wearing the AR glasses, police can access real-time facial, identification card and vehicle plate information that are linked with a national database.⁴

To stay ahead or at a minimum remain relevant with our near-peer adversaries, the Marine Corps must develop requirements *today* that address the needs of our FMF to provide Marine Corps Systems Command and industry time to mature, develop and field these systems at the time of need *tomorrow*. Sharing data intra-squad is vital but is useless unless a relevant data strategy is devised by the Marine Corps that enables Marines at the lowest level to maximize the bandwidth they have available to consume, store, and disseminate the data they are collecting.

There are several key points to build a relevant data strategy. First, we must treat data as we would any physical piece of gear in our inventory and incorporate our expeditionary mindset. With the same restraint of choosing items in our pack, we must approach our data desires with a minimalist filter. What are the most critical pieces of information that effectively build meaningful situational awareness of the common operational picture? What data elements directly reduce time to make kill chain-based decisions? These are the questions we should be asking as we load our data packs. Just as ounces equal pounds and pounds equal pain, megabytes equal

gigabytes and gigabytes equal decision fatigue. As our data packs get heavier, we must also consider data's nagging little siblings of compute, storage, and bandwidth. They go everywhere our data goes and must be accounted for in the data strategy.

The answers to these questions will be different for each echelon and the constraints become increasingly looser as we move from the forward most tactical edge to garrison. This loosening of constraints brings the second tenet of a successful data strategy: the strategy must be built upon the most constrained tactical environment, expanded to higher echelons and, a reach back to garrison. We must not endeavor to bring business-like data systems or approaches all the way to the tactical edge. In a recent article by C4ISRNET, LtGen Dennis Crall is quoted as saying,

I start my analysis at the tactical edge and work backwards. And many of the things that they look at, you know, that's at least briefed to me is, it works very well in a robust safe, stable environment. And [industry says] why don't we go with that, then we'll work our way toward that tactical edge. Those have been losing propositions for me.⁵

As the Director for Command, Control, Communications, and Computers/Cyber and Chief Information Officer, Joint Staff J6, LtGen Crall is the top official on Joint All Domain Command and Control for the Joint Chiefs of Staff and he very well defines the problem statement. The importance of correctly defining the problem statement is as Albert Einstein stated, "If I had an hour to solve a problem I'd spend 55 minutes thinking about the problem and five minutes thinking about solutions." An effective data strategy must begin with where our problems exist at the tactical edge. The very quality of our solutions depends on our ability to maintain focus on the challenges of our austere environments in which we will fight.

The Marine Corps is developing and defining a once-in-a-generation evolution to support the future defense of national interests. This evolution is necessary to blunt and deter the rise of near-peer adversaries. Reconnaissance



Joint Task Force Civil Support conducts a Joint All Domain Command and Control demonstration. (Photo by Petty Officer 2nd Class Michael Lehman.)

and counter-reconnaissance operations conducted at the platoon through squad level will be the norm. Advances in technology will provide an exponential leap in understanding through the expansion of sensors providing situational awareness far surpassing what has been provided in wars past. This understanding will rapidly accelerate the ability of deployed forces to close the kill chain faster than our adversary.

The opportunity to get ahead of our adversary can be lost, however, if the Marine Corps does not take advantage of the opportunity we have now to shape requirements and procurement strategies to field the capabilities Marines need in the future fight. Those capabilities include the need to share information rapidly through a secure wireless capability supported by a data strategy that effectively defines the essential data to store and disseminate to maximize crucial bandwidth. Marines will need to become familiar with terms such as backscattering, side lobes, and other concepts of operating within the electromagnetic spectrum in order to effectively anticipate and counter enemy tactics. Finally, understanding must be consistent throughout the length of any operation and does not have time to take a tactical pause. This can only be done if our optical systems are supported by strategies that enable the mitigation of signature management. These con-

siderations will have to be constantly monitored by small unit leaders during mission planning. Beans, bullets, and band-aids have been staples to planning considerations since the dawn of warfare. As we enter a new fight defined by the rise in technology, bits, bandwidth, and backscattering will have to take their place alongside these legacy considerations.

Notes

1. Carl von Clausewitz, *On War*, (Princeton, NJ: Princeton University Press, 1989).
2. Gen David H. Berger, *38th Commandant's Planning Guidance*, (Washington, DC: July 2019).
3. Staff, "History of Night Vision Devices," Combat Capabilities Development Command C5ISR Center, (n.d.), available at <https://c5isr.ccdc.army.mil>.
4. Yang Yingshi, "Chinese AR Start-Up Develops Smart Glasses to Help Police Catch Suspects," *South China Morning Post*, (May 2019), available at <https://www.scmp.com>.
5. Aaron Mehta, "JADC2 Strategy 'Days' Away from Going to Austin's Desk," *C4ISRNET*, (April 2021), available at <https://www.c4isrnet.com>.

