

# Spectrum Warfare Integration

Regaining dominance of the spectrum

by Maj Jonathan M. George

**W**hile the Marine Corps has historically dominated in “any climb and place,” there is one emerging battlefield that interconnects the air, land, and sea domains: the electromagnetic spectrum. Unless sweeping changes are made, the Marine Corps will be blindsided in future conflicts. Put simply, the electromagnetic spectrum spans a range of radio waves, microwaves, infrared, visible light, ultraviolet, X-rays, and gamma rays. After this short explanation, I likely have just lost half my readers, but this is why the Marine Corps is uncomfortable talking about the spectrum. It is difficult to understand and, unless it can be destroyed by fire and maneuver, we are not interested. For years we have become spectrum complacent, thinking we can do as we please in the spectrum and that no one can touch us. This thinking allowed our potential enemies—those “peer/near peer” and “pacing threats”—to outpace us in capabilities and even our *desire* to degrade and defend the spectrum. In essence, we have ceded the spectrum to the enemy without a shot being fired. To defeat these current threats (they are no longer “emerging”) and regain domination of the spectrum, we will have to be more agile, outthink and outwit our enemy, and trained to operate in a spectrum degraded environment—this is spectrum warfare.

Spectrum warfare is not a new term. Today it is commonly referred to as electromagnetic spectrum operations (EMSO), but there needs to be a mindset change to what we are attempting to achieve: domination and maneuver warfare within the spectrum. Spectrum warfare is not only the deliberate ma-

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***The Marine Corps will be decimated in the next major conflict.***

nipulation of the spectrum in order to achieve a cognitive response, it is also the commander accepting a level of risk to achieve that successful domination and maneuver. For the purpose of this vignette, spectrum warfare will simply refer to the tailored integration

of electronic warfare (EW), signature management (SIGMAN), and tactical deception into all aspects of training, planning, and operations—which 4th Marine Regiment recently experimented with at its Integrated Training Exercise (ITX).

In my article titled, “Marine Corps Electronic Warfare: We’ll Figure it Out,” (*MCG*, Oct18) I stated that the Marine Corps is “woefully unprepared for conflict in a spectrum-degraded environment, and we lack the capability to conduct electronic warfare in any significant way,” and that our

combat operations centers revolve around the copious amounts of fragile networks, platforms, and applications, we hardly practice emissions control (EMCON) and operations security, Marines routinely revert to unencrypted communications, the ad-



**Artillery on the move.** (Photo by author.)

diction to cell phones in all environments is systemic, and our aircraft and vehicles rely upon numerous spectrum-dependent systems to shoot, move, and communicate.

What I articulated in that article remains the same and should serve as a wake-up call to Marines and commanders, “If a high-tech, near-peer enemy denies the Marine Corps the spectrum, they deny key terrain in a battle where control over the spectrum may mean winning or losing the war.”

Spending a year studying and admiring the problem as an Electronic Warfare Officer at Marine Corps Forces Pacific and then moving on to 4th Marines in the summer of 2018, I found myself in a position to start to affect change across the GCE. Forward deployed to Okinawa, Japan, 4th Marines is perfectly suited to act as trainer and mentor to the constant rotation of forward deployed battalions (FDBs) participating in the Unit Deployment Program (UDP). With ITX on the horizon and the regiment tasked as the MAGTF, ideas and concepts were developed that would be tested at ITX. This started with the development of a concept of spectrum warfare tactics, techniques, and procedures (TTP), and best practices. These spectrum warfare TTP follow three major lines of effort: define the spectrum threat, mitigate the spectrum threat, and train the force.

The first step, define the spectrum threat, is essentially intelligence preparation of the battlespace for the spectrum—or intelligence preparation of the spectrum (IPS). This version of IPB, or IPS, looks at the capabilities of the enemy to sense and affect the spectrum through the prism of doctrinal processes such as a relative combat power assessment (RCPA), center of gravity analysis; defend, reinforce, attack, withdraw-delay; modified combined obstacle overlay (MCOO) for the spectrum, and even looking at how the spectrum affects area, structures, capabilities, organizations, people, and events/political, military, economic, social, information, infrastructure (ASCOPE/PMESII). The IPS process looks at enemy intelligence collection capabilities in the spectrum, EW assets, doctrine, task organization,

strategy, and how they view the employment of collections systems, sensors, EW, and other means to see us in or deny us the spectrum. This step also examines how we can affect the spectrum through our own employment of EW, SIGMAN, and tactical deception (both traditional and utilizing the spectrum) to cognitively influence the enemy and dominate the spectrum. This process then feeds in to the next step: mitigate the spectrum threat.

Mitigating the spectrum threat as the second line of effort comprises planned and unplanned staff process as well as TTP to gain the advantage in the spectrum and on the battlefield. The most critical part is the integration of EW, tactical deception, and SIGMAN in to all aspects and phases of planning (call these spectrum considerations). The creation of a spectrum warfare working group comprised of representatives from the intelligence, operations, logistics, and communications sections, radio battalion (RadBn), spectrum manager, and the EW officer (if the unit has one) helps

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### ***Training the force focuses on educating Marines ...***

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ensure there is an integrated staff process looking at the problem and developing solutions. When planning operations, essential spectrum warfare support tasks should be developed, which are those tasks that must occur to achieve success in the spectrum, before feeding into essential fire support tasks to capture EW fires. Planners should also plan for such things as the hardening of communications, the remoting of antennas, incorporating terrain masking, adjusting maneuver to shield emissions, practicing good EMCON procedures, using random communications windows and brevity codes, setting radios on the lowest power setting, developing ways to reduce visual and audio signatures, and get back to a Corps that trusts leaders to rely on commanders intent and mission-type orders. These are the areas where

that commander must be willing to accept risk to achieve success. While most plans fall apart at first enemy contact, units must also establish SOPs to deal with unforeseen spectrum degradation caused by enemy maneuver and EW—think immediate and remedial actions, but within the spectrum. Preparing for these unplanned events also includes branch plans and sequels for when operations do not go as planned in the spectrum.

This step also is where spectrum tactical deception planning comes into play by utilizing EMCON to shield movements by hiding unit movements within spiked emissions windows or using devices that emulate friendly signatures or emit false signals. Part of this step includes the evaluation of friendly signatures as well. Computer tools such as Speed can plot radio wave propagation over terrain, and devices typically at the RadBns can display emissions and help units to understand their signature. However, this becomes an issue as analyzing friendly spectrum emissions—part of spectrum management—is not currently recognized as a RadBn function, yet we do not equip our spectrum managers and communications sections within the GCE with the tools they need to help analyze, manage, and reduce signatures.

The last step is perhaps the most critical. Training the force focuses on educating Marines in how to maneuver and dominate in the spectrum. Each unit in the GCE must develop their own SOPs, but this begins with creating spectrum warfare officer billets from the MEFs down to the battalions. While training resources and funding are limited, units can send their new spectrum warfare officers to courses such as the EW Foundations Course, the Joint EW Theater Operations Course, and to the U.S. Army’s 1st Information Operations Command courses on EW and Military Deception. Once trained, this officer can then integrate spectrum warfare into planning, exercises, and PME, before starting to develop unit TTP and SOPs. Whoever holds this billet must be connected tightly to the unit intelligence, operations, and communications sections, as well as the relevant

Marine Corps communities of practice, Combat Development Command, Systems Command, and Marine Corps Warfighting Lab. This billet will also be critical in integrating the newly formed electronic warfare support teams electronic warfare support team in to unit operations.

With these concepts in mind, spectrum warfare was gradually incorporated by MAGTF-4 at ITX in October and November 2018. With the first Air Assault Course (AAC), planning for EW, SIGMAN, and tactical deception were conducted separately from the operation, but in a way that conceptually supported maneuver. This plan included both realistic tasks and the employment of tactical deception equipment in development. Once this spectrum warfare plan was briefed, it was just enough to show the MAGTF commander that integrating spectrum warfare was not only possible, it was supportable now.

The next evolution was the Regimental Assault Course (RAC), where spectrum warfare concepts were now developed in concert with operational planning. The MAGTF commander's intent was to accept some risk by reducing emissions and employing tactical deception. The published fragmentary order (FRAGO) stated his intent as,

We will deliberately control emissions to mislead adversary decision makers as to friendly military capabilities, intentions, and operations, thereby causing the adversary to take specific actions (or inactions) that will contribute to the accomplishment of the friendly forces' mission. We will accomplish this by refining our EMCON procedures and utilizing tactical deception to achieve desired effects.

This intent was fairly simple to understand, but it was the last line in the FRAGO that caused the most consternation: "No *black gear*" or *cell phones* are authorized on the battlefield unless required for safety purposes. Black gear refers to unencrypted radios that are usually black in color, much different than encrypted "green gear" radios. These



**STRATOMIST.** (Photo by author.)

two means of communications—black gear and cell phones—are arguably two of the biggest targets that will get Marines killed on the next battlefield.

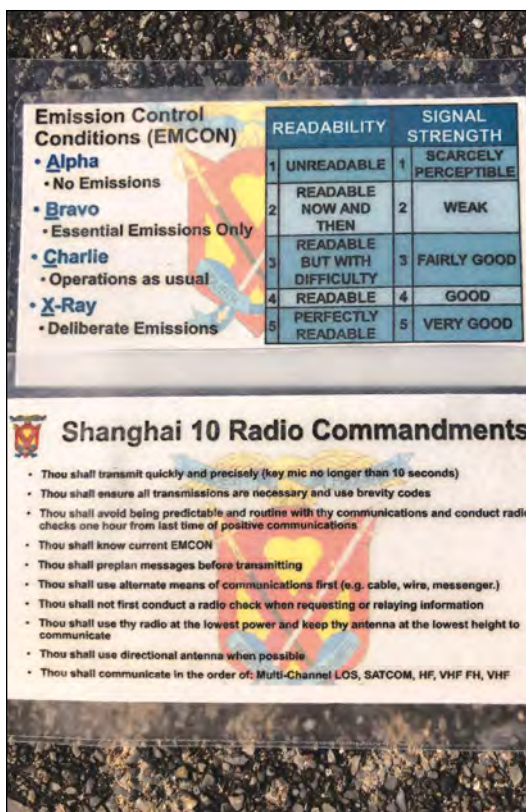
To support emissions control and tactical deception, MAGTF-4 devised

four EMCON control conditions and ten radio "commandments" to remind radio operators how to properly communicate and reduce their signature. These were then printed on small pocket-sized laminated cards and distributed throughout the MAGTF.

To support tactical deception in the spectrum, MAGTF-4 devised a plan to emplace two notional devices in the battlespace that emulated the signature of an artillery battery and an infantry battalion. Based on the real-world STRATOMIST and the wideband transceiver (WBT), training aides were constructed by the S-2. The notional WBT concept was designed to emulate a battalion-sized signature with nodes that emulated the signature of an infantry battalion headquarters, companies, and platoons. The notional STRATOMIST concept used a similar device that emulated the signature of an artillery battery, associated gun line, and supporting elements.

On D-1, all units entered the training area in EMCON Alpha (radio silence) and without cell phones. The silence was welcome, yet awkward, because we were so used to hearing the constant chatter over the radio. On D-Day at 0630, the spectrum came alive with radio checks. We spiked in the spectrum, but for the enemy, it was too late. The MAGTF had entered the area of operations under the cover of communications darkness and deception. It was one hour prior to the first artillery round hitting the deck and we were now within the enemies' OODA (observe, orient, decide, act) loop. Coyote 26 (SIGINT/EW), part of the Tactical Training Exercise Control Group (TTECG) team, verified the silent period and was able to see the spike in emissions. The deception allowed the MAGTF to move one step ahead of the enemy, forcing him to redeploy his SIGINT/EW assets to ascertain location and intentions of the MAGTF.

For the second AAC, the spectrum warfare plan was more fully integrated and less of an afterthought. Instead of being in a FRAGO, the EMCON conditions were now within the order under coordinat-



**The pocket cards.** (Photo by author.)



A jump command post. (Photo by author.)

ing instructions, with each unit briefing their EMCON conditions at each stage during the rehearsal of a concept brief. For tactical deception, a reconnaissance team emplaced a real STRATOMIST device programed to emulate a decoy reconnaissance observation post (OP). Set to a time delay prior to shaping fires occurring, the STRATOMIST concept was to entice enemy forces to alight in the spectrum looking for the decoy OP, allowing a signals intelligence support team to direction find and then conduct an electronic attack to disrupt and degrade enemy command and control nodes in the area and facilitate targeting by kinetic fires.

Once again on D-1, all MAGTF elements entered the area of operations under cover of spectrum darkness and without the convenience of black gear and cell phones. With the risk to forces minimal, commanders operated under mission-type orders, only allowed to break radio silence under extreme circumstances. Even a radio retransmission site remained off until D-Day. Coyote 26 looked for the MAGTF in the spectrum shortly before 0630 on D-Day and saw nothing, then once again, the spectrum came alive at 0633. In the words of Coyote 26, “It was frustrating, there was no traffic until it was too late.” The MAGTF was once again silent until operations kicked off, but what is even more impressive is that the MAGTF remained disciplined with EMCON until the air assault task force inserted and

the MAGTF was unmasked. During the after action, Col Kassner, TTECG Director, stated that MAGTF-4 was “on the cutting edge of exercise forces.”

The second RAC saw spectrum warfare fully integrated into the planning process. IPS identified enemy EW capabilities, and through a spectrum RCPA and MCOO, it was identified that our very high frequency frequencies were the most vulnerable to electronic attack. This led to a change in the primary, alternate, contingency, emergency plan, making satellite communication and high frequency primary and alternate frequencies. In addition, through this IPS, an enemy EW system was identified—which in this case was a U.S. Marine Corps CESAS II (Communication Emitter Sensing and Attack System II)—a RadBn SIGINT/EW vehicle. When evaluated through an RCPA, it was determined that the MAGTF lacked the EW assets to effectively counter the CESAS II. By conducting a spectrum MCOO that analyzed terrain, radio wave propagation, and known MAGTF forward and subordinate locations, the MAGTF intelligence section was able to narrow down where the enemy: CESAS was likely to be located. They then tied this to named areas of interest that were incorporated in to the collections plan, then targeted with an EW “hunter/killer” team consisting of a task-organized electronic warfare support team escorted by gun trucks.

Lessons learned and the full integration of spectrum warfare concepts during ITX will continue to be implemented in upcoming TTECG training evolutions, as well as the 4th Marines’ training and mentoring of future UDPs. These lessons learned should also be applied across the GCE to better prepare our Marines for future conflict. During ITX, the MAGTF showed significant improvement in understanding and implementing EMCON conditions, employing tactical deception, and conducting electronic warfare. To maintain this momentum, spearhead spectrum warfare integration, and develop new doctrine and TTP, 4th Marines developed a way forward that will inform commanders, train Marines, and help shape the future battlefield. With the establishment of a spectrum warfare working group, the spectrum challenge has now become a whole-of-staff effort to plan, advise, implement, and evaluate the tactical employment of spectrum warfare within the regiment. Next, the regiment appointed a spectrum warfare officer whose sole job is the action officer for tactical spectrum warfare integration. To train UDP units to operate in a denied, degraded, disrupted EMSO environment, a concept is being worked for the establishment of an EW “red team,” or EW support detachment resident within the regiment and able to deploy throughout the Indo-Pacific command area of operations. Lastly, the regiment will continue to plan for spectrum warfare opportunities across all exercises, training, deployments, and events. And of course, none of this knowledge is useful to the rest of the Corps unless it is captured and shared throughout the GCE and permeates down to every Marine and Sailor. With spectrum warfare concepts becoming muscle memory, we can then take back the spectrum and dominate once again in “any climb and place.”

