

Technical Signature Management for Small Units

Implementing TTPs that can be employed today

by Capt Luke Klena

The Marine Corps is in the initial stages of a decade-long transition to a force that is better suited for combat against a peer adversary. The Corps that emerges from this period may look much different than the Corps of today. The Marine Corps does not have the luxury of remaining motionless while it waits for changes to its organization and equipment to occur. Despite capability gaps, units will continue to deploy and meet the needs of the Nation while the Service evolves.

One of these gaps is in intelligence surveillance and reconnaissance (ISR) and counter-ISR capabilities. There is a fervent debate taking place among the information operations, communications, and intelligence communities about how the Marine Corps can best deny or counter adversary ISR capabilities through signature management.¹ Understandably absent from this conversation is perhaps the most important audience: the small unit leaders of the combat arms specialties. Shielding the technical signature of small units will become increasingly important as the Marine Corps shifts focus to an adversary with a more robust detection and collection capability. In a distributed maritime environment, small units will be the sensors and shooters that compose the inside force, making them a valuable target an adversary's missile threat.

Despite infantry battalions not being organized and equipped for the demands of the future operating en-

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vironment, there are still tactics, techniques, and procedures (TTPs) that can be implemented today to remain competitive in the battle of signatures throughout this transitory period. The organization and equipment of a battalion, while unsuited for the future fight, are currently adequate for the education and training of small unit leaders and the Marines they lead.

A few TTPs that can be implemented today are reducing communications time, adjusting power settings, and emissions masking. These tactics are not new and in most cases are throwbacks to procedures common during the Cold War. When used in conjunction with spectrum analysis tools during training, their impact can be amplified, but they do not require the use of any supplemental equipment to be effective. Teaching these procedures to small unit leaders will also enhance the effectiveness of emerging and future electromagnetic battle management technologies.

As with any aspect of maneuver warfare, it is important to remember that these methods are never employed in a vacuum; the unit leader must consider the enemy situation and the environment. If there is no threat of being detected, then leaders have more freedom in how they choose to communicate.

Each of these TTPs is best employed in specific situations. Just as forms of maneuver and formations for movement depend on the enemy and the situation, so do technical signature management TTPs.

The most immediate procedure that can be implemented within a battalion is to reduce the amount of time it takes to communicate. Although this procedure may be consistent with current doctrine, it is far from common practice. Brevity and radio etiquette have always been considered important for communicating clearly and concisely, but strict enforcement of these principles became secondary to rapid information sharing during the wars of the last two decades. An enemy with a robust direction-finding capability will certainly exploit this inability to follow protocol.

The duration of a transmission is directly related to the probability of detection of the signal. Some direction-finding techniques become more challenging with shorter duration signals.² While it is tempting to assign a numerical standard, the exact time to process a signal is highly dependent on the direction-finding system that is used to detect the signal. Instead, battalion staffs should first establish a baseline. This can be achieved by dedicating a Marine to log how frequently the unit communicates, the duration of each transmission, and the duration of conversations.³ The baseline can also reveal any patterns the unit is inadvertently setting. Just as a unit becomes

vulnerable when it sets patterns while patrolling, communications patterns can allow an adversary to discern intent from the established baseline. It is easy to measure the performance of this technique: commanders and staffs can establish a goal to reduce the time of communication. This goal should be informed by the specific threat detection capabilities the unit expects to face.

Another easy technique is to adjust the transmit power on organic radios to the lowest setting necessary to communicate. This method is best employed between two stationary units that know the distance between them and will not be moving, such as transmissions between squad battle positions and the platoon command post in the defense or when in a tactical assembly area.⁴ There are clear limitations to this tactic; you cannot effectively communicate if the receiver cannot hear you. Another limitation is the number of power settings of each radio, with PRC-152s and PRC-117s having only three each.⁵ The unfortunate consequence of this design is that there are drastic differences between the maximum effective range of each setting. This means that at a distance just beyond the maximum range of the one power setting, the radio will radiate well beyond the intended recipient on the next-higher setting. While Marines should advocate for improved radios that have a wider range of power settings, the general tactic will not change with new technology. To implement this technique, small unit leaders need to habituate programming radios in low power mode first, increasing the output power as necessary. If you cannot communicate on a lower power setting, it should be a conscious risk-assessment decision as to whether the information you are communicating to the receiver is worth the increased probability of detection.

Emissions masking uses the interaction between transverse electromagnetic waves and the environment—reflection, refraction, diffraction, and absorption—to either prevent or promote propagation in a specific direction. Terrain masking uses the environment to reflect or diffract the signal away from the threat. Placing a significant terrain



TTPs to reduce signatures right now include discipline in communications time, adjusting power settings, and emissions masking. (Courtesy photo, RC Southwest.)

feature like a hill or a ridge between the transmitter and the enemy will make it difficult for the enemy to determine the original direction of the signal while maintaining the ability to communicate with friendly units.⁶

Transverse electromagnetic waves can also be influenced by the radiating antenna. A directional antenna uses additional conducting elements to shape the propagation pattern and focus the beam in a specific direction. Although there are no purpose-built directional antennas organic to a battalion, directional communications can be achieved using field-expedient antennas and adapting omnidirectional antennas to increase their directivity. A directional field-expedient antenna, like the long wire, sloping vee, sloping wire, and vertical half-rhombic, can be implemented with the PRC-150 for High Frequency communications.⁷ For VHF line-of-site communications, a metal rod or wire placed at the proper distance behind a whip antenna will act as a reflector and increase the directivity of the antenna. A more enterprising radio operator could even develop a resonant antenna array to direct the beam of the transmitter using rigid metal rods or aluminum or copper foil on a nonconducting surface.⁸

Although the current organization of an infantry battalion may not be

suiting for the demands of the future operating environment, it is suited for the demands of the current transition. The intelligence section may not rate any signals intelligence Marines or electronic warfare specialists, but the 0231 intelligence specialists organic to the section are capable of briefing adversarial electronic warfare and signals intelligence capabilities.

The communications section can provide support to these units by modeling radio frequency signatures using the Systems Planning Engineering and Evaluation Device (SPEED). The color-coded heatmap images produced by SPEED can show the difference between the unit's baseline signature and its signature when employing spectrum management techniques, visually reinforcing the validity of such measures. SPEED can also be used as a planning tool before exercises, allowing small unit leaders to predict which techniques will be required for a specific situation. The centralized nature of the communications section may not be conducive to modeling individual squads or platoons; it would be impractical to model every exercise, mission, and operation. But this only underscores the importance of having competent small unit leaders who understand basic technical signature management TTPs. Periodically



Spectrum analyzers and frequency modeling tools can be used to better manage signatures during training exercises. (Photo by Cpl Corey Dabney.)

modeling their technical signature will enhance the understanding of these tactics and allow the unit leader to make an informed decision without a visual aid in a unique and unforeseen situation.

The battalion operations staff can provide guidance to subordinate units by publishing and adhering to a signature management standard operating procedure. They can also foster an electromagnetic stealth mindset by encouraging competition between companies, particularly during force-on-force exercises. Another way to emphasize the importance of technical signature management TTPs is to organize a squad competition where infantry squads and attached radio operators compete to demonstrate proficiency. While these events would require spectrum analysis gear not currently organic to an infantry battalion, this shortfall could be mitigated by requesting support from Radio Battalion.

Unit leaders cannot wait to be given spectrum analyzers and more robust radio frequency modeling tools to begin adapting these TTPs. Spectrum analyzers are best employed as an evaluation tool during major exercises with a dedicated electronic warfare red cell.

This team should have received previous training on the equipment and will allow the exercise force to focus on executing the TTPs rather than attempting to assess their own signature. The exercise force, having trained from classroom instruction to rehearsals of signature management tactics, will finally have an opportunity to validate their procedures. Just as live fire exercises are a validation of previous non live fire training, own force signature assessment using spectrum analyzers should be viewed as confirmation that technical signature management TTPs are being appropriately employed.

While there are articles, publications, and handbooks that capture current technical signature management best practices, a more robust analysis of these procedures needs to be conducted. There are more capable RF modeling tools than SPEED, such as the Naval Research Laboratory Interactive Scenario Builder, that can be used to provide more specific information about the risks and benefits of each tactic. Small unit leaders deserve a comprehensive list that is more accessible than the resources currently available. Although it would not be prescriptive for every

scenario, a handbook could provide guidelines for employing techniques in specific situations. The inclusion of propagation patterns compared to a baseline signature would illustrate the effectiveness of such tactics to the small unit leader.

Future adversaries are not going to wait for the Marine Corps to adapt to the emerging operating environment. It is imperative that small units begin to practice signature management techniques with the equipment and personnel currently available. While a realtime spectrum analysis tool may allow small unit leaders to continuously monitor their technical signature, such a tool would still require the commander to interpret that signature and, if necessary, decide how it can be best mitigated. The success of any future technology depends on the competence of the user. Winning tomorrow's battle of signatures depends on leveraging the resources available today.

Notes

1. Headquarters Marine Corps, *Marine Corps Concept for Signature Management*, (Washington, DC: October 2017).
2. Rhode Schwarz, "An Introduction to Direction Finding," YouTube video, 37:31, (February 2020), available at <https://www.youtube.com>.
3. Staff, *Spectrum Warfare Generic Information Requirements Handbook*, (Camp Schwab: 4th Marine Regiment, February 2020).
4. Marine Corps, "Orientation to the Spectrum Contested Environment," PowerPoint presentation, (Twentynine Palms, CA: Tactical Training Exercise Control Group, n.d.).
5. Headquarters Marine Corps, "Principle Technical Characteristics of U.S. Marine Corps Communications-Electronics Equipment, TM 2000-15/2D," (Washington, DC: June 2016).
6. Army Training and Doctrine Command, *Threat Handbook: Battlefield Survival and Radioelectronic Combat*, (Fort Monroe, VA: 1983).
7. Headquarters Marine Corps, *MCRP 8-10B.11, Antenna Handbook*, (Washington, DC: May 2016).
8. Ibid.

