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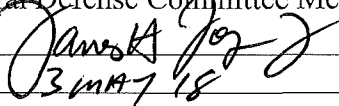
Hide and Seek: 21st Century Battle of Signatures

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Preface

My original thesis was US Signature Management equipment and techniques, and ways to improve the current capability set. After conducting research and interviews with Headquarters, Marine Corps, I realized that focusing on that exact topic would overlap with existing efforts, and likely need to be at a classified level. This led me to more closely examine the current plan for Signature Management, and suggest improvement focused mainly on the manpower and equipment readiness. This approach allowed me to delve deeper into training and readiness, as well as look at some new technologies that could be incorporated into any plan.

Due to the aforementioned desire to keep this monograph unclassified, as well as the relative “newness” of the topic, I will focus on improvements that could be made in the near future that could have the biggest impact.

Executive Summary

Title: Hide and Seek: 21st Century Battle of Signatures

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Thesis: The Marine Corps is not manned, trained, or equipped to win a battle of signatures in the near future. The Marine Corps must identify gaps in the existing plan and equipment and examine some alternatives for conducting more successful operations in the future.

Discussion: The United States Marine Corps continues to modernize to improve combat effectiveness. Improved Combat Vehicles such as the Mine-Resistant Ambush Protected Vehicles (MRAP), radio systems like the Blue Force Tracker (BFT), and new digitally interconnected systems are examples of such technological advancements. Yet all of them come at the cost of increased signatures. The Marine Corps has not put enough effort and resourcing to manage and control signatures throughout the battlefield. As the chances of opposing a near-peer adversary increases, there is a great deal of risk assumed by not managing these signatures.

Conclusion: Signature management has been done throughout history, in one shape or another. However, with the rapid increase in technology and capabilities, this depth and importance of this topic has skyrocketed and will only continue to increase. There are immediate fixes to doctrinal, manpower, and equipment shortfall that currently plague the Marine Corps, and can be implemented for rapid improvement.

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Introduction

According to the Marine Corps Operating Concept, “Tomorrow’s fights will involve conditions in which ‘to be detected is to be targeted is to be killed.’ Adversaries will routinely net together sensors, spies, UAS, and space imagery to form sophisticated ‘ISR-strike systems’ that are able to locate, track, target, and attack an opposing force. In complex terrain, adversaries will collect targeting information through eyes and ears and spread it through social media.”¹ The Marine Corps is not manned, trained or equipped to win a battle of signatures in the near future. After being at war for the last sixteen years, the entire Department of Defense has been focused on winning the current conflicts, vice looking to the future. While this is obviously the right course of action, the Marine Corps has not properly transitioned resourcing to preparing for the next conflict. This paper will cover a brief recent history on the importance of signature management (SIGMAN), explain the current USMC plan for signature management, identify gaps in the existing plan and equipment, and examine some alternatives for conducting more successful operations in the future.

Background

The United States Marine Corps continues to modernize to improve combat effectiveness. Improved Combat Vehicles such as the Mine-Resistant Ambush Protected Vehicles (MRAP), radio systems like the Blue Force Tracker (BFT), and new digitally interconnected systems are examples of such technological advancements. Yet all of them come at the cost of increased signatures. Signatures are considered a characteristic or indicator

that makes a unit identifiable or distinguishable from the rest of the environment. Signatures are broken up into physical, technical, and administrative categories based on their characteristics.² Physical signatures are those that can be picked up through direct observations, while technical signatures are those that can be collected by adversary signals intelligence (SIGINT) assets. They can include but are not limited to radio-frequency (RF) emissions from communications, radar emissions, and other signals. Administrative signatures are made by units when conducting planning or other managerial actions. Some examples can include planning documents, logistics orders, and supply requests.³

History is replete with examples of a military force managing or manipulating their signature to fool an enemy and gain a tactical advantage. For example, during the Siege of Detroit in 1812, the British commander, Major General Isaac Brock, used an artificially inflated signature to force a surrender. He ordered his men to light additional campfires, portrayed the same unit as multiple different regiments, and drafted false orders for units that did not exist. These tactics influenced American General William Hull to surrender with a minimal struggle.⁴ Another example of a more modern SIGMAN operations is the Allies' use of deception regarding the Normandy invasion. "Fake units, choreographed communications, radar manipulation and scripted HUMINT reporting all served to create, at least within Abwehr (the German General Staff military secret intelligence and counterespionage service) reporting channels and Hitler's mind, a strong and ready Allied force"⁵ where there were no actual forces. These operations exemplify the idea that signature management has been employed in all manner of conflicts ranging up to modern times, even if never named as such.

As technology improves, military signatures become more expansive and easier to detect. This is due to two major factors: the “size” of Marine Corps’ signatures and the ability of the enemy to “see” them. The Marine Corps has seen moderate growth in administrative and physical signature, while growing exponentially in technical signature footprint. For instance, the amount of equipment and size of vehicles continues to increase. The Marine Corps Combat Operations Center (COC) capability sets (CAPSETs) is what battalion and above headquarters use to operate. The smallest increment, CAPSET IV, consists of a minimum of two tents (12’x20’ each), generators, servers, and accessories.⁶ The COC should be moved often to avoid being targeted, as it creates an easily identifiable physical signature. However, the bigger and more complex the Marine Corps creates these CAPSETs, the less mobile they become. As these CAPSETs become more capable, more supporting equipment is needed, i.e. antennas, generators, and electronics. The Marine Corps’ Command Posts are larger, easier to identify, and harder to move.

All militaries must adapt and embrace technological change in order to meet current and future challenges. For the Marine Corps in the 21st Century, that means digital communication, among other things. On one hand, communication and information exchange up and down the chain of command is unparalleled, allowing for a better understanding of the mission and a more effective fighting force. On the other hand, every unit has a much higher technological signature, especially when focusing on the electromagnetic spectrum (EMS). An example of this increase in radio proliferation is the number of radios carried in a rifle platoon. A platoon commander was initially tasked with carrying and maintaining one or two different

radios. Now, with the increase of waveforms and types of communication expected, a platoon can be equipped with upwards of ten radios.⁷

Potential adversaries have also embraced technological change and have greatly increased their ability to identify US signatures, especially those of ground forces. For example, Russia has embraced the use of Unmanned Aerial Vehicles (UAVs) to employ a variety of sensors to pick up signatures on the battlefield. This tactic was seen used effectively in Ukraine as recently as 2015. According to General David Perkins, head of the Army's Training and Doctrine Command, "the Ukrainians have learned, the hard way, that when they see certain kinds of Russian UAV overhead, an all-out barrage will follow...when they see certain type UAVs, they know in the next 10-15 minutes, there're going to be rockets landing on top of them".⁸ In one incident Russian forces were able to identify two Ukrainian mechanized battalions and destroy those units in under five minutes with artillery strikes using thermobaric munitions.⁹ These identification capabilities, while impressive, are not limited to near-peer adversaries, or even to state actors. The DJI Phantom Drone family is one of the most prevalent enemy drone systems encountered by US forces. The newest variant, Phantom 4, can fly approximately fifty miles per hour, shoot video in 4K high definition, and has a range of approximately five miles. This UAV is comparable or better than all small UAVs in the DoD inventory and can be purchased for \$800 on Amazon.¹⁰ One can imagine how easy it would be for any enemy to build a solid picture of US force laydown based on the signature US forces emit.

USMC Signature Management Plan

The Signature Management Concept states that the Marine Corps is currently not organized, trained, and equipped to meet the demands of a future operating environment characterized by complex terrain, technology proliferation, information warfare, the need to shield and exploit signatures, and an increasingly non-permissive maritime domain.¹¹ Recent efforts, driven by the Marine Corps Operating Concept and Future Force 2025 personnel and equipment overhaul, have begun to identify and address manpower and equipment shortfalls. However, these changes only begin to scratch the surface at a much larger need for capabilities.

Future Force 2025, an OPT convened in 2016 at the behest of the Commandant, had the stated goal of realigning the Table of Organization (T/O) and Table of Equipment (T/E), to ensure the Marine Corps was positioned best to fight in the future environment pictured in the MOC. This OPT realized the importance of Signature Management and attempted to resource this capability area as such. The below table is pulled from the most recent Authorized Strength Report (ASR) and shows the new personnel added to support SIGMAN.¹² The additional personnel structure was created to be centrally located at Quantico and pushed out to support the entire operating force as needed. The specific MOS codes are less important but are there to show a variety of different skill-sets are pulled into this unit.

Job Title	Rank	Grade	Primary MOS	Secondary MOS
COMPANY COMMANDER	MAJ	O4	0550	0
ELECTRONIC COUNTER-MEASURES SYSTEM TECHNICIAN	GYSGT	E7	2629	2629
PLT COMMANDER	CAPT	O3	0550	0
PLANNER	SSGT	E6	2629	2629
PLANNER	SSGT	E6	2629	2629
COMMUNICATIONS SPECIALIST	SSGT	E6	2611	2651
COMMUNICATIONS SPECIALIST	CPL	E4	2611	2651

COMMUNICATIONS SPECIALIST	LCPL	E3	2611	2651
SATELLITE TRANSMISSIONS SYSTEMS OPERATOR	SGT	E5	0627	0627
SENSORS CHIEF	SSGT	E6	0848	0848
RADAR OFFICER	SGT	E5	0842	0842
RADAR OPERATOR	SGT	E5	7252	7257
MODEL/SUPPORT DESIGN OFFICER	SSGT	E6	0521	0521
ELINT OPERATOR	LCPL	E3	2631	2631
RADAR OPERATOR	SGT	E5	0842	0842
RADAR OPERATOR	SGT	E5	7252	7257
PLT COMMANDER	CAPT	O3	0550	0
PLANNER	SSGT	E6	2629	2629
PLANNER	SSGT	E6	2629	2629
COMMUNICATIONS SPECIALIST	SSGT	E6	2611	2651
COMMUNICATIONS SPECIALIST	CPL	E4	2611	2651
COMMUNICATIONS SPECIALIST	LCPL	E3	2611	2651
SATELLITE TRANSMISSIONS SYSTEMS OPERATOR	SGT	E5	0627	0627
SENSORS CHIEF	SSGT	E6	0848	0848
RADAR OFFICER	SGT	E5	0842	0842
RADAR OPERATOR	SGT	E5	7252	7257
MODEL/SUPPORT DESIGN OFFICER	SSGT	E6	0521	0521
ELINT OPERATOR	LCPL	E3	2631	2631
RADAR OPERATOR	SGT	E5	0842	0842
RADAR OPERATOR	SGT	E5	7252	7257

Thirty Marines of various ranks were all that was added to the Marine Corps. The stated purpose of these new billets is to provide the personnel to help alter the physical and technical signature of various Marine Expeditionary Force (MEF) units in order to deceive the enemy. The SIGMAN unit consists of Marines from many different military occupation specialties (MOS). The idea is to pull subject matter experts (SME) from each part of the Marine Air Ground Task Force (MAGTF) to be able to fully understand and modify the signature of the MAGTF as a whole.

There are a few issues with this T/O. First, these billets have oddly-chosen and often lacking secondary or billet MOS listed. Without a specific assigned SIGMAN billet MOS, there is no additional training required for any of the Marines assigned to this unit. While these SMEs have a great deal of information and knowledge about their specific field, all knowledge about SIGMAN would have to come via on-the-job training. There is currently no formal signature management training anywhere in the Department of Defense, although aspects of this concept can be found in many different training venues. While many different courses might cover portions of SIGMAN, there is not one place that can train and certify a SIGMAN planner. A comparable example of what should exist is the Information Operations planning MOS, 0510. Marines get introduced to IO topics at multiple schools and training venues, but a 10-day course is needed to certify a Marine as an IO planner.

Just as important as training for the SIGMAN operators, there also needs to be a mechanism for training commanders and leaders on the fundamentals of managing signatures. While the basics of managing signatures has stayed the same, new technologies and techniques are changing rapidly. In a speech to Marine Corps Command and Staff College on February 21, 2018, Brigadier General Dimitri Henry, the Director of Marine Corps Intelligence, stated, “The game is changing. Leaders will have to get used to being seen and targeted. We must find new ways to fight in order to combat this change”.¹³ (During a follow-up interview General Henry added that he believes that it is the role of the intelligence field to lead the endeavor to become “untargetable”).

Many senior leaders have never been exposed to the intricacies and details of this a sophisticated fight over signatures. With technology ever-changing, it is understandable how

leaders could miss some of the importance of this area. A quick training period for senior leaders would reiterate the importance of SIGMAN and allow commanders to fully utilize the available capabilities. This topic would be best introduced at Top-Level Schools or New Commanders' courses.

There is a saying attributed to a wide variety of Russian leaders stating that "Quantity has a quality of its own." In the case of the SIGMAN T/O, a lack of quantity most certainly hinders the quality of signature management that could be provided to any organization. Thirty personnel, housed at Quantico and spread around to each MEF's for deployments, leaves ten people to support each MEF. Accounting for unavoidable manpower shortfalls such as Permanent Change of Station (PCS), formal schooling, and deployment cycle, each MEF would be lucky to have 3-5 people available to conduct signature management at any given time.

The T/O also leaves much to be desired when examining the rank structure for signature management. With a preponderance of young non-commissioned officers (NCOs), there could be significant issues with interacting with higher staff, as well as a lack of experience. Some of the more technical MOSs listed on the T/O take many years to truly gain proficiency. A young NCO will still be learning the nuances of his or her respective job. Not only will this hamper the SIGMAN mission, it will deny that NCO an opportunity to learn more of their primary MOS. An example of a better model is some of the cyberspace MOSs. These billets mostly take career Signal Intelligence Marines of a rank of Staff Sergeant or higher. The personnel are senior enough to have a solid grasp of their MOS and the planning process.

Currently, the Marine Corps has no dedicated SIGMAN equipment anywhere in the inventory. While there is existing gear designed to reduce signature (camouflage netting, uniforms, special paint, etc.), there is no equipment to identify, manage, and falsely project a unit's signature. Any attempts to do so is done ad hoc or by using gear for unintended purposes. During the Marine Corps' Fiscal Year (FY) 2019 Program Objective Memorandum (POM) budget submission, SIGMAN was finally put forward as an area worthy of resourcing. Marine Corps Combat Development Command (MCCDC) began resourcing this capability to meet the future demands of the MOC, and to fill two gaps in the list of required capabilities for the Marine Corps.

It was a welcome change to finally see SIGMAN included in the critical tasks the Marine Corps needs to be able to accomplish in order to meet assigned missions. However, even with the high level of importance spoken to in the most recent budget documents, the planned T/E still has major shortfalls. Most importantly, the whole DoD is had been operating under a continuing resolution, vice an approved and appropriated budget. Unfortunately, that meant that no new programs could be started, even if that program is approved and funded. Thus, the SIGMAN equipment cannot be researched, purchased, or maintained until a final DoD budget is approved and funding works its way down to the Services.

Once the budgeting issue is completely worked out, there will still be many other hurdles to overcome. The biggest issue is that the acquisition process is cumbersome and untimely. While the process contains an understandable amount of oversight and quality assurance, it does not help get capabilities to the warfighter when needed. For example, if the

SIGMAN equipment was to receive funding on the FY '19 budget, the timeline would look like the following:

- Program Office (buyers of equipment) stands up 1 Oct 2018.
- Research and Development 1 Nov 2018 – 1 Oct 2019.
- Testing and Evaluating 1 Oct 2019- March 2020.
- Initial Production 1 Oct 2020. Initial Operating Capability FY '21.

Even with the most aggressive timeline, assuming nothing goes wrong, Marines would likely begin seeing the gear in FY 2021. With a best-case scenario, there is a three-year gap between identified need of a capability and receipt of equipment. Even though this is typical of the normal procurement cycle, there still is an unacceptable risk to force and mission. This risk can be mitigated through the use of quick-turn procurement programs, such as deliberate and urgent universal need requests.

The Marine Corps budgeted \$36.98 million for the development and purchasing of SIGMAN gear from FY19-23.¹⁴ This is a substantial amount of money, especially considering specific, dedicated SIGMAN equipment has never before been purchased by the Marine Corps. While the Marine Corps has clearly purchased camouflage netting, patterned utilities, and other items, there has never been one specific, dedicated program or equipment aimed at giving the commander tools for signature management. The SIGMAN equipment will provide the commander with the ability to understand own-force signatures and indicators; identify adversary methods to collect, process, and analyze those signatures; develop countermeasures

to mask signatures; and project false signatures when necessary.¹⁵ However, this level of funding only provides enough equipment for one Marine Expeditionary Brigade (MEB). The Marine Corps will be forced to prioritize one unit or theater of operation to receive this capability, leaving a gap across the rest of the operating forces. The current equipment distribution plan requires the gear to be held at Quantico and deployed forward from there. 3rd MEB is intended to be the priority user for this gear, with all other MAGTFs having a lower priority. There are solid reasons for only purchasing one MEB's worth of equipment, to include cost and complexity of the equipment, and the rapidly changing operating environment. But that does leave a great deal of risk when accepting a shortfall in a known, needed capability. The exact specifics on capabilities of the gearset are classified, but it focuses on creating false decoys for air and ground units, creating a false emitter suite, and purchasing technology to visualize and manage signatures in the environment.

Potential Solutions

Many potential solutions exist to solve or alleviate the Marine Corps' issues with signature management. This paper will look at some T/O and T/E modifications, as well as training and doctrine models that can enhance existing capabilities. Additionally, a vignette will be introduced to depict how signatures could be managed in the near future.

Manpower

The Table of Organization is not optimized for maximum efficiency. The Marine Corps is continually short on manpower, and it is unreasonable to expect to create entire new units of Marines with the sole purpose of executing signature management operations. The cost against

total Marine Corps end state manpower would be too great. When examined during the Force 2025 T/O reorganization, it was determined that it would take between 200 and 300 total Marines across the Corps to make this happen. With training and execution cycles, each MEF would need a company of roughly 100-120 Marines to have dedicated SIGMAN Marines to conduct SIGMAN operations, at a minimum. The working group at Future Force 2025 decided to cut the numbers to 30 people, but still expect these Marines to be able to plan and execute operations. It was decided that it would be impossible to create 200 new billets, but feasible to add 30 as a starting point. A more reasonable T/O should focus on the planning aspect of SIGMAN, instead of the execution. See the table below for a notional example.

Job Title	Rank	Grade	Primary MOS	Secondary MOS
DETACHMENT COMMANDER	MAJ	O4	0550	0202
SENIOR PLANNER	CAPT	O3	0550	0602
ENLISTED ADVISOR	MSGT	E8	0551	0689
INTELLIGENCE SPECIALIST	SSGT	E6	2629	2629
INTELLIGENCE SPECIALIST	SSGT	E6	0231	0231
COMMUNICATIONS SPECIALIST	SSGT	E6	0621	0621
COMMUNICATIONS SPECIALIST	SSGT	E6	0621	0621
INFORMATION OPERATIONS SPECIALIST	SGT	E5	0551	0000
INFORMATION OPERATIONS SPECIALIST	SGT	E5	0551	0000
MILITARY DECEPTION SPECIALIST	SSGT	E6	0521	0551

Each MEF would get the above personnel. This T/O would still allow for all three MEFs to maintain a planning and coordination element with the Headquarters element, while deploying one or two Marines as needed for SME support to units as needed. This T/O assumes no additional personnel could be added to the SIGMAN efforts, but instead focuses efforts on planning. The MOS breakdown needs to focus more on intelligence, information operations,

and operations. The Marines need to be slightly higher in rank, since they will be planners, interacting with a much higher level of staff, with the Major serving as the liaison to MEF. With the assigned personnel as planners and coordinators, the actual execution would fall on existing MAGTF units. That is actually more ideal, since the MAGTF units will already have the right technical knowledge to actually execute the plan, when directed. However, this leads to another issue that needs to be resolved: a lack of formal training pipeline.

Training

There is currently no MOS tied to signature management. The Marine Corps would be assigning personnel based on prior MOS, vice training or experience. Currently, the closest training for a signature management trainer is the Information Operations training. The Marine Corps would need to establish formal training or education to ensure that the SIGMAN mission could be met. There are many ways to accomplish this goal, but three very methods are listed below, ranked in order of suitability

1. Expeditionary Training Group Atlantic (EWTGLANT), based out of Virginia Beach, currently is the only place to train intermediate and advanced information operations.¹⁶ SIGMAN can be considered a subset, or capability tied to information operations. This schoolhouse could easily establish a training curriculum and apply for Training and Education Command to create a new, free MOS (open to any personnel to gain) for SIGMAN planners. The course would need to be no more than 10 training days, and include aspects of military deception, operational security, and counter-intelligence. The new T/O should list this course as a necessary MOS. Any Marine can be assigned to this

billet and will receive the training needed to plan for SIGMAN. This course length and subject matter is based on an analysis of existing courses such as the Intermediate MAGTF Information Operations Course, Cyberspace Operations Planner's Course, and Joint Electronic Warfare Theater Operations Course.

2. Currently, there are existing joint courses that teach some of the necessary skills for a SIGMAN planner. A Marine could attend an amalgamation of different courses to gain the expertise desired. Some courses that would be beneficial include Defensive Operational Security Course, Joint Military Deception Course, and any of the multitude of Information Operations planning courses offered throughout the DoD. While the Marine attending training will get a robust set of skills, the process of going to this number courses is expensive and time-consuming. Other, less optimal options include mobile training teams (difficult to establish) and online training (significantly less effective). Also, each planner could have received very different training pipelines, hurting any attempt at standardization across the MEFs.
3. The Marine Corps Information Operation Center (MCIOC) is the center of excellence for all things IO-related. This organization acts as the advocate for all related topics, to include SIGMAN. MCIOC puts on a tri-annual exercise known as the Combined Unit Exercise (CUX). The CUX pulls in practitioners from all over the Marine Corps to participate in an incredibly detailed planning exercise focused on information operations.¹⁷ MCIOC could add in a signature management module to this training module, aimed at those SIGMAN billets throughout the Marine Corps. This will provide on-the-job, hands-on training using modern and real-world situations. While the CUX

would provide training that is both timely and easy to access, this course of action is more ad-hoc and informal and has no way of ensuring the SIGMAN planners are trained or even attend the course.

Equipment

The Marine Corps will continually struggle with identifying, purchasing, and fielding signature management equipment in a timely manner. As the world becomes more technologically advanced, signatures become more complex and effusive in an ever-increasing manner. Unfortunately, the acquisition cycle for the DoD has not gotten any faster or more efficient. It would be too costly and difficult to have an ever-changing suite of gear that perfectly combats existing signatures. However, there is a great deal of improvement to be made, with a reasonable cost to the service. While much of the equipment needed or purchased has classified aspects, broad generalities or enhancements can and should be discussed.

The Marine Corp's two biggest physical signatures are vehicles and command posts. It is impossible and unwise to completely eliminate such massive characteristics. In an article on the importance of camouflage and signature management, Henry Atkinson expands on the reason why, stating "For example, the reduced radar signature of a tank in vegetative terrain blends in with its surrounding background radar return, while to completely eliminate the tank's signature (if it was possible) would leave sort of a 'black hole' that could well be no less conspicuous to a skilled radar operator than the full unimpeded radar signature of the

vehicle.”¹⁸ Individual units can take steps to mitigate these signatures with cheap, effective solutions.

To best mitigate vehicle signature footprints, the Polish Armed Forces have come up with two different viable options. The first, and more expensive idea, is to cover the entire vehicle with electrochromic windows of approximately 1cm². The vehicle would also have a digital camera, sampling the background environment in real-time. A computer would direct an electrical charge to the window, modifying the color of the window to match the surrounding environment. While this technology exists and is effective, it would be prohibitively expensive to retrofit the existing DoD inventory of vehicles. This innovative capability would have to be phased in to future vehicles, if desired. However, the other Polish camouflage endeavor is much more reasonable and fitting for the Marine Corps. Poland developed thermochromic paint that changes color based on temperature. The possibilities for color and temperature combination to improve camouflage and reduce signatures is endless. One good example is using a construction of layers to make a vehicle light green during the daylight, but when the temperature drops at night, the paint color would become darker, better suited for the environment¹⁹.

Another place the Marine Corps needs to look for gaining efficiencies in SIGMAN equipment is the joint arena. Much of the Marine Corps' equipment is either common, or very similar to other services. The Marine Corps only stood up a program office to identify and purchase gear for SIGMAN in 2016.²⁰ There has been no agency or entity to research, understand, and leverage existing research and development throughout the DoD. Since research and development tends to be the most expensive aspect of signature management

equipment production, the Marine Corps should be able to purchase effective equipment for a reasonable price. MCIOC has been attempting to conduct some of this coordination ad-hoc, but the results have been less than effective. The solution to this problem is to create a working group with the following members at a minimum: the capability developer (Marine Corps Capability Development Command), the purchaser (Marine Corps System Command), the SME (MCIOC), and the budget personnel (Marine Corps Programs and Resources Department).

The Marine Corps must also look to the civilian markets for purchasing equipment to identify and manage signatures. Again, since research and development are the highest costs, by pushing these expenses to non-DoD sources the Marine Corps can save money and get equipment faster. A perfect example of this gain in efficiency is purchasing spectrum analyzers. This piece of equipment is used to identify friendly radio emissions, by type and frequency. The version the Marine Corps most recently attempted to purchase four years ago costed approximately \$10,000.²¹ A simple search on the internet found results for similar capabilities for below \$400.²² Obviously, the cost would go up slightly to ensure the gear meets military specifications, but money and time can still be saved. The service should use the Marine Corps Warfighting Laboratory to identify and test available technologies for use in the operating forces.

This leads into the next recommendation: purchasing small-run, test gear. When the Warfighting Laboratory identifies gear worth investing in, small batches of the equipment should be purchased. Low quantity allows for rapid procurement, using non-standard acquisitions channels. A model to be used is the Marine Corps Tactical Exploitation of National Capabilities program.²³ Part of TENCAP's mission statement is to "conduct rapid prototyping

and technology insertion and develop new intelligence product lines in order to integrate current and emerging national systems data into the tactical decision-making process”.²⁴ This process is exactly what the Marine Corps needs for SIGMAN, but currently does not exist.

Techniques to mitigate

The Marine Corps will always struggle with managing signatures. A CoC for example, will always be an essential part of any exercise, and is too large to go unnoticed. However, Marines can and should be aware of ways to mitigate their presence on the battlefield. At the end of the day, Signature Management is not just an end item of hardware or software – it is a process that leads to information/intelligence gain and drives solutions to sensor threats. There are a few cost-effective ways to improve the process.

First, existing best practices must be captured, analyzed, and distributed in the form of a doctrinal publication. Currently, the organization most capable of accomplishing this task is MCIOC. They should work with MCCDC to publish the various levels of doctrine needed to inform the operating forces on how to conduct signature management, including tactics, techniques, and procedures (TTPs), and higher-level planning and coordination.

Second, once established, the guidance and principles established by doctrine must be taught and evaluated throughout the operating forces. MAGTF Staff Training Program (MSTP) is tasked to “provide training in MAGTF operations across the range of military operations, within the context of a Joint and/or Combined Task Force environment, to improve the warfighting skills of senior commanders and their staffs”.²⁵ This organization is perfectly postured to both

train and evaluate the appropriate level of staffs to improve SIGMAN throughout the Marine Corps.

Lastly, units must be able to track and report SIGMAN readiness. Luckily, the Marine Corps has an efficient system in place for this exact requirement. MAGTF units must add a signature management related mission essential task to their list of tasks they must accomplish. Along with this essential task comes requisite training and readiness standards. All of these can be rolled up and viewed in existing training and readiness systems (DRRS, MCTIMS, etc.). This task is the easiest to accomplish but cannot be completed until the first two are in progress.

Operational Vignette

Operational Vignettes are required to help drive future development within the Marine Corps. As concepts are completed, vignettes and experiments aid both the warfighter and the supporting establishment more forward with new ideas. Let's examine an operational vignette of a MAGTF unit, using proper signature management techniques. The MAGTF, conducting offensive operations, will still create a large footprint no matter where it goes. When facing a near-peer adversary like Russia, the enemy will have the ability to bring a great deal of sophisticated intelligence gathering capabilities and will attempt to use these tools to locate and destroy friendly forces. Imagining a MEF-sized unit in the attack, the following events would likely occur if the MEF was using proper SIGMAN techniques.

1. The SIGMAN planner, in coordination with the primary staff, would develop a plan for employment of decoys and deception, increasing the amount of confusion provided to the enemy.
2. Enemy drones would actively seek out friendly positions, looking for vehicles and large groups of troops. SIGMAN planners would have expected this probing and taken advanced action to mitigate. Vehicles would be properly camouflaged, and infantry troops advised to continue to move and consistently change positions.
3. The MEF CoC would create a great deal of signatures, specifically electronic and physical. However, using the techniques provided by new doctrinal pubs, this signature would be managed. Some examples of these mitigation techniques include moving antennas away from the main CoC, mixing up the type and duration of communications used, and extensive use of both information operations and military deception plans.

The United States military cannot expect to operate unseen against a near-peer in the future. Eventually, with the spread of effective, cheap technology even asymmetric adversaries will be able to accurately map our intentions and actions. The Marine Corps can use signatures to slow down the enemy decision-making process.

Conclusion

As the Marine Corps drives forward into the 21st Century, technology will continue to play a bigger and bigger role in warfare. The entire DoD continues to get more equipment, each piece larger and more complex than the last. As the operational environment becomes

more congested with all different types of signatures and indicators. While the Marine Corps has taken the first, and most important step in improving signature management, there still remains an arduous task ahead to get to a level of competency that mitigates risk in the future. The Marine Corps must improve equipment procurement, manning, and training to meet the upcoming demands of combat in the future.

Notes

- ¹ USMC, *The Marine Corps Operating Concept: How an Expeditionary Force Operates in the 21st Century* (Washington DC, US Marine Corps, September 2016), 6.
- ² USMC, *The Marine Corps Concept for Signature Management*, (Washington DC, US Marine Corps, October 2017), 3.
- ³ *Ibid*, 5.
- ⁴ Anthony J. Yanik. *The Fall and Recapture of Detroit in the War of 1812: In Defense of William Hull*. Great Lakes Books Series. Detroit: Wayne State University Press, 2011, 92.
- ⁵ *Civil War One*
- ⁶ US Marine Corps Concepts and Programs, "Combat Operations Center". Accessed 25 January 2018. <https://marinecorpsconceptsandprograms.com/programs/command-and-control-situational-awareness-c2sa/combat-operations-center-coc>.
- ⁷ Headquarters, Marine Corps, *Rifle Battalion Table of Equipment*. (Quantico, VA: United States Marine Corps, 2018) www.mccdc.usmc.gov
- ⁸ Sydney J. Freedberg Jr. "Russian Drone Threat: Army Seeks Ukraine Lessons". <https://breakingdefense.com/2015/10/russian-drone-threat-army-seeks-ukraine>.
- ⁹ *IBID*, 1
- ¹⁰ DJI. "Phantom 4 Pro: Visionary Intelligence, Elevated Imagination". <https://www.dji.com/phantom-4-pro?site=brandsite&from=nav>
- ¹¹ USMC, *The Marine Corps Concept for Signature Management*, (Washington DC, US Marine Corps, October 2017), 3.
- ¹² Headquarters, Marine Corps, *Authorized Strength Report*. (Quantico, VA: United States Marine Corps, 2018) www.mccdc.usmc.gov
- ¹³ Dimitri Henry, "Address to Command And Staff College" (speech, Marine Corps University, Quantico, VA, 21 February, 2018).
- ¹⁴ Steven Smith, *Signature Management POM Brief*, (Marine Corps Combat Development Command, Quantico VA, Nov 2016), PowerPoint presentation.
- ¹⁵ *Ibid*, 5
- ¹⁶ Expeditionary Warfare Training Group, "Course Information", Accessed 25 January 2018. <http://www.public.navy.mil/fltfor/ewtglant/Documents/index.htm>
- ¹⁷ Marine Corps Information Operations Center, "Combined Unit Exercise", Accessed 25 January 2018, <http://www.quantico.marines.mil/Tenants/Marine-Corps-Information-Operations-Center/>
- ¹⁸ Atkinson, Henry R. "Modern Camouflage Technologies and Signature Management." *Military Technology* 24, no. 9 (2000): 12.
- ¹⁹ Czulda, Robert. "Visual Signature Management Systems from Poland." *Military Technology* 39, no. 7/8 (Summer 2015): 45. International Security & Counter Terrorism Reference Center, EBSCOhost (accessed December 27, 2017).1

²⁰ Steven Smith, *Signature Management POM Brief*, (Marine Corps Combat Development Command, Quantico VA, Nov 2016), PowerPoint presentation.

²¹ III MEF, *Urgent Universal Needs Statement Request*, (Marine Corps Combat Development Command, Quantico VA, June 2012), PowerPoint presentation.

²² RF Explorer, "Handheld Spectrum Analyzer". Accessed 25 January 2018. <http://rfexplorer.com/models/>.

²³ HQMC Intelligence department website.

²⁴ *IBID*, 1

²⁵ MAGTF Staff Training Program, "Our Mission". Accessed 25 January 2018. <http://www.tecom.marines.mil/Units/Directorates/MSTP/>

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